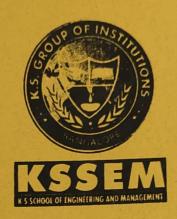
File No.:



### K.S. GROUP OF INSTITUTIONS K.S. SCHOOL OF ENGINEERING AND MANAGEMENT

#15, Mallasandra, Near Vajarahalli, Off. Kanakapura Road, Bengaluru - 560 109 Ph.: +91 80 28425163 / +91 88844 44408, website: www.kssem.edu.in

**COURSE FILE: 2023-2024** 

**Even Semester** 

Dr. ANITHA. R

**Assistant Professor** 

**Department of Applied Science** 

K S School of Engineering and Management, Bangalore-560109

CSE-A (EVEN SEM)





### RS SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE

### **COURSE FILE**

### BCHES202- CHEMISTRY FOR CSE STREAM

II SEM-2023-2024

### FACULTY IN CHARGE Dr. ANITHA, R

Assistant professor

Department of Applied Science





### K S SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE-

### DEPARTMENT OF APPLIED SCIENCE AND HUMANITIES

### CONTENTS

- 1. Front sheet (Cover page)
- 2. Vision and Mission of the Department.
- 3. Syllabus.
- 4. Calendar of Events.
- 5. Time Table (Individual).
- 6. Student list.
- 7. Lesson plan.
- 8. Question Bank.
- 9. CO-PO mapping.
- 10. Assignment (3 Assignment).
- 11. Internal Question paper and Scheme (Set-A & Set-B) (3 Internals).
- 12. Previous year University Question papers.
- 13. Course Materials.
  - -Notes/PPT/Lecture Videos/ Materials/other contents related to the subject.
- 14. Additional Teaching aid with proof (TPS/flip class/programming etc.) (IF ANY).
- 15. Slow learners and Advanced learners list (After the first Internals).
- 16. Assignments Marks (3 Assignments).
- 17. Internal Test Marks (3 Internals).
- 18. Internals Final Marks.



### K S SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE-560109

### DEPARTMENT OF APPLIED SCIENCE AND HUAMNITIES

### VISION

To impart quality education in engineering and management to meet technological, business and societal needs through holistic education and research.

### MISSION

- K.S. School of Engineering and Management shall,
- Establish state-of-art infrastructure to facilitate effective dissemination of technical and
- Provide comprehensive educational experience through a combination of curricular and experimental learning, strengthened by industry-institute interaction.
- Pursue social relevant and disseminate knowledge.
- Inculcate leadership skills and foster entrepreneurial spirit among students.

### DEPARTMENT OF APPLIED SCIENCE AND HUMANITIES

### VISION

To lay sound foundation in Applied Science and prepare the students to learn engineering better.

### MISSION

Department of Applied Science shall,

- Acquire abilities to evaluate problems using Mathematics.
- Provide a platform to keep abreast with current development in science.
- Imbibe communication skills and inculcate human values.

### Computer Science and Engineering and allied branches(Chemistry group)

Course Title: Course Code:	Applied Chemistry for Computer Science &Engineering stream						
And the second s	BCHES102/202	CIEMarks	50				
Course		SEEMarks	50				
Type(Theory/Practical/Integrated)	Integrated	Total Marks	100				
TeachingHours/Week(L:T:P:S)	2:2:2:0	Exam Hours	03				
TotalHoursofPedagogy Courseobjectives	40hoursTheory+ 10to12Labslots	Credits	04				

- To enable students to acquire knowledge on principles of chemistry for engineering applications.
- Todevelopanintuitiveunderstandingofchemistrybyemphasizingtherelatedbranchesofengineer
- To provide students with a solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in an alytical reasoning required to solve societal problem of the solid foundation in a solid foundation in all the solid foundation in a solid foundation in

### Teaching-LearningProcess

These are sample strategies, which teacher can use to accelerate the attainment of the various course outcoming the contract of the various course outcoming the contract of the various course outcoming the various couesandmakeTeaching-Learningmoreeffective

- Tutorial&remedialclassesforneedystudents(notregularT/R)
- ConductingMakeupclasses/Bridgecourses forneedystudents
- $\bullet \quad Demonstration of concepts either by building models or by industry visit$
- Experiments in laboratories shall be executed in blended mode (conventional or non-model) and the conventional or non-model (conventional or non-model) are non-model (conventional or non-model). The conventional or non-model (conventional or non-model) are non-model (conventional or non-model) and the conventional or non-model (conventional or non-model) are non-model (conventional or non-model). The conventional or non-model (conventional or non-model) are non-model (conventional or non-model) and the conventional or non-model (conventional or non-model) are non-model (conventional or non-model). The conventional or non-model (conventional or non-model) are non-model (conventional or non-model) and the conventional or non-model (conventional or non-model) are non-model (conventional or non-model) are non-model (conventional or non-model). The conventional or non-model (conventional or non-model) are non-model (conventional or non-model) are non-model (conventional or no-model) are no-model (conventional or no-model) are no-model (conventional or no-model) are no-model (conventional or no-model (cconventionalmethods)
- UseofICT-Onlinevideos,onlinecourses
- Use of online platforms for assignments/Notes/Quizzes (Ex. Google classroom)

### MODULE1:SensorsandEnergySystems(8hr)

Sensors: Introduction, working, principle and applications of Conductometric sensors, Electrochemical and the conductometric sensors and the conductometric sensors and the conductometric sensors. The conductometric sensors are considered as a conductometric sensor of the conductometric sensors and the conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors and the conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors and the conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors and the conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors and conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors and conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors and conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors. The conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors are conductometric sensors. The conductometric sensors are conductometrisensors, Thermometricsensors (Flame photometry)andOpticalsensors (colorimetry). Sensorsforthemeasurement of dissolved oxygen (DO). Electrochemical sensors for pharmaceuticals. Electrochemical gassens ors for SOx and NOx. Disposable sensors in the control of the controthe thedetection of biomolecules and pesticides.

 ${\bf Energy Systems:} Introduction to batteries, construction, working and applications of Lithium ion and Some of the construction of the constru$ diumion batteries. Quantum Dot Sensitized Solar Cells (QDSSC's)-Principle,Properties and Applications.

Self-learning: Types of electrochemical sensor, Gas sensor - O2 sensor, Biosensor -Glucosesensors.

### MODULE2:MaterialsforMemoryandDisplaySystems(8hr)

Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymerelectronicmemorydevices, Classificationofelectronicmemorydevices,

1.NOTE: Whereverthecontact hoursisnotsufficient, tutorial hourcan beconverted to theory hours

typesoforganicmemorydevices(organicmolecules.polymericmaterials,organic-inorganichybridmaterials)

DisplaySystems: Photoactive and electroactive materials, Nanomaterials and organic materials in optoelectronic desired. in optoelectronic devices. Liquid crystals (LC's) - Introduction, application in Liquid C. application in Liquid Crystal Displays (LCD's). Properties and application ofOrganic Light Emitting Diodes (QLED's), (OLED's)

Self-learning:Properties and functions of Silicon (Si), Germanium (Ge), Copper (Cu), Aluminium (Al) and the self-learning (Si), Germanium (Ge), Copper (Cu), Aluminium (Al) and the self-learning (Si), Germanium (Ge), Copper (Cu), Aluminium (Al) and the self-learning (Ge), Copper (Cu), Aluminium (Al) and the self-learning (Ge), Copper (Cu), Co

Aluminium(Al), and Brominated flameretardants in computers.

### MODULE3:CorrosionandElectrodeSystem(8hr)

CorrosionChemistry:Introduction, electrochemical theory of corrosion, types of corrosion differential materials and the control of the contro and differentialmetalanddifferentialaeration.Corrosioncontrol-galvanization,anodization sacrificial anode method. Corrosion Penetration Rate (CPR) - Introductionandnumerical problem. definition, construction, working and applications of glass electrode. Determination of pH using Introduction, calomel Reference electrodeworkingandapplicationsofcalomelelectrode.Concentrationcell-

Definition, construction and Numerical problems.

Analytical Techniques: Introduction, principle and instrumentation of Conductometry; itsapplication in the estimation of weak acid. Potentiometry; its application in the estimationofiron.

Seif-learning: IRandUV-Visiblespectroscopy.

### MODULE4:PolymersandGreenFuels(8hr)

Polymers:Introduction,Molecularweight-

Numberaverage, weightaverage and numerical problems. Preparation, properties, and commercial appl icationsofkevlar. Conductingpolymers-

synthesis and conducting mechanism of polyacetyleneand commercial applications.

Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages. Generation of energy (green hydrogen) by electrolysis of water and itsadvantages. Self-learning:Regenerativefuelcells

### MODULE5:E-WasteManagement(8hr)

E-Waste: Introduction, sources of e-waste, Composition, Characteristics, and Need of ewastemanagement. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste. Recycling Differentapproachesofrecycling(separation,thermaltreatments,hydrometallurgicalextraction,pyro Recovery: metallurgical methods, direct recycling). Extraction of gold from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, andstatutorybodies). Self-learning:Impactofheavymetalsonenvironmentandhumanhealth.

### PRACTICALMODULE

### A-Demonstration(anytwo)offline/virtual:

A1.ChemicalStructure drawingusingsoftware:ChemDraworACD/ChemSketch

A2. Determination of strength of an acid in Pb-acid batteryA3:SynthesisofIron-oxideNanoparticles

A4.Electrolysisofwater

### B-Exercise(compulsorilyany4tobeconducted);

B1.Conductometricestimationofacidmixture

B2.PotentiometricestimationofFASusingK2Cr2O2

B3.DeterminationofpKaofvinegarusingpHsensor(Glasselectrode)

B4. Determination of rate of corrosion of mildsteel by weight loss method B5.

EstimationoftotalhardnessofwaterbyEDTAmethod

### C-StructuredEnquiry (compulsorilyany4tobeconducted):

C1. Estimation of Copper present in electroplating effluent by optical sensor (colorimetry)C2.DeterminationofViscositycoefficientoflubricant(Ostwald'sviscometer)

C3. Estimation of iron in TMT bar by diphenyl amine/external indicator methodC4. Estimation of Sodium presentins oil/effluents ampleusing flame photometry

C5.DeterminationofChemicalOxygenDemand(COD)ofindustrialwastewatersample

### D-OpenEndedExperiments(anytwo):

D1:EvaluationofacidcontentinbeveragesbyusingpHsensorsandsimulation.D2.

Construction of photovoltaiccell.

D3. Designan experiment toldentify the presence of protein singiven sample.

D4.SearchingsuitablePDBfileandtargetformoleculardocking

### Courseoutcome(CourseSkillSet)

Atthe	endofthecourse thestudentwillbeableto:	
CO1.	andapplications	in scientific and engineering
CO2.		All the state of t
CO3.		eringapplications
CO4.	Applythebasicconceptsofchemistrytoexplainthechemica	alpropertiesandprocesses
	Analyzepropertiesandmultidi processes associated sciplinarysituations	withchemical substances in

### AssessmentDetails(bothCIEandSEE)

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50). The minimum passing mark for the SEE is 35% of the maximum marks (18 marks out of 50). A students hall be deemed to have satisfied the acade micrequirements and earned the credits all otted and the credit satisfied the acade micrequirements and earned the credits all otted and the credit satisfied the acade micrequirements and earned the credits all otted and the credit satisfied the acade micrequirements and earned the credit satisfied the credit satisfsubject/ course if the student secures not less than 35% (18 Marks out of 50) in thesemester-end examination (SEE), and a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

### ContinuousInternalEvaluation(CIE):

The CIE marks for the theory component of the IC shall be 30 marks and for the laboratory component 20 Marks.

### CIE for the theory component of the IC

- Three Tests each of 20 Marks; after the completion of the syllabus of 35-40%, 65-70%, and 90-100% respectively.
- Two Assignments/two quizzes/ seminars/one field survey and report presentation/one-course project totalling 20 marks.

Total Marks scored (test + assignments) out of 80 shall be scaled down to 30 marks

CIE for the practical component of the IC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be appeared. marks shall be awarded on the same day. The 15 marks are for conducting the experiment and preparation of the laborator. preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboration of the laborati evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write and the experiment report can be evaluated for 10 marks. all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 03 hours) at the end of the 15th week of the semester /after completion of all the experiment of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks.

Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory

component of IC/IPCC for 20 marks. The minimum marks to be secured in CIE to appear for SEE shall be 12 (40% of maximum marks) in the theory company. the theory component and 08 (40% of maximum marks) in the practical component. The laboratory component of the Lorgical co component of the IC/IPCC shall be for CIE only. However, in SEE, the questions from the laboratory component shall be included. The maximum of 05 questions is to be set from the practical component of IC/IPCC the component shall be included. of IC/IPCC, the total marks of all questions should not be more than 25 marks.

The theory component of the IC shall be for both CIE and SEE.

### Semester End Examination(SEE):

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the subject (duration 03 hours)

- The question paper shall be set for 100 marks. The medium of the question paper shall be English/Kannada). The duration of SEE is 03 hours.
- The question paper will have 10 questions. Two questions per module. Each question is set for 20 marks. The students have to answer 5 full questions, selecting one full question from each module. The student has to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.

There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 subquestions), should have a mix of topics under that module.

### SuggestedLearningResources:

### Books (Title of the Book/Name of the author/Name of the publisher/Edition and Year)

- WileyEngineeringChemistry,WileyIndiaPvt.Ltd.NewDelhi,2013-2ndEdition.
- 2. EngineeringChemistry,Satyaprakash&ManishaAgrawal,KhannaBookPublishing,Delhi
- 3. ATextBookofEngg.Chemistry,ShashiChawla,DhanpatRai&Co.(P)Ltd.
- 4. EssentialsofPhysicalChemistry,Bahl&Tuli,S.ChandPublishing
- AppliedChemistry,SunitaRattan,Kataria5.EngineeringChemistry,Baskar,Wiley
- 6. EngineeringChemistry-I,D.GrourKrishana,VikasPublishing
- 7. ATextbookofEngineeringChemistry,SSDara&Dr.SSUmare,SChand&CompanyLtd.,12thEdition,2011.
- 8. ATextBookofEngineeringChemistry,R.V.GadagandNityanandaShetty,I.K.InternationalPublishinghous
- TextBookofPolymerScience,F.W.Billmeyer,JohnWiley&Sons,4thEdition,1999.
- 10. NanotechnologyAChemicalApproachtoNanomaterials,G.A.Ozin&A.C.Arsenault,RSCPublishing,2005
- 11. CorrosionEngineering, M.G.Fontana, N.D.Greene, McGrawHillPublications, NewYork, 3rd Edition, 1996.

- 12. Linden's Handbook of Batteries, Kirby W. Beard, Fifth Edition, McGraw Hill, 2019.
- 13. OLEDDisplayFundamentalsandApplications,TakatoshiTsujimura,Wiley-Blackwell,2012
- 14. Supercapacitors: Materials, Systems, and Applications, MaxLu, Francois Beguin, Elzbieta Frackowiak, Wile y-VCH;1stedition,2013.
- 15. "HandbookonElectroplatingwithManufactureofElectrochemicals",ASIAPACIFICBUSINESSPRESS Inc., 2017, Dr.H. Panda,
- 16. Expandingthe Vision of Sensor Materials. National Research Council 1995, Washington, DC: The National Ac ademies Press. doi:10.17226/4782.
- 17. EngineeringChemistry,EditedbyDr.MaheshBandDr.RoopashreeB,SunstarPublisher,Bengaluru.ISBN97 8-93-85155-70-3, 2022
- 18. HighPerformanceMetallicMaterialsforCostSensitiveApplications,F.H.Froes,etal.JohnWiley&Sons,
- 19. InstrumentalMethodsofAnalysis,Dr.K.R.MahadikandDr.L.Sathiyanarayanan,NiraliPrakashan,2020
- $20.\ Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Central Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Contral Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch Seventh Edition, Contral Analysis, Douglas A. Skoog, Contral Analysis, Douglas A. Sko$ ngageLearning, 2020
- 21. PolymerScience, VRGowariker, NVV iswanathan, Jayadev, Sreedhar, NewageInt. Publishers, 4th Edition,
- 22. EngineeringChemistry,PCJain&MonicaJain,DhanpatRaiPublication,2015-16<sup>th</sup>Edition.
- 23. Nanostructuredmaterialsandnanotechnology, Hari Singh, Nalwa, academicpress, 1st Edition, 2002.
- 24. NanotechnologyPrinciplesandPractices,SulabhaKKulkarni,CapitalPublishingCompany,3<sup>rd</sup>Edition2014
- 25. Principlesofnanotechnology, Phanikumar, Scitechpublications, 2<sup>nd</sup> Edition, 2010.
- $26. \ \ Chemistry for Engineering Students, B.S. Jai Prakash, R. Venugopal, Sivakumaraiah \& Pushpa Iyengar., Subaraiah \& Pushpa Iyengar.$ shPublications,5thEdition, 2014
- $27. \ \ ``Engineering Chemistry'', O.G. Palanna, Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint, 2000. The property of the p$
- 29. LaboratoryManualEngg.Chemistry,AnupmaRajput,DhanpatRai&Co.

### Weblinksand Video Lectures (e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X-<u>9IbHrDMjHWWh</u>
- https://www.youtube.com/watch?v=j5HmI6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

### Visvesvaraya Technological University, Belagavi.

### A blow-up of the syllabus for Chemistry for

### Computer Science and Engineering and allied branches (CSE/ISE and BT) (Chemistry group)

	(overlinstry group)	
SI	No MODULE 1: Sensors and Energy Systems (8hr)	
		Duration
1.	Sensors: Introduction - Definition and terminologies of Transducer Actuators and Sensors. Working principle and any four applications of Electrochemical sensors,	1 hr
2.	(conductometry), and Optical sensors (colorimetry)	1 hr
3.	With brief introduction to different sensors, explain the principle, experimental procedure with electrode reactions	1 hr
4.	hydrocarbons; example-1-hydroxypyrene (explain with electrochemical oxidation reactions)	1 hr
5.	Electrochemical gas sensors for SOx and NOx; Working principle with electrode reactions	1 hr
6.	Disposable sensors (DS); Definition, advantages of DS over Classical sensors. Detection of biomolecules; Example-Ascorbic acid (AA) explain with Oxidation of AA to Dehydroascorbic acid, Pesticides; example-Glyphosate (explain with electrochemical oxidation)	1 hr
7.	Energy Systems: Introduction to batteries, construction, working and applications of Lithium-ion and Sodium-ion batteries	1 hr
3.	Quantum Dot Sensitized Solar Cells (QDSSC's)- Principle, Properties and Applications (any four).	1 hr
	MODULE 2: Materials for Memory and Display Systems (8hr	)
	Memory Devices: Introduction, Basic concepts of electronic memory, History of organic/polymer electronic memory devices,	1 hr
	Classification of electronic memory devices (Transistor-Type, Capacitor-Type, Resistor-Type and Charge transfer type Electronic Memory devices),	1 hr
	types of organic memory devices; Organic molecules (p-type semiconductor – ex., Pentacene; n-type ex., Perfluoropentacene used as memory materials)	1hr
	types of organic memory devices; polymeric material (Polyimide as an example with Donor-Triphenylamine; Acceptor-phthalimide)	1hr
	Display Systems: Photoactive and electroactive materials - Definition and principle for photoactive and electroactive. Optoelectronic devices: Definition, working principle.	1hr

_		
	Nanomaterials (Silicon Nanocrystals) and organic materials [Light absorbing materials - Polythiophenes (P3HT), Light emitting materials - Poly[9-vinylcarbazole] (PVK)] Explain any four properties why they are used in optoelectronic devices.	1hr \[ \] 8.
7	Liquid crystals (LC's) - Introduction, classification properties and application in Liquid Crystal Displays (LCD's)	1hr
8	Organic Light Emitting Diodes (OLED's) and Quantum Light Emitting Diodes (QLED's) – Mention any four Properties and applications.	1hr 2.
-	MODULE 3: Corrosion and Electrode System (8hr)	\3
1.	Corrosion Chemistry: Introduction (ill effects, global losses), electrochemical theory of corrosion (principle, reactions under different conditions and diagram taking iron as an example)	1hr
2.	Types of corrosion: Differential metal - Definition, Principle, Process and application), Differential aeration - (Water line) - principle and explanation,	1hr
3.	Corrosion control – Introduction (Definition, Principle and application) galvanization, Anodization and sacrificial anode method (explain with	1hr
4.	neat diagrams and reactions wherever applicable)  Corrosion Penetration Rate (CPR)- Introduction - (Definition, formula and importance), Numerical problems	1hr
5.	Electrode System: Introduction, types of electrodes; Ion selective electrode – definition, construction, working and applications of the glass electrode.	1hr
j.	Determination of pH using glass electrode, Reference electrode: Introduction - (Definition and role of reference electrode); Calomel electrode - Construction, working and applications of calomel electrode	1hr
	Concentration cell – Definition, construction, working and Numerical problems.	1hr
	Analytical Techniques: Introduction, principle, and instrumentation of Conductometry; its application in the estimation of a weak acid. Potentiometry; its application in the estimation of iron.	1hr
	MODULE 4: Polymers and Green Fuels (8hr)	
	Polymers: Introduction, Molecular weight - Number average, weight average and numerical problems.	1hr
	Conducting polymers – Synthesis and conducting mechanism of polyacetylene and commercial applications	1hr
	Preparation, properties, and commercial applications of graphene oxide.	1hr
	Green Fuels: Introduction to different types of fuels, past and future perspective of green fuels.	1hr
	construction and working of solar photovoltaic cell, advantages, and disadvantages	1hm
	Green hydrogen: Introduction to properties of hydrogen pertaining to fuel. Introduction to electrolysis of water.	4.1
	Generation of hydrogen by electrolysis of water: Alkaline water electrolysis (Explain the electrolysis of water with diagram and electrode reactions) and mention any 4 advantages	1hr

7.

	Electrolysis of water - Proton Exchange Membrane Electrolysis (Explain						
8.	the electrolysis of water with diagram and electrode reactions) and						
0.	mention any 4 advantages						
	MODULE 5: E-Waste Management (8hr)						
	E-Waste: Introduction, sources of e-waste, Composition and	1hr					
1.	Characteristics,	11-					
	Need for e-waste management concerning global perspective	1hr					
2	Toxic materials used in manufacturing electronic and electrical	1hr					
3.	are ducts; health hazards due to exposure to e-waste.						
	Recycling and Recovery: Different approaches of recycling (separation,	1hr					
4.	al treatments)						
	hydrometallurgical extraction, pyrometallurgical methods and direct	1hr					
5.							
	recycling.  Extraction of gold from e-waste (Explain the Principle and experimental	1hr					
6.	procedure)	16=					
	- 1 Cataloghalders in the environmental management of c	1hr					
7.	are called stakeholders – a local and global perspective	1hr					
	Role of stakeholders - a local and global perspect.  Role of stakeholders - producers, consumers, recyclers, and statutory	1111					
8.	bodies.						
	boules.						



### K. S. SCHOOL OF ENGINEERING AND MANAGEMENT BENGALURU-560109

11 EVEN SEMESTER (2013-2014)

Wee No.	K			868	STON	R TO JUN	and the last of th	T	Activities
	Month	Mon	-	Da		Fri	Sat	Days	6. Commencement of II sem
1	MAR	Mon	Tue	Wed 6*	Thu <sub>7</sub>	3311	9 TA	3	8- Maha Shivratri 9- Tuesday Time Table
2	MAR	11	12	13	14	15	46 DH	5	
3	MAR	18	19	20	21	22	23	6	23 - Friday Time Table 29- Good Friday
4	MAR	25	26	27	28	29 11 5	30	5	30 - Monday Time Table
5	APR	1	2	3	4	5 TA	6 DH	5	9 - Ugadi
6	APR	8	9 П	10	1111	12	13ASD	4	11 - Kutub A Ramzan 13-Tuesday Time Table
	APR	15	16	17	18	19	20 DH	5	27- Wednesday Time Table
8	APR	22T1	23T1	24T1	25* FFBI	26	27	6	T1- 22,23 & 24- 1st Internal test
9	APR/MAY	29	30	1 H	2	3	4 DH	4	1- May Day
10	MAY	6	7	8	9	10 H	11	5	10 - Basava Jayanthi 11- Friday Time Table
1	MAY	13	14	15	16	17ASD	18DH	5	
2	MAY	20	21	22	23	24	25	6	25-Monday Time Table
3	MAY/	27BV	28	2912	30Т2	31*FFB-II	'IDII	5	T2- 29,30-2nd Internal test
4	JUNE	3T2	4	5	6	7	8	6	T2-03-2nd Internal test 8-Monday Time Table
5	JUNE	10	11	12	13	14	15DH	5	
6	JUNE	1711	18	19	20	21	22	5	17-Bakrid
7	JUNE	24	25	26	27/Γ3	28T2	29T3*	6	T3-27 to 29 3rd Internal test 29* last working
3	JULY	HAT S	2LT	3J-T	ALT I			4	

Total Number of working days (Excluding holidays and Tests)=77

	10441144
H	Holiday
BV	Blue Book Verification
T1,T2,T3	Tests 1,2,3
ASD	Attendance & Sessional Display
DH	Declared Holiday
LT	Lab Test
TA	Test attendance

ng days (Exclud	ing nondays
Monday	16
Tuesday	16
Wednesday	17
Thursday	17
Friday	14
Saturday	10
Total	90

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaturu - 500 109

Dr. C. VASUDEV
Professor & HOD
Department of Applied Science
K.S. School of Engineering & Management
Bangalore - 560 109





### K. S. SCHOOL OF ENGINEERING AND MANAGEMENT

BENGALURU-560109

	1	Week		TENTATHE	CALLNDAR	OF EVENT	S: HEVENS TO JUNE 20	EMESTER (	2023-20	924)
	1	No. Me	onth L					T	Dity 4	Activities
		1 M	Me	h Tre	Wed 0	1 ho 7		9 TA	3	6*-Commencement of II sem 8- Maha Shivratri 9- Tuesday Time Table
		2 MA	R 11	12	13	14	15	i (cui)	5	
		3 MA	R 18	19	20	21	22	23	6	23 - Friday Time Table
		4 MAI	R 25	26	27	28	12911	30	5	29- Good Friday 30 - Monday Time Table
	1	5 APR	1	2	3 .	4	5 TA	6 D.U	5	
	6	APR	8	29.11	10	1111	12	13ASD	4	9 - Ugadi 11 - Kutub A Ramzari 13-Tuesday Time Table
	7	APR	15T1		17T1	18	19	20 DH	5	
	8	APR	22	23BV	24	25* FFBI	26	27	6	27- Wednesday Time Table 25 - First Faculty Feed Back
	9	APR/MA	Y 29	30	1.11		3	i 4 DH	4	I- May Day
	10	MAY	6	7	8	9	1011	11 .	5	10 - Basava Jayanthi 11- Friday Time Table
-	11	MAY	13	14	15	16	17ASD	HUN	5	
	12	MAY	20Т2	21T2	22T2	23	24	25	6	25-Monday Time Table
	13	MAY/ JUNE	27BV	28	29	30	31*FFB-II	IDH	5	31 - Second Faculty Feed Back
	14	JUNE	3	4	5	6	7	8	6	3-Monday Time Table
_	15	JUNE	10	!1	12	13	14	15011	5.	
	16	JUNE	3)711 <sup>rs</sup>	18	19	20T3	21T3	22T3	5	17-Bakrid
-	17	JUNE	に統領しのの差別的状	251.T	26LT 31	271 I	28BV	29*	6	29-Tuesday Time Table 29* last working

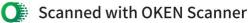
Total No of Working Days: 86

### Total Number of working days (Excluding holidays and Tests)=73

Holiday
Blue Book Verification
Tests 1,2.3
Attendance & Sessional Display
Declared Holiday
Lab Test
Test attendance

, ,	
Monday	15
Tuesday	15
Wednesday	14
Thursday	14
Friday	15
Total	73

SIGNATURE OF PRINCIPAL Dr. K. RAMA NARASIMHA
Principar/Director
K.S. School of Engineering and Management
Bengaluru - 560 109



Class: II-A (CSE)

K.S. SC. WOL OF ENGINEERING AND MANAGEMENT, BENGAL DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMIESTER) CLASS TIME TABLE (Chemistry Cycle)

(W.E.F. 06-03-2024)

Lecture Hall: A113

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	3.002.3.50	543	STATES	LAST VET (1883)	CA HERRY	the state of the s	MSR 409 Flours	ENTS	months and the property of the same	r, C Vossadev	R Radha (D).							9
7 50. 1 00	BC ED N 773 Theres	Dr. Say	BKBKK207	AI BATCH (BPLCK205B.PMR.PW.LAE WOORS)	AL BATCH (BCHES205-DEAR, DEBRY	AT Library	AZ BATCH (BMATS29] .NTK, RD-A4938-49 Shees	AS PER CALENDAR OF EVENTS	44	& Divya, R (RD), D	a. S (Dr.SS), Dr. H							V
1.20-2.10	BCHES202	(Dr. AR)	BESCRZOLA (NSP.)	ALBATCH (BP	AL BATCH		AZ BATCIE ( BM	AS PER	STAFF	Theory: Dr. C Vasudev (Dr. Cv.), Lab: Mrs. Nagarathna T K (NTK), Mrs. Divya.R (RD), Dr. C Vassadev (Dr.Cv.)	Pheory: Dr. Anitha R (Dr. AR), Lab: Dr. Anitha R (Dr.AR), Dr. Swarna, S (Dr.SS), Dr. 18 R Radha (Dr. HRR)	rya (Dr. SA)	(NSP)	(PMR)	e M S (SM)	(TR)	Mr. Sasindran M Prabbu (SMP)	
12.35-1.20				NV38	NCH BI	17				Theory: Dr. C Vasudev (Dr. CV), Lab: Mrs. Nagarathna T K (NTK (Dr.CV)	Theory: Dr. Anitha R (Dr. AR), Lab: Dr. Anitha R (Dr.AR), Dr. HRR)	Dr. Srinidhi Acharya (Dr. SA)	Mr. Shashiprad N (NSP)	Ms. Punitha M R (PMR) Lab: PMR, PN	Mrs. Sindhushree M S (SM)	Mr. Thrimurthy (TR)	Mr. Sasindran	
11.40-12.35	BMATS201	BPWSK20K	(SNI)	BESCK204A (NSP)	BMATS201	BPLCK205B	(PMR)		HOURS AVEEK	7+3	4+3	2+3	7	3+3	-	-	-	1
10.45-11.40	BCHES202 (Dr. AR)		3)	BCHES202 (Dr. AR)		BESC K204A	(ASA)	ENTS					-					
10.30-10.45	TEA BREAK	A1 BATCH (BMATS201 -NTK,RD-A403B-4th Floor)	COLC NO SELVIR, PN. LA3 NO. 003)	TEA BREAK	BCEDK203 - Lab (Dr.SA)	TEA BREAK		AS PER CALENDAR OF EVENTS SUBJECT	ВСТ			Sal				ada		
0000	BPLCK205B (PMR)	TCH (BMATS201-N	Section 1	(Dr. CV)	BCEDK203-	BMATS201				CSE Stream-II	E Stream	Computer-Aided Engineering Drawings	ivil Engineering	Introduction to Python Programming	Professional Writing Skill In English	nada/ Balake Kannada	esign Thinking	
	BESCK204A (NSP)	Al BA	RPI CESORES	(PMR)		BCHES202 (Dr.AR)				Mathematics For CSE Stream-II	Chemistry For CSE Stream	Computer-Aided I	Introduction To Civil Engineering	Introduction to Py	Professional Writh	Samskrutika Kannada/ Balake	Innovation and Design Thinking	
	MONDAY	TUESDAY	- Contraction	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY		CODE	BMATS201	BCHES202	BCEDK203	BESCK204A	BPLCK205B *	BPWSK206	BKSKK207/		

Head of the Department of Lead of the Department Professor & HOD K.S. School of Engineering & Managemen. Bangalore - 560 109

K.S. School of Engineering and Management Dr. K. RAMA NARASIMHA Bangalum - 560 109 Principal/Director Principal Department of Applied Science

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K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER)

INDIVIDUAL TIME TABLE (W.E.F-06/03/2024)

8.40-9.35

DAY

Faculty Name: Dr. Anitha R

DAY	20000									
	55.6-04-0	9.35-10.30	10.30-10.45							
MONDA				10.45-11.40	11.40-12.35	12.35-1.20	1.20-2.10			
NONDAY.			IK.	BCHES202				2.10-3.00	3.00-3.50	
TUESDAY			งสภย <i>ง</i> สา	(Dr. AR)			BCHES202 (Dr. AR)			
VEDNESDAY		CI BATCH- (BCHES202 (Dr. HRR, Dr. AR)	R, Dr. AR)	BCHES202		. ,	DI BATC	DI BATCH- BCHEM292 (Dr. HRR. Dr. *AR)	n. 3.(R)	
THURSDAY		В2 ВАТСН (ВСНЕ	B2 BATCH (6CHES202-Dr.SS, Dr.AR)	(Dr. AR)		CH BREVI	A2 BA	A2 BATCH (BCHES202- Dr. AR, Dr.SS)	38)	
FRIDAY	BCHES202 (Dr.AR)					רמג	AIBAI	AI BATCH ( BCHES202-DEAR, DEHRR)	RKI	
SATURDAY		ASPR	AS PER CALENDAR OF EV	EVENTS				To state of the art of	and the second s	
CODE		SUB	SUBJECT		HOURS AVEEK					
BCHES202	Chemistry For CSE Stream	Stream			4					
BCHES202	Chemistry Lab				10					

Head of the Department

Dr. C. VASUDEV

K.S. School of Engineering & Management Bangalore - 560 109 Department of Applied Sciance Professor & HOD

S. Som S

K S School of Engineering and Management Dr. K. RAMA NARASIMHA Bengaluru - 560 109 Principal/Director

Time -table Co-ordinator



# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109

# DEPARTMENT OF APPLIED SCIENCE

SESSION: 2023-2024 (EVEN SEMESTER)

LAB TIME TABLE

	Instructor	1.20-2.10 2.10-3.00 3.00-3.50	B1 BATCH (BCHES202-Dr.SS.Dr.HRR)	DI BATCH- BCHEM202 (Dr. HRR, Dr. AR)	A2 BATCH (BCHES202- Dr. AR, Dr.SS)	AI BATCH (BCHES202-Dr.AR, Dr.HRR)	CZ DATCH - BCHES202 (Dr. HRR, Dr. SS)	AS PER CALENDAR OF EVENTS
4 _	A R	1.20		BEVK	писн в	7		
(W.E.F-06/03/2024)	10.45-11 40	11.40-12.35					TS	
(-	10.30-10.45		BREAK	C1 BATCH- (BCHES202 (Dr. HRR, Dr. AR)	B2 BATCH (BCHES202-Dr.SS, Dr.AR)	TEA	AS PER CALENDAR OF EVENTS	
	9.35-10.30			H- (BCHES2	гсн (вснея		AS PER C	
	8.40-9.35			CI BATC	B2 BA1	4		
Lab No.: A112	DAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	
,								

Head of the Department

Dr. C. VASUDEV

Professor & HOD
Department of Applied Science
K.S. School of Engineering & Manageme.
Bangalora - 560 109

18. Bar Principal

K S School of Engineering and Management Dr. K. RAMA NARASIMHA Bengalun - 560 109 Principal/Director

Vin the . s.y

Time -table Co-ordinator

@ K	. S. SCHOOL OF ENGINEERING &	MANAGENTER	Vent:2	023-24	
totic	Chemistry group, With effect for	rom 06.03.2024	a and N	o, A 113	
Semester- II	Chemistry group , with the		Class	Lab	
Section: A	Branch: CSE	Mentors	Teacher	Batches	
No USN	Student Name	Mentor			
	the state of the s	9			
1 1KG23CS001 0 2 1KG23CS003 0		Dr. VASUBEV C			
1 1KG23( S003 )	DILYA F MASABINAL	3			
4 1NG23CS005 A	JITH KUMAR	5			
5 1KG23CS006 A	KASII S	0			
	KHIL GOUTHAM K				
1KG23CS088 A					
1KG23CS010 A	NKITHA P				
1KG23CS011 A	NUSHA M N				
1 KG23CS013 A	HWINI N R			-	
1KG23CS014 B	IARATH KUMAR S C		1 1	=	
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### 'K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109 DEPARTMENT OF APPLIED SCIENCE

SESSION: 2023-2024 (EVEN SEMESTER)

### LESSON PLAN

 $N_{\mbox{\scriptsize AME}}$  Of the staff: Dt. anitha R.

COURSE CODE/TITLE: BCHES202/APPLIED CHEMISTRY FOR COMPUTER SCIENCE AND ENGINEERING STREAM

SEMESTER/YEAR : II SEM/I

Sl. No.	Topic to be covered	Mode of Delivery	Teaching Aid	No. of Periods	Cumulative No. of Periods	Proposed Date	Delivery Date
	MODULE 1	: Corrosior	and Elec	trode Sy	stem		
3	Corrosion Chemistry: Introduction,	L+I	BB	1	1	6/3/24	13/3/24
	Types of corrosion- differential metal	L+ I	BB+PPT	.1	2	11/3/24	14/3/24
2	and differential aeration, Corrosion control-galvanization, anodization and	. *.					la la a
3	Sacrificial anode method  Corrosion Penetration Rate (CPR) -	L+PS	BB	1	3	11/3/24	15/3/24
4	Introduction and numerical problem.  Electrode System: Introduction, types of electrodes. Ion selective electrode— definition, construction,	L+1	BB	1	4	13/3/24	18/3/24
8	working and applications of glass electrode.  Determination of pH using glass	L+ l	BB+PPT	1	5	15/3/24	18(3)24
5	Reference electrode-Introduction, calomelelectrode—construction, working and applications of calomel	L+1	BB	1	6	18/3/24	19/3/24
7	Concentration cell- Definition,	L+ PS	BB	1	7	18/3/24	20/3/24
	construction and Numerical problems.  Analytical Techniques: Introduction, principle and instrumentation of	. L+AV	BB+PPT	1	8	20/3/24	22/3/2
3 2	Conductometry; its application in the estimation of weak acid. Potentiometry; its application in the estimation of iron.						
	Tutorials: numerical problems on CPR	L+ PS	BB	0	8	22/3/24	25/3/24
)_	Tutorials: explained Analytical	L	BB	0	8	23/3/24	25/3/24 25/3/24 26/3/24
1	Techniques.  Self-Study: IR and UV-Visible spectroscopy.	Books & Online materials	Interacti	0	8	25/3/24	26/3/24
		Practical	Compone	nt			

1) Pract				3	A2-Batch	Electroch
2 estimate Potentiamenta	Denselman	Lab	1 lab	3	6/3/24	Sensors
estimation of FAS using K.C. O	1		slot=3		A1-Batch	School
Nichon	tation +D		Periods		15/3/24	13 Optical
2) Promi		07101	0.1.0		13/3/2 Patch	Sensor
3 Of win Determination of A	-	and a constraint of the latest the	The second second	6	AZ-Batell	20/3 \ dissol
close using pH sensor (C)	Experimen		9		13/3/24	Float
Clectrode) Schsor (Glass	tation +D	1 '			A1-Batch	2.7121.
3) 1)		al kit + D			22/3/24	pila
Practicals: Estimation C				and the second second second	A2-Batch	27 3 Ele
4 bar bar	Experimen	Lab	3	9	20/2/24	12 13 NO
amine/external indicate diphenyl		experiment			20/3/2	and at D
	, and on v D	al kit + D			Al-Batch	28/3/2/0
and the same of th					23/3/24	
Polymers	F 2. Polym	1.0	-			120
weight-Number Molecular	Z. Polym	The second secon	reen Fuel		125/3/24	Tall
Weight average	L+I	BB	1	9	25/3/24	30/3/24
dVProge	-		<i>i</i> .			***
West	L+ PS	BB	1	10	27/3/24	114
proble average and purposite			11 25			1000
Problems.	L+ PS	BB	1	11	30/3/24	2/4/24 3/4/24 3/4/24 5/4/24
weight average and			' -		00,0	214124
problems. numerical	L+ PS	RR		40	20/2/24	1 1
Preparation properties and		DD	'	12	30/3/24	3/4/24
applications of keylar	L+I	DD ( DD(n				
Synthesis and conduction		DD+bbT	1	13	_1/4/24	2/2/20
polyacetylene polyacetylene	T +1	DD				371124
applications and commercial	271	BR+bbL	1	14	1/4/24	-1 1
-113.	٠					3/4/24
Green Fuels: Introduction, construction	-					
and working of solar photograph	L+I	BB	1			
advantages and disadvantage			- '	15	3/4/24	8/4/24
Generation of energy (	-					10/1/24
by electrolysis as	L+AV	DD i ppm				
1 11010		PR+bb.L	1	16	5/4/24	-
1 603.					3	8/4/24
ratorials: numerical problems.	1+ DC				-	01
Tutorials: mechani	2175	BB	0	16	9/4/04	- International Contractions of the Contraction of
mechanism of polyacetylene	I.+I	DD			0/4/24	10 101
Self-Study: Regenerative fuel - V		ВВ	0	16	8/4/24	10/4/24
s sometative idel cells	Books &	Interacti	0			12/4/2
	Online		0	16	10/4/24	12/4/24
Assignment 1	materials	OII				15/4/24
Sargimient-1					- '	100
					25/3/24	
4) Demonstrati	Practical (	Component				
Electrolysis c	Experimenta	Lab				
Dicerolysis of water	tion +D	experimenta	3	12	A2-Batch	
	,	kit + D			27/3/24	3/4/21
MODILLE	3. Sonoar-	and 5			5/4/24	3/4/24
Sensors: Introduction wasting	o. Jensors	and Ener	gy Syster	ns	-	
working	L+1	BB	1	17	10	
principle .					I I I I I I I I I I I I I I I I I I I	
principle and applications of Conductometric sensors			, ' -	17	12/4/24	15/4/24
	2) Practicals: Determination of pRa of vinegar using pH sensor (Glass electrode)  3) Practicals: Estimation of iron in TMT bar by diphenyl amine/external indicator method.  MODUL  Polymers: Introduction weight-Number average and numerical problems.  Weight average and numerical problems.  Weight average and numerical problems.  Preparation properties and commercial applications of kevlar.  Synthesis and conducting mechanism of polyacetylene and commercial applications.  Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages.  Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Tutorials: numerical problems.  Tutorials: mechanism of polyacetylene  Self-Study: Regenerative fuel cells  Assignment-1	2) Practicals: Determination of pKa of vinegar using pH sensor (Glass electrode)  3) Practicals: Estimation of iron in TMT bar by diphenyl amine/external indicator method.  MODULE 2: Polym Molecular L+1  Weight average and numerical L+PS Preparation properties and commercial applications of kevlar.  Synthesis and conducting mechanism of polyacetylene and commercial applications.  Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages.  Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Tutorials: numerical problems.  L+PS  Tutorials: mechanism of polyacetylene L+I  Self-Study: Regenerative fuel cells Books & Online materials Assignment-1  Practical O  Experiment tation +D	2) Practicals: Determination of pKa of vinegar using pH sensor (Glass electrode)  3) Practicals: Estimation of iron in TMT bar by diphenyl amine/external indicator method.  MODULE 2: Polymers and Giveight Number average Molecular L+I BB weight average and numerical L+PS BB weight average and numerical L+PS BB weight average and numerical L+PS BB Preparation properties and commercial applications of kevlar.  Synthesis and conducting mechanism of polyacetylene and commercial advantages and disadvantages.  Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages and disadvantages.  Tutorials: mumerical problems.  L+PS BB  L+PT  BB+PPT  Lab experiment al kit + D  Experiment tation +D  Ex	2) Practicals: Determination of PAS using K,CryO <sub>2</sub> tation +D  2) Practicals: Determination of pKa electrode)  3) Practicals: Estimation of iron in TMT bar by diphenyl amime/external indicator method.  4) MODULE 2: Polymers and Green Fuel at tation +D  5) Polymers: Introduction weight-Number average problems.  Weight average and numerical problems.  Weight average and numerical L+PS BB 1  Weight average and numerical problems.  Weight average and numerical L+PS BB 1  Preparation properties and commercial applications of kevlar.  Synthesis and conducting mechanism of polyacetylene and commercial advantages and disadvantages.  Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Tutorials: numerical problems.  L+PS BB 1  L+I BB+PPT 1  BB+PPT 1  Lab experiment al kit + D  3  solt=3  prepriods  Assignment-1  Experiment attain +D  Experiment attain +D  Separation +D  Experiment al kit + D  3  solt=3  prepriods  Assignment-1  Experiment attain +D  Experiment attain +D  Separation +D  Experiment al kit + D  3  solt=3  prepriods  Experiment attain +D  Experiment attain +D  Experiment attain +D  Experiment attain +D  Separation +D  Experiment attain +D  Solt=3  problems.  Experiment attain +D  Experiment attain +	estination of FAS using K,CryO <sub>2</sub> tation +D  2) Practicals: Determination of pKa of vinegar using pH sensor (Glass electrode)  3) Practicals: Estimation of iron in TMI bar by diphenyl amine/external indicator method.  MODULE 2: Polymers and Green Fuels  Molecular L+I BB 1 9  Weight average and numerical L+PS BB 1 100  Weight average and numerical L+PS BB 1 110  Weight average and numerical L+PS BB 1 112  Preparation properties and commercial applications of Kevlar.  Synthesis and conducting mechanism of polyacetylene and commercial applications.  Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages.  Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Tutorials: mechanism of polyacetylene L+I BB 0 16  Self-Study: Regenerative fuel cells Books & Online materials on materials L+PS BB 0 16  Seperiment alkit + D 2  Experiment Lab 3 9  Experiment Lab 3 9  ### Approximative experiment alkit + D 3  ### Approximative experiment to alkit + D 3  ### Approximative experiment: Experiment alkit + D 3  ### Approximative experiment alkit + D 3  ### Approximative experiment a	estimation of FAS using K,CryO <sub>2</sub> tation +D  2) Practicals: Determination of pKa of vinegar using pH sensor (Glass electrode)  3) Practicals: Estimation of iron in Tabra by diphenyl amine/external indicator method.  4) Polymers: Introduction weight average and numerical problems.  Weight average and numerical L+PS BB 1 1 10 27/3/24  Weight average and numerical L+PS BB 1 1 11 30/3/24  Weight average and numerical L+PS BB 1 1 11 30/3/24  Synthesis and conducting mechanism of polyacetylene and commercial applications of kevlar.  Synthesis and conducting mechanism of polyacetylene and disadvantages.  Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Tutorials: numerical problems.  Experimen tation +D experiment alk it + D  Experiment tation +D experiment alk it + D  Experiment tation +D experiment alk it + D  A2-Batch A2-Bat

14 10h /	Electrochemical sensors, thermore						
'cn	Dhotometry)		+ I BB+PP	T 1	18	100	
1	sensors (Flame photometry) Optical sensors (colorimetry)	and			10	19/4/24	ial h
120	Sensors for the measurement	it of L4					18/4/24
1/3/3/3/2	30 dissolved oxygen	(DO).	BB+PP	T 1	19	22/4/24	
43/	Electrochemical sensors for	the					19/4/24
3/	pharmaceuticals				-		
ેં	31 Electrochemical gas sensors for So	x and L+	BB+PP		20	001111	_
125					20	22/4/24	19/4/29
1	Disposable sensors in the detection biomolecules and pesticides.	on of L+/	AV BB+PPT	1	21	24/4/24	1 1
1	Energy Systems 1	to L+					19/4/24 25/4/24 29/4/24 29/5/24 11/5/24
-/	batteries, construction, working	and	BB	1	22	26/4/24	1
	applications of Lithium ion						29/4/24
	MDO and applications - C Y !.	hium L+	BB+PPT	1	23	27/4/24	
	Quantum Dot Sensitized Solar				2.0	2114124	29/5/24
		Cells L+	BB	1	24	29/4/24	. 1
1							11/5/24
1	36 Tutorials: gas sensors for Sox and	NOx L+	BB	0	24		
	37 Tutorials: Lithium ion batteries.	L+	1 1			29/4/24	11/5/24
			33	0	24	3/5/24	11 /5/24 13/5/24 13/5/24
1	38 Self-Study: Types of electrochem sensor, Gas sensor - O <sub>2</sub> sen			0	24	6/5/24	
	Biosensor – Glucose sensors						1315124
		materi					
1	5) Practicals: Conductome		ical Componer				<u> </u>
1.	Conductonie			3	15	A2-Batch	10/4/24
-	39 estimation of acid mixture.	tation -	al kit + D			3/4/24 A1-Batch	
						12/4/24	18/4/24
	6) Practicals: Estimation of Cop	per Experin	nen Lab	3	18	A2-Batch	1-1.12
	present in electroplating effluent	by tation +	D experiment			10/4/24	17/4/24
- 1	optical sensor (colorimetry)		al kit + D		3	A1-Batch	25/4/24
-					,	19/4/24	
1 :	7) Practicals: Estimation of to			3	2.1	A2-Batch	15/5/20
41	hardness of water by EDI	`A tation +	D experiment			24/4/24	10 122
	method.					Al-Batch	15/5/24
		s: Guiding	Lab	3	24	26/4/24 A2-Batch	-
* **	8) Open ended experiment		experiment		24	27/3/24	22/5/24
42	Design an experiment to identify		al kit			A1-Batch	
	the presence of proteins in give	7	10			3/5/24	16/5/24
	sample.	perform	Lob	-	07		
	9) Open ended experiments		Lab experiment	3	27	A2-Batch	23/5/24
	Searching suitable PDB file an	d the	al kit			8/5/24	
43	target for molecular docking.	students	to			A1-Batch	6/6/24
		perform		,		11/5/24	
	Assignment-2					27/4/24	
4	MODULE 4: M.	aterials for	r Memory an	d Displa	av Syste	ms	
	WODGEE				, 5,500		

					The second second second second second		
Memory Devices: Introduction, concepts of electronic memory of or					25	6/5/24	pyr
devices: Introduction, of organic/polymer electronic	Basic	1.+1	BB+PP7	1	20		\ re
							14/53 E
46 Classification					The second secon	21	1
devices, of electronic me	emory 1	L+1	BB+PPT	T 1	26	8/5/24	15)5
13 pes of organic mou						15/24	
de d	Vices L	+1	BB+PPT	Γ 1	27	11/5/24	17/5
materials) organic inorganic by	vbrid				A Comment		1.60
48 Display System		- 1	1				(6
electro active materials.	and L4	+1	DD: DDG			10/5/24	2015/2
Nanomaterials.		1	BB+PPT	1	28	13/5/24	ZUULL
used in optoelectronic devices.	rials L+	FT	BB+PPT	.   1		10/5/24	-
Liquid crystals (1 a)			DD+LLT	1	29	13/5/24	20/5/2
classification, properties	ion, L+ A	AV	BB	1	20	1=15/24	
application in Liquid	and		טט	F	30	15/5/24	م داداء
(LCD's) Proposi	iys	7	7				2/12/6
Properties and application of Organ							
Light Emitting Diodes (OLED's).	nic L+1		ВВ	1	31	17/7/04	
52 (OLD) Emitting Died	-				31	17/5/24	22/5/24
liole			BB	1	32	2:15:21	2000
electrochemical acti	g	-		1	32	24/5/24	
53   Tutorials: Explained 4	+			f ·			2-21512
of QLED's	is L+1		BB	0	32		
54 Tutorials: Explained the applications of OLED's	-			, , ,	32	25/5/24	22/5/2
of OLED's	s L+1		BB	0	32		23/5/2
Self-Study: Properties and functions of	+			,	32	25/5/24	24/5/24
			nteracti	0	22		2413127
		.   .	on		32	27/5/24	1-6
flame retardants in computers	materials	S		J	1		24/5/24
- Faceto		1		. 1	1		
la s	Practic	al Con	nponent				
0) Demonstrative experiment:							
56 Synthesis of Iron-oxide	Experimen		Lab	3	30	T	2
nanoparticles.	tation +D		periment		30	A2-Batch	-
			al kit			15/5/24	5/6/20
						Al-Batch	, , , , , ,
MODU	II E E. E.					17/5/24	5/6/24
57 E-Waste: Introduction, sources of e-	ILE 5: E-V	Vaste	Manage	ement			/
waste, Composition,	L+1	BB	+PPT	1	20	-	
Characteristics - 1 N				'	33	27/5/24	1.
Characteristics and Need of e- waste	- L+1	DD.	DDD		* * *	· · · · · ·	26/5/24 26/5/24 5/6/24
management.	L. 1	רממ	+PPT	1	34	29/5/24	177-1
Toxic materials used in manufacturing						2010124	heles.
	L+1	BB+	+PPT	1	35	2112:	201514
I health become		1				31/5/24	1.1
					1 1	1	5/6/24
e-waste.	~	1.			- A		1,0
Recycling and Recovery:	1 . 41/	-					
Tocal Transfer of the total transfer of the transfer of the total transfer of the transfer of the transfer of the transfer of transfer of the transfer of transfer	L+ AV	BB+l	PPT	1	36	3/6/24	
1 lecveling						3/0/24	7/6/24
separation, thermal treatments.	THE RESIDENCE OF STREET	-					1000
Hydrometallurgical extraction.	+ AV	DDII	2700				
3.53	TAV	BB+F	PI	1 1	37	3/6/24	-1-1
	1		1.	1	, , , , , , , , , , , , , , , , , , ,	3/6/71	

60

Ý	pyro metallurgical methods, direct	L+I	BB+PPT	1	38	5/6/24	
£	recycling.					3/0/24	7. [6/24
63		L+1	BB+PPT	1	39	7/6/24	8/6/24
64	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)	L+1	BB+PPT	1	40	8/6/24	7./6/24 8/6/24 10/6/24
65	Tutorials: Different approaches of recycling.	L+1	BB	0	40	8/6/24	11/6/24
66	Tutorials: Extraction of gold from E-waste.	L+I	BB	0	40	10/6/24	12/6/24
	environment and numan nearbi.	Books & Online materials	Interacti on	0	. 40	10/6/24	12/6/24
08	Revision	L	BB	0	40	12/6/24	13/6/24
70	Revision and mqp solving	L	BB	0	40	14/6/24	7246124
_	Revision and mqp solving	L	BB	0	40	19/6/24	722/6/20
_	Acevision and mqp solving	L	BB	0	40	28/6/24	) 27 10 129
_		Practical	Component		, -		
2	11) Practicals: Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.	Experimen tation +D	Lab experiment al kit + D	3	33	A2-Batch 29/5/24 A1-Batch	12/6/24
+	12) Programatical Programme 2					24/5/24	
	Viscosity coefficient of lubricant	Experimen tation +D	experiment	3	36	5/6/24	19/6/24
	(Ostward's viscometer)		ai Kii + D			A1-Batch 31/5/24	26/6/24
	65 66 67 68 70 71	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)  Tutorials: Different approaches of recycling.  Tutorials: Extraction of gold from E-waste.  Self-Study: Impact of heavy metals on environment and human health.  Revision  Revision and mqp solving  Revision and mqp solving  Revision and mqp solving  11) Practicals: Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)  Tutorials: Different approaches of recycling.  Tutorials: Extraction of gold from E-waste.  Self-Study: Impact of heavy metals on environment and human health.  Self-Study: Impact of heavy metals on environment and human health.  Revision  Revision  Revision and mqp solving  Tutorials: Determination of Experimen tation +D  Viscosity coefficient of lubricant tation +D	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)  Tutorials: Different approaches of recycling.  Tutorials: Extraction of gold from E-waste.  Tutorials: Extraction of gold from E-waste.  Self-Study: Impact of heavy metals on environment and human health.  Self-Study: Impact of heavy metals on environment and human health.  Revision  Revision and mqp solving  Revision and mqp solving  Tutorials: Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.  Texperiment tation +D  Viscosity coefficient of lubricant tation +D  Revision +D  Experimen tation +D  Viscosity coefficient of lubricant tation +D  Revision +D  Experiment tation +D  Experiment tation +D  Experiment tation +D  Viscosity coefficient of lubricant tation +D	recycling.    Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)   Tutorials: Different approaches of recycling.   Tutorials: Extraction of gold from E-waste.   E+1 BB   0	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)  Tutorials: Different approaches of recycling.  Tutorials: Extraction of gold from E-waste.  Self-Study: Impact of heavy metals on environment and human health.  Self-Study: Impact of heavy metals on environment and human health.  Revision  Revision and map solving  Revision and map solving  Tutorials: Extraction of gold from E-waste.  Revision  Revision and map solving  L  BB  A  Practical Component  11) Practicals: Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.  12) Practicals: Determination of Viscosity coefficient of lubricant tation +D experiment attion +D experiment	Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies)  Tutorials: Different approaches of L+1 BB 0 40 10/6/24 waste.  Tutorials: Extraction of gold from E-waste.  Self-Study: Impact of heavy metals on environment and human health.  Revision Revision and mqp solving  Tutorials: Determination of Chemical Oxygen Demand (COD) of industrial waste water sample.  Tutorials: Determination of Experimen Lab oxygen Demand (COD) of industrial waste water sample.  Tutorials: Extraction of gold from E-L+1 BB 0 40 10/6/24 waste.  BBB 0 40 12/6/24  BBB 0 40 12/6/24  Table

4	Mode of Assignments and Instructions	Date
Assignment 1	Written Assignment	25/03/24
Assignment 2	Written Assignment	27/04/24

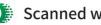
Total No. of Lecture Hours = 40 Total No. of Tutorial Hours = 10 Total No. of Self-study Hours = 5 Total no. of Practical Hours = 36 Total no. of Practical Classes = 12 Total no. of Revision Hours = 4

ourse In charge

Professor & HOD

17. 50mg

Principal Dr. K. RAMA NARASIMHA Principal/Director & Engineering and Management





# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE APPLIED CHEMISTRY FOR COMPUTER SCIENCE STREAM Question Bank (BCHES102/202) MODULE-1

### Sensors and Energy Systems

- Explain the working principle of Conductometric sensors (conductometry), and Optical sensors (colorimetry).
- 2. What are Electrochemical Sensors? Explain its application in the measurement of Dissolved Oxygen (DO)
- Explain optical sensor for measurement of Dissolved Oxygen (DO).
- Explain Electrochemical sensor for measurement of Dissolved Oxygen (DO).
- 5. Explain the working principle of Electrochemical sensors, and mention its applications.
- Describe the construction, working and applications of Lithium-ion batteries and mention any four applications.
- 7. Describe the application of Electrochemical sensors in sensing Diclofenac (DCF).
- 8. Describe the application of Electrochemical sensors in sensing hydrocarbons-1-hydroxy pyrene.
- 9. Explain the working principle of Electrochemical sensors, and mention its applications.
- 10. Describe the application of Electrochemical gas sensors in sensing SOx and NOx.
- 11. What are Quantum Dot Sensitized Solar Cells (QDSSC's)? Explain the working Principle, Properties and Applications.
- 12. What are batteries? Explain the working Principle, Properties and Applications of Quantum Dot sensitized solar cells.
- 13. Write a note on Disposable Sensors? Explain its advantages over classical sensors.
- 14. Explain about detection of Ascorbic acid with electrochemical oxidation.
- 15. Explain about detection of Glyphosate with electrochemical oxidation.
- 16. Describe the construction, working and applications of Sodium-ion batteries and mention any four applications.
- 17. What are Actuators & Transducers? Explain about detection of Glyphosate with electrochemical oxidation.
  - K.S. School of Engineering and Management



### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109

### DEPARTMENT OF APPLIED SCIENCE APPLIED CHEMISTRY FOR COMPUTER SCIENCE STREAM

### Question Bank (BCHES102/202) MODULE- II

### Materials for Memory and Display Systems

- 1. Explain the types of organic memory devices by taking p-type and n-type semiconductor
- 2. What are optoelectronic devices? Explain the working principle of Optoelectronic device.
- 3. Explain any four properties and applications of Silicon nanocrystals suitable for optoelectronic
- 4. What are photoactive and electroactive materials and explain their working principle in display
- 5. What are nanomaterials? Explain any four properties of Polythiophenes (P3HT) suitable for
- 6. What are nanomaterials? Explain any four properties of Poly[9- vinylcarbazole] (PVK)
- 7. What are Memory Devices? Explain the Classification of electronic memory devices with
- 8. Mention any four properties and applications of LC-displays.
- 9. What are OLEDs? Explain the working principle and properties of OLED. Mention its
- 10. What are QLEDs? Explain the working principle and properties of QLED. Mention its
- 11. Write a note on (a) Nematic liquid crystal, (b) Smectic liquid crystal
- 12. What are liquid crystals? How liquid crystals are classified?
- 13. Discuss the working of Liquid Crystal Display.
- 14. What are LECs? Explain the working principle and properties of LECs. Mention its applications.
- .S. School of Engineering and Management







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### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE APPLIED CHEMISTRY FOR COMPUTER SCIENCE STREAM Question Bank (BCHES102/202) MODULE- 111

### Corrosion and Electrode System

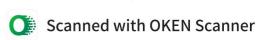
- 1. Define metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example.
- 2. Explain: (i) Differential metal corrosion & (ii) Water-line corrosion.
- Explain differential aeration corrosion with suitable example.
- Describe galvanizing and mention its applications.
- 5. Explain: i) corrosion control by Anodization & ii) Sacrificial anodic method.
- 6. What are reference electrodes? Explain the construction and working of Calomel electrode.
- 7. Explain the construction and working of glass electrode.
- 8. What is an Electrode? Discuss the different types of electrodes with example.
- 9. Discuss the determination of pH using glass electrode.
- 10. What are concentration cells? Write a note on Electrolyte concentration cells.
- 11. Define corrosion? Mention at least six implications of corrosion.
- 12. Explain the application of conductometric electrode in estimation of weak acid.
- 13. Discuss the theory, instrumentation and application for the estimation of weak acid using conductometry.
- 14. Discuss the theory, instrumentation and application for the estimation of iron using potentiometry.



### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE APPLIED CHEMISTRY FOR COMPUTER SCIENCE STREAM Question Bank (BCHES102/202) MODULE- IV

### Polymers And Green Fuels

- 1. A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in following proportions. Ig of 10000 molecular weight, 2g of 50000 molecular weight and 2g 100000 molecular weight. Determine number average and weight average molecular weight, F the index of polydispersity.
- 2. In a polymer sample, 20% of molecules have molecular mass 15000g/mol, 45% molecules have molecules mass 25000g/mol remaining molecules have molecular mass 27000g/mol. Calculate the number avera weight average molecular mass and PI of the polymer.
- 3. Define Polymerization, Number-average molecular weight (Mn) and Weight-average molecul
- 4. What are conducting polymers? Explain the synthesis of Polyacetylene and mention its applications
- Explain the reaction mechanism conduction in Polyacetylene by oxidative doping.
- 6. Explain the reaction mechanism conduction in Polyacetylene by reductive doping.
- Explain the generation of hydrogen by Alkaline water electrolysis.
- Describe the hydrogen production by photo catalytic water splitting method.
- 9. What are Polymer composites? Explain the preparation, properties, and commercial applications of
- Explain the preparation, properties and commercial applications of Graphene Oxide.
- 11. Explain the construction and working of photovoltaic cells.
- 12. What are green fuels? Explain the advantages & disadvantages of photovoltaic cells.
- 13. Mention the properties of hydrogen pertaining to fuel and its advantages in production of energy.
- 14. What are green fuels? Explain the different types of fuel.
- 15. Explain the generation of hydrogen by alkaline water electrolysis.
- 16. Explain the generation of hydrogen by PEM water electrolysis.
  - K.S. School of Engineering and Management





## K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109 DEPARTMENT OF APPLIED SCIENCE APPLIED CHEMISTRY FOR COMPUTER SCIENCE STREAM

### Question Bank (BCHES102/202) <u>MODULE-V</u>

### Waste Management

- Mention the sources of e-waste and explain the need for e-waste management.
- 2. What is e-waste and explain the need for e-waste management.
- 3. Explain the recycling of e-waste.
- 4. Explain the advantages of recycling and recovery in e-wastes.
- 5. Explain the extraction of gold from e-waste.
- 6. Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.
- 7. Explain the health hazard due to exposure to e-waste.
- 8. Explain the pyrometallurgical and direct recycling methods.
- 9. Explain the Hydrometallurgical method.
- 10. What is the role of stakeholders in the environmental management of e-waste?
- 11. Write a brief note on role of stakeholders for example; producers, consumers, recyclers, and statutory bodies.
- 12. Which all toxic materials used in manufacturing electrical and electronic products, write there effects on environment.
- 13. Explain about sources, composition and characteristics of e-waste.



### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

### DEPARTMENT OF CHEMISTRY

SESSION: 2023-2024 (EVEN SEMESTER)

Course: Applied Cher Type: Core (Theory/P	CO nistry for Computer Science (actical/Integrated)	-PO MAPPIN &Engineering	G	
	actical/Integrated)	Course Co	ode: BCHE	\$202
Theory	The second by the second secon	No of Hours	-	
- (Lecture Ct.	Practical/Field Work/Allied Activities	Total/Wee	k	Total teaching hours
	3	7(4+3)		76 (40 + 36)
Internal Assessment		Marks		A major majo
50	Examination	7	otal	Credits
m/Objectives of the (	50		100	4

- 1. To enable students to acquire knowledge on principles of chemistry for engineering applications.
- 2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
- To provide students with a solid foundation in analytical reasoning required to solve societal problems.

### Course Learning Outcomes

After completing the course, the students will be able to X7,:11

CO1	Utilize various concepts of chemistry for corrosion control and to analyze engineering materials.	Applying (K3)
CO2	Make use of different techniques for the production of green fuels and also able to determine molecular weight of a polymer.	Applying (K3)
CO3	Utilize the principle of electrochemical and optical sensors for the estimation of different components in the analyte.	Applying (K3)
CO4	Utilize the properties of Liquid Crystal, Organic Light Emitting Diodes and Quantum Light emitting diodes to Illustrate the working mechanism of display systems.	Applying (K3)
CO5	Apply the concepts of various recycling and extraction techniques in the e-waste management	Applying (K3)
	Syllabus Content	
	1: Corrosion and Electrode System	COL
differential	Chemistry: Introduction, electrochemical theory of corrosion, types of corrosion- metal and differential aeration. Corrosion control - galvanization, anodization and	8 hrs
sacrificial a	anode method. Corrosion Penetration Rate (CPR) - Introduction and numerical problem.	PO1-3
Electrode	System: Introduction, types of electrodes. Ion selective electrode – definition, construction,	PO2-3
working ar	nd applications of glass electrode. Determination of pH using glass electrode. Reference	PO3-1
electrode-	Introduction, calomel electrode- construction, working and applications of calomel	PO5-1
electrode. C	Concentration cell- Definition, construction and Numerical problems.	PO6-1

Analytical Techniques: Introduction, principle and instrumentation of Conductometry; its application in the estimation of weak acid. Percent	PO7-2
in the estimation of weak acid. Potentiometry; its application in the estimation of iron.  Self-learning: IR and UV-Visible procedures its application in the estimation of iron.	PO9-3
Self-learning: IR and UV-Visible spectroscopy.  Practical Component:	PO12-1
I. Conductorests	PSO <sub>1-2</sub> PSO <sub>2-1</sub>
Conductometric estimation of acid mixture     Potentiometric estimation of acid mixture	1 502-1
2. Potentiometric estimation of acid mixture 3. Determination of pKs of size of FAS using K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	
<ul> <li>3. Determination of pKa of vinegar using k<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub></li> <li>4. Estimation of total hardness of water by EDTA method</li> <li>LO: At the end of this regard the content of the property of of</li></ul>	
LO: At the end of this session the students of water by EDTA method	
and the collection of electrophonoidal it	
corrosion and its control. Also, able to determine corrosion penetration rate of metals at	
different corrosive medium.	
2. Derive an expression for Physics 1	
3. Make use of principle and instruments of electrochemical and optical sensors for sample	
MODELLE 2 P.	
MODULE 2: Polymers and Green Fuels	
Folymers: Introduction, Molecular weight, Newsbarn	CO2
Preparation, properties, and commercial applications of Kevlar fiber. Conducting polymers—synthesis and conducting mechanism of polyacetylene and commercial applications.	002
and conducting mechanism of polyacetylene and commercial applications.  Green Fuels: Introduction, construction, c	8 hrs
	0.1112
disadvantages. Generation of energy (green hydrogen) by electrolysis of water and its advantages.  Self-learning: Regenerative fuel cells	PO1-3
Self-learning: Regenerative fuel cells.	PO2-3
Practical Component:	PO3-1
1. Determination of Viscosity coefficients	PO5-1
O: At the end of this session the student will be able to	PO6-1
1. Apply electrolysis concent in the ment of	PO7-1
2. Find Number average and Weight average M. I.	PO9-1
2. Find Number average and Weight average Molecular weight of polymers to know the nature of polymer.	PO12-1
5. Explain working and applications of D.V.	PSO1-2
OBCLE J. Sellsors and Knaper Creek.	PSO2-1
chours: Introduction working principle to the	
ensors: Introduction, working, principle and applications of Conductometric sensors, Electrochemical easurement of dissolved oxygen (DO). Electrochemical sensors (colorimetry). Sensors for the	COS
easurement of dissolved oxygen (DO) and optical sensors (colorimetry). Sensors for the	CO3
ectrochemical gas sensors for Sox and NOv. Disposable sensors for the pharmaceuticals.	Q han
sticides.	8 hrs
ergy Systems: Introduction to batteries, construction, working and applications of Lithium ion and	PO1-3
dium ion batteries. Quantum Dot Sensitized Solar Cells (QDSSC's)-Principle, Properties and	PO2-3
plications.  f Iconomic Transfer of Sensitized Solar Cells (QDSSC's)-Principle, Properties and	PO2-3
f-learning: Types of electrochemical sensor, Gas sensor - O <sub>2</sub> sensor, Biosensor - Glucose sensors.	PO5-1
ctical Component:	PO6-1
1. Estimation of iron in TMT bar by external indicator method.	PO7-1
Determination of Chemical Oxygen Demand (COD) - 6: 1	POS-1
3. Determination of strength of an acid in Pb-acid battery.	PO9-3
At the end of this session the student will be obtain	PO12-1
Apply redox reaction concept to illustrate the working of batteries.  Make use of principle and instruments of electrochemical and optical sensors for sample analysis.	PSO1-2
. IVIAKE USE OF DETRICIPLE and instruments of 1	PSO2-1

3. Determine strength of an acid in Pb-acid battery.  MODULE 4: Materials for Memoty and Display Systems memory Devices: Introduction, Basic concepts of electronic memory. History of organic/polymer electronic molecules, Polymeric materials, organic, inorganic hybrid materials.  Display Systems: Photoactive and electroactive materials, Nanomaterials and organic materials used in crystals (LC's) - Introduction, classification, preperties and application in Liquid Crystal Displays Diodes (QLED's), Light emitting electrochemical cells.  Brominated flame retardants in computers.  1. Synthesis of iron oxide nanoparticles.  LO: At the end of this session the student will be able to  1. Classify different types of memory devices.  2. Utilize the properties of Liquid Crystal, Organic Light Emitting Diodes and Quantum Light emitting diodes to Illustrate the working mechanism of display systems.	CO4  8 brs  PO1-3 PO2-3 PO3-1 PO5-1 PO6-1 PO7-1 PO9-3 PO12-1 PSO1-2 PSO2-1
MODULE 5: E-Waste Management  E-Waste: Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste.	CO5 8 hrs
materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste. Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical)	PO1-3
Total and Recovery Dice	PO2-3
extraction, pyro metallurgical methods, direct recycling). Extraction of gold from E-waste. Role of stakeholders in environmental management of e-waste (producers consumers and attained by the stakeholders).	PO3-1
environmental management of e-waste (producers, consumers, recyclers, and statutory bodies).  Self-learning: Impact of heavy metals on environmental discount and because health.	PO5-1
Self-learning: Impact of heavy metals on environment and human health.  Practical Component:	PO6-1
o imponent.	PO7-3
2. Estimation of metal in e-waste by optical sensors.	PO9-I
20. At the end of this session the student will be able to	PO12-1
5. Explain various sources of e-waste	PSO1-2
4. Apply various recycling and extraction techniques in the e-waste management.	PSO2-1

### Text Books

- 1. Basuchandra's Applied Chemistry for Electrical and Electronic Engineering Stream Fourth edition-2022
- 2. A Text Book of Engg. Chemistry, Shashi Chawla, & Co.(P)Ltd.
- 3. SS Dara & Dr. SS Umare. A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
- 4. R.V. Gadag and Nithyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing house. 2nd Edition, 2019.
- 5. B.S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar., Chemistry for Engineering Students", Subash Publications, Bangalore.5th Edition, 2014
- 6. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Edition, 2004.

### Reference Books (specify minimum two foreign authors text books)

- Wiley Engineering Chemistry, Wiley India Pvt .Ltd. New Delhi,2013-2ndEdition.
- Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi 2.
- G.A.Ozin, A.C. Arsenault &Lud ovicoCademartiri "Nanochemistry A Chemical Approach to Nanomaterials", Royal Society of Chemistry, First Edition, 2005.
- Wiley, "Engineering Chemistry", India Pvt. Ltd. New Delhi. Second Edition. 2013.

- V.R. Gowariker, N.V.Viswanathan&J.Sreedhat., "Polymer Science", Wiley-Eastern Ltd. New Delhi, First Editor 1986. M.G.Fontana., "Corrosion Engineering", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi, Third Edition, In

### Weblinks and Video Lectures(e-Resources):

- · http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.nc.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN411
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

### Activity Based Learning (Suggested Activities in Class)/Practical Based learning

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

### Useful Journals

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- 1. Journal of Power Sources. (www.journals.elsevier.com/journal-of-power-sources)
- 2. Journal of Alloys and Compounds.( www.journals.elsevier.com/journal-of-alloys-and-compounds)
- 3. Fuel Cells Bulletin.(www.journals.elsevier.com/fuel-cells-bulletin)
- 4. Electrochemical Acta. (www.journals.elsevier.com/electrochimica-acta)
- 5. European Polymer Journal. (www.journals.elsevier.com/european-polymer-journal)

### Teaching and Learning Methods

- 1. Lecture class: 40 hrs
- 2. Practical classes: 36

### Assignment: 2 assignments

Type of test/examination: Written examination/Assignment

### Continuous Internal Evaluation (CIE):

- 1. Three Tests each of 25 Marks, in which average of best of two internals is considered and scale down to 1
- 2. Two assignments each of 25 Marks later scale down to 10 marks
- 3. CIE for the practical component: On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 15 marks are for conducting the experiment, Brief procedure writeup and preparation of the laboratory record, the other 10 marks shall be for the test conducted at the end of the semester (The laboratory test duration of 03 hours is conducted for 50 marks and scale down to

otal: CIE: IA Tests+ CCA+ Lab = 15+10+25= 50 Marks

### mester End Exam (SEE):

sory SEE will be conducted by University as per the scheduled timetable, with common question papers for the

he question paper will have ten questions. Each question is set for 20 marks.

nere will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 subions), should have a mix of topics under that module. The students have to answer 5 full questions, selecting one

SEE will be conducted for 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

### CO to PO Mapping

PO1: Science and engineering Knowledge PO2: Problem Analysis

pO3: Design & Development

pO4: Investigations of Complex Problems

PO5: Modern Tool Usage

PO6: Engineer & Society

PO7: Environment and Society

PO9: Individual & Team Work

PO10: Communication

PO11: Project Mngmt & Finance

PO12:Lifelong Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Inderstand to analyze, design and implement the solutions for the real world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of

		T													
СО	РО	PO1	PO2	РО3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Danie	K-									-					
BCHES202	level	1								_					
CO1	K3	3	3	1	-	1	1	2	-	3	-	-	1	2	1
CO2	K3	. 3	3	1	-	1	1	1	-	1	-		. 1	2	1
CO3	КЗ	3	3	1	_	1	1	1	-	3	-	-	1	2	1
CO4	К3	3	3	1	-	1	1	1	-	3	-		1	2	1
CO5	КЗ	3	3	1	-	1	1	3	1	1	-	-	1	2	1

Dr. C. VASUDEV Professor & HOD

Department of Applied Science

K.S. School of Engineering & Management Bangalore - 560 109

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Principal/Director K S School of Engineering and Manage

Bengaluru - 560 109



### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE -

### 560109

### DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER)

### FIRST ASSIGNMENT

Degree	The state of the s	The second second	and the second of the second o
Branch	i B.E	Semester	: 11
Course Title	: CSE and AL&DS	Course Code	: BCHES202
Date	: Applied Chemistry	Max Marks	: 15
the second section of the sect	: 25/3/2024	Last Date for Submis	sion : 1/4/2024

Q. No.	Question	Marks	K-Level	CO mapping
1.	<ul> <li>(a) Apply electrochemical theory to explain the corrosion of iron.</li> <li>(b) What is CPR? A thick brass sheet of area 400 inch² is exposed to moist air. After 2 years of period, it was found to experience a weight loss 375g due to corrosion. If the density of brass is 8.73g/cm³. Calculate CPR in mpy and mmpy.</li> </ul>	3	Applying K3	CO1
2.	<ul><li>(a) Explain differential metal corrosion with an example.</li><li>(b) What are concentration cells? Explain an Electrolyte concentration cells by taking Copper electrode.</li></ul>	2	Understanding K2	CO1
3.	(a) Explain Waterline corrosion with an example. (b) Explain Pitting corrosion with an example.	2	Understanding K2	CO1
	<ul> <li>(a) Derive an expression for P<sup>H</sup> using glass electrode.</li> <li>(b) Two zinc rods are placed in 0.1M &amp; 1M ZnSO<sub>4</sub> solution separately to form a cell. Give the electrochemical representation of the cell &amp; calculate its emf.</li> </ul>	2	Applying K3	CO1
5.	What are reference electrodes? Construct the Calomel electrode and illustrate the working of electrode with reactions.	2	Applying K3	CO1
6. e	What are ion selective electrodes? Construct the Glass electrode and illustrate the working of electrode with eactions.	2	Applying K3	COI
(a	a) Applying Cathodic protection principle, explain corrosion control by galvanisation. b) Applying Cathodic protection principle, explain corrosion control by sacrificial anode method with example.	2.	Applying K3	COI
8. pl	xplain the construction, Illustrate the working of notovoltaic cells and write advantages of the cell.	3	Applying K3	CO2
9. (a)	Explain the generation of hydrogen by alkaline water electrolysis.  What is green hydrogen? Discuss any four advantages of alkaline electrolysis of water.	4	Understanding K2	CO2
10. Do	escribe the hydrogen production by proton exchange embrane water electrolysis.	3	Understanding K2	CO2

Silla R.
Course Incharge

Dr. C. VASUDEV

Professor & HOD Department of Applied Science K.S. School of Engineering & Managamar



### K.S.SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

### DEPARTMENT OF CIVIL ENGINEERING

SESSION: 2023-2024 (EVEN SEMESTER) SECOND ASSIGNMENT

Degree

B.E

Branch

CSE & AI-DS

Course Title

Applied Chemistry for CSE Stream

Date

07/05/2024

Semester:

11

Course Code:

BCHES202

Max Marks:

25

Last Date for:

17/05/2024

submission

Question	Marks	K- Level	CO
three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 3g of		Applying K3	
average molecular weight and the index of polydispersity.  (b). Explain the synthesis of Polyacetylene and mention its applications	5		CO2
oxidative or reductive doping technique			
(a).Explain the preparation, properties and commercial applications of Kevlar (b). Describe Preparation, properties, and commercial applications of graphene oxide.	5	Understanding K2	CO2
Describe the application of Electrochemical gas sensors in asing SOx and NOx	5	Understanding K2	CO3
What are Disposable Sensors? Explain its advantages over classical sors  What are Actuators & Transducers? Explain about detection of hosate with electrochemical oxidation.  What are Batteries? Discuss the classification of batteries	5	Understanding K2	CO3
Describe the construction, working and applications of Sodium-ion ries  Explain the construction, Illustrate the working and ations of Lithium-ion batteries  pplying working Principle of Quantum Dot Sensitized Solar	,	Applying K3	CO3
	(a). A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 3g of 100000 molecular weight. Calculate number average and weight average molecular weight and the index of polydispersity.  (b). Explain the synthesis of Polyacetylene and mention its applications  (c). Discuss the conduction mechanism in polyacetylene through oxidative or reductive doping technique  (a). Explain the preparation, properties and commercial applications of Kevlar  (b). Describe Preparation, properties, and commercial applications of graphene oxide.  a). Explain the working principle of Conductometric sensors conductometry) and Optical sensors (colorimetry)  b). What are Electrochemical Sensors? Explain its application in a measurement of Dissolved Oxygen (DO)  Describe the application of Electrochemical gas sensors in using SOx and NOx  What are Disposable Sensors? Explain its advantages over classical sors  What are Actuators & Transducers? Explain about detection of thosate with electrochemical oxidation.  What are Batteries? Discuss the classification of batteries  Describe the construction, working and applications of Sodium-ion ries  Explain the construction, Illustrate the working and applications of Lithium-ion batteries	(a). A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 3g of 100000 molecular weight. Calculate number average and weight average molecular weight and the index of polydispersity.  (b). Explain the synthesis of Polyacetylene and mention its applications (c). Discuss the conduction mechanism in polyacetylene through oxidative or reductive doping technique (a). Explain the preparation, properties and commercial applications of Kevlar (b). Describe Preparation, properties, and commercial applications of graphene oxide.  a). Explain the working principle of Conductometric sensors conductometry) and Optical sensors (colorimetry) (b). What are Electrochemical Sensors? Explain its application in the measurement of Dissolved Oxygen (DO) (c). Describe the application of Electrochemical gas sensors in sing SOx and NOx  What are Disposable Sensors? Explain its advantages over classical sors  What are Actuators & Transducers? Explain about detection of thosate with electrochemical oxidation.  What are Batteries? Discuss the classification of batteries  Describe the construction, working and applications of Sodium-ion ries  Explain the construction, Illustrate the working and applications of Lithium-ion batteries	Question  (a). A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 3g of 100000 molecular weight. Calculate number average and weight average molecular weight and the index of polydispersity.  (b). Explain the synthesis of Polyacetylene and mention its applications (c). Discuss the conduction mechanism in polyacetylene through oxidative or reductive doping technique  (a). Explain the preparation, properties and commercial applications of Kevlar  (b). Describe Preparation, properties, and commercial applications of graphene oxide.  (a). Explain the working principle of Conductometric sensors conductometry) and Optical sensors (colorimetry)  (b). What are Electrochemical Sensors? Explain its application in a measurement of Dissolved Oxygen (DO)  (c). Describe the application of Electrochemical gas sensors in using SOx and NOx  What are Disposable Sensors? Explain its advantages over classical fors  What are Batteries? Discuss the classification of batteries  Describe the construction, working and applications of Sodium-ion fies  Explain the construction, Illustrate the working and applying applying the properties of the polytome.

07/05/2024

Dr. C. VASUDEV

Professor & HOD Department of Applied Science e school of Engineering & Managemen'



K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109 SECOND SUST SUST LAST A A SEMESTER) I STACTORAL THAT OF FATTON PAPER

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Branch	I. h.i	TENN TO F	the second second second
Course Title	The River of the State of the S	Circulation Co.	
Duration	Applied Chemistry	Paura Patte	in the state of th
and and have been been been been been been been be	1.1 Inti editation	Date	r di minir
1		May Marke	111

Q	Nate: Answer ONE full question fro	nan consti		
No.	Question	Marks	R- Level	CG mapping
1(n)	Explain differential metal corresion with an example			
(b)	Construct Calonial -1	5	Understanding   K2	COT
	The state of the s	5	Applying K3	COL
(c)	A thickness of alloy sheet of area 100 inch <sup>2</sup> is exposed to air near the ocean. After 1 year period it was found to experience a weight loss of 35 g due to corrosion. If the density of alloy is 8.4 g/cm <sup>3</sup> . Calculate the CPR in mmpy and mpy.	5	Applying K3	CO1
-		-		a said to pay a society of
2(a)	What is galvanization? Explain corrosion control by galvanization process.	5	Understanding K2	COL
(b)	Applying electrochemical theory of corrosion, Illustrate rusting of iron with reactions.	5	Applying K3	COI
(e)	Define concentration cell. The emf of the cell Cu(s)/CuSO <sub>4</sub> (0.001M)//CuSO <sub>4</sub> (XM)/Cu(s) is 0.0595V at 25°C, Calculate the value of X.	5	Applying K3	£01
	PART-B		The state of the s	The state of the s
(a)	Explain the generation of hydrogen by alkaline water electrolysis.	5	Understanding K2	CO2
(b)	Explain the production of Hydrogen by Photo catalytic water splitting method.	5	Understanding K2	CO2
	OR			
91	Explain the production of Hydrogen by PEM water electrolysis.	5	Understanding K2	CO2
,,	Explain the construction, working and application of photovoltaic cell.	5	Understanding K2	CO2

Course Incharge

William .

Dr. C. VASUDEV

Professor & HOD Department of Applied Science K.S. School of Engineering & Management

**IQAC-Coordinator** 

Princip &

Dr. K. RAMA NARASIMHA Principal/Director

K S School of Engineering and Mana Rengalisa Footos





# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT,

#### BENGALURU-560109

#### DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER)

# SCHEME OF I SESSIONAL TEST QUESTION PAPER

STAIN .	SCHEME OF I SESSIONA SET-	
	71.1	Semester 21 Gd-402
Degree	: B.E	Date of HES202
Branch	: CSE & AIDS	Course Code : BCTT
Course Title	: Applied Chemistry	Max Marks
Duration	: 60 Minutes	question from each part M

Co	ourse Title	: 1	Applied Chemistry		Max Marks	and the state of t	Marks
Dr	iration	; (	50 Minutes	ONE full question	trom caes		And the Control of th
Language		and the latest terms to the latest terms term terms to the latest terms to the latest terms terms to the latest terms to the latest terms terms terms terms to the latest terms term terms ter	Note: Attack	s with Scheme & So	lution		antina managaran da
No.			A TOTAL COMMENT OF THE PARTY OF	11 A D L - A	The state of the s	and the same of th	5
No.		Carlotte State Colored Williams	The second special second second	PARTER		corrosive	
		1.00	tial metal corrosion	with an example.	with each oth	er in a conte	
a)	Explain d	ifteren	Harmetar o	netals are in contact	in a galvanio	current. Income	
-	This occu	irs who	en two dissinitian in	with an example.  netals are in contact erence is set up result	ing in a gar	lower electrode	2
	conductiv	e medi	um; a potential diffe	with an example.  netals are in contact rence is set up result undergo oxidation.	The metal with	higher electrode	
	notential	or m	ore active metal a	tial difference is main	n factor for con-	acked.	
	potential	acts as	s cathode. The poten	undergo oxidation.  ets as anode and to  tial difference is main  on whereas cathodic not a contact with	netal gets un das	lower electrode	
	The anod	ic meta	d undergoes corrosio	tial difference is main on whereas cathodic notion iron contact with	copper, from field		
	The anom		Egs: Wi	l acts as anode.	2. 2.5		1
		• New	controde At	anode: Fe	$Fe^{2+} + 2e^{-}$	OH.	
ol	anode ]	o: trom straosphere		$\alpha \cap A \cap A \cap A$	+ 40-		
		₿ ₿	<b>1</b>	2e <sup>2+</sup> + 2OH → 1·e(	2(	Fe <sub>2</sub> O <sub>3</sub> · 3H <sub>2</sub> O)	2
		O: In soln		4Fe (OH)2 + O2 1 2112	ving higher elec	trode potential	
	量	OHE	W/herea	is copper which is	The rate of	galvanic desthodic	:
	Fe <sup>2+</sup> + 2OH						1
	c	errorier pro	depend	s upon potential and	tal factors and te	nuchey	
	tale r	atio of					5
	metals, re	o pass	ivity etc.	Lustrate working of 6	electrode with re	actions	1
	Constru	ct Calc	mel electrode and II	lustrate working of enel electrode: calomel electrode co	0100	e tube, Mercury i	S
(b)	Constru		Calor	nel electrode: calomel electrode co d at the bottom of a	onsists of a gras	aste of mercury an	d
	-		nlacet	d at the bottom of a	glass tibe. A p	mercury. The space	e
	28-→ P	t wire	merci	d at the bottom of a arrous chloride is plate the paste is filled	ced above kill	solution of know	n
			above	the paste is filled entration. A platinum	wire is kept	immersed into the	m
			conce	entration. A platinur ury to obtain electric	al contact. Poro	is disc at the botto	in a
			merc	ary to obtain electrication	be acts a	s salt bridg	1
	FEET		of	the outer tul	represented a	S, $Hg(t)$ $Hg(t)$	"
			Calo	mel electrone		i i danandi	ne
	FINA	Calome	KCI :	solution Calomel electrode ca	n act as anode c	or cathode dependi	
~ .		– Me	reury The C	e nature of the other	electrode of the	cell.	
Sol	===	Satura	N - 4 1	alf-cell reaction is			
		Porous	disc Net i	$Cl_2(s) + 2e^-$	2Hg(l	) + 2Cl	
			$\mathrm{Hg}_2$	C12(8) 1 20	u 208 K		
		D <sub>0</sub>	tential $E = E^{\alpha}$	0.0591 log( Cl ")	11 470 11		
	Electrode	Faua	tation for Calomel	electrode ) Calomel electrode	dependent on	the concentration	of
	( Nernst	the el	ectrode potential of	Calomei electrode	dependent		
	Hence,	e ions		on of KCl Saturated	d		
	Cinoria		Concentration	Electrode 0.242 V			

	A thickness of a	How where of some 1000 inco	Ab? is awanted to air near	the ocean. After 1 year	mandania (man
1	1(c) period it was from	Hely sheet on area in in-	in is exposed to due to cor	rosion. If the density of	N. Samuel
	TO BE WELL	I blenlate this I DD in	M 1088 Of 35 g title to see.	rosion. If the density of	
	To ententate Cf	NO IL ALLENS	mmpy and mpy.	Proceeds on chickly soldward taket reproduct account and account and account a	
The state of		Th things	A Vindor	COD	Mo
		Marie Contraction of the Contrac	(liven	CPR in mmpy	me
No. of Contractions	. 1	W (wt loss)	2 C	87.6	Y W
1		0	35 g	35 x 1000 mg	00
		٨	8.4 g/ cm <sup>1</sup>	8.4 g/ cm <sup>1</sup>	18
			l year	100 x 6.45cm <sup>2</sup>	1
			1 inch <sup>2</sup> = 6.45 cm <sup>2</sup>	365 x 24 hrs	1
dowing					
		rm kxw	$I \text{ cm}^2 = 0.155 \text{ inch}^2$		
So	Я	$CPR = \frac{k \times W}{D(p) \times A \times T}$	ž 87.6	x 35 x 1000	
				x 6.45 x 365 x 24	2
	-	CPR =	***	X 6.45 X 365 X 24	
	Lo calculate	CPR =	0.064 mmpy		
		The man			
		K	Given		
		W (wt loss)		CPR in mpy	
	Name of the latest and the latest an	P (W( loss)	35 g	534	
	1	A	8.4 g/ cm <sup>3</sup>	35 x 1000 mg	1/2
	1	T	100 inch <sup>2</sup>	8.4 g/ cm <sup>3</sup>	
			I Vac	100 inch <sup>2</sup>	
	CPR = 2.54 mpy	$CPR = \frac{k_X}{D(\rho)_X}$	x w	365 x 24 hrs	
	mpy mpy	υ(ρ) χ		4 x 35 x 1000	
2(a)	What	The state of the s		100 x 365 x 24	2
()	what is galvanizat	tion? Explain	OR	100 X 365 X 24	
7	Galvanisation: It i	Sa phain corrosion	OR n control by galvanization base metal (iron) with the	on process.  nc (Zn) metal. This process	
1	usually carried out	by the coating a	base metal (in a land)	n process.	
1	tronsneet	by not dipping method	i.	ac (Zn) metal. This	5
1	-	Miles	Orier	rnis process	
1	100	3			
		1		Galvanisad iron	1
ol	Organic solvent	Dil Histo.		- 40	
	Process: first the be	Technique of gal	ished properly with organ the surface afterwards it. Finally the base		
	any organic matter (	se metal surface is wa	shed property	nic solvents to remove t washed with dil. H <sub>2</sub> SO <sub>4</sub>	
1	to remove any inore	like oil, grease etc) on	the surface of	aic solvente	2
11	and air-dried. The ba	anic matter (like rust).	Finally the base	t washed with dill to	
. ! :	and one	use metal then dinned:	in a metal is	e wall with dil. Hiso	
(	on the surface is rem	tux of NH <sub>4</sub> Cl to prever	nt the oxidation of mot	maintained at 425, 4500c	1
l c	coating is obtain t	toved by passing through	igh a pair set	en zine Than 723-450°C	1
) A	Applying electroche		in a bath of molten zine is ent the oxidation of molte igh a pair of hot rollers so sion, <b>Illustrate</b> rusting of	o that a proper thin	2
	- It has a second cite.	mical theory of corros	sion, Illustrate rusting o	The state of the s	,
		The second secon	and the same of th	iron with reactions	
				10115.	5

Most of the corrosion takes place on the basis of electrochemical reactions on the surface of 1 metal such a type of corrosion is known as wet corrosion. When a metal like iron is exposed to the environment according to electrochemical theory corrosion of metal takes place due to the formation of anodic and cathodic regions on the same metal surface or when the two metals are in contact with each other in a corrosive medium. These anodes and cathodes are formed due to the heterogeneities at the interfaces of the metal and environment. The heterogeneities on a metal surface could develop due to several factors like 1. On a metal surface if the concentration of the oxygen is different (if in the metal the area which is exposed to more oxygen acts as cathode, the area which is exposed to less 1 2. Due to contact of two different metals (eg: if copper and iron are in contact with each other, then Fe acts as anode and copper acts as cathode due to change in electrode potential). 3. If metal surface subjected to stress (area under stress acts as anode). At anode oxidation takes place so that metal is converted into metal ions with the liberation of electric Sol of electrons. Eg: Fe  $\longrightarrow$  Fe<sup>2+</sup> + 2e<sup>-</sup> If the medium is acidic and in the absence of O; If the medium is neutral or alkaline in the absence of O Cathodic reactions: 2H<sub>2</sub>O + 2e' - 2OH' + H<sub>2</sub> ■ If the medium is acidic and in the presence of O2. 2 ightharpoonupIf the medium is neutral or alkaline in the presence of  $O_2$ Cathodic reactions The metal ions (Fe<sup>2+</sup>) liberated at anode and some anions (OH) formed at cathode diffuse towards each other through the conducting medium and form a corrosion product somewhere between the anode and cathode as In an oxidizing environment, the insoluble Fe(OH)2 oxidized to ferric oxide as following 1  $4Fe(OH)_2 + O_2 + 2H_2O \longrightarrow 2(Fe_2O_3.3H_2O)$ Define concentration cell. The emf of the cell Cu(s)/CuSO<sub>4</sub>(0.001M)//CuSO<sub>4</sub>(XM)/Cu(s) is 5 0.0595V at 25°C, Calculate the value of X. 2(c) Solution: n=2,  $C_2 = x M$ ,  $C_1=0.0093 M$  $E_{\text{cell}} = \frac{0.0591}{n} \log \frac{c^2}{c^2},$   $0.0595 = \frac{0.0591}{2} \log \frac{x}{0.001}$  $\mathbf{2}$ 1  $\log \frac{x}{0.001} = 0.0595/0.0295, \qquad \log \frac{x}{0.001} = 2.016949$   $\frac{x}{0.001} = \text{antilog } 2.016949 \qquad \frac{x}{0.001} = 103.9798 \qquad \underline{X} = 0.10$ 1 Sol X = 0.1039 M1 Part B 5 Explain the generation of hydrogen by alkaline water electrolysis. 3(a)

4		
Se	used as the separator. It is a good ionic conductor of hydroxyl ions and bad electronic	1 4(b)
and meetings and an interest of the second o	molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the separator towards anode and get oxidized to oxygen and water.  At cathode:  2 H.O + 2 or x H. (g) + 2 OH	2
3(b)	anode: $2 \text{ OH} \rightarrow \frac{1}{2} \text{ O2}(q) + \text{H}_2\text{O} + \text{2 e}^2$	
5(0)	That the production $H_2(g) + H_2(g) + H_2(g)$	
	photography water to get hydrogen by using a his water splitting method.	5
Sol	Splitting of water to get hydrogen by Photo catalytic water splitting method.  photocatalytic water splitting. When solar energy interacts the photocatalyst, produces charge carrier holes and electronsdue to absorption of energy. Thus, produced hole will react with the neighboring water molecule liberates the hydrogen ionand oxygen.	1
	Reactions: - $H_2O(1) + [hv] + 2h^+$	2
	$2H^{+} + 2e^{-} \longrightarrow H_{2} (g)$	
1(0)	Photo catalyst	2
4(a)	Photo catalyst	2
4(a)	Photo catalyst  OR  Explain the production of Hydrogen by PEM water electrolysis	
2	Explain the production of Hydrogen by PEM water electrolysis.  Electrolysis of water is a non-spontaneous chemical reaction. It is carried out by applying sufficient voltage between the two electrodes in an electrolyser. The important components used in the electrolyser are as shown in the figure.  Anode: Iridium metal particles dispersed on porous carbon is used.	5
	Explain the production of Hydrogen by PEM water electrolysis.  Electrolysis of water is a non-spontaneous chemical reaction. It is carried out by applying sufficient voltage between the two electrodes in an electrolyser. The important components used in the electrolyser are as shown in the Components used	5

Explain the construction, working and application of photovoltaic cell.	
<ul> <li>Photovoltaic cell is a device having semiconductor diodes converts the fine chargy (electromagnetic radiation) from solar or illumination source to electrical energy. It is also called as solar cells. So it will be generating electricity as long as it is exposed to light (i.e. sunlight).</li> <li>Construction of PV cells:</li> <li>A typical silicon photovoltaic cell is composed of a thin wafer consisting of an ultrathin layer of phosphorous doped (n-type) silicon on top of boron doped (p-type) silicon.</li> <li>Hence a p-n junction is formed between the two.</li> <li>A metallic grid forms one of the electrical contacts of the diode and allows light to fall on the semiconductor between the grid lines.</li> <li>An antireflective layer between the grid lines increase the amount of light transmitted to the semiconductor.</li> <li>The cell's other electrical contact is formed by a metallic layer on the back of the solar cell.</li> </ul>	2
<ul> <li>Working:</li> <li>When light radiation falls on the p-n junction diode, electron-hole pairs are generated by the absorption of the radiation</li> <li>The electrons are drifted to and collected at the n- type end and the holes are drifted to and collected at the p-type end.</li> <li>When these two ends are electrically connected through a conductor, there is a flow of current between the two ends through the external circuit.</li> <li>Thus photoelectric current is produced and available for use.</li> </ul>	1
	Photovoltaic cell is a device having semiconductor diodes converts the light energy (electromagnetic radiation) from solar or illumination source to electrical energy. It is also called as solar cells. So it will be generating electricity as long as it is exposed to light (i.e. sunlight).  Construction of PV cells:  A typical silicon photovoltaic cell is composed of a thin wafer consisting of an ultrathin layer of phosphorous doped (n-type) silicon on top of boron doped (p-type) silicon.  Hence a p-n junction is formed between the two.  A metallic grid forms one of the electrical contacts of the diode and allows light to fall on the semiconductor between the grid lines.  An antireflective layer between the grid lines increase the amount of light transmitted to the semiconductor.  The cell's other electrical contact is formed by a metallic layer on the back of the solar cell.  Working:  When light radiation falls on the p-n junction diode, electron-hole pairs are generated by the absorption of the radiation  The electrons are drifted to and collected at the n- type end and the holes are drifted to and collected at the p-type end.  When these two ends are electrically connected through a conductor, there is a flow of



## K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109 DEPARTMENT OF APPLIED SCIENCE

SESSION: 2023-2024 (EVEN SEMESTER) I SESSIONAL TEST QUESTION PAPER

SET-B

Degree : B.E	USN	
Branch : CSE & AIDS	Semester	1:11
Course Title   Applied G	Course Code	: BCHES202
Duration : Applied Chemistry : 60 Minutes	Date	: 22/4/2024
The second secon	Max Marks	: 25

	Note: Answer ONE full question fr	om each p	part.	
1	No. Question	Marks	K- Level	CO mapping
110	a) Derive an expression	Le reconsession de la consession de la c		
	PART-A  Derive an expression for pH using Glass electrode  Applying electrode	5	Applying K3	CO1
-	rusting of iron and theory of corrosion, Illustrate	5	Applying K3	CO1
(c	Collectration call? The and of the call	5	Applying K3	CO1
	OR			
2(a)	Illustrate corrosion control in Iron by applying galvanization technique.	5	Applying K3	CO1
(b)	Construct Calomel electrode and illustrate working of electrode with reactions.	5	Applying K3	CO1
(c)	A thickness of alloy sheet of area 100 inch <sup>2</sup> is exposed to air near the ocean. After 1 year period it was found to experience a weight loss of 35 g due to corrosion. If the density of alloy is 8.4 g/cm <sup>3</sup> . Calculate the CPR in mmpy and mpy.	5	Applying K3	CO1
	PART-B			
(a)	Explain the production of Hydrogen by PEM water	5	Understanding K2	CO2
(b)	electrolysis.		Understanding K2	CO2
	OR			
2)	Explain the generation of hydrogen by alkaline water	5	Understanding K2	CO2
a)   )	electrolysis.  Explain the production of Hydrogen by Photo catalytic water splitting method.	5	Understanding K2	CO2

Amilto R. Course Incharge

**IQAC-Coordinator** 

Principal/Director





#### K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109

#### DEPARTMENT OF APPLIED SCIENCE

#### SESSION: 2023-2024 (EVEN SEMESTER)

#### SCHEME OF I SESSIONAL TEST QUESTION PAPER

#### SET-B

Degree	1	B.I	Semester	11	
Branch	*	CSL & AIDS	Date	22-04	2024
Course Title	and the	Applied Chemistry	Course Code	A CONTRACTOR OF THE PARTY OF TH	S101
Duration	1	60 Minutes	Max Marks	25	al construction of

No.	Note: Answer ONE full question from each part Questions with Scheme & Solution	Marks
a later		
(a)	PART-A	5
(4)	Derive an expression for pH using Glass electrode	to the Park of the Residence
Sol	Principle: When a thin glass membrane is placed between two solutions of different pH values, a potential difference arises across the membrane. The potential difference varies as the pH of these solutions varies. In practice, pH of one of these solutions is kept constant and therefore the electrode potential depends on pH of the other solution ic experimental solution.  Procedure: glass electrode is immersed in the solution; the pH is to be determined. It is combined with a reference electrode such as a calomel electrode through a salt bridge. The cell assembly is represented as,  Hg  Hg <sub>2</sub> Cl <sub>2</sub>  Cl'  Solution of unknown pH glass 0.1M HCl AgCl Ag  The emf of the above cell, Ecell is measured using an electronic voltmeter with a pH meter. The emf of the cell is given by $E_{Cell} = E_{Cathode} - E_{Anode} \dots 1$ $E_{Cell} = E_{Gloss} - E_{SCE} \dots 2$ Since E SCE is knowing emf the cell,  The potential of glass electrode is given by $E_{Glass} = E_1 - E_2 \dots 3$ Where E & Fa are the electrode potential of outer & inner membrane	1
	$E_{Glass} = [E^{O} + 0.0591 \log (C_{1})] - [E^{O} + 0.0591 \log (C_{2})]$	
	Where .C. & C. are the concentrat ion s of outer & inner acid solutions.	
	$E_{\text{corr}} = 0.0591 \log(C_1) - 0.0591 \log(C_2)$	1
	$E_{Glass} = -0.0591 \log(C_2) + 0.0591 \log(C_1)$ Since the H <sup>+</sup> concentration inside the glass bulb is a constant. The first term on RHS of the above equation becomes a constant. $E_{Glass} = Cons \tan t + 0.0591 \log[C_1]$	
	$E_{Glass} = Cons \tan t + 0.0591 \cdot \log[H^+] \qquad \text{Since, } C_t = [H^+]$	
	$E_{Glass} = Cons \tan t - 0.0591.p^{H}4$ Where $P^{H} = \log [H^{*}]$	
	a 1 what the equation 4 in equation 2.	
	$E_{ij} = Cons$ tan $I = 0.0591$ . $ptt = E_{ME}$	
	Constant $E = E_{xy} - E_{xy}$	
	p = 0.0591	-
1(1	Applying electrochemical theory of corrosion, Illustrate rusting of iron with reactions.	

Most of the corrosion takes place on the basis of electrochemical reactions on the surface of metal such a type of corrosion is known as wet corrosion. When a metal like iron is exposed to the environment according to electrochemical theory corrosion of metal takes place due to the formation of anodic and cathodic regions on the same metal surface or when the two metals are in contact with each other in a corrosive medium. The state of the s tron root These anodes and cathodes are formed due to the heterogeneities at the interfaces of the metal and environment. The last of the factors and environment. The heterogeneities on a metal surface could develop due to several factors like 1. On a metal surface if the concentration of the oxygen is different (if in the metal the area which is exposed to less oxygen 1 which is exposed to more oxygen acts as cathode, the area which is exposed to less oxygen concentration acts as anode). 2. Due to contact of two different metals (eg: if copper and iron are in contact with each other, then Fe acts as another.) Sol then Fe acts as anode and copper acts as cathode due to change in electrode potential).

3. If metal surface and copper acts as cathode due to change in electrode potential). 3. If metal surface subjected to stress (area under stress acts as anode). At anode oxidation takes place so that metal is converted into metal ions with the liberation of electrons. Eg: Fe Cathodic reactions: If the medium is acidic and in the absence of O2 2H- +2e-Liberation of Hydrogen type  $_{f L}$  If the medium is neutral or alkaline in the absence of O<sub>2</sub> Cathodic 2H<sub>2</sub>O + 2e' 2OH' + H<sub>2</sub> reactions 2 ► If the medium is acidic and in the presence of O<sub>2</sub>. Absorption of oxygen type 2H<sub>2</sub>O If the medium is neutral or alkaline in the presence of  $O_2$ The metal ions (Fe<sup>2+</sup>) liberated at anode and some anions (OH) formed at cathode diffuse towards each other through the conducting medium and form a corrosion product Fe<sup>2+</sup> + 2OH → Fe(OH)<sub>2</sub> In an oxidizing environment, the insoluble Fe(OH)<sub>2</sub> oxidized to ferric oxide as following 1 Define concentration cell? The emf of the cell Cu(s)/CuSO<sub>4</sub>(0.001M)//CuSO<sub>4</sub>(XM)/Cu(s) is 0.0595V at 25°C, Calculate the value 1(c) Solution: n=2,  $C_2 = x M$ ,  $C_1=0.0093 M$  $E_{\text{cell}} = \frac{0.0591}{n} \log \frac{C2}{C1},$   $0.0595 = \frac{0.0591}{2} \log \frac{X}{0.001}$ Sol 2  $\log \frac{x}{0.001} = 0.0595/0.0295, \qquad \log \frac{x}{0.001} = 2.016949$ 1 = antilog 2.016949  $\frac{x}{0.001}$  = 103.9798 X = 0.1039 M1 Illustrate corrosion control in Iron by applying galvanization technique. 2(a) 1 5

	Galvanisation: It is a process of coating a base metal (iron) with zinc (Zn) metal. This process usually carried out by hot dipping method.	1
	usually carried out by hot dipping method.	1
	tron sheet horters bytes garventeed man	
	The contraction of the contracti	
	2	
1		-
	Organic solvent Dil 1150 Zoci + Invest Motion Zo (4500) Freets Zo	2
Sol	1 gentleman and Religion in the Control of the Cont	
	Process: first the base metal surface is washed properly with organic solvents to remove any	
_ 1	organic matter (like oil, grease the rust). The base metal-rust it washed with dil. H <sub>2</sub> SO/16	
	dried 37 - 1 dried and dipped in a bath of molten zinc maintained at 425-450°C and	
	covered with a flow of NH4Cl to prevent the oxidation of molten zinc. Then excess zinc on	2
	the surface is removed by passing through a pair of hot rollers so that a proper thin coating is	
	obtained.	
2(b)	Construct Calomel electrode and illustrate working of electrode with reactions.	5
		1
	The calomel electrode consists of a glass tube, Mercury is placed at the bottom of a glass tube.	
	A paste of mercury and mercurous chloride is placed above the mercury. The space above the	
	paste is filled with a KCl solution of known concentration. A platinum wire is kept infinered	
	THE THE PICTURE OF THE CALL OF	
- 1	Calomel electrode canbe represented as, Hg(l)   Hg <sub>2</sub> Cl <sub>2</sub> (S),	
		1
1		
101		
		2
	Flectrode Potential $E = E^{0} - 0.0591 \log(Cl^{-})$ At 298 K	
	Calomel (Nowast Equatation for Calomel electrode)	
	Mercury  Mer	
1	Saturated satura	
1	Concentration of RCI Sustained	1
	- 1 Clasting de   1) /4/ V	
	the econon Allei I year I	5
A	thickness of alloy sheet of area weight loss of 35 g due to corrosion. If the density of area	
)   pe	eriod it was found to experience a weight	
lis	8.4 g/cm <sup>3</sup> . Calculate the CT R	
T	o calculate CPR in mmpy Given CPR in minpy	
	87.6	1/2
	1 13 9	
	0.4 g/ cm²	
	$1 \text{ inch}^2 = 6.45 \text{ cm}^2$	
	$1 \text{ cm}^2 = 0.155 \text{ inch}^2$	
-	k × W 87.6 x 35 x 1000	-
	$CPR = \frac{1}{D(0) \times A \times T}$ 8.4 x 100 x 6.45 x 365 x 24	2
	CPR = 0.064 mmpy	
1	OFN = 0.55	
	)   pe	organic matter (like oil, grease to the process of the process and programs of the concentration of the process and the process of the process and the process of the proc

	To calculate	CPR in mpy	Company of the Compan		
	1	I'K in mpy		CPR in mpy	1/2
		K	Given	534	
		W (set loses)		35 x 1000 mg	
		P (mass)	35 g	8.4 g/ cm <sup>3</sup>	
		٨	8.4 g/ cm	() () () () () () () () () () () () () (	2
	CPR = 2.54 mp	1	100 inch²	365 x 24 hrs	
			I I year	534 x 35 x 1000	
Street, Square, or other party	(	$PR = \frac{k \times W}{D(\rho) \times A \times X}$		8.4 x 100 x 365 x 24	
the state of the same					
3(n)	Explain the produ	ction of Hydrogen by	Part B		5
	Electrolysis of water	ction of Hydrogen by	PEM water electro	olysis	
Sol	and bad electronic co Working: Deionised gas and hydrogen i membrane towards co Reactions: At a Overall reaction:	Polymer electrodes in an hown in the figure.  Polymer electrode  Discharge  Polymer electrode  Discharge  Discharge  Polymer electrode  Materia passed in to the ons. The hydrogen ion athode. At the cathode, node:  H2O  athode:  2 H <sup>+</sup> +	Anode: Iridia porous carbon Cathode: Pla porous carbon Electrolyte/sej electrolyte man tetrafluoroethy membrane) is a separator. It is spontaneous recommende chamber, while hydrogen ions a 1/2 O2 (g) + 2 e -> + H2 (g)	important components used in the important components used in the um metal particles dispersed on is used as anode electrocatalyst. tinum metal particles coated on is used as cathode electrocatalyst. parator: A porous solid polymer de of chemically stablesulfonated lene base fluoro polymer (NAFION used as an electrolyte as well as a a good ionic conductor of protons abination of H2 and O2. Here it is oxidized liberating oxygen the proton exchange electrolyte re reduced to hydrogen gas.  H'+2 e	2
b) 1	Explain the construc	tion and working of p	(g)		
		working of p	notovoltaic cells.		=
					5
	(electromagnetic red	is a device having	semiconductor die	odes converts the light energy	1
	called as solar cells	nation) from solar or i	llumination source	odes converts the light energy e to electrical energy. It is also	
5	sunlight)	so it will be generating	g electricity as lo	ng as it is awarenergy. It is also	
	···).		y 110 (O)	e to electrical energy. It is also ng as it is exposed to light (i.e.	
	A metallic grid for on the semiconduc	ms one of the electric	is consist phosph on top silicon.  Hen between al contacts of the	ruction of PV cells:  spical silicon photovoltaic cell mposed of a thin wafer ing of an ultrathin layer of forous doped (n-type) silicon o of boron doped (p-type)  ce a p-n junction is formed n the two. diode and allows light to fall e amount of light transmitted	1

./	Working:	
	by the absorption of the parties.	
	• The electrons are drifted to and collected at the n-end and the holes are drifted to and collected at the p-type end.  When these two ends are electrically connected through a conductor, there is a flow of current between the	1
	current between the two ends through the external circuit.	
	OR	5
(a)	Explain the general:	$\frac{1}{1}$
lo	Electrolysis of water is a non-spontaneous chember the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is carried out by applying sufficient voltage between the It is a good in the cletrolyse.  Anode: Nickel metal particles dispersed on porous carbon is used as cathode used as anode electrocatalyst. Cathode: Nickel metal particles dispersed on porous carbon is used as cathode electrolyse.  Separator: Porous dense anion exchange membrane is used as the separator. It is a good sonic conductor of hydroxyl ions and bad electronic conductor. It prevents the spontaneous ionic conductor of hydroxyl ions and bad electronic conductor. It prevents the spontaneous recombination of H2 and O2.  Working: Deionized water is passed in to the cathode chamber. At cathode water working: Deionized water is passed in to the cathode chamber. At cathode water and hydroxyl ions. The hydroxyl ions move through the molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the molecules are reduced to hydrogen and hydroxyl ions. The hydroxyl ions move through the molecules are re	2
	talytic water splitting method.	5
)	Explain the production of Hydrogen by Photo catalytic water splitting method.  Splitting of water to get hydrogen by using photocatalyst and solar energy is called photocatalytic water splitting.  Photocatalytic water splitting.  When solar energy interacts the photocatalyst, water splitting interacts the photocatalyst, produces charge carrier holes and electrons due to	1
	absorption of energy.  Thus, produced hole will react with the neighboring water molecule liberates the hydrogen ion and oxygen.  ater electrons reduce the H <sup>+</sup> ions in to hydrogen gas.	2
- 1	Reactions: - $H_2O(1) + [hv] + 2h^+ \longrightarrow 2H^+(aq) + \frac{1}{2}O_2(g)$	2

. Sicha R.

Head of the Department to

Principal

# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE -560109

DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) II SESSIONAL TEST QUESTION PAPER SET-A

Degree Branch Course Title

Duration

B.E.

CSE & Al-DS

Applied Chemistry for CSE Stream
55 Minutes

USN Semester : II

Course Code : BCHES202

Date: 29/5/2024

Max Marks: 25

-	Note: Answer ONE full question from eac	h part.		co
Q No.	Question	Marks	K- Level	mapping
	PART-A			
	In a sample of a polymer, 100 molecules have molecular mass 10 <sup>3</sup> g/mol, 250 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass10 <sup>5</sup> g/mol, Calculate the number average, weight average molecular mass of the polymer and Find PDI and comment on it.	5	Applying K3	CO2
(b)	Explain the preparation, properties, and commercial applications of Kevlar Fiber	5	Understanding K2	CO2
	OR			T
(a)	In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol,35% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, Calculate the number average and weight average molecular mass of the	5	Applying K3	CO2
b)	polymer and Find PDI, comment on it.  Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping technique.	5	Understanding K2	CO2
	PART-B			
	Using gas sensors Illustrate the working principle of electrochemical gas sensors for the detection of SOx and NOx	5	Applying K3	CO3
	Explain Na-Ion battery construction, it's working and applications	5	Understanding K2	CO3
c)	What are disposable sensors? Mention the advantages of disposable sensors.	5	Understanding K2	cos
	OR			
a)	Using Electrochemical Sensors, Illustrate measurement of	. 5	Applying K3	cos
1	Dissolved Oxygen (DO)  Explain the construction, working and uses of Li-lon battery.	5	Understanding K2	CO
)	Discuss the detection of a ascorbic acid bio-molecule using disposable sensor also write the electro oxidation reaction.	5	Understanding K2	CO:
	disposable sensor also write the		150	C

Course Incharge

Dr. C. VASUTEV

- Bangalore - 560 109

Professor & HOD
Department of Applied Science
K.S. School of Engineering & Management

**IQAC- Coordinator** 

Principal

Dr. K. RAMA NARASIMHA
Principal/Director

K S School of Engineering and Manag
Bengaluru - 560 109



# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE -560109

#### DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) II SESSIONAL TEST QUESTION PAPER SET-A

Degree USN Branch B.E 11 Semester : Course Title CSE & AI-DS BCHES202 Course Code : Applied Chemistry for CSE Stream Duration 29/5/2024 Date : 75 Minutes Max Marks: 25

Q	Note: Answer ONE full question from each	h part.		CO
No		Marks	K- Level	CO mapping
_	PART-A			
	In a sample of a polymer, 100 molecules have molecular mass $10^3$ g/mol, 250 molecules have molecular mass $10^4$ g/mol, and 300 molecules have molecular mass $10^5$ g/mol, Calculate the number average, weight average molecular mass of the polymer and Find PDI and comment on it.	5	Applying K3	CO2
(b)	<b>Explain</b> the preparation, properties, and commercial applications of Kevlar Fiber	5	Understanding K2	CO2
	OR			
2(a)	In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol,35% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, Calculate the number average and weight average molecular mass of the polymer and Find PDI, comment on it.	5	Applying K3	CO2
(b)	Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping technique.	5	Understanding K2	CO2
,	PART-B			
	Using gas sensors Illustrate the working principle of electrochemical gas sensors for the detection of SOx and NOx	5	Applying K3	CO3
b)	Explain Na-Ion battery construction, it's working and applications	5	Understanding K2	CO3
(c)	What are disposable sensors? Mention the advantages of disposable sensors.	5	Understanding K2	СОЗ
	OR			
(a)	Using Electrochemical Sensors, Illustrate measurement of Dissolved Oxygen (DO)	. 5	Applying K3	СОЗ
h)	Explain the construction, working and uses of Li-lon battery.	5	Understanding K2	CO3
c)	Discuss the detection of a ascorbic acid bio-molecule using disposable sensor also write the electro oxidation reaction.	5	Understanding K2	CO3

Course Incharge

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- Bangalore - 560 109

**IQAC-Coordinator** 

Principal

Dr. K. RAMA NARASIMHA
Prindpal/Director

⊀ S School of Engineering and Managem



#### SESSION: 2023-2024 (EVEN SEMESTER) SCION OF APPLIED SCIENCE APPLIES APPLIES II SESSIONAL TEST QUESTION PAPER

SET-A

Degree

Branch B.E

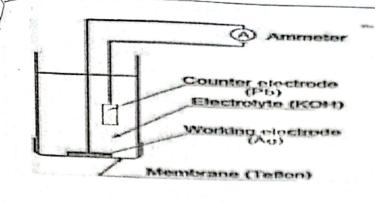
Course Title Duration

CSE & Al-DS

	Course Title CSE & Al-DS	
1	Duration : Applied Chemistry for CSE Stream   Semester : II   Course Code : BCHES202   75 Minutes   Date : 29/5/2024	
	/S Minutes Date : 29/5/2024	
	Max Marks: 25	
Q.	Note: Answer ONE full and the	•
No.	Note: Answer ONE full question from each part	
110.		** 1
-	Questions with Scheme & Solution	Marks
14-1	In a sample of a s	
1(a)	molecular mass 10 <sup>4</sup> g/mol molecules have malecular mass 10 <sup>3</sup> g/mol 250 molecules have	and the state of t
-	average, weight average and 300 molecules have molecular mass 10 g/mol, 250 molecular the number	5
	molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>3</sup> g/mol, 250 molecules have average, weight average molecular mass of the polymer and Find PDI and comment on it.	
	Solution	
	It is given that	
	$N_1 = 100 \& M_1 = 10^3 g/mol$ $N_2 = 250 \& M_1 = 10^4 g/mol$	
	$N_2 = 250 \& M_1 = 10^3 g/mol$ , $N_3 = 300 \& M_1 = 10^4 g/mol$ . The number average $g/mol$ .	1
	The number average molecular mass of the polymer is given by $ \frac{Nim}{Ni} = \frac{NiMi}{Ni} $	1
	Z 1V1	•
ol	$= \frac{N_1 M_1 + N_2 M_2 + N_3 M_3}{N1 + N2 + N3 \dots} = \frac{100 \times 10^3 + 250 \times 10^4 + 300 \times 10^3}{100 + 250 + 300} = 50153g/mol$ The weight average molecular mass of the polymer in given by	
O1	The weight average molecular mass of the polymer is given by $\sum Ni Mi^2$	1
	$\overline{Mw} = \frac{\sum Ni  Mi^2}{\sum Ni  Mi}$	
	$\overline{M_{W}} = \frac{N_{1}M_{1}^{2} + N_{2}M_{2}^{2} + N_{3}M_{3}^{2}}{N_{1}M_{1} + N_{2}M_{2} + N_{3}M_{3}}$	1
	$\overline{M_{W}} = \frac{100  X (10^{3})^{2} + 250  X (10^{4})^{2} + 300  X (10^{5})^{2}}{100  X 10^{3} + 250  X 10^{4} + 300  X 10^{5}} = 92794  g / mol$	
	Poly dispersity index, PDI = $\frac{\overline{Mw}}{\overline{Mn}} = \frac{92794}{50100} = 1.85$	1 -
	PDI >1, the given polymer is less homogeneous and poly disperse in nature.	
		-
(b)	Explain the preparation, properties, and commercial applications of Kevlar Fiber.	5
(~)	Kevlar is a polyamide, in which all the amide groups are separated by para-phenylene groups. The	1
	Chemical composition of Kevlar is poly para phenylene terephthalamide	
	Chemical composition of Reviai is poly para phonylone terspenses	
Name of the last	Synthesis:	
- Salar		
	MgN Creephthaloyldichloride (TDC)	
	- A	
	1 and most in it called Polymer Composite.	
	Kevlar is fiber embedded in an epoxy resin polymer matrix is called Polymer Composite.	
	* FV order	
ol	1. Kevlar is crystalline, lightweight and non-flammable	
	to the heat impact scialcii	2
	2. Resistant to near, impact, sections 3. Withstands harsh environmental conditions	
	3. Withstands harsh environmental substant	
	4. Abrasion and corrosion resistant	
	s High tensile strength	
	6. Resistant to Chemicals	1
	Applications  Applications  Applications	
		,
	It is used in lightweight beautiful and the state of	
	<ol> <li>Bulletproof vests and combat heinlets</li> <li>Bulletproof vests and combat heinlets</li> <li>Reinforce material for car tires, bicycle tires, which reduces puncture rate</li> </ol>	
	3. Reinforce material for car distributions	

3. Reinforce material for car tires, bicycle tires, which reduces puncture rate
4. Marine current 4. Marine current turbine and wind turbine Ropes and cables 6. Fiber-optic cables for communication, data transmission and ignition In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol,35% molecules have molecular mass 25000 g/mol, molecular mass 25000 g/ molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, Calculate the number and remaining molecules have molecular and Find PDI, 2(a) Calculate the number average and weight average molecular mass of the polymer and Find PDI, it is given that. N<sub>1</sub> = 20 & M<sub>1</sub> = 15000g/mol. N<sub>2</sub> = 35 & M<sub>1</sub> = 25000g/mol. N: =45 & M: = 20000 g/mol The number average molecular mass of the polymer is given by  $\overline{\Lambda gn} = \frac{\sum Ni\Lambda gi}{\sum Ni}$  $= N_1 M_1 + N_2 M_2 + N_3 M_3$  $= \frac{20 \times 15000 + 35 \times 25000 + 45 \times 20000}{20 \times 25000 + 45 \times 20000} = 20750 \text{ g/mol}$ The weight average molecular mass of the polymer is given by MN = NIMI Sol  $\overline{M_{W}} = \frac{N_{1}M_{1}^{2} + N_{2}M_{2}^{2} + N_{3}M_{3}^{2}}{N_{1}M_{1} + N_{2}M_{2} + N_{3}M_{3}}$  $\overline{M_W} = \frac{20X(15000)^2 + 35X(25000)^2 + 45X(20000)^2}{20X(5000)^2 + 35X(25000)^2 + 45X(20000)^2} = 21385g/mol$ 20X15000 + 35X25000 + 45X20000Poly dispersity index, PDI =  $\frac{\overline{Mw}}{\overline{Mn}} = \frac{21385}{20750} = 1.03$ PDI >1, the given polymer is less homogeneous and poly disperse in nature. Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping 2(b) Mechanism of conduction in polyacetylene: Conducting polymers are generally produced by doping an oxidizing or a reducing agent into an organic polymer with conjugated back Sol bone consisting of pi-electron system. An organic polymer can be converted into a conducting polymer if it has 1. Linear structure 2. Extensive conjugation in polymeric back bone (Pi-back bone) The conducting polymers are synthesized by doping, in which charged species are introduced in organic polymers having pi-back bone. The important doping reactions are; 1. Oxidative doping (p-doping) 2. Reductive doping (n-doping) 1. Oxidative doping (p-doping): In this process, pi-back bone of a polymer is partially oxidized using a suitable oxidizing agent. This creates positively charged sites on polymer back bone, which are current carriers for conduction. The oxidizing agents used in p-doping are iodine vapor, iodine in CCl4, HBF4, perchloric acid and benzoquinone. 2 PART-B Using gas sensors Illustrate the working principle of electrochemical gas sensors for the detection of SOx and NOx Scanned with OKEN Scanner

	Electrochemical gas sensors for SOx and NOx.	
	Filters	
_	Manufrance	
	The state of the s	
_ ~	No.	
e	Cauntar Cauntar	
	Baseline and Therestyle	1
5	Filters: Used to prevent unwanted contaminants, mainly particulate matter	
1	Membrane: A gas-permeable membrane is used to regulate the gas flow into the sensors. It allows	
$\bigvee$	only analyte gas to pass and prevent the leakage of the electrolyte.	
	Electrodes: two or three electrodes are used on the requirement. Working or sensing, counter and	
	reference electrode.	
	Electrolyte: Electrolyte should be ionic conductor and chemically stable. Main role is, it transport charge within the sensor contact all place and the stable in the reactant and product	1
	and Solitolis an	
7	The same point	
	Sensors for SOX:	
	The sensors contains two or three electrodes	
	Sensing electrode: Au/Nafion	
	Electrolyte: 0.5M H2SO4	1
	Working:	
	☐ The diffusion of gas analyte through filter, membrane and then finally through electrolyte	
So.	of to the surface of sensing electrode	
	☐ Adsorption of analyte gas molecules on the surface of sensing electrode.	
	Oxidation of analyte on the surface of sensing electrode, liberating electrons.	
	U Description of product from the electrode surface	
	☐ Diffusion of the products away from the reaction zone to bulk of electrolyte.	
	$SO_2 + 2H_2O \rightarrow SO_4^{2-} + 4H^+ + 2e^-$	1
	Sensors for NO2:	
	The sensors contain two or three electrodes.	1
	Sensing electrode: Au, Pt/Nafion.	
	Electrolyte: 10 M H2SO4	
	Working:  ☐ The diffusion of gas analyte through filter, membrane and then finally through electrolyte	
	1 leg on the curtace () Schoule of the	
	☐ Adsorption of analyte gas molecules on the surface of sensing electrode, liberating electrons. ☐ Oxidation of analyte on the surface of sensing electrode, liberating electrons.	
	Desorption of product from the electrode surface.	
	☐ Desorption of product from the electrode surface. ☐ Diffusion of the products away from the reaction zone to bulk of electrolyte.	1
W	$\frac{1}{NO_2 + 2H^+ + 2e^- \rightarrow NO + 2H_2O}$	
CAR DO		
	Sensors for NO:	
	The sensors contain two or three electrodes.	
	Sensing electrode: Au/NASICON.	
	Electrolyte: NaNO2	-
	Working:  ☐ The diffusion of gas analyte through filter, membrane and then finally through electrolyte	
	☐ The diffusion of gas analyte through filter, memorane and the file	
	on to the surface of sensing electrode.	
	on to the surface of sensing electrode.  \[ \sum Adsorption of analyte gas molecules on the surface of sensing electrode. \] \[ \sum Adsorption of analyte gas molecules on the surface of sensing electrode. \]	1
	1 - a . I time of analyte on the surface of sensing their and	1 .
	☐ Oxidation of analyte on the simple of Desorption of product from the electrode surface. ☐ Desorption of product from the reaction zone to hulk of electrolyte.	
	Diffusion of the products away from the reaction zone to bath by electrosyste.	
	$NO \pm 2H_0O \rightarrow NU_0^{-} \pm 4H_0^{-} \pm 3b$	
	Explain Na-Ion battery construction, it's working and applications	5
b)	Explain the for safety (SIR)	
	SODIUM-ION BATTERY (SIB)	2
	Composition of the battery: Reactive species at anode: Carbon	
u	Reactive species at cathode: NaCoO2	
	Reactive species at cutilous The San Carlos	



2

5

2

Working:

The difference in potential between the anode and the cathode should be at least 0.5V. When electrode is dipped in the cathode and the cathode should be at least 0.5V.

When electrode is dipped in water to measure DO, anode undergoes oxidation liberating electrons At cathode, DO undergo reduction.  $^{2Zn} \rightarrow ^{2Zn^{2+}}4e^{-}$  reduction. Ag cathode is inert, it only passes electrons to oxygen for

Overall reaction is

$$0_2 + 2H_2O + 4e^- \rightarrow 4OH^-$$

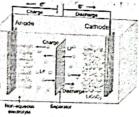
The current produced by the reduction of oxygen at cathode is proportional to the oxygen in the water sample.  $2Zn + O_2 + 2H_2O \rightarrow 2Zn(OH)_2$ water sample.

(d) Explain the construction, working and uses of Li-Ion battery.

Composition of the battery: Reactive species at anode: graphite

Reactive species at cathode: LiCoO2

Electrolyte: Lithium salt Separator: Polypropylene Output Voltage: 3.6V



#### Working of LIB:

During charging lithium ions in cathodic side (positive electrode) is migrated and move towards anodic side (negative electrode)

Cathodic Reaction:  $LiCoO_2 \rightarrow Li_{(1-x)}CoO_2 + xLi^+ + xe^-$ 

Anodic Reaction:  $xLi^+ + xe^- + 6C \rightarrow xLiC_6$ 

 $Overall\ Reaction: LiCoO_2 + 6C \leftrightarrow Li_{(1-x)}CoO_2 + xLiC_6$ 

During discharging lithium ions move from anode to cathode.

Anodic Reaction:  $xLiC_6 \rightarrow xLi^+ + xe^- + 6C$ 

Cathodic Reaction:  $Li_{(1-x)}CoO_2 + xLi^+ + xe^- \rightarrow LiCoO_2$ 

Overall Reaction:  $Li_{(1-x)}CoO_2 + xLiC_6 \rightarrow LiCoO_2 + 6C$ 

Applications of LIB:

The Li - ion batteries are used in mobile phones, cameras, calculators, LCD TVs, pagers, to operate laptop computers, in aerospace applications.

Discuss the detection of a ascorbic acid bio-molecule using disposable sensor also write the elect. 4(e) exidation reaction. Detection of Ascorbic acid. K.S. SCHOO Ascorbic acid is a chemical name of Vitamin C, it is water soluble. In the disposable strip, the sensing electrode, counter and reference electrode are printed using Screen printing technology. Working: Active material is coated on sensing electrode must be capable of oxidizing ascorbic acid on its surface. The active surfaces of the counter electrode and working electrode have been coated with accordance. Reference electrode and working electrode have been coated with aconductive ink of C (MWCNI) and modified with gold nanoparticles. Reference electrode is Ag/AgCl The sensor is immersed in the analyte. The analyte diffuses and adsorbed on the sensing electrode The electrode. The sensor is immersed in the analyte. The analyte of the dehydroascorbic acid and produces electric current electric current. Sol electric current or voltage and it is proportional to the concentration of the ascorbic acid. 64165 ranch ourse Title Darstion HO-Ascorbic acid Dehydroascorbic acid

Course In charge

Head of the Departing

Dr. C. VASUDEV Professor & HOD

Department of Applied Science K.S. School of Engineering & Management Bangalore - 560 109

Dr. K. RAMA NARASIMFIA

Principal/Director K S School of Engineering and Management Bengaluru - 560 109

## DEPARTMENT OF APPLIED SCIENCE

DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) II SESSIONAL TEST QUESTION PAPER SET-B

190

Degree

: B.E

Branch Course Title CSE & AI-DS

Duration :

Applied Chemistry for CSE Stream

75 Minutes

USN

Semester: II

Course Code : BCHES202

Date : 29/5/2024

Max Marks: 25

Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping technique  OR  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>3</sup> g/mol, 250 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number verage and weight average molecular mass of the polymer, alculate PDI and comment on it.  Applying K3  CO2  PART-B  Polain the preparation, properties, and commercial applications Kevlar fibre.  5 Understanding K2  CO3  PART-B  Polain the principle, working and applications of conductometric sors  Strate the construction, working and applications of Lithium-batteries  Applying K3  CO3  Applying K2  CO3  Applying K2  CO3  Applying K3  CO3  Applying K3  CO3  Applying K2  CO3  Applying K3  CO3  CO3  CO4  CO4  CO5  CO5  CO5  CO5  CO6  CO7  CO7  CO7  CO7  CO7  CO7  CO7	Note: Answer ONE full question from e	Marks	K- Level	CO mapping
molecules have molecular mass 25000 g/mol, and remaining average and weight average molecular mass of the polymer, Calculate the number PDI and comment on it.  Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping technique  OR  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>3</sup> g/mol, 250 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number verage and weight average molecular mass of the polymer, alculate PDI and comment on it.  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass of the polymer, alculate PDI and comment on it.  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass of the polymer, alculate PDI and comment on it.  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number start the polymer, and some start the polymer, and some start the polymer, and comment on it.  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, and 3	In a sample of a polymer 2007			
OR  In a sample of a polymer, 100 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number verage and weight average molecular mass of the polymer, falculate PDI and comment on it.  Explain the preparation, properties, and commercial applications (Kevlar fibre)  PART-B  Plain the principle, working and applications of conductometric sors  Strate the construction, working and applications of Lithium-batteries  In a sample of a polymer, 100 molecules have molecular mass of the polymer, 100 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>4</sup> g/mol, and	molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, Calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment on it.	5		CO2
Applying National Sample of a polymer, 100 molecules have molecular mass 10 <sup>3</sup> g/mol, 250 molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number verage and weight average molecular mass of the polymer, calculate PDI and comment on it.  Applain the preparation, properties, and commercial applications (Kevlar fibre.)  PART-B  Plain the principle, working and applications of conductometric scores  Strate the construction, working and applications of Lithium-botteries  Applying K2  CO2  PART-B  Plain the principle, working and applications of Lithium-botteries  Applying K3  CO3  Applying CO3  Applying K3  CO3  Applying K3  CO3  Applying K3  CO3  Applying K3  CO3  Applying K2  CO3  CO4  CO5  CO5  CO6  CO7  CO7  CO7  CO7  CO7  CO7  CO7	oxidative or reductive doping technique	5	0	CO2
Applying K3 CO2  Applying K2 CO3  Applying K2 CO3  Applying K2 CO3  Applying K2 CO3  Applying K3 CO3  Applying K2 CO3  Applying K3 CO3  Applyi	OR			
PART-B  plain the principle, working and applications of conductometric sors  strate the construction, working and applications of Lithium-batteries  at are Quantum Dot Sensitized Solar Cells (QDSSC's)? In the working Principle, Properties and Applications.  OR  ain the working principle of electrochemical gas sensors for election of SOx and NOx  rate the construction, working and uses of Na-Ion battery.  Solution of SOx and NOx  Applying K2  CO3  Understanding K2  CO3  Applying CO3  K2  CO4  CO5  CO5  CO5  CO5  CO5  CO5  CO5	molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 molecules have molecular mass 10 <sup>5</sup> g /mol, Calculate the number verage and weight average molecular mass of the polymer, falculate PDI and comment on it.	5		CO2
polain the principle, working and applications of conductometric sors  Strate the construction, working and applications of Lithium-batteries  Interest are Quantum Dot Sensitized Solar Cells (QDSSC's)?  In ain the working Principle, Properties and Applications.  OR  In the working principle of electrochemical gas sensors for effection of SOx and NOx  The tection o	<b>xplain</b> the preparation, properties, and commercial applications Kevlar fibre.	5	-	CO2
sors  Strate the construction, working and applications of Lithium- Deatteries  Intervention and applications of Lithium- Deatteries  OR  OR  Intervention of SOx and NOx  The construction and applications of Lithium- Strate the construction, working and uses of Na-Ion battery.  Solvential the working principle of electrochemical gas sensors for the construction, working and uses of Na-Ion battery.  Solvential the construction and solve the construction and solve the construction and solve the construction, working and uses of Na-Ion battery.  Solvential the construction and solve the construction are constructed as a solve the construction and solve the construction and solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the construction and solve the construction are constructed as a solve the c	PART-B			
otteries  It are Quantum Dot Sensitized Solar Cells (QDSSC's)?  In the working Principle, Properties and Applications.  OR  In the working principle of electrochemical gas sensors for tection of SOx and NOx  The tection of SOx		5		CO3
ain the working Principle, Properties and Applications.  OR  in the working principle of electrochemical gas sensors for tection of SOx and NOx  rate the construction, working and uses of Na-Ion battery.  5  Understanding K2  COX  COX  Applying COX  K3		5		CO3
tection of SOx and NOx  The te	t are Quantum Dot Sensitized Solar Cells (QDSSC's)?	5		CO3
tection of SOx and NOx  ate the construction, working and uses of Na-Ion battery.  5 Applying CO  K3	OR			1
rate the construction, working and uses of Na-Ion battery. 5 K3	in the working principle of electrochemical gas sensors for	5		CO
are disposable sensors? Mention the advantages of K2 Understanding K2	rate the construction, working and uses of Na-Ion battery.	5		CO
	are disposable sensors? Mention the advantages of	5		СО

urse Incharge

Dr. C. VASUDEV
Professor & HOD

artment of Applied Science

IQAC-Coordinator

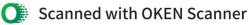
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#### SELARIMENT OF APPLIED SCIENCE FARRIAGEMENT, BANGALORE - 560109 SESSION: 2023-2024 (EVEN SEMESTER) II SESSIONAL TEST QUESTION PAPER

Degree B.E Branch

CSE & AI-DS Course Title Duration

Applied Chemistry for CSE Stream 75 Minutes

Semester : II

Course Code : BCHES202 Date : 29/5/2024

Max Marks: 25

	Questions with Scheme & Solution	Mark
	In a same to Solution	5
1(a)	calculate the number average and weight average molecular mass of the polymer, Calculate PDI	5
	N <sub>1</sub> = 20 & M <sub>1</sub> = 15000g/mol, N <sub>2</sub> = 35 & M <sub>1</sub> = 25000g/mol, N <sub>3</sub> = 45 & M <sub>1</sub> = 20000 g/mol. The number average molecular mass of the polymer is given by $ \overline{Mn} = \frac{\sum NiMi}{\sum Ni} = \frac{N_1 M_1 + N_2 M_2 + N_3 M_3}{N_1 + N_2 + N_3} $ $ = \frac{20X15000 + 35X25000 + 45X20000}{20 + 35 + 45} = 20750 g/mol $ The weight average molecular mass of the polymer is given by	1
Sol	$M_W = \frac{\sum_{i=1}^{M} N_i M_i}{\sum_{i=1}^{M} N_i M_i}$	
	$\overline{M_W} = \frac{N_1 M_1^2 + N_2 M_2^2 + N_3 M_3^2}{N_1 M_1 + N_2 M_2 + N_3 M_3}$ $\overline{M_W} = \frac{20X(15000)^2 + 35X(25000)^2 + 45X(20000)^2}{20X15000 + 35X25000 + 45X20000} = 21385g / mol$	1
	Poly dispersity index, PDI = $\frac{\overline{Mw}}{\overline{Mn}} = \frac{21385}{20750} = 1.03$ PDI >1, the given polymer is less homogeneous	1
(b)	Describe the conduction mechanism in Polyacetylene through oxidative or reductive doping technique.	5
	1. Oxidative doping (p-doping): In this process, an appropriate oxidizing agent is added to bring partial oxidation of polymer pi- backbone. Thus, positively charged sites are generated on the polymer backbone and facilitates the movement of charge carriers in the chain. Most commonly used oxidative doping or p-doping agents are iodine vapor, iodine in CCl4, HBF4, perchloric acid and benzoquinone.	1
	1 oxidation   12 in CCl <sub>4</sub>   - e <sup>-</sup> , + 13 <sup>-</sup>	1
ol	H oxidation	1
	Recombination of radicals  13.	1
	Reactions of p- doping of polyacetylene	1

2. Reductive doping (n-doping):
In reductive doping technique, pi-backbone of a polymer is partially reduced by a suitable for reductive doping technique, pi-backbone of negative charged sites on the pi-backbone area. In reductive doping technique, pi-backbone of a polymore reducing agent. This facilitates the formation of negative charged sites on the pi-backbone and reducing agents are: sodium named as Keylar is a F reducing agent. This facilitates the formation of negative changes agents are: sodium napthalidates are sodium napthalidates are sodium napthalidates. Chemicalco Mechanism of conduction: The addition of an electron to the polymer back bone by using a reducing agent generates a radical ion polaron. A second reduction of chain containing polaron, followed by the recombination of radicals yields two charged (-ve) carriers on each chain. These charge sites on the polymer chains are compensated by cations (Na+ions) formed by the reducing agent. 1 Reduction Na-Naphthalide O Na II Reduction - c\*, + Na\* ⊖ Na¹ Recombination of radicals O Na Reactions of n- doping of polyacetylene In a sample of a polymer, 100 molecules have molecular mass 10<sup>3</sup>g/mol, 250 molecules have molecular mass 10<sup>4</sup>g/mol, and 300 molecules have molecular mass 10<sup>5</sup>g /mol, Calculate the number average and weight average molecular mass of the polymer, Calculate PDI and comment 5 No of Molecules(N) Molecular Mass( M)  $M_1 = 10^3$   $M_2 = 10^4$  $N_1 = 100$  $N_2 = 250$  $N_3 = 300$ Number average molecular mass (Mn) is given by:  $M_3 = 10^{5}$  $\overline{Mn} = \frac{N_1 M_1 + N_2 M_2 + N_3 M_3 + \dots}{N1 + N2 + N3 + \dots}$  $M_{\rm D} = \frac{100 \cdot 10^3 + 250 \cdot 10^4 + 300 \cdot 10^8}{100 + 250 + 300} = 50153 \, \frac{g}{l}$ 1 Weight average molecular mass (Mw) is given by: 1  $\overline{M_W} = \frac{N_1 M_1^2 + N_2 M_2^2 + N_1 M_1^2 + \dots}{N_1 M_1 + N_2 M_2 + N_1 M_1 + \dots}$ 1  $\frac{100*)*(10^{3})*(10^{3}) + 250*(10^{4})*(10^{4}) + 300*(10^{5})*(10^{5})}{100*10^{3} + 250*10^{4} + 300*10^{5}} = 92794 \frac{9}{1}$ 1

 $PDI = \frac{\overline{Mw}}{\overline{Mn}} = \frac{92794}{50153} = 1.85$ 

PDI >1, the given polymer is less homogeneous and poly disperse in nature.

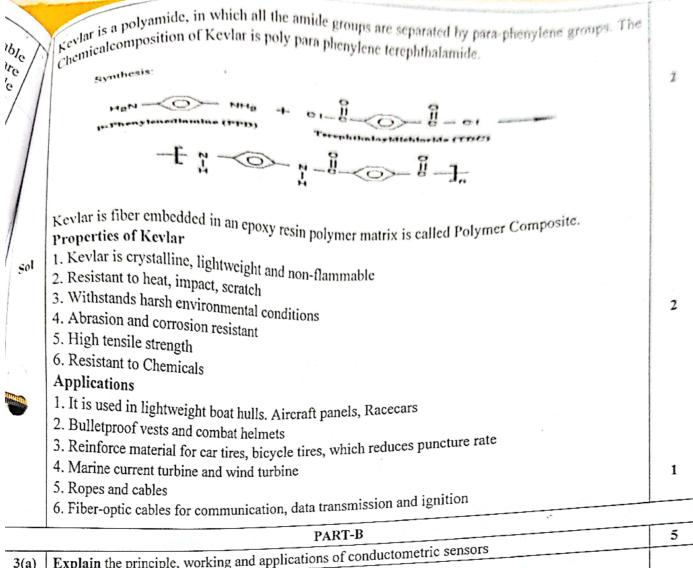
Explain the preparation, properties, and commercial applications of Kevlar fibre.

2(a)

Sol

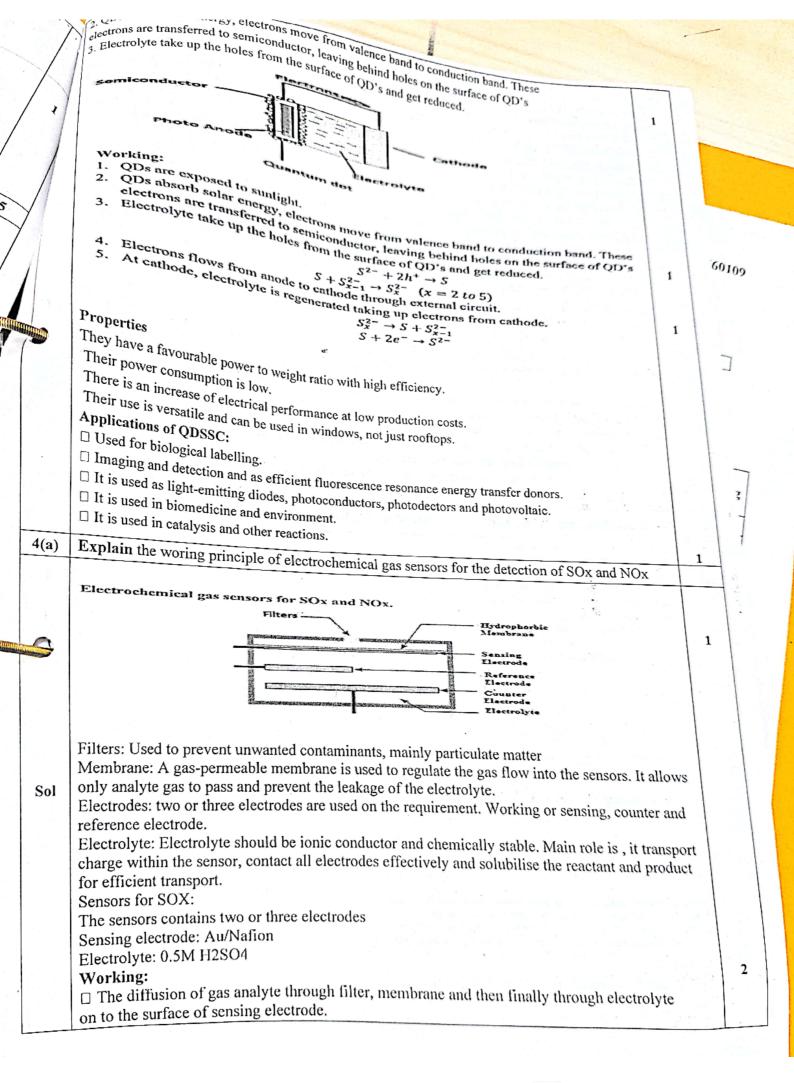
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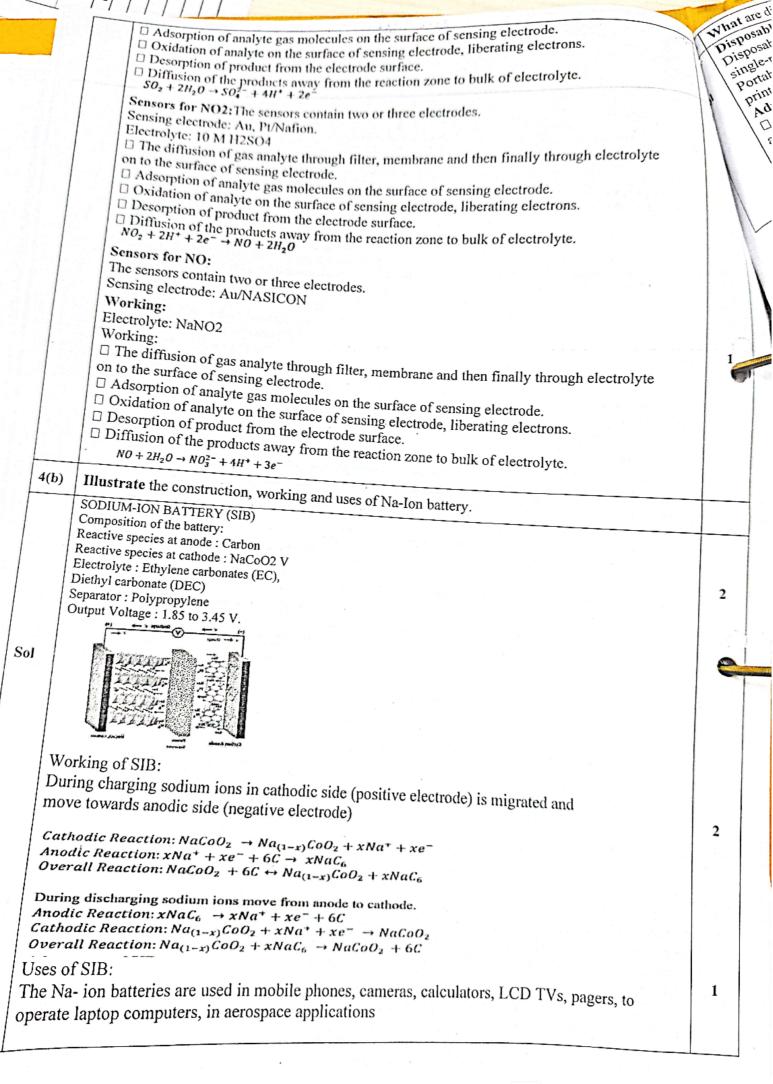
5



	PART-B	5	
3(a)	Explain the principle, working and applications of conductometric sensors		
	Conductometric Sensors:  Conductometric sensors are chemical sensors determines concentration of analyte on the basis of measurement of changes in electrical conductivity when a specific analyte interacts between the	1	
Sol	Principle: The basic principle of conductometric detection involves a reaction that can change the concentration of ionic species. The ions or electrons produced during an electrochemical reaction concentration of ionic species. The ions or electrons produced during an electrochemical reaction concentration of ionic species. The ionic conductivity of the solution or current flow. The change leads to changes in electrical conductivity or resistivity of the solution or current flow. The in conductivity is measured and correlated with the concentration of the analyte in the sample. The final output is a quantitative measure of the concentration of the analyte.  Conductance of a solution depends on The concentration of ions (number of ions).  Mobility of ions. Mobility of ion depends on its size. Smaller the size higher is the mobility and higher is the electrolytic conductance.	1	
	Working: Transducer used in conductometric sensor is called as conductivity cell. It is made of two platinum foils with unit cross sectional area and unit distance between them. Volume between two electrodes is 1cm3Conductance of unit volume of the solution is called as specific conductance. There will be change in specific conductance of solution when there is change in number of ions or type of ion. This change is measured using conductivity cell. The conductivity is a result of dissociation of an electrolyte, into ions. The migration of the ions is induced by an electrical field. When a potential difference is applied to the electrodes, there is an electrical field within the electrolyte, so the positively charged ions move towards cathode and negatively charged ions are move towards anode. Thus, the current in the electrolyte is conducted by the ion movement towards the electrodes where the ions are neutralized and isolated as neutral atoms or molecules.	2	

This chemical change is recognized by working electrode or transducers 2. QDs absorb and converts this chemical change into electrical signal. electrons are Applications: 3. Electroly Conductometric sensors can be used to monitor any chemical which can change the electrolytic conductance of solution on chemical reaction. It is used to estimate acids, bases and their mixtures in the sample. It is used to check the amount of ionic impurities in water samples. It is used in measuring acidity or alkalinity of sea water and fresh water. Conductometic biosensors are used in biomedicine, environment monitoring, biotechnology and agriculture related applicaions. Used in enzyme catalysis to determine analyte concentration and enzyme activity and selectivity. 3(b) Illustrate the construction, working and applications of Lithium-ion batteries Construction: Lithium ion battery uses lithium intercalated electrodes. The following are battery components used in the construction of LIBs 5 Anode (negative electrode): Layered structure intercalated graphite and binder coated on a copper foil. • Cathode (positive electrode): Layered structure lithium cobalt oxide(LiCoO2) or lithium manganese oxide (LiMnO2) mixed with conductor and binder are coated on aluminum foil Electrolyte: Lithium hexafluoro phosphate (orlithium per chlorite or lithium tetrafluoro borate orlithium halida) dissolved in the second of the second or lithium tetrafluoro borate orlithium per chlorite orlithium per chlori halide) dissolved in an organic solventsuch as propylene carbonate and ethylene carbonate with gelling agent. • Separator: Micro porous Polypropylene membrane which separates the cathode & anode and allowsthe movement of ionsfrom anode to cathode and cathode to anode . • Binder: Poly vinylidene fluoride • Container: Stainlesssteel or aluminium alloy. Cell representation: Lithiated Graphite layer /LiPF6 dissolved in organic solvent & gelling Working Principle: Anode and cathode can insert lithium ions into their layered structures reversibly. During intercalation ions move into the electrode. During the reverse process ( deintercalation)ions move back out. The electrolyte conducts Lithium-ions to move between the electrodes. solu 1 node: Cathode Overall reaction: LiC<sub>6</sub> + CoO<sub>2</sub> = Discharging LiCoO2 + 6C 1 Applications of LIBs: • High energy density LIBs are used in electronic devices such as mobile phones, laptops, note PC, portable CD player, semiconductor driven audio electric devices. • Used for emergency power backup or an uninterruptable power supply. • Used in Electric vehicles. • Renewable Energy storage systems. • Defence and Aerospace applications What are Quantum Dot Sensitized Solar Cells (QDSSC's)? Explain the working Principle, 3(c) Properties and Applications. 5 A quantum dot solar cell (QDSC) is a solar cell that uses quantum dots as the absorbing 1 photovoltaic material. It is used to replace bulky materials such as silicon, or copper indium gallium selenide. Quantum dots have band gaps that are adjustable through a wide array of energy levels by Sol changing the size of the dots. Working: 1. QDs are exposed to sunlight.





what are disposate sensors:

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what are disposate sensors in the advantages of disposable sensors. pisposable sensors: pisposable sensors are low-cost and easy-to-use sensing devices designed for short-term or rapid possingle-point measurements.

single-point measurements. Advantages of disposable sensors: Advantages of Clapositole sensors:

They transduce physical, chemical, or biological changes in their environment to an advantage of Clapositole sensors: 2 □ Disposable sensors are biodegradable and sustainable ☐ They have a short duration of analysis and fast response times. 3 ☐ It provides digitized chemical and biological information. ☐ Prevents the contamination of samples 560109 Course In charge Principal Dr. K. RAMA NARASIMHA Dr. C. VASUDEV Principal/Director

Department of Applied Science
School of Engineering and Management
Reporting 550 100 K.S. School of Engineering & Management Bangalore - 560 109

### DEPARTMENT OF MANAGEMENT, BANGALORE -560109 DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER)

II SESSIONAL TEST QUESTION PAPER pegree granch B.E Course Title CSE & AI-DS puration USN Applied Chemistry for CSE Stream Semester : Course Code: BCHES202

	Thirdes Tor CSE Stream		e : 29/5/2024	
Q	Note: Answer ONE full question from eac	Max Mark	s : 25	
10.	Question	Mante	K- Level	CO mapping
	In a sample of		Bever	
	In a sample of a polymer, 100 molecules have molecular mass molecules have molecular mass 10 <sup>4</sup> g/mol, and 300 average, weight average molecular mass 10 <sup>5</sup> g/mol, Calculate the number PDI and comment on it.	5	Applying K3	CO2
(b)	Explain the preparation, properties, and commercial applications of Kevlar Fiber	5	Understanding K2	CO2
	OR			
2(a)	In a sample of a polymer, 20% molecules have molecular mass 15000 g/mol,35% molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 20000 g /mol, Calculate the number average and weight average molecular mass of the polymer and Find PDI, comment on it.	5	Applying K3	CO2
(b)	<b>Describe</b> the conduction mechanism in Polyacetylene through oxidative or reductive doping technique.	5	Understanding K2	CO2
, ,	PART-B		, =	
	Using gas sensors Illustrate the working principle of electrochemical gas sensors for the detection of SOx and NOx	5	Applying K3	CO3
(b)	Explain Na-Ion battery construction, it's working and applications	5	Understanding K2	CO3
(c)	What are disposable sensors? Mention the advantages of disposable sensors.	5`	Understanding K2	CO3
	OR			
4(a)	Using Electrochemical Sensors, Illustrate measurement of Dissolved Oxygen (DO)	5	Applying K3	CO3
(b)	Explain the construction, working and uses of Li-Ion battery.	5	Understanding K2	CO3
(c)	Discuss the detection of a ascorbic acid bio-molecule using disposable sensor also write the electro oxidation reaction.	5	Understanding K2	CO3
	20/			

Course Incharge

**IQAC-Coordinator** 

Principal

Professor & HOD Department of Applied Science K.S. School of Engineering & Management - Bangalore - 560 109

Dr. K. RAMA NARASIMH Principal/Director S School of Engineering and Man Bengaluru - 560 109



## K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

#### DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) III SESSIONAL TEST QUESTION PAPER SET-A

Degree Branch

Duration

Course Title

B.E

CSE & AI&DS

Applied Chemistry CSE-Stream

: 75 Minutes USN Semester :

BCHES202 Course Code :

27/6/2024 Date :

Max Marks: 25

Note: Answer ONE full question from each part.

Q No.	Question	Marks	K- Level	CO mapping
	PART-A			
Pa)	Explain construction, working and applications LCD.	5	Understanding K2	CO4
(b)	Applying photoactive and electroactive principle, illustrate the working of optoelectronic devices in display system.	5	Applying K3	CO4
(c)	Discuss any four properties and applications of QLED.	5	Understanding K2	CO4
	OR	7 - 2	in the same of the same	
2(a)	What are Memory Devices? Explain the Classification of electronic memory devices with examples.	5	Understanding K2	CO4
(b)	Using donor acceptor organic polymers, illustrate the working of Polymer memory device.	5	Applying K3	CO4
(C)	Explain properties and applications of light emitting material Poly[9-vinylcarbazole] (PVK)] for optoelectronic devices.	5	Understanding K2	CO4
	PART-B	-		
3(a)	Explain the need for e-waste management concerning to global perspective.	5	Understanding K2	CO5
(b)	Utilizing the metal extraction technique, illustrate the extraction of gold from e-waste.	5	Applying K3	CO5
	OR			
4(a)	Discuss the toxic materials used in the manufacturing of electronic and electrical products.	5	Understanding K2	CO5
(b)	Applying pyrometallurgical and hydrometallurgical technique, illustrate the recycling of e-waste.	5	Applying K3	CO5

Course Incharge

Dr. C. VASUDEV

Professor & HOD Department of Applied Science K.S. School of Engineering & Manageme. Bangalore - 560 109

Principal

Dr. K. RAMA NARASIMHA

Principal/Director

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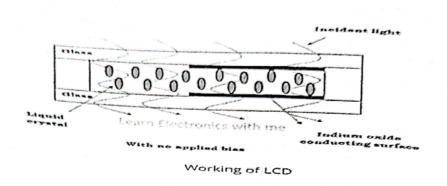
## DEPARTMENT OF ADDITION SCIENCE BANGALORE - 560109 SESSION: 2023-2024 (EVEN SEMESTER) III SESSIONAL TEST QUESTION PAPER

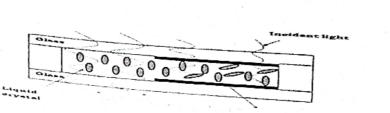
Degree Branch B.E Course Title USV CSE & AL&DS Duration Applied Chemistry CSE-Stream Semester : Course Code : BCHES202 Date : 27/06/2024

Q.	Note: Answer ONE full question from each part	
No.		
	Questions with Scheme & Solution	Mante
1(a)	Explain con PART-A	Marks
	Explain construction, working and applications LCD.  Construction and working principle of liquid.	
	Construction, working and applications LCD.  The electron	5
	The electro-optic effect of liquid crystals controls brightness/ darkness of the light emerging from its elements and this is used in information displays Information is passed on to the user, using liquid crystals which control the brightness/darkness of the parts of a display.  Construction of display	1
a)   6	Liquid crystal displays are used in a number of applications from clock to oscilloscope.  In these devises a thin film of liquid crystals is placed between two sheets of glass.  One of which is coated on one side with a thin layer of an electrically conductive material such a indium oxide  When no current is passing though the conductive coating, the molecules (liquid crystal molecules) are uniformly oriented and the light can pass though the cell.  When the current is applied the molecules alignment changes (because the liquid crystal molecules are polar) and the cell appears opaque or black. Thus number or a letter is displayed in black against a silvery back ground.	1
	Polarizer 90°  Transparent Electrode  Polarizer 0°  Glass sheet  Glass sheet  Glass sheet	1
4		

#### Working Of display

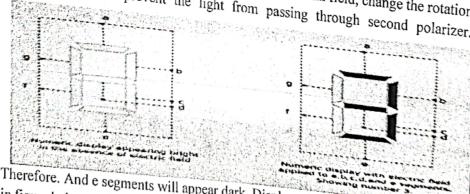
Working Of display
When the light of the display is ON and electric field is not applied to any of the segments, then all the segments appear bright. Numeric display will not display any number as shown in the figure.





In this case, light radiation passing through first polarizer will be rotated by a liquid crystal to an extent corresponding to angle of inclination between two polarizers Hence, light passes through second polarizer also and display appears bright when

Now, if electric field is applied to a, b, c, d, and e segments of the number. Then liquid crystal molecules in this part are aligned to external field, change the rotation angle of light and prevent the light from passing through second polarizer.



Therefore. And e segments will appear dark. Display will show number 3 as shown in figure below. Similarly, applying electric field to only b and c segments will show number 1, applying electric field to only a, b and c segments will show number 7 and applying electric field to all segments will show number 8. In this way 0 to 9 numbers can be displayed by applying electric field across appropriate segments.

Applications of liquid crystals in display devices:

I

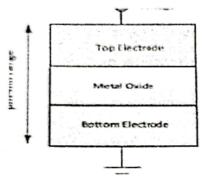
Liquid crystal may be described as a distinct state of matter in which the degrees of molecular ordering lie intermediate between the ordered crystalline solid state and the completely disordered liquid. The liquid crystal state is also referred to as mesophase.  Liquid crystal displays operate at low voltages (a few volts) and consume less power as compared to other display and hence are used in:  a) Watches, calculators, mobile telephones, laptop computers and related electronic gadgets.  Indicators in automobile dashbeards, airplane cockpits, traffic signals advertisement boards and petrol pump indicators.  Applying photoactive and electroactive principle, illustrate the working of optoelectronic devices are referred to as photo and electroactive materials. These are commonly semiconducting materials. These are capable of materials used in optoelectronic devices are referred to as photo and electroactive materials. Semiconductors like Si, Ge etc.,  2. Organic Semiconductors like Si, Ge etc.,  2. Organic Semiconductors like Polythiophenes (P3HT), Polyl9- vinylearbazolel (PVK)  4. Nanomaterials like Nano Silicon  Photoactive materials; are those that can absorb light and convert it into an electrical signal. These materials are used in photo sensors and photovoltaic cells, which are commonly found in solar panels. When light falls on a photoactive materials; it releases electrons, which encerate an electric current  The photon of the properties of QD-LEDs is due to their unique optical and electronic features as given below:  1. Unique properties of QD-LEDs is due to their unique optical and electronic features as given below:  2. High quantum yields  3. High molar extinction Co-efficient  4. Large effective stokes shifts  5. Broad excitation profiles  6. Narrow/ Symmetric emission spectra			
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Liquid crystal displays operate at low voltages (a few volts) and consume less power as compared to other display and hence are used in:  a) Watches, calculators, mobile delephones, laptop computers and related electronic gadgets.  Indicators in automobile dashboards, airplane cockpits, traffic signals advertisement boards and petrol pump indicators.  Applying photoactive and electroactive principle, illustrate the working of opposite common opposite to exices in display system.  Materials used in optoelectronic devices are referred to as photo and electroactive materials. These are commonly semiconducting materials. These are capable of absorbing light radiation and eject electrons or emit light when electric field is applied.  Eg. 1. Inorganic semiconductors like Si, Ge etc., 2. Organic Semiconductors like pentacene, perfluoropentacene etc 3. conducting polymers like Polythiophenes (P3HT), Poly[9- vinylearbazole] (PVK)]  4. Nanomaterials like Nano Silicon Photoactive materials: are those that can absorb light and convert it into an electrical signal. These materials are used in photo sensors and photovoltaic cells, which are commonly found in solar panels. When light falls on a photoactive material. it releases electrons, which energate an electric current  Eg. Absorption can occur only when  Ender hu = Eg - Eg. A downward transition involves emission of a pholon of energy:  """  """  """  """  """  """  """		mesophase.	
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<ul><li>4. Large effective stokes shifts</li><li>5. Broad excitation profiles</li></ul>			3
5. Broad excitation profiles			
U. Ivailum/ Symmetric chrission spectra			
		o. manow/ symmetric emission spectra	

7. High resistance to reactive oxygen 8. High resistance to metabolic degradation 9. High brightness. 10. High efficiency with long lifetime. 11. More flexibility. 2 12. High quality lighting with superior color gamut. 13. High color rendering index. Applications: QD-LED are superior to other display technologies like liquid crystal displays (LCDs), OLEDs and plasma displays due to ideal blend of features QD-LEDs are more reliable solutions for flat-panel TV screens, digital cameras, mobile phones and personal gaming equipment's. QD-LED displays will be large and flexible and would not deteriorate as easily as OLEDs. What are Memory Devices? Explain the Classification of electronic memory 2(a) devices with examples. Memory Devices: 5 An electronic memory device is a form of semiconductor storage which is fast in response and compact in size, and can be read and written when coupled with a central processing unit (CPL processor). Classification of electronic memory devices According to the device structure, electronic memory devices can be divided into four primary categories: transistor type, capacitor type, resistor type and charge 1 1. Transistor-Type Electronic Memory: A transistor is a miniature electronic component that can work either as an amplifier or a switch. Computer memory chip consists of billions of transistors, 1 each transistor is working as a switch, which can be switched ON or OFF. Each transistor can be in two different states and store two different number ZERO and ONE. Since chip is made of billions of such transistors and can store billions of Zeros and Ones, and almost every number and letter can be stored. 2. Capacitor-Type Electronic Memory A capacitor consists of two metal plates which are capable of storing an electric 1 charge. It is like a battery that holds data based on energy. If the capacitor is charged, it holds the binary numeral,"1" and holds "0" when the cell is discharged. If the parallel plates of a capacitor are separated by dielectric layer, charges dissipate slowly and memory would be volatile. On the other hand, if the medium between the electrodes is ferroelectric in nature, can maintain permanent electric polarization that can be repeatedly switched between two stable states (bistable) by an external electric field. Thus, memory based on ferroelectric capacitors (FeRAM) is non-volatile memory.



3. Resistor-Type Electronic Memory

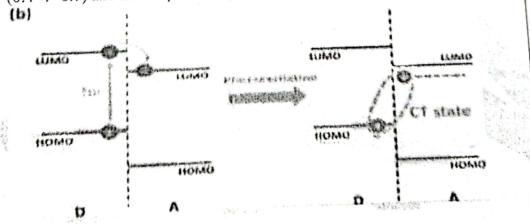
Memory devices containing switchable resistive materials are classified as resistor-type memory, or resistive random access memory (RRAM). Resistortype electronic memory usually has a simple structure, having a metalinsulator-metal structure generally referred to as MIM structure. The structure comprises of an insulating layer (1) sandwiched between the two metal (M) electrodes and supported on a substrate (glass, silicon wafer, plastic or metal foil). Initially, the device is under high resistance state or "OFF" and logically "0" state, when resistance changed or under external applied field changes to low resistance state or "ON" logical value "1",



4. Charge Transfer Effects

A charge transfer (CT) complex is defined as an electron donor acceptor (D-A) complex, characterized by an electronic transition to an excited state in which a partial transfer of charge occurs from the donor moiety to the acceptor moiety. The conductivity of a CT complex is dependent on the ionic binding between the D-A components.

If the donor has intermediate size and ionization potential, it tends to form a weakly ionic salt with the acceptor, which possesses incomplete CT (0.4<?<0.7) and thus is potentially conductive.



1

1

Westwate the working of Po	ymer memor
Using donor acceptor organic polymers, illustrate the working of Podevice.	s
Polymer memory devices: Organic polymer used for organic memory device is Polyimide with Donorand Acceptor-phthalimide. Donor: Triphenyl Amine group (TPA)	
000000000000000000000000000000000000000	3
isopropylidene (6F): Increases the solubility of PI The donors and acceptors of PIs contribute to the electronic transit induced charge transfer (CT) effect under an applied electric field.  When an electric field more than threshold energy is applied, the electronic transit is excited to LUMO.  The energy of LUMO of donor and acceptor are similar and therefore, a electron transferred to LUMO (acceptor), generating a CT state.  This permits the generation of holes in the HOMO, which produces the the charge carriers to migrate through.	ons of the HOMO fter excitation the
switching behavior (bistable states ON/OFF).  Donor Acceptor type conjugated polymers are used to fabricate different device, such as volatile DRAM and SRAM devices, and non-volatile Very supplier of the properties and applications of light with the properties.	types of memory VORM and Flash
Properties and	5
Properties:  1. It is a semiconducting polymer and an electron acceptor converts ultra-violet (UV) light into electricity.  2. PVK has a band gap of 3.4 eV, optical absorption edge stating at 350 nm capable of absorbing Ultra- Violet light.  3. The PVK film is hydrophobic, thermally stable with relational transition temperature (Tg) of 200 °C  4. The PVK solution also showed good wettability, and provide upon glass/ITO substrates.  Applications:	Vely hist
<ol> <li>PVK is used in OLEDs for light harvesting</li> <li>Used in the fabrication of light emitting diodes and laser printer</li> <li>Used in the fabrication of organic solar cells when combined we substrate</li> </ol>	s. vith TIO on glass 2

	3(a)	Explain the need for e-waste man	
		Explain the need for e-waste management concerning to global perspective.  From a global perspective.	5
	5	management of c-waste may include:  1. International organizations: such as the United Nations, World Trade Organization, and the International Telecommunication Union, that are responsible for setting global standards for e-waste management and promoting cooperation and collaboration among countries.  2. Transnational corporations: responsible for the design, production, and distribution of electronic products on a global scale, and have a significant impact on e-waste management practices.	1
		3. Global e-waste trade networks: responsible for the transportation and processing of e-waste between countries and may impact the environmental and health outcomes of e-waste management.	1
		for creating and enforcing regulations and policies to manage e-waste, as well as promoting public awareness and education about e-waste management.  5. Environmental organizations: responsible for advocating for sustainable and responsible e-waste management practices and raising public awareness about e-waste issues on a global scale.	1
	6. sc		1
3(b	1	ilizing the metal extraction technique, illustrate the extraction of gold from este.	5
	Pri on t	inciple: The principle behind the extraction of gold from e-waste is based the fact that gold is a relatively non-reactive metal, which allows it to be overed from complex electronic waste matrices through a series of mical and physical processes. Experimental procedure:	1
1	1. colle	Collection and segregation of e-waste: The first step involves ecting and segregating the e-waste into different categories, such as puter motherboards, cell phones, and other electronic devices.  ysical separation: The e-waste is physically separated into different	1

	The same and the s	- 1
	3. Leaching: The metals, including gold, are leached from the e-waste using a suitable reagent, such as aqua regia (a mixture of hydrochloric acid and nitric acid), to dissolve the gold.	1
	$Au + HNO_3 + 4HCI \rightarrow HAuCl_4 + NO + 2H_2O$	
	4. Precipitation: The dissolved gold is then precipitated out of the solution through the	
	addition of a suitable reducing agent, such as sodium metabisulfite.	1
	$2H[AuCl_4] + 3Na_2S_2O_5 + 3H_2O \rightarrow 2Au + 3SO_2 + 3Na_2SO_4 + 8HCl$ 5.Purification:	
	The precipitated gold is then purified through processes such as ion its quality.	
	o. Wetal Recovery Stage:	
	methods like Electrodeposition, Solvent – Extraction, Ion – Exchange,	
	Ex: - Electrodeposition:-	1
4(a)	In this method pure gold metal taken as cathode and inert anode are dipped electrodeposited or another solution. When current is carried at the	
-1(a)	Discuss the toxic materials used in the manufacturing of electronic and electrical	5
	Toxic materials used in manufacturing of Electronic and Electrical products.  Electronic and electrical products can contain a variety of toxic materials,	1
	devices.  used in some fluorescent lights, batteries, and other electronic	
	2. Cadmium: Cadmium is a toxic heavy metal used in rechargeable batteries, pigments, and plastic stabilizers.	1
Sol	3. Polyvinyl Chloride (PVC): PVC is a common plastic used in electronic cables and other components. It can release toxic chemicals, such as dioxins, when burned or during disposal.	
	4. Brominated flame retardants (BFRs): BFRs are used in the manufacture of electronic products to prevent fires. However, they are toxic and can liarm the environment and human health.  5. Barium: Barium is used in some electronic components,	1
	Darram, Darram is used in some electronic components,	

> 1		
1	7. Chlorofluorocarbons (CFCs) are toxic chemicals that were widely used as coolants and solvents in electronic products, such as refrigerators, air conditioners. They cause ozone depletion.  Applying	1
4(b	Applying pyrometallurgical and hydrometallurgical technique, illustrate the recycling of e-waste.	5
	Hydrometallurgical extraction of E waste: E-waste hydrometallurgical extraction is a process used to extract valuable metals and other materials from electronic waste through chemical reactions in aqueous solutions. The process typically involves the following steps:	
	1. Pre-treatment: This involves the fragmentation and size reduction of electronic waste to prepare it for further processing.	
	2. Leaching: The e-waste is treated with chemical reagents in a solution to dissolve the metals and other materials, creating a leachate.	3
	<ol> <li>Separation: The leachate is then processed to separate and purify the metals and other materials, through methods such as precipitation or ion exchange.</li> </ol>	
	4. Recovery: The extracted metals and other materials are then recovered and processed for reuse. Hydrometallurgical extraction is a more environmentally friendly alternative to thermal treatments, as it generates less hazardous waste and can be more easily regulated to minimize environmental impact.	
So		
	Hydrometallurgical extraction is a more environmentally friendly alternative to thermal treatments, as it generates less hazardous waste and can be more easily regulated to minimize environmental impact.	
	Pyrometallurgical methods E-waste recycling:	2
-	E-waste pyrometallurgical methods refer to the process of extracting valuable metals and other materials from electronic waste using high temperatures. These methods include:	
	1. Smelting: The e-waste is melted in a furnace and then separated into individual metals and other materials.	
	2. Refining: The metals from the smelted e-waste are further processed to remove impurities and improve their quality.	
	3. Incineration: Electronic waste is burned at high temperatures to reduce its volume and recover metals.	
	Pyrometallurgical methods are effective at recovering valuable metals from e-waste, but they also generate hazardous byproducts and require significant energy inputs. Additionally, these methods can pose a risk to the environment and human health if not properly regulated and monitored	





# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

### DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) III SESSIONAL TEST QUESTION PAPER

SET-B

Degree Branch

B.E

Course Title Duration

CSE & AI&DS

Applied Chemistry CSE-Stream

USN

BCHES202 Course Code :

27/6/2024 Date :

Max Marks : 25

### Note: Answer ONE full question from each part.

Q No.		Marks	K- Level	CO mapping
	PART-A			
(i)	Applying photoactive and electroactive principle, illustrate the working of optoelectronic devices in display system.	5	Applying K3	CO4
(b)	Explain any four properties and applications of	5	Understanding K2	CO4
(c)	What are memory devices? Explain the classification of	5	Understanding K2	CO4
	OR			
2(a)	Using donor - acceptor organic polymers, illustrate the	. 5	Applying K3	CO4
	working of Polymer memory devices.  Explain construction, working, properties and applications	5	Understanding K2	CO4
(b) (b)	of OLED.  Explain working of organic memory devices by taking p-type and n-type organic semiconductor materials.	5	Understanding K2	C04
	PART-B			
	Utilizing the metal extraction technique, illustrate the	5	Applying K3	COS
(a) (b)	extraction of gold from e-waste.  Explain the role of stakeholders in terms of producers, consumers, recyclers, and statutory bodies in the e-waste management.	5	Understanding K2	C05
	OR		-	1
	Applying pyrometallurgical and hydrometallurgical	5	Applying K3	COS
a) 📙	being illustrate the recycling of e-waste.	5	Understanding K2	COS
3	Explain sources and composition of e-waste.			

Course Incharge

Dr. C. VASUDEV Professor & HOD

Department of Applied Science

Cohool of Engineering & Managemen.

IQAC- Coordinator

Principal Dr. K. RAMA NARASIMHA Principal/Director

K S School of Engineering and Manager Bengaluru - 560 109



# DEPARTMENT AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF APPLIED SCIENCE SESSION: 2023-2024 (EVEN SEMESTER) III SESSIONAL TEST QUESTION PAPER SET-B

Degree

B.E

Branch

CSE & A1&DS

Course Title Duration

Applied Chemistry CSE-Stream

75 Minutes

USN

Course Code : BCHES202 Date : 27/06/2024

Max Marks : 25

### Note: Answer ONE full question from each part

Q	Outstions with Deficille of Doration	Marks
No	PART-A  Applying photoactive and electroactive principle, illustrate the working of	5
1(a	Photoactive materials: are those that can absorb light and convert it into an electrical signal. These materials are used in photo sensors and photovoltaic cells, which are commonly found in solar panels. When light falls on a photoactive material, it releases electrons, which generate an electric current Electroactive materials: are materials that can undergo a reversible change in their physical or chemical properties in response to an applied electrical	2
(a)	stimulus.  Working principle of Optoelectronic device.  If the photon has an energy larger than the energy gap, the photon will be absorbed by the semiconductor, exciting an electron from the valence band into the conduction band, where it is free to move. A free hole is left behind in the valence band. When the excited electron is returning to valence band, extra photon energy is emitted in the form a light. This principle is used in Optoelectronic devices. $E_2  \text{Absorption can occur}  \text{only when}$ $E_1  \Delta E = hv = E_2 - E_1  \text{A downward trainvolves emission aphoton of energy}  \text{a photon of energy}$	ins
	$\frac{1}{E_1} = \frac{1}{E_{\text{photon}}} = hv = \frac{1}{E_{\text{photon}}}$ <b>Explain</b> any four properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications of Polythiophenes (P3HT) suitable to the properties and applications are properties at the propert	E <sub>2</sub>
Ex	xplain any four properties and applications of the same for the same f	

Preparties and applications of Polythiophenes (PMIII) suitable for gittedectronic devices.  Polythiophenes are conjugated polymers, environmentally and thermally stable metal. Chemical structure of PMIII Poly (J-lexythitophene) is a polymer with material. Chemical structure of PMIII Poly (J-lexythitophene) is a polymer with the metal formula (CHIII 18). It is a polythiophene with a short alkyl group on each repeat unit. Highly ordered (PMIII) are composed of closely packed, polymer to the person of the packed of the pair.  1. PMIII has a crystalline structure and good charge-transport properties required for Oproelectronic.  2. Poly-3-betylthiophene (PMIII) have great capability as light-absorbing materials in organic electronic edvices.  3. PMIII has a direct-allowed optical transition with a fundamental energy gap of 3. Fundamental bandgap of PMIII is 490m visible region, corresponding to JI—Applications.  3. PMIII has a direct-allowed optical transition with a fundamental energy gap of 3. Fundamental bandgap of PMIII is 490m visible region, corresponding to JI—Applications.  3. Leave of the construction of Organic Solar Cells.  3. Used in the construction of Organic Solar Cells.  3. Used in the construction of Organic Solar Cells.  4. Manufacture of smart windows.  5. Used in the fabrication new types of memory devices.  An electronic memory devices? Explain the classification of electronic memory devices and complete it size, and comber of a packed and written when coupled virtue of the devices structure, electronic memory devices can be divided in into four primary categories: transistor type, capacitory of the devices transistor type, eaged or the devices transistor type, eaged or type.
Properties and applications of Polythiophenes (P3HT) suitable optoeketremic devices.  Polythiophenes are conjugated polymers, cavironmentally and thermally st material Chemical structure of P3HT Poly (3-hexylthiophene) is a polymery chemical formula (C10H148). It is a polythiophene with a short alsty group each repeat until Highly ordered (P3HT) are composed of closely packed, stacked (p-p distance of 0.33 nm).  Properties of nanostructured P3HT suitable for optoekettranic devices is listed as follows:  1. P3HT is a semiconducting polymer with high stability and exhib combuctivity due to holes therefore considered as p-type semiconductor 2. Poly-3-hexylthiophene (P3HT) have great capability as light-absorbit materials in organic electronic devices.  3. P3HT has a organic electronic devices.  4. P3HT has a direct-allowed optical transition with a fundamental energy gap of 2.14 eV.  5. Tudamental bandgap of P3HT is 490nm visible region, corresponding to J1-4 eV.  5. Tudamental bandgap of P3HT is 490nm visible region, corresponding to J1-4 eV.  5. Tudamental bandgap of P3HT is 490nm visible region, corresponding to J1-4 eV.  5. Tudamental bandgap of P3HT is 490nm visible region, corresponding to J1-4 eV.  5. Tudamental bandgap of P3HT is 490nm visible region, corresponding to J1-4 eV.  5. Lie ab be used as a positive electrode in Lithium batteries.  5. Used in the fabrication new types of memory devices.  5. Used in the fabrication new types of memory devices white contrad processing unit (CP1 processor).  6. Manufacture of smart windows.  5. Used in the fabrication new types of memory devices and be divided intenory devices? Explain the classification of electronic memory devices with a central processing unit (CP1 processor).  Classification of electronic memory devices and be divided into four primary categories: transition type, capacitor type and charge transfer-type.
Properties and applications of Polythiophenes (P3HT) suitable optoeketremic devices.  Polythiophenes are conjugated polymers, environmentally and thermally st material Chemical structure of P3HT Poly (3-hexylthiophene) is a polymery chemical formula (C10H148). It is a polythiophene with a short alsty group each reyent unit. Highly endered (P3HT) are composed of closely packed, stacked (p-p distance of 0.33 nm).  Properties of nanostructured P3HT suitable for optoekettranic devices is listed as follows:  1. P3HT is a semiconducting polymer with high stability and exhib combuctivity due to holes therefore considered as p-type semiconductor 2. Poly-3-hexylthiophene (P3HT) have great capability as light-absorbit materials in organic electronic devices.  3. P3HT has a organic electronic devices.  4. P3HT has a direct-allowed optical transition with a fundamental energy gap of 2.14 eV.  5. Fundamental bandgap of P3HT is 490nm visible region, corresponding to J1—Applications.  1. P3HT-H7O forms a p-n junction permit the charge carriers to move in opposite devices on the bused as a positive electrode in Lithium batteries.  3. Used in the construction of Organic Solar Cells.  4. Manufacture of smart windows.  5. Used in the fabrication new types of memory devices.  5. Used in the fabrication new types of memory devices with exemples.  An electronic memory devices? Explain the classification of electronic memory devices with a central processing unit (CPL processor).  Classification of electronic memory devices and be divided into four primary categories: transition; the neurony devices and edvice structure, electronic memory devices and be divided into four primary categories: transition type, capacitor type, resistor type and charge transfer-type.
Sol Apple 2. It and the state of the state o

# 1. Transistor-Type Electronic Memory:

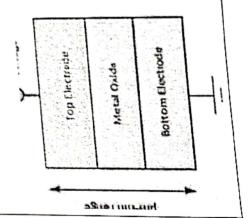
A transistor is a miniature electronic component that can work either as an a switch. Computer memory chip consists of billions of transistors, each transistor is working as a switch, which can be switched ON or OFF. Each transistor can be in two different states and store two different number ZERO and ONE. Since chip is made of billions of such transistors and can store billions of Zeros and Ones, and almost every number and letter can be stored. amplifier or

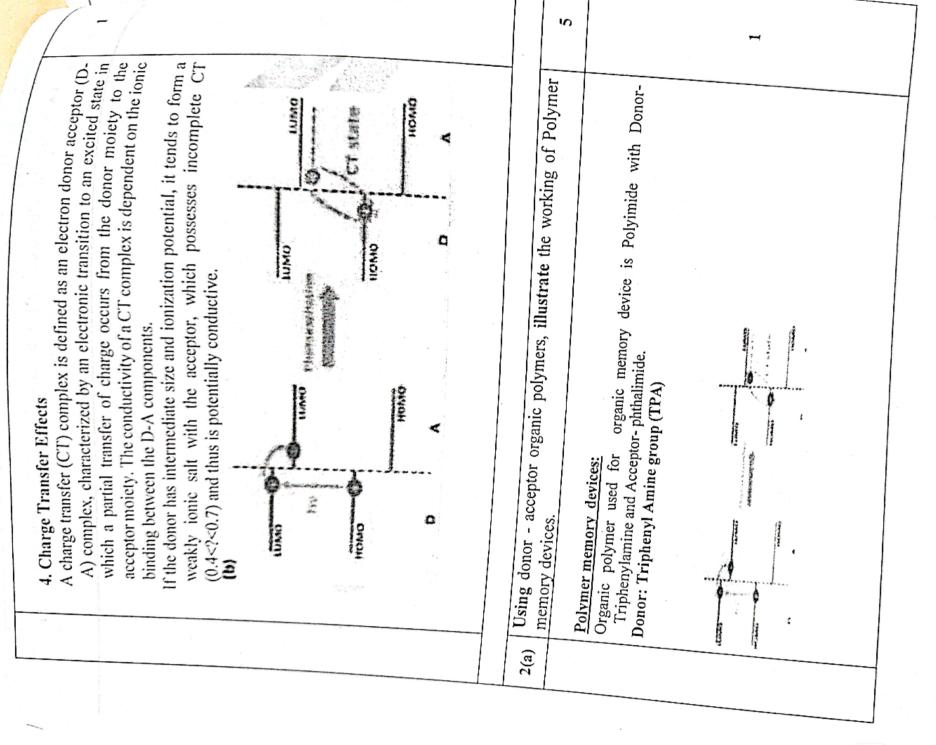
# 2. Capacitor-Type Electronic Memory

Thus, memory based on ferroelectric capacitors (FeRAM) is non-volatile On the other hand, if the medium between the electrodes is ferroelectric in switched between two stable states (bistable) by an external electric field. capacitor is charged, it holds the binary numeral,"1" and holds "0" when the nature, can maintain permanent electric polarization that can be repeatedly A capacitor consists of two metal plates which are capable of storing an electric charge. It is like a battery that holds data based on energy. If the cell is discharged. If the parallel plates of a capacitor are separated by dielectric layer, charges dissipate slowly and memory would be volatile.

memory.

"OFF" and logically "0" state, when resistance changed or under external plastic or metal foil). Initially, the device is under high resistance state or metal (M) electrodes and supported on a substrate (glass, silicon wafer, structure comprises of an insulating layer (1) sandwiched between the two metal-insulator-metal structure generally referred to as MIM structure. The (RRAM). Resistor-type electronic memory usually has a simple structure, having Memory devices containing switchable resistive materials are classified as applied field changes to low resistance state or "ON" logical value "1" resistor-type memory,





	32		· +\$*						4					
The donors and acceptors of PIs contribute to the electronic transition based on an induced charge transfer (CT) effect under an applied electric field.  1. When an electric field more than threshold energy is applied, the electrons of the HOMO (TPA unit) is excited to LUMO (acceptor), generating a CT state.  3. This permits the generation of holes in the HOMO, which produces the open channel for the charge carriers to migrate through.  4. Therefore, Field-induced charge transfer from Triphenylamine to Phthalimide exhibit the switching behavior (bistable states ON/OFF).  Donor Acceptor type conjugated polymers are used to fabricate different types of memory device, such as volatile DRAM and SRAM devices, and non-volatile WORM and Flash devices.	Explain construction, working, properties and applications of OLED.	Organic Light Emitting Diodes (OLED)  Principle involved in the working of OLED  Organic light emitting diode (OLED) is a carrier injection type	electroluminescent device that uses organic materials. OLED devices consists of	two electrodes, an anode and cathode and organic layers are placed between two	electrodes. Multiple organic layers are used., in which each layer plays an	intrinsic role. When a voltage is applied to an OLED device through anode and	cathode, charge carriers are injected from the electrode to the organic layers.	Anode injects holes (Positive charges) and cathode injects electrons (negative	charges) to the system. The hole and electrons are transported to an emission site	and recombined. Organic materials in the emission site are excited by	recombination of holes and electrons. When the exited organic material returns	to its ground state, then emission occurs. The emission frequency in an OLED	depends upon the energy gap between the excited and ground states. Emission	colour can be controlled by the energy gap between the excited and ground states.
Sol	2(b)							los						3

2(C)

Example: Pentacene When a positive voltage was applied between gate and source, it was found no flow of electrons to drain due to higher energy gap between the Fermi level of gold (source) and LUMO of Pentacene. On the other hand, when a negative voltage is applied between the drain and source, holes are induced at source. This permits a channel of charges (holes) to drain through semiconductor and insulator interface when a secondary voltage is applied. Therefore it called as Patype semiconductor	3
-1 mmorrows	
per seminative direction of the seminative of th	
b. The n-type organic semiconducting material Perfluoropentacene An Organic molecule with a conjugated system with electron withdrawing substituent groups and possess electrons as major charge carrier is called n-type	
semiconductor.  In Pentacene, when hydrogen atoms are substituted by highly electronegative	
fluorine atoms, it is called Perfluoropentacene and acts as N-type of semiconductor. When a positive voltage is applied between source and drain,	
electrons are induced in the source (gold). This permits the channel of charges to drain through semiconductor-insulator interface as the bandgap between Fermi levels of gold (source) LUMO energy of Perfluoropentacene is 1.95ev which is	2
lesser than LUMO energy of Pentacene. Therefore, it is n-type semiconductor.	
F F F F	
PART-B	
Utilizing the metal extraction technique, illustrate the extraction of gold from e-waste.	5
The action of gold from e-waste:	
t and a gold Holl C-waste to	
Principle: The principle behind the extraction of gold red based on the fact that gold is a relatively non-reactive metal, which	

3(a)

Sol

allows it to be recovered from complex electronic waste matrices through a series of chemical and physical processes. Experimental procedure:

- Collection and segregation of e-waste: The first step involves collecting and segregating the e-waste into different categories, such as computer motherboards, cell phones, and other electronic devices.
- 2. Physical separation: The e-waste is physically separated into different components, such as plastics, metals, and glass.
- 3. Leaching: The metals, including gold, are leached from the e-waste using a suitable reagent, such as aqua regia (a mixture of hydrochloric acid and nitric acid), to dissolve the gold.

$$Au + HNO_3 + 4HCI \rightarrow HAuCl_4 + NO + 2H_2O$$

4. Precipitation: The dissolved gold is then precipitated out of the solution through the

addition of a suitable reducing agent, such as sodium metabisulfite.

$$2H[AuCl_4] + 3Na_2S_2O_5 + 3H_2O \rightarrow 2Au + 3SO_2 + 3Na_2SO_4 + 8HCl$$

### 5. Purification:

The precipitated gold is then purified through processes such as ion exchange, electrowinning, or distillation, to remove impurities and improve its quality.

## 6. Metal Recovery Stage:

In this stage Gold metal can be recovered from the obtained complex using methods like Electrodeposition, Solvent - Extraction, Ion -Exchange, Precipitation, etc.,

### Ex: - Electrodeposition:-

3(b)

In this method pure gold metal taken as cathode and inert anode are dipped in obtained leached complex solution. When current is applied gold is electrodeposited on cathode.

Explain the role of stakeholders in terms of producers, consumers, recyclers, and statutory bodies in the e-waste management.

2

2

5

	Role of stakeholders - producers, consumers, recyclers,	
	and statutory bodies.	
	In the management of electronic waste (e-waste), the following stakeholders play important unique role in the management of e-waste:	
Sol	1. Producers - are responsible for designing and producing electronic products and may also be involved in the collection and recycling of e-waste.	
	Consumers - play a crucial role in the responsible disposal of e-waste and making informed choices about the purchase of electronic products.	
	3. Recyclers - are responsible for safely and responsibly managing e- waste, including the collection, dismantling, and recycling of electronic waste.	
	Statutory bodies - such as governments, are responsible for creating and enforcing regulations and policies to manage e-waste and promoting public awareness and education about e-waste management.	
4(:	Applying pyrometallurgical and hydrometallurgical technique, illustrate the recycling of e-waste.	5
	Hydrometallurgical extraction of E waste: E-waste hydrometallurgical extraction is a process used to extract valuable metals and other materials from electronic waste through chemical reactions in aqueous solutions. The process typically involves the following steps:	2
	1. Pre-treatment: This involves the fragmentation and size reduction of electronic waste to prepare it for further processing.	
	<ol> <li>Leaching: The e-waste is treated with chemical reagents in a solution to dissolve the metals and other materials, creating a leachate.</li> </ol>	
	3. Separation: The leachate is then processed to separate and purify the metals and other materials, through methods such as precipitation or ion exchange.	
Sol	4. Recovery: The extracted metals and other materials are then recovered and processed for reuse. Hydrometallurgical extraction is a more environmentally friendly alternative to thermal treatments, as it generates less hazardous waste and can be more easily regulated to minimize environmental impact.	
	<ol> <li>Recovery: The extracted metals and other materials are then recovered and processed for reuse.</li> </ol>	
	Hydrometallurgical extraction is a more environmentally friendly alternative to thermal treatments, as it generates less hazardous waste and can be more easily regulated to minimize environmental impact.	
	Pyrometallurgical methods E-waste recycling:	
	E-waste pyrometallurgical methods refer to the process of extracting valuable metals and other materials from electronic waste using high temperatures. These methods include:	3
	1. Smelting: The e-waste is melted in a furnace and then separated into individual metals and other materials.	

_			F .
	2. Refining: The metals from the smelted e-waste are further processed to remove impurities and improve their quality.		0
	<ol> <li>Incineration: Electronic waste is burned at high temperatures to reduce its volume and recover metals.</li> </ol>		
	4. Pyrometallurgical methods are effective at recovering valuable metals from e-waste, but they also generate hazardous byproducts and require significant energy inputs. Additionally, these methods can pose a risk to the environment and human health if not properly regulated and monitored		
4(	(b) Explain sources and composition of e-waste	5	
	Source of E- Waste:  1. Electronic devices: such as TV's, computer monitors, laptops and display devices.		
	2. Telecommunication devices: such as cellphones, calculators, audio and video devices, printers' canners', fax machines etc		
	<ol> <li>Electronic components: such as sensors, alarms, sirens, security devices automobile electronic devices.</li> </ol>		
	4. Kitchen equipment's (coffee makers, microwave ovens, refrigerator,)	3	
	5. Laboratory equipment's (Hot plates, microscopes, microwave ovens)		•
	6. Medical equipment such as X-ray machines, monitors, and diagnostic equipment.		
Sol	Composition of E-Waste;  1. The composition of electronic waste (e-waste) can vary depending on the type of device and its components. In general, e-waste contains a mixture of materials including:		
	2. Metals: E-waste often contains valuable metals such as copper, gold, silver, and aluminium, ferrous metal, lead, mercury, Lithium, Nickle.		
	3. Plastics: Many electronic devices contain plastic components, including casings, insulation, and cables.		
	<ol> <li>Glass: Electronic devices often contain glass components, such as screens and lenses.</li> </ol>	2	il.
	5. Circuit boards: Many electronic devices contain circuit boards, which contain a mixture of metals and other materials. 6. Batteries: Some electronic devices contain batteries, which can contain hazardous materials such as lead, mercury, and cadmium. 7. Other hazardous materials: E-waste may also contain other hazardous materials, such as flame retardants, heavy metals, and polychlorinated biphenyls (PCBs).		
			,

Course In charge

Dr. C. VASUDEV

Professor & HOD

Department of Applied Science K.S. School of Engineering & Managemen' Principal

Dr. K. RAMA NARASIMHA Principal/Director

★ S School of Engineering and Manager

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# Visvesvaraya Technological University, Belagavi

Model Question Paper-1 with effect from 2022 Computer Science & Engg. Stream (CBCS Scheme)

	Computer Science & Engg. Stream (CBCS Schem)
	First /Second Semester Engineering Degree Examination
USN:	

Subject Title: Chemistry for Computer Science & Engineering Stream 22CHES12/22

Max. Marks: 100 TIME: 03 Hours

Note: Answer FIVE full questions, choosing one full question from each module

		answer FIVE full questions, choosing one full question from each mount	Marks			
		MODULE 1				
		Explain the working principle of Conductometric sensors (conductometry),	7			
	1	and Optical sensors (colorimetry)	7			
1	1	What are Flactrochemical Sensors? Explain its application	/			
1	L	measurement of Dissolved Oxygen (DO)	6			
	C	Describe the construction working and applications of Educations	0			
_		batteries and mention any four applications				
			6			
	a	Explain the working principle of Electrochemical sensors, and mention its				
	a	applications sensing SOx and	7			
2	Ь	applications  Describe the application of Electrochemical gas sensors in sensing SOx and				
_	L	NOx CODSC's)? Explain the	7			
	c	What are Quantum Dot Sensitized Solar Cells (QDSSC's)? Explain the	, ,			
		working Principle, Properties and Applications.				
_		MODULE 2  Module 2 have taking netype and netype	7			
	a	Explain the types of organic memory devices by taking p-type and n-type	′			
3	a	semiconductor materials	6			
	Ь	What are photoactive and electroactive materials and explain their working	0			
	D		7			
		What are nanomaterials? Explain any four properties of Polythiophenes	/			
	C	(P3HT) suitable for optoelectronic devices.	7			
		OR electronic memory	6			
		What are Memory Devices? Explain the Classification of electronic memory				
	a	devices with examples	7			
	b	Mantion any four properties and applications of LC-displays	7			
	C	Mention any four properties and applications of QLED	1			
		MODULE 3	1			
_		Define metallic corrosion? Describe the electrochemical theory of	7			
	a	tan taking iron as an example.				
	b	Explain: (i) Differential metal corrosion & (ii) water-line corrosion	6			
-	c	Describe galvanizing and mention its applications.	7			
	<u> </u>	OR .				
-7		Explain: i) corrosion control by Anodization & ii) Sacrificial anodic	6			
	a	ethod	0			
-		Explain the construction and working of Calomel electrode	7			
-	b	What is CPR? A thick brass sheet of area 400 inch <sup>2</sup> is exposed to moist air.				
		After 2 years of period, it was found to experience a weight loss 375 g due				
	c	After 2 years of period, it was found to experience a weight loss 373 g due to corrosion. If the density of brass is 8.73 g/cm <sup>3</sup> . Calculate CPR in mpy and	7			
	۲					
		mmpy.				

		MODULE 4	
7	b c	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight, betermine number average and weight average molecular weight. Find the index of polydispersity.	7 7 6
		OR	-0
8	a	Describe the hydrogen production by photo catalytic water splitting method.	7
	b	Preparation, properties, and commercial applications of Kevlar.	7
	C	Explain the construction and working of photovoltaic cells.	6
	1	MODULES	
	a b	Mention the sources of e-waste and explain the need for e-waste management	7
t	C	Explain the recycling of e-waste	7
	_	Explain the extraction of gold from e-waste	6
1	a b	Explain the ill effects of toxic materials used in manufacturing electrical Explain the	7
	c	Write a brief note and direct recycling methods.	6
		Write a brief note on role of stakeholders for example; producers, consumers, recyclers, and statutory bodies.	7

# Visvesvaraya Technological University, Belagavi

Model Question Paper-2 with effect from 2022 Computer Science & Engg. Stream (CBCS Scheme) First /Second Semester Engineering

HCN.	Engineering Degree	Examination
OSIN:	Language Ing Degree	Skammation

Subject Title: Chemistry for computer science & Engineering stream 22CHES12/22

TIME: 03 Hours

Max. Marks: 100

Note:Answer FIVE full questions, choosing one full question from each module

-	_		MODULE 1	Marks
		a	sensors (Flame photometer)	7
	1	b	classical sensors	7
_		С	Describe the construction, working and applications of Sodium-ion batteries and mention any four applications	6
_	1	_	OR	
		а	Explain the working principle of Electrochemical sensors, and mention its applications	6
2		b	What are Actuators & Transducers? Explain about detection of Glyphosate with electrochemical oxidation.	7
		С	What are batteries? Explain the working Principle, Properties and Applications of Quantum Dot sensitized solar cells.	7
			MODULE 2	
		а	Explain the types of organic memory devices by taking p-type and n-type semiconductor materials	7
3		b	What are Memory Devices? Explain the Classification of electronic memory devices with examples	6
		С	What are nanomaterials? Explain any four properties of Poly[9 vinylcarbazole] (PVK) suitable for optoelectronic devices.	7
			OR	
	a	ı	Explain the types of organic memory devices by taking p-type and n-typ semiconductor materials	e 6
,	b	1	Mention any four properties and applications of LCD-displays	7
	С		Mention any four properties and applications of OLED	7
			MODULE 3	
	а		Define corrosion? Mention at least six implications of corrosion .	
	b	- 1	Explain: (i) Differential metal corrosion & (ii) Water-line corrosion	
	С	I	Explain the construction and working of glass electrode	
			OR	

	a Explain the application of conductometric electrode in estimation of weak acid.  b Explain: i) corrosion control by Anodization & ii) Sacrificial anodic method.  What is CPR? A thick brass sheet of area 100 inch² is exposed to moist air. After 1 years of period, it was found to experience a weight loss 75 g due to corrosion. If the density of brass is 2.52 g/cm³, Calculate CPR in mpy and mmpy.	7	Con
	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight. Determine number average and weight average b Explain the Preparation, properties and before the control of the same of the control of the co	7	
	Reviar. Properties, and commercial applications of	7	
	c Describe the hydrogen production by photo catalytic water splitting method.	6	Minh
1	a Describe the hydrogen production		_
	method. method.	7	
	advantages in production advantages in production	7	
	c What are green fuels? Explain the advantages & disadvantages of photovoltaic cells.	6	
	a What are a weater 1		-
9	- Tracal Ce-waste and overlain a	7	$\dashv$
9	b Explain the health hazard due to exposure to e-waste.  Write a brief note on role of stable but to be a brief note on role of stable but to e-waste.	7	
	consumers, recyclers, and statutory bodies.	6	
	Which all toxic metavials		$\dashv$
0	Which all toxic materials used in manufacturing electrical and electronic products, write there effects on environment.  b Explain the advantages of resmalling the environment.	7	
	and recovery in a wastes	6	
	c Explain about sorces, composition and characteristics of e-waste	0	_

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# Visvesvaraya Technological University, Belagavi.

# Model Question Paper for Chemistry for

# Computer Science and Engineering and allied branches (CSE/ISE and BT) (Chemistry group)

-	1	First/Second Semester B.E. Degree Examina	tion		
Time	Join	from each modul questions choosing one full question	v (21CHE12/22)		100
MOI	DULE 1		1	outcomes	Marks
	a	Explain the	Level		
1	b	Explain the working principle of Conductometric sensors (conductometry), and Optical sensors (colorimetry) in the mass.	L1, L2	CO1	7
	c	Describe the second Oissolved Oxygen (DO)	L3	CO2	7
OR		Describe the construction, working and applications of Lithium-ion batteries and mention any four applications	L4	CO3	6
2	a	Explain the working principle of Electrochemical sensors, and mention its applications	L3	C04	6
2	b	sensing SOx and NOx	L3	CO5	7
MODU	C	What are Quantum Dot Sensitized Solar Cells (QDSSC's)? Explain the working Principle, Properties and Applications.	L2	CO3	7
МОВ	LE Z				
	а	Explain the types of organic memory devices by taking p- type and n-type semiconductor materials	L2	CO2	7
3	b	What are photoactive and electroactive materials and explain their working principle in display system	L2	CO2	6
- 12	c	What are nanomaterials? Explain any four properties of Polythiophenes (P3HT) suitable for optoelectronic devices.	L2	CO4	7
R		, , , , , , , , , , , , , , , , , , ,			
	. 6	What are Memory Devices? Explain the Classification of electronic memory devices with examples	L1	CO2	6
	b I	Mention any four properties and applications of LC- lisplays	L2	CO3	7
		Mention any four properties and applications of QLED	L2	CO3	7 4
ODUL					
á	th	efine metallic corrosion? Describe the electrochemical leory of corrosion taking iron as an example.	L3	C02	7
b	E:	xplain: (i) Differential metal corrosion & (ii) Water-line orrosion	L2	CO2	6
C	De	escribe galvanizing and mention its applications.	L2	CO3	7

				Charles and Market	
	a	What is meant by metal finishing? Mention (any five)	 L2	CO1	6
	b	Explain the constance of metal finishing.	L2	CO2	3
6	С	What is CPR? A thick brass sheet of area 400 inch <sup>2</sup> is exposed to moist air. After 2 years of period, it was found to experience a weight loss 375 g due to corrosion. If the density of brass is 8.73 g/cm <sup>2</sup> Colonial to CPR in the and	L3	CO4	7
Mol	DULE 4	mmpy, Calculate CPR in mpy and			
7	a	A polydisperse sample of polystyrene is prepared by mixing three monodisperse samples in the following proportions. 1g of 10000 molecular weight, 2g of 50000 molecular weight and 2g of 100000 molecular weight. Determine number average and weight average molecular weight. Find the index of polydispersion.	L3	CO4	7
	b	applications	L2	C02	7
20	С	Explain the generation of hydrogen by Alkaline water electrolysis	L2	C03	6
OR_	_				
	а	Describe the hydrogen production by photo catalytic water splitting method.	L2	CO2	7
<b>3</b>	b	Preparation, properties, and commercial applications of graphene oxide.	L2	CO2	7
1001	C	Explain the construction and working of photovoltaic cells.	L2	CO2	6
1001	JLE 5				- '
	a	Mention the sources of e-waste and explain the need for e-waste management	L2	CO1	7
	b	Explain the recycling of e-waste	L2	CO2	7
	С	Explain the extraction of gold from e-waste	L2	CO3	6
R			L		
	a	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products	L2	CO1	7
	b	Explain the pyrometallurgical and direct recycling methods.	L2	CO2	6
	с	Write a brief note on role of stakeholders for example producers, consumers, recyclers, and statutory bodies.	; L2	CO1	7

6	Y	USN STREET SEMESTANDE			
		USN SO			
/		concepter B B		BC	HES102
/		Applied Chemistry for CSF Stream  2. VTU Formula Hand a questions of the stream  3. M: Many Many Properties of the stream of the		DC.	1123102
		Note: I. Answer any FIVE full questions, choosing and full question from each 3. M: Marks, L: Bloom's level, C: Course putcomes.	eb.	2023	3
		2. VTU Formula Hand Book is permitted  3. M: Marks, L: Bloom's level, C: Course putcomes.  applications of Quarter Explain			
		Marks 1 and Book to the Changla Change	h mo	Aarks dule.	: 100
	Q.	a. What are batteries? Explain the Working principle, properties and applications of quantum Dot sensitized boolar cells.  b. Explain the working principle of clectrochemical sensors, and mention its c. What are	,		
	<u> </u>	applications of open Explain Module - 1	TA	-	C
		b. Explain the working principle of clectrochemical sensors, and mention its using sensors? Explaints	7	AND DESCRIPTION OF THE PERSON NAMED IN	THE RESIDENCE OF STREET
-		applications. Working principles			
		c. What are	6	L2	CO1
1		using sensors? Expund the			
1		what are sensors? Explain the detection of ascorbic Acid and Glyphosate	7	L2	CO1
	Q.2	What a like the second			
L		measurement chemical sensors? Registring its applications in the	7	L2	CO1
		a. What are electro chemical sensors? Explain its applications in the measurement of dissolved oxygen (DO).  b. Describe the corrections of the correction o	'	"	001
		TOUTHE THAT	6	L2	CO1
1		batteries and mention any four applications.			
		Tapidii about 1	7	L2	CO1
$\vdash$	<u> </u>	electro chemical oxidation sensors.		•	
Q	2.3	a. What are plate in Module -22	_		* 17 1 =
		a. What are photoactive and electro active materials and explain their working principle in display system.	6	L2	CO1
-	$\dashv$				
		b. Explain any four properties and applications of light emitting materials – poly [9 – Vinyl Carbazole] (PVK) spitable for opto electronic devices.	6	L2	CO1
-	-	Proprietable for opto electronic devices.			
		c. Discuss the working and liquid crystal display.	8	L2	CO1
_	4	OR 1			
Q.	4   8	Explain the types of organic memory devices by taking P-type and n-type semi conducting materials.	6	L2	CO1
	b	. What are nano materials? Explain any four properties and applications of	7	L2	CO1
		polythiophenes (P3HT) suitable for optoelectronic devices.	<b>'</b>		COI
	c.	What is QLED? Mention any four properties and applications of QLED.	6	L2	CO1
		Module - 3	100		
.5	a.	Define metallic corrosion. Describe the electrochemical theory of corrosion taking iron as an example.	6	L2	CO2
	1		1		
	b.	What are Ion-selective electrodes? Explain the determination of pH of a solution using glass electrode.	7	L2	CO2
_	-				
	c.	Define Concentration cell. The EMF of the cell	7	L3	CO2
_	Ш	Ag/AgNO <sub>3</sub> (C <sub>1</sub> M)//AgNO <sub>3</sub> (0.2M)/Ag is 0.8V at 25°C. Find the value of C <sub>1</sub> .		7 1	
	1	1 of 2			
	~				

4		filly diametry	6	L2 C	1
Q.6	a.	Briefly explain the principle instrumentation and working of potention		L2 /	201
	b.	What are reference electrode? Explain the construction, working and application of Calometelectrode	7	L2	$CO_1$
	ο.	What are reference electrode? Explain the construction, working			
		application of Calomel electrode.			1
	-	and the creed of the control of the	7	L3	CO <sub>2</sub>
	c.	What is China is a sublicity			- 52
		ocean vessel. It was estimated that the original area of the plate was			\ \
	1	10 inch <sup>2</sup> and that approx 2.6kg had corroded away during the submersion.  Assuming a part of the submersion.	1		
		Assuming a correct approx 2.6kg had corredted away during the start in sea			
		Assuming a corrosion penetration rate of 200 mpy for this alloy in sea water, estimate the control of the state of the sta			
		water, estimate the time of submersion in years. The density of steel is 7.9g/cm <sup>3</sup> .			
		1	- 1		
$\overline{Q.7}$	a.	In sample of Module - 4	_		000
		The state of the s	6	L3	CO3
		molecules have molecular mass 15000 g most			
		molecules have molecular mass 25000 g/mol, and remaining molecules have molecular mass 27000 g/mol, and remaining			
		molecules have molecular mass 25000 g/mol, and remaining and weight average molecular mass 27000g/mol, calculate the number average			
		mass of the polymer.			
	b.	Explain the prépage			
		Explain the préparation, properties and commercial application of Kevlar.	7	L2	CO3
1 8	c.	What are	gi <sup>2</sup> i		
		What are green fuels? Explain the generation of hydrogen by Alkaline water electrolysis with its advantages.	~	12	CO3
		water electrolysis with its advantages	7	L2	CO3
_					
0	1	Explain the court of OR			
8.	a.	Promi the constitution of the			
		Explain the construction and working of photovoltaic cells. Mention the advantages and disadvantages.	6	L2	CO4
		disadvantages.			
	b.	Explain the			
		Explain the preparation, properties, and commercial applications of	_		
		graphiene oxide.	7	L2	CO4
	c.	What are conducting polymer? Discuss the conduction mechanism in polyacetylene through oxidative doning technique and			
		polymore polymore in the conduction most and the condu		-	
		polyacetylene through oxidative General Conduction mechanism in	7	11.2	COA
		polyacetylene through oxidative doning technique and its uses.	7	L2	CO4
		The state of the s	7	L2	CO4
0		Model to thinque and its uses.		L2	CO4
9	a.	Explain the ill effects of foxic materials with the suses.			CO4
9	a.	Explain the ill effects of foxic materials with the suses.		L2	
9	a.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	7		CO4
	a.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	7		
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical write a brief note on role of stake holders for	7	L2	CO5
	a. b.	Explain the ill effects of foxic materials with the suses.	7		
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.	7	L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.	7	L2 L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in button and the uses.	7	L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.	7	L2 L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2 L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2 L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7 6 7	L2 L2 L2	CO5
	a. b.	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2 L2 L2	CO5
10	a. b. c. l	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 6 7	L2 L2 L2	CO5
10	a. b. c. l	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7 6 7	L2 L2 L2	CO5
10	a. b. c. l	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 6 7	L2 L2 L2	CO5
0 2	a. b. c. l	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.  Explain the steps involved in extraction of gold from e-waste.	7 7 7	L2 L2 L2 L2 L2	CO5 CO5 CO5
0 2	a. b. c. l. b. H. c. N	Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory podies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 7 7	L2 L2 L2 L2 L2	CO5 CO5 CO5

Module-4 cen chemisfix from be-(07 Marks) Explain any six basic principle of green chemisfry Explain the synthesis of Adipic acid from benzene and green synthesis from glucose. (07 Marks) c. Discuss the construction and working of alloyovoltaic cell. (06 Marks) a. Explain the construction and working of methanol-oxygen fuel cell (07 Marks) b. Briefly explain the impacts of existes of nitrogen and oxides of sulphur on environment. c. Write short notes on microwave synthesis and bio catalyzed reaction with examples. (06 Marks) What is hard water Explain the determination of hardness using EDTA titration. (07 Marks) b. In a COD test 28.1 and 14.0 cm<sup>3</sup> of 0.0518 FAS (Ferrous Ammonium Sulphate) solution was required for blank and sample titration respectively. The volume of test sample taken was 25cm Calculate the COD of the sample. Explain conductometric titration method for the determination of mixture of strong acid and (06 Marks) Explain the principle and instrumentation of colorimetry. ality. Long. b. Define the terms normality, molarity and molality. c. Define primary and secondary standard solutions, explain briefly the requirement of primary (06 Marks)

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BCHES102

First Semester B.E./B. Tech. Degree Examination, Jan./Feb. 2023 Applied Chemistry for CSE Stream

1	111	ne: 3 hrs.		202.	,
		Note: 1. Answer any FIVE full questions, choosing OVE full question from ea.  2. VTU Formula Hand Book is permitted.  3. M: Marks, L: Bloom's level, C: Course and the contraction of th			
		2. VTI E. Juli question	far 1	darks	. 166
		3. M: Marks, L: Bloom's level, C: Course outcomes.	ch ma	riatks. Auto	: 100
		L. Bloom's level C. Com	CH MIG	aute.	
101	1	The second			
Q.1	a.	11 Hdt are bett : 110dule 1			-
-		applications of quantum Dot sensitized solar cells.	M	L	(
_		duantum Dot sensitized solar principle, properties and	d 7	L2	CC
	b.	Explain the			
1		Explain the working principle of electrochemical sensors, and mention its applications.			
1	1	applications.	6	L2	CC
	1-				
	c.	What are sensors? Explain the detection of ascorbic Acid and Glyphosate using sensors.		1-	CC
	1	using sensors. Explain the detection of ascorbic Acid and Glyphosate	:   7	L2	CC
-	1	9 1113013.			ST AND ADDRESS OF THE PARTY OF
			1		1
Q.2	a.	When OR			CC
\ \.	a.	What are electro chemical sensors? Explain its applications in the	7	L2	C
	1 1	measurement of dissolved oxygen (DO).			
-	1-1		-	L2	co
	b.	Describe the construction working and applications of Lithium - ion	6	L	
		batteries and mention any four applications.			
	, ,		-	L2	CC
	c.	Explain about detection of Diclofenac and hydro carbons (PAH's) with	7	146	
- 1		electro chemical oxidation sensors.			
	1 0	deciro chemical oxidation scusus.	1 1		_
- 1					
				7.2	CC
			6	L2	CC
Q.3	a.   V	Module - 2  What are photoactive and electro active materials and explain their working	6	L2	CC
Q.3	a. V	What are photoactive and electro active materials and explain their working rinciple in display system.			
Q.3	a. V	What are photoactive and electro active materials and explain their working rinciple in display system.	6	L2	
	a. V	What are photoactive and electro active materials and explain their working rinciple in display system.			
	a. V	What are photoactive and electro active materials and explain their working rinciple in display system.	6	L2	CC
	a. V p	Module – 2  What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials — oly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.			CC
	a. V p	Module – 2  What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials — oly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.	6	L2	CC
	a. V p b. E po	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Toly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.	6	L2	CC
	a. V p b. E po	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Toly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.	6	L2	CC
	a. V p b. E po	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Toly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.	8	L2	CC
	a. V p b. E po c. Di	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—oly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Secuss the working and liquid crystal display.  OR  OR  OR  OR  OR  OR  OR  OR  OR  O	8	L2	CC
	a. V p b. E po c. Di	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—oly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Secuss the working and liquid crystal display.  OR  OR  OR  OR  OR  OR  OR  OR  OR  O	8	L2	CC
).4 a	a. V p b. E po c. Di sen	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Secuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.	8	L2 L2	CC
	a. V p b. E po c. Di sen	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Secuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.	8	L2 L2	CC
0.4 a	a. V p b. E po c. Di wh	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Foly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  For a suitable for opto electronic devices by taking P-type and n-type in conducting materials.  For a suitable for optoelectronic devices.	6 7	L2 L2 L2	CC
).4 a	a. V p b. E po c. Di wh	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Foly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  For a suitable for opto electronic devices by taking P-type and n-type in conducting materials.  For a suitable for optoelectronic devices.	8	L2 L2	CC
).4 a	a. V p b. E po c. Di wh	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Foly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  For a suitable for opto electronic devices by taking P-type and n-type in conducting materials.  For a suitable for optoelectronic devices.	6 7	L2 L2 L2	CC
0.4 a. b.	a. V p b. E po c. Di Wha wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Poly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.  OR  Polain the types of organic memory devices by taking P-type and n-type in conducting materials.  Part are nano materials? Explain any four properties and applications of exthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.	6 7 6	L2 L2 L2 L2	C()
0.4 a. b.	a. V p b. E po c. Di Wha wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Poly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.  OR  Polain the types of organic memory devices by taking P-type and n-type in conducting materials.  Part are nano materials? Explain any four properties and applications of exthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.	6 7	L2 L2 L2	C()
0.4 a. b. c.	a. V p b. E po c. Di Wha wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Poly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.  OR  Polain the types of organic memory devices by taking P-type and n-type in conducting materials.  Part are nano materials? Explain any four properties and applications of exthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.	6 7 6	L2 L2 L2 L2	C()
0.4 a. b. c.	a. V p b. E po c. Di Sen Wh poly Wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 - Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Socuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  Sat are nano materials? Explain any four properties and applications of atthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module - 3  The metallic corrosion. Describe the electrochemical theory of corrosion	6 7 6	L2 L2 L2 L2	
0.4 a. b.	a. V p b. E pc EX sen Wh poly Wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Socuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  Solution and inaterials? Explain any four properties and applications of atthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module – 3  The metallic corrosion. Describe the electrochemical theory of corrosion as an example.	6 8 7 6	L2 L2 L2 L2 L2	CC CC CC CC
0.4   a.   b.   c.	a. V p b. E pc EX sen Wh poly Wha	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Socuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  Solution and inaterials? Explain any four properties and applications of atthiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module – 3  The metallic corrosion. Describe the electrochemical theory of corrosion as an example.	6 7 6	L2 L2 L2 L2	C()
0.4 a. b. c.	a. V p b. E po c. Di What takin	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—oly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  at are nano materials? Explain any four properties and applications of at thiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module – 3  The metallic corrosion. Describe the electrochemical theory of corrosion as an example.  The selective electrodes? Explain the determination of pH of a	6 8 7 6	L2 L2 L2 L2 L2	C()
0.4 a. b. c.	a. V p b. E po c. Di What takin	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—oly [9 — Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Secuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  At are nano materials? Explain any four properties and applications of at thiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module — 3  The metallic corrosion. Describe the electrochemical theory of corrosion again as an example.  are Ion-selective electrodes? Explain the determination of pH of a on using glass electrode.	6 8 6 7 6	L2 L2 L2 L2 L2	C() C() C()
0.4 a. b. c. 5 a. b.	a. V p b. E pc Ex sen What takin What soluti	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—  Soly [9 – Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Socuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  Solvential and four properties and applications of attribute the conduction of the conduction and four properties and applications of attribute the conduction of the conduction of the conduction of the conduction and four properties and applications of QLED.  Module – 3  The metallic corrosion. Describe the electrochemical theory of corrosion is given as an example.  The metallic corrosion of photon of the coll of the	6 8 7 6	L2 L2 L2 L2 L2	CC CC CC CC
2.4 a. b. c. 5 a. b.	a. V p b. E pc Ex sen What takin What soluti	What are photoactive and electro active materials and explain their working rinciple in display system.  Explain any four properties and applications of light emitting materials—oly [9 — Vinyl Carbazole] (PVK) suitable for opto electronic devices.  Escuss the working and liquid crystal display.  OR  Plain the types of organic memory devices by taking P-type and n-type in conducting materials.  But are nano materials? Explain any four properties and applications of at thiophenes (P3HT) suitable for optoelectronic devices.  It is QLED? Mention any four properties and applications of QLED.  Module — 3  The metallic corrosion. Describe the electrochemical theory of corrosion as an example.  are Ion-selective electrodes? Explain the determination of pH of a con using glass electrode.	6 8 6 7 6	L2 L2 L2 L2 L2	CC

		Briefly explain the principle, instrumentation and working of potentiometry taking estimation of Iron as example.	a consumery	BCHE	ES102
		taking estimation of Iron as example, instrumentation and working of potentiometry	-		de regar account
	1	chample, stands of potentiometry	6	1.2	COL
	1	b. What are reference electrode? Explain the construction, working and			
	1	application of Calomel electrod	Lagran		F/F/4
	1	officerode.	7	1.2	COL
	-	What is CPR2 A			
		ocean vessel. It was estimated that the original area of the plate was Assuming a correction.		-	COZ
	- 1	10 inch <sup>2</sup> and that approx 2.6kg had corroded away during the submersion.  Water, estimate the time to place was found in a submerged assuming a corrosion penetration rate of 200 may for this allow in sea.	7	L3	602
	- 1	Assuming a sprox 2.6kg had corrected area of the plate was			
	- 1	Assuming a corrosion penetration rate of 200 mpy for this alloy in sea 7.99/cm <sup>3</sup>			
		7.0-1.3			
	1	water, estimate the time of submersion in years. The density of steel is			
Q.7	:	In sample of a polymer 2004	-	L3	CO3
		In sample of a polymer, 20% molecules have molecular mass 15000 g/mol.	6	Lo	000
		make molecular mass 25000 at mol and femalitilly			
	1	have molecular mass 77000g/mol calculate the number average			
		and weight average molecular mass of the polymer.			
		113		1.2	CO
	b	Explain the preparation, properties and commercial application of Kevlar.	7	L2	CO.
					CO
	c	What are green fuels? Explain the generation of hydrogen by Alkaline	7	L2	CO.
	-	water electrolysis with its advantages.			
	1	water electrorysis with its advantages.			
	1	OR			60
	_	Explain the construction and working of photovoltaic cells. Mention the	6	L2	CO
8.9	a.	Explain the construction and working of photo			
		advantages and disadvantages.			= 0
	_	Explain the preparation, properties, and commercial applications of	7	L2	CO
	b.	Explain the preparation, properties, and commercial			
	1	graphene oxide.			
		a River the conduction mechanism in	7	L2	CO
	1		7	144	
	c.	What are conducting polymer? Discuss the conduction	1	1.2	
	c.	What are conducting polymer? Discuss the conduction mechanism in polyacetylene through oxidative doping technique and its uses.	1	Liz	
	c.	polyacetylene through oxidative doping technique and its uses	1	Liz	
	c.	polyacetylene through oxidative doping technique and its uses.			CC
0		polyacetylene through oxidative doping technique and its uses.	7	L2	CC
9	с.	polyacetylene through oxidative doping technique and its uses.  Module - 5  Explain the ill effects of toxic materials used in manufacturing electrical			CC
9		Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	7	L2	
9	a.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.			
9		Module - 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers,	7	L2	
9	a.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.	7	L2	
9	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.	7	L2	CC
	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy	7	L2	cc
	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.	7	L2	CC
	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2	CC
9	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2 L2	CC
	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7	L2	CC
	a. b. c.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 6 7	L2 L2	CC
0   4	a. b.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 6 7	L2 L2 L2	CC
0   4	a. b. c.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.	7 6 7	L2 L2	
0 2	a. b. c.	Module – 5  Explain the ill effects of toxic materials used in manufacturing electrical and electronic products.  Write a brief note on role of stake-holders for example, producers, consumers, recyclers and statutory bodies.  Briefly discuss the various chemical methods involved in hydrometallurgy process of recovery of E-waste.  OR  Explain the pyro metallurgical recycling methods.	7 6 7	L2 L2 L2	CC

BCHES102/202

# First/Second Semester B.E./B.Tech. Degree Examination, June/July 2024 Applied Chemistry for CSE Stream

Time: 3 hrs.

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module. Max. Marks: 100

2. VTU Formula Hand Book is permitted.
3. M: Marks, L: Bloom's level, C: Cours

			. Bloom's level, C: Course outcomes.				
C	2.1	7					_
1		a.	What are electronic	M	L	C	-
		+	The concession of the concessi	07	L1	co	1
		b.	Explain the principle west:	06	L1	CO	1
		c.	What is Quantum Dot sensitized solar cell? Explain the construction and working of Quantum Dot sensitized solar cell?	07	L1	CO	-
	_	1	working of Quantum Dot sensitized solar cell? Explain the construction and	07	L		
Q.	2	To	OD.			1	
	_	a.	Explain the detection of his malandary 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1: 1:	07	L1	CO	01
	_	-	The till Circuit Avidation magation				
	11	b.	Tapiani the Working principle of electrockenical and cancers for the	06	L1	C	01
_	-		Total of So <sub>x</sub> and NO <sub>x</sub>	-			
		c.	Explain the construction and working of Lision battery Mention any two	07	L1	C	01
_	_		applications.				
_			Module – 2				
Q.3	3	2.	What are memory devices? Explain the classification of electronic memory	07	L	2 0	:02
			devices.				
1	ĺ	b.	Define optoelectronic device. Explain the working principle of	06	L	2 (	CO2
			optoelectronic device.				
		c.	What are liquid crystals? Explain the classification of liquid crystals.	0	7 L	2 (	CO2
		7	OR				
.4		a.	Explain the types of organic memory devices by talking p-type and n-type	0	7 I	.2	CO
	1		semiconducting materials.				
_	+,	). j	Explain any three properties and applications of polythiophene (P3HT)	10	6 1	L2	CO
	'	, [	Explain any times properties and applications of polyunophene (1911)	′  °			•
	+	15	suitable for optoelectronic devices.	+	7	L2	CC
	C	.   \	What is QLED? Mention any three properties and applications of QLED.		11	LL	-
			Module – 3			T 2 1	
5	a	.   I	Define metallic corrosion. Explain electrochemical theory of corrosion.		_	L3	CC
	b	. A	A thick steel sheet of area 400 inch2 is exposed to moist air. After 2 year	S	06	L1	CC
		10	f period, it was found to experience a weight lost of 375g due to corrosio	n		* 7	
		1 ; 6	the density of steel is 7.9 g/cm <sup>3</sup> , calculate CPR in mpy and mmpy.				1, 1
_	-	177	What are reference electrodes? Explain the construction, working an	d	07	L1	C
	c.	"	oplications of calomel electrode.		- 1		
		a	OR OR				
				te	07	L1	C
,	a.		hat is galvanization? Explain galvanization of Iron. Mention i	13	07	LI	
		ap	oplications.	-	0.6	¥ 1	-
-	b.	W	hat are concentration cells? Calculate the cell potential of the following	ng	06	L1	C
	υ.		II at 298 K.				
			$Ag \mid AgNO_3(0.005M) \parallel AgNO_3(0.5M) \mid Ag$	10			1 4
				_		¥ 2	C
-+	_	Fv	plain the principle and instruction of conductometry taking estimation	of	07	L2	100
	c.	L	eak acid using a strong base as an example.				
		We	dr dold monits				

-		The state of the s		-	
0 ~	7-	Madule		4	
Q.7	a.	In a sample of a polymer 20% molecules have molecular mass	07	L3	CO <sub>4</sub>
1	1	15,000g/mol 35% molecules have molecular mass	"		004
		15,000g/mol, 35% molecules have molecular mass 20000g/mol. Calculate			
	b.	dycrage and weight average metantles mass a file polymer			
	10.	Explain the preparation of Kevlar. Mention any four applications.	06	L2	CO <sub>4</sub>
	-				
	c.	Explain the generation of hydrogen by Alkaline water electrolysis with a	07	L2	CO
		neat labelled diagram.	0,		00-
Q.8	a.	What are OR	,		
		What are conducting polymers? Explain the conduction mechanism in	07	L3	CO
	1	The control of the co			
-	_				
1	<b>b.</b>	What are PV cells? Explain the construction and working of photovoltaic cell.	06	12	CO
		cell. Explain the construction and working of photovoltaic	06	L2	CO
			-		
		Explain the generation of hydrogen by proton exchange membrane	07	L2	CO
		electrolysis.	٠,		
.9 2	a. I	Define E wests F 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			
	- T	Define E-waste. Explain the sources and composition of E-waste.	07	L2	CO
10		Plant the III effects of materials used interest to the state of the s	06	L2	CO
	e	lectronic products.	00	LZ	100
C.	. TF	xplain pyrometally 1			
		xplain pyrometallurgical process of extraction of E-waste.	07	L2	CO
		OR			
10   a.	E	xplain the extraction of gold from E-waste.			
		-F-waste.	07	L2	CC
-1-	-				
b.	E	plain direct recycling of E-waste.	06	T 2	-
	1		06	L2	CC
- 1	1		"		
-	W	rite a brief not			
c.	W	rite a brief note on role of stakeholders for example, producers			CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of F-waste	07	L2	CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	COL	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wi	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			CC
c.	Wicon	*****  *****			CO
c.	Wicon	rite a brief note on role of stakeholders for example, producers assumers, recyclers and statutory bodies in management of E-waste.			C
c.	Wicon	*****  ***  ***  ***  **  **  **  **	07	L2	
c.	Wicon	*****  *****	07	L2	

BCHES102/202

# First/Second Semester B.E./B.Tech. Degree Examination, Dec.2023/Jan.2024 Applied Chemistry for CSE Stream

Time: 3 hrs.

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. 17U Formula Hand Book is permitted.
3. At Mark the Property of the Pr

3. M : Marks , L: Bloom's level , C: Course outcomes.

s level, C: Course outcomes.			
Q.1 8. Explain the wards Module - 1			
Q.1 a. Explain the working principle of conductometric sensors and mention any b. Discuss the	M 06	1.2	CO2
b. Discuss the constant	00	1.2	CO2
b. Discuss the construction and working of Li-ion batteries. Mention its applications.	07	1.2	CO4
c. Describe the application of Electrockers			
c. Describe the application of Electrochemical gas sensors for the detection of SO, and NO.	07	L3	CO3
Q.2 a. Explain the I			
Q.2 a. Explain the working principle of an Electrochemical sensor in the detection of Dissolved Oxygen (DO).	06	L2	CO2
6. Discuss the construction	07		601
Cells (QDSSCs). Mention its applications.	07	L2	CO4
	07	L3	CO3
the state of the s	0,		
Q.3   a.   What are memory days   0.2   Module - 2	,		
a. What are memory devices? Explain the classification of Electronic memory devices with examples.	07	L1	COI
b. What are nanomaterials? Explain any four properties of polythiophenes	07	L2 L1	COI
(P <sub>3</sub> HT) suitable for optoelectronic devices.	07	L2	CO
c.   Mention any three properties and applications of QLED.	06	LI	CO
OR 1	100	1 2.	100
.4 a. Explain the types of organic memory. Devices by taking p-type and n-type	07	L2	CO
semiconductor materials.	1		
b. What are photoactive and electroactive materials and explain their working	07	L2	CO
principle in the display system.			CU
c.   Mention any 3 properties and applications of LC-displays.	06	LI	CO
Module – 3		,	
a. Define metallic corrosion. Describe the electrochemical theory of corrosion	07	L	CC
taking.		L	2   CC
b. Describe galvanizing and mention its applications.	06	L	2 CC
c. What is CPR? A thick brass sheet of area 400 inches exposed to moist air	. 07	7 L	2 CC
After 2 years of period. It was found to experience a weight loss of 375 g	3		CC
due to corrosion. If the density of brass is 8.73 g/cms, calculate CPR in	1		
mpy and mmpy.			
, ° OR			
a. Explain the construction and working of the Calomel electrode.	0.	7 L	2 C
b. Explain the application of conductometric electrodes in the estimation of	a 0	6 L	2 C
weak acid.			
c. Define concentration cell. Derive an expression for emf of the cell.	. 0	7 L	1 C
	-		2 C
· · ·			



### BCHES102/202

10-				
Q.7	a. A polydisperse sample of polystyrene is prepared by mixing three I g of 10000 molecular many following proportions.			
1	monodisperse sample of polystyrene is prepared by mixing three I g of 10000 molecular weight 2 n of thoses.			
1	1 g of 10000 molecular weight. 2 g of 50000 mol. wt and 2 g of 100000  b. What is Green fuel (hydrocental and weight average mol. wt.)	07	L2	CO3
1	met 10000 molecular visible a proportions.			
	b. What is Green fuel (hydrogen fuel)? Mention the different back.  Explain the control of the fuel of			
-	C.   Explain the carrier (Mydrogen fuel)? Mention the Ad-	_		
-	the construction and working of Dhother advantages of Green fuel.	06	LI	co
Q.8 ]	a. Discovered OR	07	L2	CO
	Discuss the conduction meabout			
	a. Discuss the conduction mechanism in polyacetylene through oxidative or eductive doping techniques (Any one).  Explain the generation of hard	07	12	CO
	b. Explain the general exp	07	L3	CO
	Explain the generation of hydrogen by alkaling			
	Explain the generation of hydrogen by alkaline water electrolysis.  Explain the preparation, properties and applications of Kevlar.  Module - 5	07	L2	CO
Q.9 a	Was and applications of Keylar.	06	L2	CO
_	What is e-waste? Explain the need for e-waste management.  Discuss the fell.	00	1.72	CO
D	Explain the process of recycling e-waste management.  Discuss the following:			
C.	Discuss the Guerral Discuss of recycling e-waste	07	L2	CO
1	Discuss the following:	06	L2	CO
		07	L3	CO
701	- Jaiotticulturas	07	L3	CO
10 a.	Explain the average OR			
b.	Explain the extraction of gold from e-waste.  Write a brief note on the relationship of the relationship o			
1	or the a brief note on the role of	07	L2	CO
	CONSUMERC CALL			
C.	Explain the health by boules.	07	L3	CO
1 1	meatth nazards due to exposure to a			
	Explain the health hazards due to exposure to e-waste.	06	L2	CO
				CU



# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

### RIMENT OF APPLIED SCIENCE

# SLOW LEARNERS LIST AFTER FIRST IA

Class/ Section: 11 A

Subject/ Subject code: Applied Chemistr

Sl.No.	USN	Student Name	Marks	Signature
	1KG23C5005	AJITH KUMAR	11	Between ch
2	1KG23C5007	AKHIL GOUTHAM K	3	Charles
3	1KG23CS009	AMRUTHA K	9	Amulto 16
4	1KG23CS010	ANKITHA P	7	Autito
5	1KG23CS016	BHAVYA SAI SHREE V	4	House
6	1KG23CS020	CHALLA BALAJI NAIDU	9	Bulaisi
7	1KG23CS022	D JAYA KRISHNA	5	p-sonobiahra
8	1KG23CS024	DEEKSHA N	11	(A)
9	1KG23CS027	DHEERAJ R	12	phoeno
10	1KG23CS046	K BINDU	7	K.B.d.
1	1KG23CS047	K DHEERAJ CHOWDARY	3	Dijeyile
2	1KG23CS049	K P NIHAAL	9	DATE:
3	1KG23CS050	K YESHWANTH CHOWDARY	10	Goolwart
1 :	1KG23CS055	KOTHA HARSHA NANDHAN	11	sch)
1	LKG23CS063	M NEVARUTH SAI	6	hy white
1	KG23CS091	S AKSHATHA	12	18
1	KG23CS106	SOURABH GOUD ALLOLLI	10	And
1	KG23CS078	PARSHURAM N	AB	

Signature of the Staff

Professor & HOD

Department of Applied Science K.S. School of Engineering & Manage Bangalore - 560 109





# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109 DEPARTMENT OF APPLIED SCIENCE

# ADVANCE LEARNERS LIST AFTER FIRST 1A

Class/ Section: II A

Subject/ Subject code: Applied

Sl.No.	LION:	Pplied Chemistry/ BCHES202			
1.	1VC22				
2.	1KG23CS001	A YASHWITHA	Marks	Sign	ature
3.	1KG23CS003	ADITYA H	17	11/1	
4.	1KG23CS004	ADITYA P MASABINAL	16	(D)	
	1KG23CS006	AKASH S	13	au	
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Signature of the Staff

Dr. C. VASUDEV

Professor & HOD

Department of Applied Science

K.S. School of Engineering & Management

Bangalore - 560 109



# K.S. SCHOOL OF ENGINEERING AND MANAGEMENT

### BENGALURU-560109

# DEPARTMENT OF APPLIED SCIENCE

SESSION: 2023-2024 (EVEN SEMESTER)

Pedagogical approach-Flipped Class

Class/Section: CSE, 'A'

Subject: Applied Chemistry for CS stream

Subject code: BCHES202

Date: 20/05/2024 & 21/05/2024

Course In charge: Dr. Anitha R.

Flipped class for second semester 'A' section students was conducted on 20.05.24 & 21.05.24. The topics such as, e-waste management-Hydrometallurgical extraction of E waste, Types of organic memory devices, Molecular ordering in liquid crystals and Conductometric sensors were suggested to the students. Students were given access to study materials, an NPTEL link, and appropriate YouTube videos one week prior to the start of class. During the course of the study, students used a black board and presented using Power Point. The inverted class helped students build a deeper understanding of topics and a greater development of independent learning skills.

### Document shared:

Soft copy of Module-1 and 5 notes

### YouTube links:

https://youtu.be/ur0MdW5rTIc?si=71146G1J4URE0ts8

https://youtu.be/U3KUJTDPsSE?si=Y-FnH5Ym8AFaVTTe

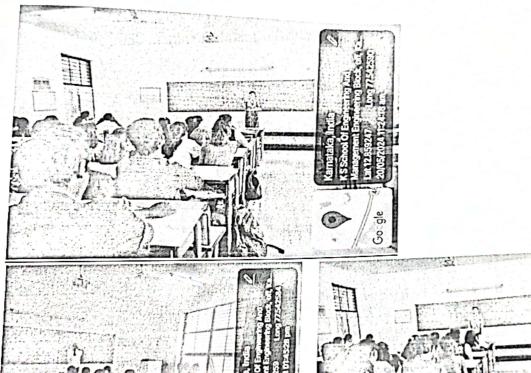
https://in.hach.com/oxygen/o2

https://youtu.be/hsGHQUrEfss?si=bEwBtBdHg3NojQFP

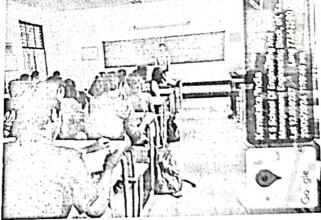
# NPTEL link:

https://youtu.be/\_r5rHyMHKEg?si=0mUxmXCAyIjHLBCj https://youtu.be/kUCVBhSka2Q?si=119aoy5T6LnyfwUWT https://youtu.be/mYGfyO3sPxk?si=tC2uyXpaQEwlEFh9 https://youtu.be/17XLmrpgqEs?si=jX\_zANT5K56JWma9 https://youtu.be/d0-LywQVLPM?si=Q7QNqMkIF\_P4N0G-

### Photograph:







whither R Course In charge

Dr. C. VASUDEV Professor & HOD



K. S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-109
DEPARTMENT OF APPLIED SCIENCE
ACADEMIC YEAR: 2023-2024 (Even sem)
Chemistry Cycle – A section

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