



Visvesvaraya Technological University

"Jnana Sangama" Belagavi-590018, Karnataka State, India

Dr. A. S. Deshpande B.E., M.Tech., Ph.D.

Registrar

Phone: (0831) 2498100

Fax: (0831) 2405467

Ref: VTU/BGM/SO2/2020-21/5296

Dated: 15 JAN 2021

NOTIFICATION

Subject: Academic Calendar for I sem PG programmes and I sem (revised)

B.E./B.Tech./B.Arch./B.Plan, III sem (revised) MCA for the year 2020-21 regarding...

Reference: Hon'ble Vice-Chancellor Approval dated 15.01.2021

Academic Calendar for I semester of M.Tech./M.Arch./MBA/MCA programmes, I sem (revised) B.E./B.Tech./B.Arch./B.Plan., and III sem (revised) MCA for the Year 2020-21 is hereby notified as enclosed.

The Principals of Affiliated, Constituent, and Autonomous Engineering Colleges are hereby informed to bring the contents of this Notification to the notice of all the concerned.

Sd/-

REGISTRAR

Encl: As mentioned above.

To,

1. The Principals of all affiliated/ constituent /Autonomous Engineering Colleges under the ambit of VTU Belagavi.
2. The Chairpersons of all Departments, Centres for PG Studies in Belagavi, Kalaburgi, Muddenahalli, and Mysore.

Copy to.

1. To the Hon'ble Vice-Chancellor through the secretary to VC, VTU Belagavi for information
2. The Registrar (Evaluation), VTU Belagavi for information.
3. The Regional Directors (I/c) of all the regional offices of VTU for circulation.
4. The Special Officer CNC VTU Belagavi for uploading on VTU website
5. PS to Registrar VTU Belagavi
6. All the concerned Special Officer/s and Caseworker/s of the academic section, VTU, Belagavi

15-1-2021
REGISTRAR

First Semester - M. Tech/M. Arch/ MBA/MCA, I Semester (revised) B.E./B.Tech./B. Plan./B.Arch., and III Semester (revised) MCA

	I Semester M. Tech.	I Semester M. Arch.	I Semester MBA	I Semester MCA	I Semester B.E./B.Tech.,/ B.Plan.B.Arch	III Semester MCA
Commencement of ODD Semester	18.01.2021 ✓	18.01.2021 ✓	18.01.2021 ✓	18.01.2021 ✓	14.12.2020 ✓	01.09.2020 ✓
Last Working day of ODD Semester	17.04.2021 ✓	17.04.2021 ✓	17.04.2021 ✓	17.04.2021 ✓	31.03.2021 ✓	30.01.2021 ✓
Practical Examinations	03.05.2021 To 07.05.2021 ✓	--	--	03.05.2021 To 07.05.2021 ✓	05.04.2021 To 16.04.2021 ✓	04.02.2021 To 09.02.2021 ✓
Theory Examinations	19.04.2021 To 30.04.2021 ✓	19.04.2021 To 30.04.2021 ✓	19.04.2021 To 30.04.2021 ✓	19.04.2021 To 30.04.2021 ✓	19.04.2021 To 06.05.2021 ✓	11.02.2021 To 19.02.2021 ✓
Internship Viva-Voce	--	--	--	--	--	--
Professional training / Organization study	--	--	--	--	--	--
Commencement of EVEN Semester	10.05.2021 ✓	10.05.2021 ✓	10.05.2021 ✓	10.05.2021 ✓	10.05.2021 ✓	22.02.2021 ✓

Note:

- The Institute needs to function for **six days** a week with additional hours (**Saturday is a full working day**).
- The faculty/staff shall be available to undertake any work assigned by the university.
- If any of the above dates are declared to be a holiday then the corresponding event will come into effect on the next working day.
- Notification regarding the Calendar of Events relating to the conduct of University **Examinations** will be issued by the Registrar (Evaluation) from time to time.
- Academic Calendar may be modified based on guidelines/directions issued in the future by MHRD/UGC/AICTE/State Government.
- In case if any changes are to be effected by Autonomous Colleges in the academic terms and examination schedule, they could do so with the approval of the University.

15.1.2021
REGISTRAR



ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ

"ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ" ಕರ್ನಾಟಕ ಸರ್ಕಾರದಿಂದ ಸ್ಥಾಪಿತವಾದ ರಾಜ್ಯ ವಿಶ್ವವಿದ್ಯಾಲಯ
"ಜ್ಞಾನ ಸಂಗಮ", ಬೆಳಗಾವಿ-೫೯೦೦೧೮, ಕರ್ನಾಟಕ, ಭಾರತ

Visvesvaraya Technological University

(State University of Government of Karnataka Established as per the VTU Act, 1994)

"Jnana Sangama" Belagavi-590018, Karnataka, India
Phone: (0831) 2498100, Fax: (0831) 2405467, Website: vtu.ac.in

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Registrar

Ref: VTU/BGM/BOS/A9/2020-21 /6652

Date: 12 MAR 2021

Revised -NOTIFICATION

Subject: Academic Calendar for I semester (revised) B.E./B.Tech./B.Plan./B.Arch., for the year 2020-21 regarding...

Reference:

1. VTU/BGM/SO2/2020-21/5296, dated 15.01.2021
2. Hon'ble Vice-Chancellor's approval dated 12.03.2021

Revised Academic Calendar for I semester of B.E./B.Tech./B.Arch./B.Plan., for the Year 2020-21 is hereby notified as below-

Events	Dates
Commencement of ODD Semester	14.12.2020
Last Working day of ODD Semester	10.04.2021
Practical Examinations	05.05.2021 to 15.05.2021
Theory Examinations	19.04.2021 to 03.05.2021
Internship	-----
Internship Viva-Voce	-----
Professional training / Organization study	-----
Commencement of EVEN Semester	19.05.2021

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Sd/-

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Rangaraj
REGISTRAR 12/03/21



II JAI SRI GURUDEV II
Sri Adichunchanagiri Shikshana Trust (R)

S.J.C. Institute of Technology, Chickballapur

CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2020-2021 (ODD SEMESTER) FOR B.E, MBA & M.Tech

Accredited by NBA (ECE, ME & CSE) & NAAC and QS – I Gauge (Gold Rating)



Week No.	Month	Week Days								EVENTS
		Mon	Tue	Wed	Thu	Fri	Sat	Sun		
1.	SEP	31	1	2	3	4	5	6	5	31 ST AUG – Staff Council Meeting, 1 ST SEP – Commencement of Classes for III, V, VII BE, III M.Tech & MBA Students
2.	SEP	7	8	9	10	11	12	13	6	2 ND SEP – HODs Meeting, 3 RD SEP – Class Teachers and Proctors meeting
3.	SEP	14	15	16	17	18	19	20	5	17 TH SEP – Mahalaya Amavasya
4.	SEP	21	22	23	24	25	26	27	6	21 ST to 30 TH SEP – Organization Study Viva Voce Exam
5.	SEP/OCT	28	29	30	1	2	3	4	5	2 ND OCT – Gandhi Jayanthi, 1 ST to 5 TH OCT – Tutorial I
6.	OCT	5	6	7	8	9	10	11	6	9 TH to 12 TH OCT – Continuous Internal Evaluation I, 6 TH OCT – Announcement of Attendance IA - I, 7 TH OCT – HODs Meeting
7.	OCT	12	13	14	15	16	17	18	6	15 TH to 17 TH OCT – VII Sem BE Project Phase I Review I
8.	OCT	19	20	21	22	23	24	25	6	20 TH OCT – Submission of CIE – I Marks, 23 RD OCT – Progress Report Dispatch CIE – I, 25 TH OCT – Mahanavami, Ayudha Pooja
9.	OCT/NOV	26	27	28	29	30	31	1	3	26 TH OCT – Vijaya Dashami, 30 TH OCT – Eid Milad, 31 ST OCT – Maharshi Valmiki Jayanthi, 1 ST NOV – Kannada Rajyotsava
10.	NOV	2	3	4	5	6	7	8	6	28 TH OCT – Class Teachers and Proctors meeting
11.	NOV	9	10	11	12	13	14	15	5	2 ND to 5 TH NOV – Tutorial II, 4 TH NOV – Announcement of Attendance CIE - II, 4 TH NOV – HODs Meeting
12.	NOV	16	17	18	19	20	21	22	6	6 TH to 9 TH NOV – CIE II
13.	NOV	23	24	25	26	27	28	29	6	14 TH NOV – Naraka Chathurdashi
14.	NOV/DEC	30	1	2	3	4	5	6	5	16 TH NOV – Balipadyami, 17 TH NOV – Submission of CIE –II Marks, 20 TH NOV – Progress Report Dispatch CIE –II
15.	DEC	7	8	9	10	11	12	13	6	26 TH to 28 TH NOV – VII Sem BE Project Phase I Review II
16.	DEC	14	15	16	17	18	19	20	6	2 ND DEC – Announcement of Attendance IA – III, 2 ND DEC – HODs Meeting, 3 RD DEC – Kanakadasa Jayanthi
17.	DEC	21	22	23	24	25	26	27	5	30 TH to 2 ND DEC – Tutorial III, 4 TH to 7 TH DEC – CIE III, 2 ND DEC – Class Teachers and Proctors meeting
18.	DEC/JAN	28	29	30	31	1	2	3	6	8 TH to 12 TH – Internal Lab Assessment
19.	JAN	4	5	6	7	8	9	10	6	15 TH DEC – Submission of CIE – III Marks, 16 TH DEC – Progress Report Dispatch IA – III
20.	JAN	11	12	13	14	15	16	17	6	16 TH DEC – Class Teachers and Proctors Meeting
21.	JAN	18	19	20	21	22	23	24	6	17 TH DEC – Last working Day for III, V, VII BE, III M.Tech & MBA Students
22.	JAN	25	26	27	28	29	30	31	6	21 ST to 31 ST DEC – Practical Exam for III, V, VII BE Students & III M.Tech students, 25 TH DEC – Christmas
										4 TH to 23 RD JAN – Theory Exams for III, V, VII BE, III M.Tech & MBA Students
										25 TH JAN to 8 TH FEB – Project Viva Voce

27th July 2020 - Commencement of ODD Semester BE ,3rd Semester MBA / 3rd August – Commencement of ODD Semester for III Semester MTech

Note: VII Semester B. E students shall have to undergo Internship for a period of four Weeks 8TH February 2021 - Commencement of 2nd, 4TH, 6TH, 8TH Semester BE Classes, 4th Semester MBA 22ND February 2021 - Commencement of Classes for 4th Semester M.Tech classes

VISION: SJGIT is Committed to Quality Education, Training and Research

MISSION : • Augmenting the supply of Competent Engineers and Managers • Building Engineers and Managers with Value, Vision and Versatility • Developing and Disseminating New Knowledge and Insights.

Dr. R. Ranganatha
Academic Incharge

MEETINGS: Orange HOLIDAYS: Red TEST & PROJECT REVIEWS: Blue

Dr. K M Ravikumar
Principal



S J C Institute of Technology, Chickballapur
 CALENDAR OF EVENTS FOR THE ACADEMIC YEAR 2021-22, ODD SEMESTER III FOR FIRST SEMESTER BE
 Accredited by NAAC,NBA (MED,CSE,ECE),QS-I Gauge (Gold)

Week No.	Month	Week Days								EVENTS
		Mon	Tue	Wed	Thu	Fri	Sat	Sun		
1.	Dec	14	15	16	17	18	19	20	6	14 th December- Commencement of Classes for I BE, 14 th to 19 th December - Induction Program as per VTU guidelines.
2.	Dec	21	22	23	24	25	26	27	5	19 th December - Class Teachers and Proctors Meeting
3.	Dec/Jan	28	29	30	31	1	2	3	6	13 th January - HODS Meeting, 13 th January - Sankranti
4.	Jan	4	5	6	7	8	9	10	6	26 th January - Republic Day, 29 th January - Test I Attendance Submission
5.	Jan	11	12	13	14	15	16	17	5	1 st to 3 rd February - Test I Marks Submission, 10 th February - Test I Progress Report Dispatch, Class Teachers and Proctors Meeting
6.	Jan	18	19	20	21	22	23	24	6	15 th February - HODS Meeting
7.	Jan	25	26	27	28	29	30	31	5	25 th February - Test II Attendance Submission, 27 th February to 2 nd March - Test II Marks Submission
8.	Feb	1	2	3	4	5	6	7	6	10 th March - Test II Marks Submission, 11 th March, Maha Shivarathri, 12 th March - Test II Progress Report Dispatch, Class Teachers and Proctors Meeting
9.	Feb	8	9	10	11	12	13	14	6	15 th March - Test III Attendance Submission, 19 th March - HODS Meeting
10.	Feb	15	16	17	18	19	20	21	6	22 nd March to 24 th March - Test III
11.	Feb	22	23	24	25	26	27	28	6	29 th March - Test III Marks Submission, 30 th March - Test III Progress Report Dispatch, Class Teachers and Proctors Meeting,
12.	Mar	1	2	3	4	5	6	7	6	31 st March Last Working Day.
13.	Mar	8	9	10	11	12	13	14	5	1 st to 6 th April - Easter Holidays
14.	Mar	15	16	17	18	19	20	21	6	9 th April to 6 th May - Theory Examinations
15.	Mar	22	23	24	25	26	27	28	6	
16.	Mar/April	29	30	31	1	2	3	4	4	
17.	April	5	6	7	8	9	10	11	4	
18.	April	12	13	14	15	16	17	18	4	
19.	April	19	20	21	22	23	24	25	4	

NOTE: 1. Tutorials : Two hours/week

Note: As per VTU, First semester BE students shall compulsorily undergo one week induction program.

10th May 2021 - Commencement of Even Semester BE classes

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- ❖ Building Engineers and managers with Value, Vision and Versatility
- ❖ Developing and Disseminating New Knowledge and Insights

Dr.R.Ranganatha
Academic In-charge

Dr.K.M.Ravikumar
Principal

CHICKBALLAPUR

BLOW-UP SYLLABUS

ENGINEERING CHEMISTRY (18CHE12/22)

(Common to all Branches)

(Effective from the academic year 2018-19)

MODULE- I: Electrochemistry and Energy storage systems

Use of free energy in chemical equilibria: Thermodynamic functions: Definitions of free energy and entropy. Cell potential, derivation of Nernst equation for single electrode potential, numerical problems on E , E^0 , and E_{cell} (3 hrs)

Electrochemical energy systems: Reference electrodes: Introduction, construction, working and applications of Calomel electrode. Ion-selective electrode – Definition, construction and principle of Glass electrode and determination of pH using glass electrode. Electrolyte concentration cells, numerical problems (3 hrs)

Energy storage systems: Introduction, classification - primary, secondary and reserve batteries. Construction, working and applications of Ni-MH and Li-ion batteries (2 hrs)

(RBT Levels: L3)

Details of the Module- I

S.No.	Topics	Duration	Remarks
1.1	Use of free energy in chemical equilibria: Thermodynamic functions: Introduction, I Law of Thermodynamics, Definitions of energy & free energy. II Law of Thermodynamics, definition of entropy. Cell potential: Meaning of EMF	1 hr	
1.2	Derivation of Nernst equation for single electrode potential and numerical problems	1hr	Numerical problems
1.3	Nernst equation for a cell, Numerical problems on E , E^0 , and E_{cell} .	1 hr	Numerical problems
1.4	Electrochemical energy systems: Introduction, types of electrodes, Meaning of reference electrodes, construction, working, advantages and applications of Calomel electrode.	1 hr	
1.5	Ion-selective electrode – Definition, examples, membrane electrodes, construction and principle of Glass electrode,	1 hr	
1.6	Determination of pH using glass electrode, Concentration cells: Definition, examples, derivation of an equation to find the EMF of concentration cells, Numerical problems on concentration cells	1 hr	Numerical problems
1.7	Energy storage systems: Introduction, classification - primary, secondary and reserve batteries with examples	1 hr	
1.8	Construction, working and applications of Ni-MH and Li-ion batteries	1 hr	
1.9	Tutorial classes: Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	2 hrs	

MODULE-II: Corrosion and Metal Finishing

Corrosion: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH, conductivity and temperature. Types of corrosion - Differential metal and differential aeration - pitting and water line). Corrosion control: Anodizing – Anodizing of aluminium, Cathodic protection - sacrificial anode and impressed current methods, Metal coatings – Galvanization (4 hrs)

Metal finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing electroplating-Polarization, decomposition potential and overvoltage. Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel & copper, distinction between electroplating and electroless plating processes (4 hrs)
(RBT Levels: L1 & L2)

Details of the Module-II

Sl. No.	Topics	Duration	
2.1	Corrosion: Definition, Wet & Dry corrosion, Electrochemical theory taking corrosion of iron as an example	1 hr	
2.2	Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of corrosion product, nature of medium – pH (greater than 10, between 3 and 10, lower than 3), conductivity and temperature	1 hr	
2.3	Types of corrosion- Differential metal corrosion and differential aeration corrosion: Pitting and water line corrosion with diagrams, Corrosion control: Anodizing – Anodizing of aluminium	1 hr	
2.4	Cathodic protection : Definition, sacrificial anode and impressed current methods, Metal coatings - Galvanization	1 hr	
2.5	Definition and technological importance of metal finishing, Principles governing metal finishing- Polarization, decomposition potential and overvoltage	1hr	
2.6	Electroplating: Introduction, Electroplating of chromium (hard and decorative), its applications	1 hr	
2.7	Electroless plating: Introduction, electroless plating of nickel	1 hr	
2.8	Electroless plating of copper and its applications, distinction between electroplating and electroless plating processes	1 hr	
2.9	Tutorial classes: Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	2 hrs	

MODULE-III: Energy Systems

Chemical Fuels: Introduction, classification, definitions of CV, LCV, and HCV, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Knocking of petrol engine – Definition, mechanism, ill effects and prevention. Power alcohol, unleaded petrol and biodiesel (4 hrs)

Fuel Cells: Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte, and solid oxide fuel cell (SOFCs) (2 hrs)

Solar Energy: Photovoltaic cells- introduction, construction and working of a typical PV cell, Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells (2 hrs)

(RBT Levels: L3)

Details of the Module-III

Module-III: Energy Systems			
3.1	Chemical Fuels: Introduction, classification based on occurrence and state of aggregation, definitions of CV, LCV and HCV	1 hr	
3.2	Determination of calorific value of solid/liquid fuel using bomb calorimeter: Principle, diagram, construction, working and calculation	1 hr	
3.3	Numerical problems on calorific values.	1 hr	Numerical problems
3.4	Knocking of petrol engine – Definition, mechanism, ill effects and prevention, Power alcohol, unleaded petrol and biodiesel	1 hr	
3.5	Fuel Cells: Introduction, differences between conventional cell and fuel cell, limitations & advantages.	1 hr	
3.6	Construction, working & applications of methanol-oxygen fuel cell with H_2SO_4 electrolyte, and solid oxide fuel cell (SOFCs).	1 hr	
3.7	Solar Energy: Photovoltaic cells- introduction, construction and working of a typical PV cell	1 hr	
3.8	Preparation of solar grade silicon by Union Carbide Process/Method. Advantages & disadvantages of PV cells	1 hr	
3.9	Tutorial classes: Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	2 hrs	

MODULE IV: Environmental Pollution and Water Chemistry

Environmental Pollution: Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and sulphur, hydrocarbons, Particulate matter, Carbon monoxide, Mercury and Lead. Secondary air pollutant: Ozone, Ozone depletion (3 hrs)

Waste Management: Solid waste, e-waste & biomedical waste: Sources, characteristics & disposal methods (Scientific land filling, composting, recycling and reuse) (1 hr)

Water Chemistry: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, boiler corrosion (due to dissolved O_2 , CO_2 and $MgCl_2$). Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry). Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis (4 hrs)

(RBT Levels: L3)

Details of the Module-IV

4.1	Environmental Pollution: Introduction, Air pollutants: Sources, effects and control of primary air pollutants: Carbon monoxide, Oxides of nitrogen and hydrocarbons,	1 hr	
4.2	Oxides of sulphur, Particulate matter, Carbon monoxide, Mercury and Lead.	1 hr	
4.3	Secondary air pollutant: Ozone, Ozone depletion	1 hr	
4.4	Waste Management: Solid waste, e-waste, Biomedical waste: Sources, Characteristics & disposal methods (Scientific land filling, composting, recycling and reuse)	1 hr	
4.5	Water Chemistry: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages-scale and sludge formation	1 hr	
4.6	Boiler corrosion (due to dissolved O_2 , CO_2 and $MgCl_2$), Sources of water pollution, Sewage, Definitions of Biological oxygen demand (BOD) and Chemical Oxygen Demand (COD), Determination of COD	1 hr	
4.7	Numerical problems on COD. Chemical analysis of water: Sulphates (gravimetry) and Fluorides (colorimetry),	1 hr	Numerical problems
4.8	Sewage treatment: Primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis.	1 hr	
4.9	Tutorial classes: Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	2 hrs	

Module V: Instrumental methods of analysis and Nanomaterials

Instrumental methods of analysis: Theory, Instrumentation and applications of Colorimetry, Flame Photometry, Atomic Absorption Spectroscopy, Potentiometry, Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base) (4 hrs)

Nanomaterials: Introduction, size dependent properties (Surface area, Electrical, Optical, Catalytic and Thermal properties). Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by Sol-gel, precipitation and chemical vapour deposition, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications (4 hrs)

(RBT Levels: L1 & L2)

Details of the Module-V

5.1	Instrumental methods of analysis: Introduction, principle, advantages and limitations	1 hr	
5.2	Instrumentation and applications of Colorimetry (Estimation of copper in brass), Flame Photometry(estimation of sodium and potassium)	1 hr	
5.3	Instrumentation and applications of Atomic Absorption Spectroscopy, Potentiometry (estimation of FAS),	1 hr	
5.4	Instrumentation and applications of Conductometry (Strong acid with a strong base, weak acid with a strong base, mixture of strong acid and a weak acid with a strong base)	1 hr	
5.5	Nanomaterials: Introduction, size dependent properties: Surface area, Electrical, Optical, Catalytic and Thermal properties	1 hr	
5.6	Synthesis of nanomaterials: Top down and bottom up approaches, Synthesis by bottom up approach: Sol-gel	1 hr	
5.7	Precipitation and chemical vapour deposition methods with advantages	1 hr	
5.8	Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes – properties and applications (synthesis not required)	1 hr	
5.9	Tutorial classes: Involvement of faculty and students in identifying the engineering applications, doubts and clarifications about the module.	2 hrs	

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ENGINEERING CHEMISTRY LABORATORY

Semester	: I/II	CIE Marks	: 40
Course Code	: 18CHEL16/26	SEE Marks	: 60
Teaching Hours/week (L:T:P)	: 0:0:2	Exam Hours	: 03
Credits : 01			

Course Objectives:

To provide students with practical knowledge of

- Quantitative analysis of materials by classical methods of analysis.
- Instrumental methods for developing experimental skills in building technical competence.

Instrumental Experiments

1. Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.
2. Conductometric estimation of acid mixture.
3. Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.
4. Colorimetric estimation of Copper.
5. Determination of pKa of the given weak acid using pH meter.
6. Flame photometric estimation of sodium and potassium.

Volumetric Experiments

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement solution by rapid EDTA method.
3. Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
4. Determination of COD of waste water.
5. Estimation of Iron in haematite ore solution using standard $K_2Cr_2O_7$ solution by external indicator method.
6. Estimation of percentage of available chlorine in the given sample of bleaching powder (Iodometric method)

Course Outcomes:

On completion of this course, students will have the knowledge in,

- CO1: Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
- CO2: Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

Conduction of Practical Examination :

1. Examination shall be conducted for 100 marks, later reduced to 60 marks.
2. All experiments are to be included for practical examination.
3. One instrumental and another volumetric experiment shall be set.
4. Different experiments shall be set under instrumental and a common experiment under volumetric.

Reference Books :

1. G.H. Jeffery, J. Bassett, J. Mendham and R.C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis",
2. O.P. Vermani & Narula, "Theory and Practice in Applied Chemistry", New Age International Publishers,
3. Gary D. Christian, "Analytical chemistry", 6th Edition, Wiley India.

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CO-PO Justification for Engg Chemistry lab

CO1-PO1: Students will gain the basic knowledge to perform the experiments

CO1-PO2: Students will identify the quantity using different methods.

CO1-PO9: Students will do the experiment both individual & team

CO2-PO1: Students will have a good knowledge to estimate the quantity of material in the given samples.

CO2-PO2: Students will estimate the quality of material using mathematical expression

CO2-PO9: Students will do the experiment both individual & team

CO3-PO1: Students will gain the very good knowledge to find the various parameters

CO3-PO2: Students will identify the different parameters using various instruments.

CO3-PO9: Students will have ability to do the experiment both individual & team

CO4-PO1: Students will gain the very good knowledge to determine the quantity of the material in in the different samples.

CO4-PO2: Students will analyze the quantity of material present in the sample using various quantitative methods..

CO4-PO9: Students will have ability to do the experiment both individual & team





Name of the staff: Dr M N Manjunath, Srinivas D, Chandrashekar K N, Vinutha H R, Bindu s

Subject: Engg Chemistry Lab

Sub code: 18CHEL16/26

Semester: I/II

Course Outcomes:

At the end of the course students will be able to:

CO1	Develop skills & knowledge to perform the experiments.
CO2	Estimate the small quantity of material present in a given sample using different instruments
CO3	Measure the parameters like pH & Viscosity
CO4	Determine the quantity of material in a sample by using different quantitative methods.

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	-	-	-	-	1	-	-	-
CO2	3	1	-	-	-	-	-	-	1	-	-	-
CO3	3	1	-	-	-	-	-	-	1	-	-	-
CO4	3	1	-	-	-	-	-	-	1	-	-	-
AVG	3	1	-	-	-	-	-	-	1	-	-	-

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**CO-PO Justification for Engg Chemistry**

CO₁-PO₁= Students will gain the more knowledge and applications of energy sources.

CO₁-PO₂= Students will analyze the problems of energy sources.

CO₂-PO₁= Students will acquire good knowledge about the corrosion & material science.

CO₂-PO₂= Students will analyze the problems occur in the industries.

CO₂-PO₇= Students have understand the problems related to environment & Societal problems.

CO₃-PO₁= Students will gain very good knowledge about pollution free renewable energy source.

CO₃-PO₂=Students will analyze the problems occur by using of crude oil in automobiles, etc.,

CO₃-PO₇=Students will understand the problem related to environment by using chemical fuel

CO₄-PO₁=Students will have very good knowledge about the environmental problems.

CO₄-PO₇= Students will explain the problems about the environment.

CO₅-PO₁=Students will gain the knowledge in different instrumental analysis

Name of the staff: Dr M N Manjunath, Srinivas D, Chandrashekar K N, Vinutha H R, Bindu s

Subject: Engg Chemistry

Sub code: 18CHE12/22

Semester: I/II

Course Outcomes:

At the end of the course students will be able to:

CO1	Use free energy in equilibria concepts to analyze the bulk properties and processes of thermodynamic, electrochemical energy systems.
CO2	Define & analyze Engineering problems related to corrosion & metal finishing in achieving a practical solution for corrosion.
CO3	Understand & analyze the parameters of chemical fuels & renewable energy sources for reduction of environmental pollution.
CO4	Explain the problems about environmental pollution, e-waste management & its solutions.
CO5	Describe the different instrumental methods of analysis & its applications, discuss about nano materials & its applications.

CO-PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	2	-	-	-	-	-
CO3	3	2	-	-	-	-	2	-	-	-	-	-
CO4	3	-	-	-	-	-	2	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
AVG	3	2	-	-	-	-	2	-	-	-	-	-
1: Slightly 2: Moderately 3: Substantially												



II Jai Sri Gurudev II
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DEPARTMENT OF CHEMISTRY
QUESTION BANK

Subject: Engg. Chemistry

Subject Code: 18CHE12/22

- 1) Derive the Nernst equation for single electrode potential.
- 2) Iron rod is immersed in ferrous sulphate solution of 0.25 M and copper rod immersed in copper sulphate solution of 0.45M. Standard electrode potentials of Cu & Fe electrodes are 0.34 and -0.44V respectively. Give the cell representation, cell reaction & calculate EMF of the cell at 25°C.
- 3) Calculate the $E^0_{\text{Cu}^{+2}/\text{Cu}}$, if the potential of cell electrode immersed in 0.015M Cu^{+2} is 0.0296v at 25°C.
- 4) The standard electrode potential of Zn electrode is -0.76v & the concentration of Zn^{+2} is 0.25M. Calculate $E^0_{\text{Zn}^{+2}/\text{Zn}}$ at 25°C.
- 5) What are reference electrodes? Describe the construction and working of calomel electrode.
- 6) What are ion selective electrodes? Describe the principle and construction of glass electrode.
- 7) Explain the determination of pH of a solution using glass electrode.
- 8) What are electrolyte concentration cells? Derive an emf equation for a electrolyte concentration cell.
- 9) A concentration cell is constructed by immersing two Silver electrodes in 0.05M and 1.0M Silver nitrate solutions at 298 K. Write the cell representation, cell reaction and calculate the emf of the cell.
- 10) The emf of the cell $\text{Cd}/\text{CdSO}_4 (0.0093 \text{ M}) // \text{CdSO}_4 (X \text{ M}) / \text{Cd}$ is 0.03 V at 298K. Find the value of X
- 11) The emf of the cell $\text{Cu}/\text{CuSO}_4 (X \text{ M}) // \text{CuSO}_4 (1.0 \text{ M}) / \text{Cu}$ is 0.0295 V at 298 K. Find the value of X
- 12) What is battery? Give the classification of batteries with example.
- 13) Describe the construction & working Nickel – Metal Hydride battery. Mention its applications.
- 14) Describe the construction & working of Lithium ion battery. Mention its applications.
- 15) Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.
- 16) Explain the factors affecting the rate of corrosion.
- 17) Explain the following types of corrosion with suitable examples.
 - a) Differential metal corrosion.
 - b) Differential aeration corrosion.
- 18) What is anodizing? Explain the process of Anodizing of Aluminium.
- 19) Explain the galvanization process.
- 20) What is cathodic protection? Explain the Sacrificial anode & Impressed current methods.
- 21) Define Metal finishing? Mention the technological importance of the metal finishing.

- 22) Explain the following governing factors i) Polarization ii) Over voltage
- 23) Explain the governing factor Decomposition potential with diagram and example.
- 24) Define Electroplating? Explain the Electroplating of chromium.
- 25) Define Electrolessplating? Explain the Electrolessplating of copper.
- 26) Discuss the Electrolessplating of Nickel.
- 27) Distinguish between Electroplating & Electrolessplating.
- 28) Define fuel? Give the classification of fuels with suitable example.
- 29) Define HCV(GCV) and LCV (NCV)? Explain the determination of calorific value of a solid / liquid fuel by using bomb calorimeter.
- 30) 0.85 g of coal sample (carbon 90%, H₂ 6% and ash 4%) was subjected to combustion in Bomb calorimeter. Mass water taken in the calorimeter was 2Kg and the water equivalent of calorimeter is 0.55Kg. The rise in temperature was found to be 2.2° C. Calculate HCV (GCV) and LCV (NCV) of the sample. Latent heat of steam = 2457KJ/Kg and specific heat of water = 4.187KJ/ Kg/°C.
- 31) 0.90 g of coal sample (carbon 90%, H₂ 4% and ash 6%) was subjected to combustion in a Bomb calorimeter. Mass water taken in the calorimeter was 3000 g and the water equivalent of calorimeter was 700 g. The rise in temperature was found to be 2.5° C. Calculate HCV (GCV) and LCV (NCV) of the sample. Latent heat of steam = 2457KJ/Kg.
- 32) Calculate the HCV (GCV) and LCV (NCV) by data given. Mass of Coal is 0.78 g, Mass of water is 2 kg, Water equivalent of calorimeter is 0.30 Kg, Raising temperature is 3.2° C, Specific heat of water = 4.187 kJ kg⁻¹°C⁻¹, Latent heat of steam = 580 calories/ g [1 calorie = 4.187 kJ] and H₂ = 2%,
- 33) Define Gasoline Knocking. Explain its mechanism with reactions. Mention its ill effects and prevention methods.
- 34) Write a note on
i) Unleaded Petrol ii) Power Alcohol
- 35) What is Biodiesel? Give the synthesis of Biodiesel with reaction and mention its advantages.
- 36) Define fuel cell. Discuss the construction and working of methanol-oxygen fuel cell.
- 37) Discuss the construction and working of Solid Oxide fuel cell (SOFC).
- 38) Distinguish between conventional cell and fuel cell. Mention the advantages and limitations of fuel cells.
- 39) What are Photovoltaic cells? Explain the construction and working of PV cells. Mention its advantages and disadvantages.
- 40) Explain the preparation of solar grade silicon by Union Carbide process.
- 41) What is primary air pollutant? Mention sources, effects and control of the following.
- 42) 1) Carbon monoxide
2) Oxides of nitrogen
3) Oxides of sulphur
4) Hydrocarbons
5) Particulate matter
6) Mercury
7) Lead

- 43) What is secondary air pollutant? Explain ozone formation & ozone layer depletion with reactions. Mention its effects and control measures.
- 44) What are the sources of solid waste? Explain disposal methods of solid waste.
- 45) Define E-waste. Explain the sources, characteristics & disposal methods of e-waste.
- 46) Define biomedical waste. Give its sources characteristics & disposal methods of biomedical waste.
- 47) Define boiler feed water. Explain scale & sludge formation in boilers. Mention their disadvantages & preventive methods.
- 48) Write a note on boiler corrosion.
- 49) Define water pollution. Explain its various sources.
- 50) Define COD & BOD. Explain the method of determination of COD.
- 51) Describe the determination of fluoride by SPADNS method using colorimetry.
- 52) Describe the determination of sulphate by gravimetric method.
- 53) Write a note on sewage treatment process.
- 54) What is desalination process? Explain the desalination by reverse osmosis process.
- 55) Explain the softening of water by ion exchange process.
- 56) Calculate the COD of effluent sample when 30cm^3 of effluent sample requires 9.5cm^3 of $0.2\text{N K}_2\text{Cr}_2\text{O}_7$ solution for complete oxidation.
- 57) In a COD test 23.5 cm^3 and 15.2 cm^3 of 0.04N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25cm^3 . Calculate the COD in the water sample.
- 58) In a COD experiment 25 cm^3 of waste water sample consumes 11.5cm^3 of $0.02\text{M K}_2\text{Cr}_2\text{O}_7$ for oxidation of impurities. Calculate COD value of water sample.
- 59) Explain the theory, instrumentation of atomic absorption spectroscopy. Mention its applications.
- 60) Explain the theory and instrumentation of potentiometry. Mention its applications.
- 61) Explain the theory and instrumentation of colorimetry. Mention its applications.
- 62) Explain the theory and instrumentation of flame photometry. Mention its applications.
- 63) Explain the theory and instrumentation and applications of conductometry by taking following examples.
- i) Strong acid with a strong base
 - ii) weak acid with a strong base
 - iii) Mixture of strong acid and a weak acid with a strong base
- 64) What is a nanomaterial? Explain the properties of nanomaterials.
- 65) Explain the following methods of preparation of nanomaterials.
- 1) Sol gel Method
 - 2) Precipitation Method
 - 3) Chemical vapour Condensation Method (CVD)
- 66) Write a note on
- 1) Carbon Nanotubes
 - 2) Graphenes
 - 3) Fullerenes

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FREQUENTLY ASKED QUESTIONS (FAQ'S)

Module-01

1. What is single electrode potential? Derive the Nernst equation for single electrode potential
2. A galvanic cell is constructed by using Zinc rod is immersed in Zinc sulphate solution of 0.15 M and copper rod immersed in copper sulphate solution of 0.30M .Standard electrode potentials of Zn & Cu electrodes are -0.76 and 0.34 V respectively. Give the cell representation, cell reactions & calculate EMF of the cell at 25°C.
3. What voltage will be generated by a cell that iron electrode in 0.5M FeSO₄ solution and copper electrode immersed in 1M CuSO₄ solution at 298K. Given $E^{\circ}\text{Cu} = 0.34\text{V}$ and $E^{\circ}\text{Fe} = -0.44\text{V}$. Write the cell representation, & cell reaction.
4. What are reference electrodes? Describe the construction and working of calomel electrode. Mention its applications.
5. The emf of the cell $\text{Ag}/\text{AgNO}_3 (0.0083 \text{ M})// \text{AgNO}_3 (X \text{ M})/ \text{Ag}$ is 0.074 V at 298K. Find the value of X
6. The emf of the cell $\text{Cu}/\text{CuSO}_4 (XM)// \text{CuSO}_4 (0.01 \text{ M})/ \text{Cu}$ is 0.0595 V at 298 K. Find the value of X
7. What is battery? Give the classification of batteries with example.
8. Describe the construction & working Nickel – Metal Hydride battery. Mention its applications.
9. Describe the construction & working of Lithium ion battery. Mention its applications.

Module-2

10. Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.
11. Explain the following types of corrosion with suitable examples.
 - a) Differential aeration corrosion.
12. Explain the galvanization process with a neat diagram.
13. What is cathodic protection? Explain the Sacrificial anode & Impressed current methods.
14. Define Metal finishing? Mention the technological importance of the metal finishing.
15. Define Electroplating? Explain the Electroplating of chromium.
16. What is Electrolessplating? Explain the Electrolessplating of copper.
17. Discuss the Electrolessplating of Nickel.
18. Distinguish between Electroplating & Electrolessplating.

Module-03

19. Define fuel? Give the classification of fuels with suitable examples.
20. Define HCV and LCV? Explain the determination of calorific value of a solid / liquid fuel by using bomb calorimeter.

21. 0.96 g of coal sample (carbon 90%, H₂ 4% and ash 6%) was subjected to combustion in Bomb calorimeter. Mass water taken in the calorimeter was 2.3 Kg and the water equivalent of calorimeter is 0.65Kg. The rise in temperature was found to be 3.4⁰ C. Calculate HCV and LCV of the sample. Latent heat of steam =2457 KJ/Kg and specific heat of water = 4.187 KJ/Kg⁰C.
22. 0.75 g of coal sample (carbon 90%, H₂ 5% and ash 5%) was subjected to combustion in a Bomb calorimeter. Mass water taken in the calorimeter was 2100 g and the water equivalent of calorimeter was 700 g. The rise in temperature was found to be 3.2⁰ C. Calculate HCV and LCV of the sample. Latent heat of steam = 585 x 4.2 KJ/Kg and specific heat of water =4.187 KJ/Kg⁰C
23. Calculate the HCV and LCV by data given. Mass of Coal is 0.8 g, Mass of water is 2.5 kg, Water equivalent of calorimeter is 0.395 Kg, Temperature was rising from 24⁰ C to 27.6⁰ C , Specific heat of water = 4.2 kJ kg⁻¹⁰C⁻¹, Latent heat of steam =2457 kJ/Kg and H₂ =2%,
24. Define fuel cell. Discuss the construction and working of methanol-oxygen fuel cell. Mention its applications.
25. Discuss the construction and working of Solid Oxide fuel cell (SOFC). Mention its applications.
26. Distinguish between conventional cell and fuel cell. Mention the advantages and limitations of fuel cells.
27. What are Photovoltaic (PV) cells ? Explain the construction and working of PV cells. Mention its advantages and disadvantages.
28. Explain the preparation of solar grade silicon by Union Carbide process.

Module-04

29. In a COD test 23.5 cm³ and 15.2 cm³ of 0.04N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25cm³. Calculate the COD in the waste water sample.
30. In the COD test, 25cm³ of effluent sample requires 8.9cm³ of 0.1 N K₂Cr₂O₇ solution for complete oxidation. Calculate COD of effluent sample.
31. In a COD experiment, 30 cm³ of an effluent sample required 9.8 cm³ of 0.001 M K₂Cr₂O₇ solution for oxidation. Calculate the COD of the sample.

Module-05

32. Explain the preparation of nanomaterials by Sol-gel method.

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ENGINEERING CHEMISTRY LAB EXPERIMENTS

SL NO	NAME OF THE EXPERIMENTS	VIDEO LINKS
VOLUMETRIC EXPERIMENTS		
1	Estimation of Total hardness of water by EDTA complexometric method.	https://youtu.be/4feACUeCFPw
2	Estimation of CaO in cement solution by rapid EDTA method.	https://youtu.be/6BPkkyIeJE4
3	Determination of percentage of Copper in brass using standard sodium thiosulphate solution.	https://youtu.be/gkGiOJ1p7nQ
4	Determination of COD of waste water.	https://youtu.be/8He8rWZQNs
5	Estimation of Iron in hematite ore solution using standard $K_2Cr_2O_7$ solution by external indicator method.	https://youtu.be/TLfbWs-HMKw
6	Estimation of percentage of available chlorine in the given sample of bleaching powder (Iodometric method).	https://youtu.be/2K_C1SGIMU4
INSTRUMENTAL EXPERIMENTS		
1	Determination of pKa of the given weak acid using pH meter.	https://youtu.be/qI2DBURCUbA
2	Potentiometric estimation of FAS using standard $K_2Cr_2O_7$ solution.	https://youtu.be/g5z6EaT46iA
3	Colorimetric estimation of Copper.	https://youtu.be/yY5bFg2CY64
4	Conductometric estimation of acid mixture.	https://youtu.be/fD8ZL6PnrRw
5	Determination of Viscosity co-efficient of the given liquid using Ostwald's viscometer.	https://youtu.be/YslaWEpTDWk
6	Flame photometric estimation of sodium and potassium.	https://youtu.be/5Zwf2lan9ww

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S J C INSTITUTE OF TECHNOLOGY, Chickballapur
DEPARTMENT OF CHEMISTRY

TUTORIAL -1

For the academic year 2020-21(Odd Sem))

Subject: Engg. Chemistry

Subject Code: 18CHE12

1. Define i) Free Energy ii) Cell Potential iii) Entropy
2. What is single electrode potential. Derive the Nernst equation for single electrode potential
3. A galvanic cell is constructed by using iron rod is immersed in ferrous sulphate solution of 0.10 M and copper rod immersed in copper sulphate solution of 0.20M .Standard electrode potentials of Fe & Cu electrodes are -0.44V and 0.34 V respectively. Give the cell representation, cell reactions & calculate EMF of the cell at 25°C.
4. What voltage will be generated by a cell that consists of zinc electrode immersed in 0.5M ZnSO₄ solution and copper electrode immersed in 1M CuSO₄ solution at 298K. Given $E^{\circ}_{Zn} = -0.76V$ and $E^{\circ}_{Cu} = 0.34V$. Write the cell representation, & cell reaction.
5. Calculate the $E^{\circ}_{Zn^{+2}/Zn}$, if the potential of cell electrode immersed in 0.015M Zn⁺² solution is 0.0296v at 25°C.
6. The standard electrode potential of Copper electrode is 0.34 V & the concentration of Cu⁺² is 0.1 M. Calculate $E_{Cu^{+2}|Cu}$ at 25°C.
7. What are reference electrodes? Describe the construction and working of calomel electrode. Mention its applications.
8. What are ion selective electrodes? Describe the construction, principle & working of glass electrode.
9. Explain the determination of pH of a solution using glass electrode.
10. What are electrolyte concentration cells? Derive an emf equation for a electrolyte concentration cell.
11. A concentration cell is constructed by immersing two Zinc electrodes in 0.05M and 1.0M Zinc sulphate solutions at 298 K. Write the cell representation, cell reactions and calculate the emf of the cell.
12. The emf of the cell Cd/CdSO₄ (X M)// CdSO₄ (0.025M)/ Cd is 0.035V at 298K. Find the value of X
13. The emf of the cell Ag/AgNO₃ (0.01M)// AgNO₃ (XM) / Ag is 0.0591 V at 298 K. Find the value of X
14. What is battery? Give the classification of batteries with an example.
15. Describe the construction & working Nickel – Metal Hydride battery. Mention its applications.
16. Describe the construction & working of Lithium ion battery. Mention its applications.
17. Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.
18. Explain the factors affecting the rate of corrosion.
19. Explain the following types of corrosion with suitable examples.
 - a) Differential metal corrosion.
 - b) Differential aeration corrosion.
20. What is anodizing? Explain the process of Anodizing of Aluminium.
21. Explain the galvanization process with a neat diagram.
22. What is cathodic protection? Explain the Sacrificial anode & Impressed current methods.



Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Dr. Manjunath M N/ Srinivas K/Chandrashekar K N/ Vinutha H R/ Bindu S
 Date: 01-02-2021

Signature:

Reviewer's Signature:

NOTE: Only the following information's to be given to the students.

S.J.C. Institute of Technology
DEPARTMENT OF CHEMISTRY

Semester: I

Test: I

Sections: A,B,C, D, E, F & G

Subject Name & Code: Engineering Chemistry & 18CHE12

Duration: 90 minutes

Max Marks: 50

Answer any five full questions, choosing ONE full question from each part.

Question Number		Marks	CO	Levels
PART-A				
1	a) Derive Nernst equation for single electrode potential.	05	CO1	L1
	b) A galvanic cell is constructed by Fe rod is immersed in FeSO_4 solution of 0.10 M and copper rod immersed in CuSO_4 solution of 0.20 M. Standard electrode potentials of Fe and Cu are -0.44 & 0.34 V respectively. Give the cell representation, cell reactions & calculate EMF of the cell at 298 K.	05	CO1	L2
OR				
2	a) What are ion selective electrodes? Explain the-construction and working of glass electrode.	05	CO1	L1
	b) Describe the construction & working of Nickel – Metal Hydride battery. Mention its applications.	05	CO1	L2
PART-B				
3	a) Calculate the $E^0_{\text{Zn}^{+2}/\text{Zn}}$, if the potential of electrode immersed in 0.095M Zn^{+2} solution is -0.79V at 25°C .	05	CO1	L2
	b) Explain the determination of pH of a solution using glass electrode.	05	CO1	L1
OR				
4	a) The emf of the cell $\text{Ag}/\text{AgNO}_3(0.01\text{M})//\text{AgNO}_3(\text{XM})/\text{Ag}$ is 0.0591 V at 298 K. Find the value of X.	05	CO1	L2
	b) What are reference electrodes? Describe the construction & working of calomel electrode	05	CO1	L1
PART-C				
5	a) A concentration cell is constructed by immersing two Zinc electrodes in 0.05M and 1.0M zinc sulphate solutions at 298 K. Write the cell representation, cell reactions and calculate the emf of the cell.	05	CO1	L2



	b) Describe the construction & working of Lithium ion battery. Mention its applications	05	CO1	L1
OR				
6	a) What are electrolyte concentration cells? Derive an emf equation for a electrolyte concentration cell.	05	CO1	L2
	b). What is battery? Give the classification of batteries with example.	05	CO1	L1
PART-D				
7	a) Define i) Free Energy ii) Cell potential	05	CO1	L2
	b) A concentration cell is constructed by immersing two Copper electrodes in 0.01M and 0.10M copper sulphate solutions at 298 K. Write the cell representation, cell reaction and calculate the emf of the cell.	05	CO1	L1
OR				
8	a) Define i) Single electrode potential ii) Entropy	05	CO1	L2
	b) A galvanic cell is constructed by Fe rod is immersed in FeSO_4 solution of 0.10 M and silver rod immersed in AgNO_3 solution of 0.20 M. Standard electrode potentials of Fe and Ag are -0.44 & 0.80 V respectively. Give the cell representation, cell reactions & calculate EMF of the cell at 298 K.	05	CO1	L1
PART-E				
9.	a) Define corrosion. Explain the electrochemical theory of corrosion by taking Iron as an example.	05	CO2	L1
	b) Explain the following factors affecting on rate of corrosion. i) Ratio of anodic to cathodic areas ii) pH iii) Conductivity of medium	05	CO2	L2
OR				
10.	a). Explain the differential metal corrosion with suitable example.	05	CO2	L1
	b). Explain the pitting corrosion with neat diagram.	05	CO2	L1

**DEPARTMENT: CHEMISTRY****Scheme & Solutions- TEST- I****Date: 01/02/21****Semester: I****Subject Title: Engg Chemistry****Subject Code: 18CHE12**

Question Number	Solution	Marks Allocated
	PART-A	
1. (a)	$-\Delta G_2 W_{Max} \dots \dots \dots$ $W_{Max} = +nFE$ $-\Delta G_2 nFE$ $\Delta G_2 = -nFE$ $\Delta G^\circ = -nFE^\circ$ $M^{n+} + ne^- \xrightleftharpoons{K_c} M$ $\Delta G_2 = \Delta G^\circ + RT \ln K_c$ $-nFE = -nFE^\circ + RT \ln \frac{[M]}{[M^{n+}]}$ $\div \text{ by } -nF \text{ on Both Side \& } [M] = 1$ $E = E^\circ - \frac{RT}{nF} \ln \frac{1}{[M^{n+}]}$ $= E^\circ + \frac{RT}{nF} \ln [M^{n+}]$ $= E^\circ + \frac{8.314 \times 298 \times 2.303}{n \times 96500} \log [M^{n+}]$ $E = E^\circ + \frac{0.0591}{n} \log [M^{n+}]$	<p>1M</p> <p>1M</p> <p>1M</p> <p>2M</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
(b)	<p>cell representation $\text{Fe} \text{Fe}^{2+} (0.10\text{M}) \text{Cu}^{2+} (0.20\text{M}) \text{Cu}$ - - -</p> <p>cell reactions.</p> <p>anode - $\text{Fe} \longrightarrow \text{Fe}^{2+} + 2e^-$</p> <p>cathode - $\text{Cu}^{2+} + 2e^- \longrightarrow \text{Cu}$ } - - -</p> <p>$E_{\text{cell}}^{\circ} = E_{\text{c}}^{\circ} - E_{\text{A}}^{\circ}$ - - -</p> <p>$= 0.34 + 0.44 = 0.78\text{V}$</p> <p>$E_{\text{cell}} = E_{\text{cell}}^{\circ} + \frac{0.0591}{n} \log \frac{(\text{M}^{n+}) \text{ at cathode}}{(\text{M}^{n+}) \text{ at anode}}$ - - -</p> <p>$= 0.78 + \frac{0.0591}{2} \log \frac{0.20}{0.10}$</p> <p>$= 0.78 + 0.02955 \times 0.3010$</p> <p>$= 0.78 + 0.008$</p> <p>$E_{\text{cell}} = 0.78\text{V}$</p> <p>(OR)</p>	<p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p> <p>1M</p>
2 (a)	<p>Definition of Ion selective electrode - - -</p> <p>Diagram - - -</p> <p>construction with explanation & representation - - -</p> <p>working of glass electrode - - -</p>	<p>1M</p> <p>1M</p> <p>1M</p> <p>2M</p>

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
(b)	<p>Diagram - - - - -</p> <p>construction - explanation with representation</p> <p>Working - Anodic & cathodic reactions -</p> <p>Any two applications - - - - -</p> <p><u>PART - B</u></p>	<p>1M</p> <p>1M</p> <p>2M</p> <p>1M</p>
3(a)	$E = E^{\circ} + \frac{0.0591}{n} \log [M^{n+}]$ $-0.79 = E_{Zn^{2+}/Zn}^{\circ} + \frac{0.0591}{2} \log (0.095)$ $E_{Zn^{2+}/Zn}^{\circ} = -0.79 - \frac{0.0591}{2} \log (-1.0222)$ $= -0.79 + 0.030$ $= -0.76V$	1M
(b)	<p>Diagram - - - - -</p> <p>representation of cell - - - - -</p> <p>Emf equation: $E_{cell} = E_c - E_a$</p> $= E_4 - E_{SCE}$ $= L' - 0.0591pH - E_{SCE}$ $pH = \frac{L' - E_{SCE} - E_{cell}}{0.0591}$	<p>1M</p> <p>1M</p> <p>3M</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
7.(a)	<p style="text-align: center;">(OR)</p> $\text{Ag} \text{AgNO}_3 (0.01\text{M}) \text{AgNO}_3 (X\text{M}) \text{Ag}$ $E_{\text{cell}} = \frac{0.0591}{n} \log \frac{C_2}{C_1}$ $\frac{0.0591}{1} = \frac{0.0591}{1} (\log X - \log (0.01))$ $\frac{0.0591}{0.0591} + \log 0.01 = \log X$ $1 - 2 = \log X$ $\log X = -1$ $X = \text{Antilog}(-1)$ $(X = 0.10\text{M})$	(1)
(b)	<p>Definition of Reference electrode —</p> <p>Diagram —</p> <p>Construction - Explanation with representation —</p> <p>Reactions - Anodic & cathodic —</p>	<p>1M</p> <p>1M</p> <p>1M</p> <p>2M</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
5. (a)	<p>PART-C</p> <p>$\text{Zn} \text{Zn}^{+2} (0.05\text{M}) \text{Zn}^{+2} (1.0\text{M}) \text{Zn}$ - - - - -</p> <p>$\text{Zn} \rightarrow \text{Zn}^{+2} + 2\text{e}^-$ - Anode</p> <p>$\text{Zn}^{+2} + 2\text{e}^- \rightarrow \text{Zn}$ - Cathode</p> <p>$E_{\text{cell}} = \frac{0.0591}{n} \log \frac{C_2}{C_1}$ - - - - -</p> <p>$= \frac{0.0591}{2} \log \frac{1}{0.05}$</p> <p>$= 0.02955 \times \log 20$</p> <p>$= 0.02955 \times 1.3010$</p> <p><u>$E_{\text{cell}} = 0.038\text{V}$</u></p>	<p>1M</p> <p>1M</p> <p>1M</p> <p>2M</p> <p>1M</p>
(b)	<p>Diagram - - - - -</p> <p>Construction with representation - - - - -</p> <p>Reaction - Anodic & Cathodic - - - - -</p> <p>Any two Applications - - - - -</p> <p>(OR)</p>	<p>1M</p> <p>2M</p> <p>1M</p>



Subject Code: 18CHE12

Subject Title: Engg Chemistry

Question Number	Solution	Marks Allocated
6 (a)	Definition of electrolytic <u>cell</u> - - - - -	1M
	Example with diagram & cell representation	1M
	Anodic & cathodic reactions - - - - -	1M
	Derivation of ΔE equation - - - - -	2M
(b)	Definition of Battery - - - - -	2M
	Classification of Battery with suitable example	3M
<u>PART - D</u>		
7 (a)	Definition of (i) Free energy - - - - - (ii) cell potential - - - - -	2M 3M
(b)	$\text{Cu} \text{Cu}^{+2} (0.01M) \text{Cu}^{+2} (0.10M) \text{Cu}$ - - - - -	1M
	$\text{Cu} \longrightarrow \text{Cu}^{+2} + 2e^-$ - Anode $\text{Cu}^{+2} + 2e^- \longrightarrow \text{Cu}$ - Cathode	1M



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
	$E_{\text{cell}} = \frac{0.0591}{n} \log \frac{C_2}{C_1} \dots\dots\dots$ $= \frac{0.0591}{2} \log \frac{0.10}{0.01}$ $= 0.02955 \log 10.$ $= 0.02955 \times 1$ $E_{\text{cell}} = 0.02955 \text{ V}$	1M 2M
8(a)	<p style="text-align: center;">(OR)</p> <p>Definitions of (i) Single electrode potential -</p> <p>(ii) Entropy -</p>	3M 2M 1M
(b)	<p>$\text{Fe} / \text{Fe}^{+2} // \text{Ag}^+ / \text{Ag}$</p> <p>Anode - $\text{Fe} \rightarrow \text{Fe}^{+2} + 2e^-$</p> <p>Cathode - $2\text{Ag}^+ + 2e^- \rightarrow 2\text{Ag}$</p> $E_{\text{cell}} = E_{\text{cell}}^0 + \frac{0.0591}{n} \log \frac{(\text{M}^{n+})_{\text{cathode}}}{(\text{M}^{n+})_{\text{anode}}}$ $= 1.24 + \frac{0.0591}{2} \log \frac{(0.20)^2}{(0.10)} \dots\dots\dots$ $= 1.24 + 0.02955 \times 0.3979$ $= 1.24 + 0.0117$ $E_{\text{cell}} = 1.2517 \text{ V}$	1M 1M 2M



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
	<u>PART - C</u>	
9 (a)	Definition of Corrosion - _____	1M
	Diagram - _____	1M
	Anodic reaction - $\text{Fe} \rightarrow \text{Fe}^{+2} + 2e^-$ - _____	1M
	Cathode - $\text{O}_2 + 2\text{H}_2\text{O} + 4e^- \rightarrow 4\text{OH}^-$	1M
	$2\text{H}_2\text{O} + 2e^- \rightarrow 2\text{OH}^- + \text{H}_2 \uparrow$	
	$2\text{H}^+ + 2e^- \rightarrow \text{H}_2 \uparrow$	
	$2\text{Fe}^{+2} + 4(\text{OH})^- \rightarrow 2\text{Fe}(\text{OH})_2$	1M
	$4\text{Fe}(\text{OH})_2 + 2\text{H}_2\text{O} + \text{O}_2 \rightarrow 2[\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}]$	
(b)	(i) Ratio of Anodic to Cathodic Area - _____	2M
	(ii) pH of Medium - _____	2M
	(iii) Conductivity of Medium - _____	1M
	(OR)	
10. (a)	Explanation of differential metal corrosion with example	3M
	Reactions - Anodic & Cathodic - _____	2M



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
(b)	<p>pitting corrosion - explanation with diagram Reaction - Anodic & Cathodic - -</p> <p><i>M. J. S. 1/2/2021</i> H.O.D. of Chemistry S. J. C. I. T. CHICKBALLAPUR-502 10.</p>	<p>3M 2M.</p>

II Jai Sri Gurudev II
S J C INSTITUTE OF TECHNOLOGY, CHICKBALLAPUR
DEPARTMENT OF CHEMISTRY
FOR THE ACADEMIC YEAR (ODD SEMESTER) 2020-21
TUTORIAL -2

Sec: A, B, C, D E, F, & G

Subject Code: 18CHE12

Subject: Engg.Chemistry

1. Define Metal finishing? Mention the technological importance of the metal finishing.
2. Explain the following governing factors i) Polarization ii) Over voltage
3. Explain the governing factor Decomposition potential with diagram and example.
4. Define Electroplating? Explain the Electroplating of chromium.
5. What is Electrolessplating? Explain the Electrolessplating of copper.
6. Discuss the Electrolessplating of Nickel.
7. Distinguish between Electroplating & Electrolessplating.
8. Define fuel? Give the classification of fuels with suitable examples.
9. Define HCV and LCV? Explain the determination of calorific value of a solid / liquid fuel by using bomb calorimeter.
10. 0.96 g of coal sample (carbon 90%, H₂ 4% and ash 6%) was subjected to combustion in Bomb calorimeter. Mass water taken in the calorimeter was 2.3 Kg and the water equivalent of calorimeter is 0.65Kg. The rise in temperature was found to be 3.4⁰ C. Calculate HCV and LCV of the sample. Latent heat of steam =2457 KJ/Kg and specific heat of water = 4.187 KJ/ Kg⁰C.
11. 0.75 g of coal sample (carbon 90%, H₂ 5% and ash 5%) was subjected to combustion in a Bomb calorimeter. Mass water taken in the calorimeter was 2100 g and the water equivalent of calorimeter was 700 g. The rise in temperature was found to be 3.2⁰ C. Calculate HCV and LCV of the sample. Latent heat of steam = 585 x 4.2 KJ/Kg and specific heat of water =4.187 KJ/Kg⁰C
12. Calculate the HCV and LCV by data given. Mass of Coal is 0.8 g, Mass of water is 2.5 kg, Water equivalent of calorimeter is 0.395 Kg, Temperature was rising from 24⁰ C to 27.6⁰ C , Specific heat of water = 4.2 kJ/ kg/C, Latent heat of steam =587 Cal (1Cal = 4.187 J/g) and H₂ =2%,
13. Define Gasoline Knocking. Explain its mechanism with reactions. Mention its ill effects and prevention methods.
14. Write a note on
i) Unleaded Petrol ii) Power Alcohol
15. What is Biodiesel? Give the synthesis of Biodiesel with reaction and mention its advantages.
16. Define fuel cell. Discuss the construction and working of methanol-oxygen fuel cell. Mention its applications.
17. Discuss the construction and working of Solid Oxide fuel cell (SOFC). Mention its applications.
18. Distinguish between conventional cell and fuel cell. Mention the advantages and limitations of fuel cells.
19. What are Photovoltaic (PV) cells? Explain the construction and working of PV cells. Mention its advantages and disadvantages.
20. Explain the preparation of solar grade silicon by Union Carbide process.



Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Dr. MN Manjunath, Srinivas K, Chandrashekar K V,
Vinita H R, Bindu S

Date: 01/3/21

Signature: *[Signature]*

Reviewer's Signature:

[Signature] 1/3/2021

S J C INSTITUTE OF TECHNOLOGY DEPARTMENT OF CHEMISTRY

Semester: I

Test: II

Sections: A, B, C, D, E, F & G

Subject Name & Code: Engineering Chemistry & 18CHE12

Duration: 90 minutes

Max Marks: 50

Answer any five full questions, choosing ONE full question from each part.

Q.No		Marks	CO	Levels
PART-A				
1	a) What is Metal finishing? Mention any four technological importance of the metal finishing.	5	CO2	L2
	b) Explain the galvanization process with a neat diagram.	5	CO2	L2
OR				
2	a) Discuss the Electrolessplating of Nickel.	5	CO2	L2
	b) Define decomposition potential. Explain the experimental determination of decomposition potential.	5	CO2	L2
PART-B				
3	a) What is Electrolessplating? Explain the Electrolessplating of Copper.	5	CO2	L2
	b) What is cathodic protection? Explain the Sacrificial anode & Impressed current methods.	5	CO2	L2
OR				
4	a) Define Electroplating. Explain the Electroplating of Chromium.	5	CO2	L2
	b) Write a note on over potential.	5	CO2	L2
PART-C				
5	a) Define fuel. Give the classification of fuels with suitable example.	5	CO3	L2
	b) Define Higher calorific Value (HCV). A coal sample of mass 0.85g (carbon 93%, H ₂ 4% and ash 3%) was subjected to combustion in Bomb calorimeter. Mass of water taken in the calorimeter was 2.2 Kg and the water equivalent of calorimeter is 0.65 Kg. The rise in temperature was found to be 3.4° C. Calculate HCV and LCV of the sample. Latent heat of steam = 2457 KJ/Kg and specific heat of water = 4.187KJ/ Kg°C.	5	CO3	L3
OR				



6	a) Write a note on i) Unleaded Petrol and ii) Power Alcohol	5	CO3	L2
	b) Explain the preparation of solar grade silicon by Union Carbide process.	5	CO3	L3
PART-D				
7	a) Explain the determination of calorific value of a solid fuel by using bomb calorimeter.	5	CO3	L2
	b) Define Lower Calorific Value (LCV). A coal sample of mass 0.7 g (carbon 95%, H ₂ 2% and ash 3%) was subjected to combustion in a Bomb calorimeter. Mass of water taken in the calorimeter was 2.5 kg and the water equivalent of calorimeter was 0.7 kg. The rise in temperature was found to be 3.2° C. Calculate HCV and LCV of the sample. Latent heat of steam = 587Cal/gm (1Cal= 4.187 KJ/Kg) and specific heat of water = 4.187 KJ/ Kg°C.	5	CO3	L3
OR				
8	a) Define Gasoline Knocking. Explain its mechanism with reactions. Mention its ill effects.	5	CO3	L2
	b) What is Biodiesel? Give the synthesis of Biodiesel with reaction and mention its advantages.	5	CO3	L3
PART-E				
9	a) Define fuel cell. Discuss the construction and working of methanol-oxygen fuel cell.	5	CO3	L3
	b) What is Photovoltaic cell? Explain the construction and working of Photovoltaic cell.	5	CO3	L2
OR				
10	a) Discuss the construction and working of Solid Oxide fuel cell (SOFC). Mention its applications.	5	CO3	L3
	b) Distinguish between conventional cell and fuel cell. Mention the advantages and limitations of fuel cells.	5	CO3	L2

**DEPARTMENT: CHEMISTRY****Scheme & Solutions- TEST- II****Date: 01/03/21****Semester: I****Subject Title: Engg Chemistry****Subject Code: 18CHE12**

Question Number	Solution	Marks Allocated
1. a)	Definition : It is a process carried out to modify the surface properties of a metal by electrodeposition of a layer of another metal on the substrate by applying electric current or by using reducing agent.	1 m
	Any 4 technological importance	4 m
b)	Definition of galvanisation	1 m
	Diagram	1 m
	Explanation	03 m
2. a)	Pretreatment	1 m
	Bath composition & condition	2 m
	Reaction	
	Anode:- $\text{H}_2\text{PO}_2^- + \text{H}_2\text{O} \rightarrow \text{H}_2\text{PO}_3^- + 2\text{H}^+ + 2\text{e}^-$	
	Cathode:- $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$	
	Net reac ⁿ :- $\text{H}_2\text{PO}_2^- + \text{Ni}^{2+} + \text{H}_2\text{O} \xrightarrow[\text{surface}]{\text{Catalytic}}$	2 m
	$\text{H}_2\text{PO}_3^- + \text{Ni} + 2\text{H}^+$	

**DEPARTMENT: CHEMISTRY****Scheme & Solutions- TEST- II****Date: 01/03/21****Semester: I****Subject Title: Engg Chemistry****Subject Code: 18CHE12**

Question Number	Solution	Marks Allocated
2. b)	<p>Definition of decomposition potential</p> <p>Diagram</p> <p>Explanation with equation and example</p> $E_D = E_{\text{Back}} + \eta$	<p>1m</p> <p>1m</p> <p>3m</p>
3. a)	<p>Definition : Deposition of a layer of metal from its salt solution on a catalytically active surface of the object using a suitable reducing agent without electric current.</p> <p>pretreatment</p> <p>plating bath and composition</p> <p>Reactions at Anode & Cathode</p>	<p>1m</p> <p>1m</p> <p>2m</p>
b)	<p>Definition of cathodic protection</p> <p>Explanation of Sacrificial Anode method</p> <p>Explanation of Impressed current method with diagram</p>	<p>1m</p> <p>2m</p> <p>2m</p>

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
4. a)	<p><u>Definition</u> : It is a process of coating a layer of metal on the surface of another metal or conductor by applying electric current.</p> <p>plating bath Composition & Condition for hard Chromium and decorative Chromium</p> <p>Reactions</p>	<p>1M</p> <p>3M</p> <p>1M</p>
b)	<p><u>Definition</u> :- It is a excess voltage that must be applied above the theoretical decomposition potential to carry out continuous electrolysis.</p> $\eta = E_D - E_{Back}$ <p>Any four factors</p>	<p>1M</p> <p>3M</p>
5. a)	<p><u>Definition</u> :- It is a carbonaceous substance on combustion in presence of air or O_2 produces heat & light energy.</p> <p><u>classification</u> : Primary & Secondary</p> <p>Solid, liquid & gaseous fuel with example</p>	<p>1M</p> <p>2M</p> <p>2M</p>

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
6. b)	<p>Explanation of each step with reaction <u>production of metallurgical grade Si</u> $\text{SiO}_2 + 2\text{C} \xrightarrow{1200^\circ\text{C}} \text{Si} + 2\text{CO}$ $4\text{Al} + 3\text{SiO}_2 \longrightarrow 2\text{Al}_2\text{O}_3 + 3\text{Si}$ $2\text{C} + \text{SiO}_2 \longrightarrow 2\text{CO} + \text{Si}$ <u>production of solar grade silicon</u> $\text{Si} + 2\text{HCl} \longrightarrow 2\text{HSiCl}_2$ $2\text{HSiCl}_2 \longrightarrow \text{H}_2\text{SiCl}_2 + \text{SiCl}_4$ $3\text{H}_2\text{SiCl}_2 \longrightarrow \text{SiH}_4 + 2\text{HSiCl}_2$ $\text{SiH}_4 \longrightarrow \text{Si} + 2\text{H}_2$</p>	<p>2 m</p> <p>3 m.</p>
7. a)	<p>Diagram of Bomb Calorimeter</p> <p>Principle</p> <p>Construction of Bomb Calorimeter</p> <p>Working of Bomb Calorimeter</p> <p>Observation & calculation</p> $\text{HCV} = \frac{(w_1 + w_2) \times \Delta t \times 8}{m}$ $\text{LCV} = \text{HCV} - (0.09 \times \frac{1}{100} \times \text{H}_2 \times 9)$	<p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
7. b)	<p>Definition :- It is the amount of heat liberated when a unit quantity of a fuel burnt completely in air O_2 and combustion products are let off into atmosphere.</p> $HCV = \frac{(w_1 + w_2) \times \Delta t \times S}{m}$ $= \frac{(2.5 + 0.7) \times 3.2 \times 4.187}{0.7 \times 10^{-3}}$ $= 61249 \text{ kJ/kg}$ $LCV = HCV - (0.09 \times 1.0 \times H_2 \times L)$ $= 61249 - (0.09 \times 2 \times 2457)$ $= 61249 - 442.26$ $= 60806.74 \text{ kJ/kg}$	
8. a)	<p>Definition of Gasoline knocking</p> <p>Explanation</p> <p>Reactions at Normal conditions and knocking conditions</p> <p>One ill effect & one preventive method</p>	<p>1m</p> <p>1m</p> <p>2m.</p> <p>1m</p>

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
8. b)	<p><u>Definition</u> :- It is a mixture of methyl or ethyl esters of fatty acid obtained by transesterification of vegetable oil @ animal.</p> <p><u>Explanation</u></p> <p><u>Reactions</u></p> $ \begin{array}{c} \text{CH}_2 - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_1 \\ \\ \text{CH} - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_2 \\ \\ \text{CH}_2 - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_3 \end{array} + 3 \text{H}_2\text{O} \xrightarrow[60^\circ\text{C}]{\text{NaOH}} \begin{array}{c} \text{CH}_3 - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_1 \\ + \\ \text{CH}_3 - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_2 \\ + \\ \text{CH}_3 - \text{O} - \overset{\text{O}}{\parallel} \text{C} - \text{R}_3 \end{array} + \text{Glycerol} $ <p>Bio diesel</p> <p>Any two advantages</p>	<p>1m</p> <p>1m</p> <p>2m</p> <p>1m.</p>
9. a)	<p><u>Definition of fuel cell</u></p> <p><u>Diagram</u></p> <p><u>Explanation of construction & working</u></p> <p><u>Reactions at anode & Cathode</u></p>	<p>1m</p> <p>1m</p> <p>1m</p> <p>2m</p>
9. b)	<p><u>Definition of PV cell</u></p> <p><u>Diagram</u></p> <p><u>Explanation</u></p> <p>Any two advantages & disadvantages</p>	<p>1m</p> <p>1m</p> <p>2m</p> <p>1m</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
10. a)	Diagram of solid oxide fuel cell Construction and working Reactions at Anode and cathode of solid oxide fuel cell Any two applications	1m 1m 2m 1m,
10. b)	Any four differences between Conventional cell & fuel cell Any two advantages & limitations of fuel cell	3m 2m,
	<i>Ans</i>	

S.J.C. INSTITUTE OF TECHNOLOGY
DEPARTMENT OF CHEMISTRY
TUTORIAL-III
For the academic year 2020-21(Odd semester)

Subject: Engg. Chemistry

Subject Code: 18CHE12

- 1) What is primary air pollutant? Mention sources, effects and control of the following pollutants.
 - 1) Carbon monoxide
 - 2) Oxides of nitrogen
 - 3) Oxides of sulphur
 - 4) Hydrocarbons
 - 5) Particulate matter
 - 6) Mercury
 - 7) Lead
- 2) What is secondary air pollutant? Explain ozone formation & ozone layer depletion with reactions. Mention its effects and control measures.
- 3) What are the sources of solid waste. Mention the characteristics & disposal methods of solid waste.
- 4) Define E-waste. Mention the sources, characteristics & disposal methods of E-waste.
- 5) What is biomedical waste? Give its sources, characteristics & Mention the disposal methods of biomedical waste.
- 6) Mention the sources & impurities of water.
- 7) What is boiler feed water? Explain scale & sludge formation in boilers. Mention their disadvantages
- 8) Write a note on boiler corrosion.
- 9) Define COD & BOD. Explain the method of determination of COD.
- 10) Describe the determination of fluoride by SPADNS method using colorimetry.
- 11) Describe the determination of sulphate by gravimetric method.
- 12) Explain sewage treatment process.
- 13) What is desalination process? Explain the desalination by reverse osmosis process.
- 14) Explain the softening of water by ion exchange process.
- 15) In a COD test 27.5 cm^3 and 13.2 cm^3 of 0.05N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 30 cm^3 . Calculate the COD in the waste water sample.
- 16) In the COD test, 28.1 cm^3 of effluent sample requires 15 cm^3 of 0.1 N $\text{K}_2\text{Cr}_2\text{O}_7$ solution for complete oxidation. Calculate COD of effluent sample.
- 17) In a COD experiment, 25 cm^3 of an effluent sample required 6.8 cm^3 of 0.001 M $\text{K}_2\text{Cr}_2\text{O}_7$ solution for oxidation. Calculate the COD of the sample.
- 18) Explain the theory, instrumentation of atomic absorption spectroscopy. Mention its applications.
- 19) Explain the theory and instrumentation of potentiometry. Mention its applications.
- 20) Explain the theory and instrumentation of colorimetry. Mention its applications.
- 21) Explain the theory and instrumentation of flame photometry. Mention its applications.
- 22) Explain the theory and instrumentation and applications of Conductometry by taking following examples.
 - i) Strong acid with a strong base
 - ii) weak acid with a strong base
 - iii) Mixture of strong acid and a weak acid with a strong base
- 23) What is a nanomaterial? Explain the size dependant properties of nanomaterials.
- 24) Explain the following methods of preparation of nanomaterials.
 - 1) Sol gel Method
 - 2) Precipitation Method
 - 3) Chemical vapour Condensation Method (CVD)
- 25) Write a note on
 - 1) Carbon Nanotubes
 - 2) Graphenes
 - 3) Fullerenes



Internal Test Question paper format- CBCS Scheme

Name of the staff/s: Dr. Manjunath M N/ Srinivas K/Chandrashekar K N/ Vinutha H R/Bindu S
Date: 01-03-2021

Signature:

Reviewer's Signature:

NOTE: Only the following information's to be given to the students.

S.J.C. Institute of Technology
DEPARTMENT OF CHEMISTRY

Semester: I

Test: III

Sections: A,B,C, D, E, F & G

Subject Name & Code: Engineering Chemistry & 18CHE12

Duration: 90 minutes

Max Marks: 50

Answer any five full questions, choosing ONE full question from each part.

Question Number		Marks	CO	Levels
PART-A				
1	a) What is primary air pollutant? Mention sources, effects and control of the Oxides of sulphur	05	CO4	L2
	b) In a COD test 30.7 cm ³ and 20.5 cm ³ of 0.04N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25cm ³ . Calculate the COD in the water sample.	05	CO4	L3
OR				
2	a) Define E-waste. Mention the sources, characteristics & disposal methods of E-waste.	05	CO4	L2
	b) Calculate the COD of effluent sample, when 30cm ³ of effluent sample requires 13.5cm ³ of 0.025N K ₂ Cr ₂ O ₇ solution for complete oxidation.	05	CO4	L3
PART-B				
3	a) Define COD. Explain the method of determination of COD.	05	CO4	L2
	b) What is desalination process? Explain the desalination of reverse osmosis process.	05	CO4	L2
OR				
4	a) What is biomedical waste? Give its sources, characteristics & Mention the disposal methods of biomedical waste.	05	CO4	L2
	b) What is secondary air pollutant? Explain ozone formation & ozone layer depletion with reactions.	05	CO4	L2
PART-C				
5	a) In a COD experiment, 30 cm ³ of an effluent sample required 7.3 cm ³ of 0.02 M K ₂ Cr ₂ O ₇ solution for oxidation. Calculate the COD of the sample.	05	CO4	L3
	b) Explain softening of water by ion exchange method	05	CO4	L2
OR				



6	a) In a COD test 28.3 cm ³ and 18.5 cm ³ of 0.05N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 30cm ³ . Calculate the COD in the water sample.	05	CO4	L3
	b) Explain secondary & tertiary sewage treatment process.	05	CO4	L2
PART-D				
7	a) Describe the determination of fluoride by SPADNS method using colorimetry.	05	CO4	L2
	b) Explain the theory and instrumentation and applications of Conductometry by taking strong acid with strong base as an example.	05	CO5	L2
OR				
8	a) Mention sources, effects and control measures of Mercury	05	CO4	L2
	b) Explain the theory and instrumentation of colorimetry. Mention its applications.	05	CO5	L2
PART-E				
9	a) Explain the theory and instrumentation of potentiometry. Mention its applications.	05	CO5	L2
	b) Explain the synthesis of Nanomaterials by sol gel method.	05	CO5	L2
OR				
10	a) Write a Note on Fullerenes	05	CO5	L2
	b) What is a nanomaterial? Explain the size dependant properties of nanomaterials	05	CO5	L2

**DEPARTMENT: CHEMISTRY****Scheme & Solutions- TEST- III****Date: 29/03/21****Semester: I****Subject Title: Engg Chemistry****Subject Code: 18CHE12**

Question Number	Solution	Marks Allocated
1)	<p><u>PART- A</u></p> <p>a) Definition of primary air pollutant 1M Any two sources 1M Any three effects 2M Control measures of oxides of Sulphur 1M</p> <p>b) $\text{COD} = \frac{(X-Y) \times NFA \times 8 \times 1000}{V}$ $\Rightarrow \frac{(30.7 - 20.5) \times 0.04 \times 8 \times 1000}{25}$ $\Rightarrow \frac{3264}{25}$ $\text{COD} \Rightarrow 130.56 \text{ mg of } O_2 / \text{dm}^3$ <p>(OR)</p> </p>	1M 1M 2M 1M 1M 2M
2)	<p>a) Definition of E-waste 1M Any two sources 1M Any three effects 1M Any two disposal methods 2M</p> <p>b) 1000 cm^3 of $1N \text{ K}_2\text{C}_2\text{O}_4 = 8 \text{ g of Oxygen}$ 1M 13.5 cm^3 of $0.025N \text{ K}_2\text{C}_2\text{O}_4 =$ $\Rightarrow \frac{13.5 \times 0.025 \times 8}{1000 \times 1} \Rightarrow 2.7 \times 10^{-3}$ 1M</p>	1M 1M 1M 2M 1M 1M



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
	<p>Converting gram into milligram, then we have = 2.7 mg of O_2</p> <p>30 cm³ of effluent sample = 2.7 mg of O_2</p> <p>1000 cm³ of effluent sample =</p> $\frac{1000 \times 2.7}{30}$ <p>= 90 mg of O_2 / dm³</p>	<p>1M</p> <p>1M</p> <p>1M</p>
	<u>PART-B</u>	
3)	<p>a) Definition of COD</p> <p>principle</p> <p>procedure</p> <p>Formula</p>	<p>1M</p> <p>1M</p> <p>2M</p> <p>1M</p>
	<p>b) Definition of Desalination</p> <p>principle of Reverse osmosis</p> <p>Diagram with explanation.</p> <p>(OR)</p>	<p>1M</p> <p>1M</p> <p>3M</p>
4)	<p>a) Definition of Biomedical waste</p> <p>Any three sources</p> <p>Any three characteristics</p> <p>Any three disposal methods of Biomedical waste</p>	<p>1M</p> <p>1M</p> <p>1M</p> <p>2M</p>

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
4	<p>b) Definition of Secondary air pollutant Ozone formation reaction with Explanation.</p> <p>Ozone depletion reactions with Explanation.</p> $\text{CF}_2\text{Cl}_2 \longrightarrow \text{CF}_2\text{Cl}^\bullet + \text{Cl}^\bullet$ $\text{Cl}^\bullet + \text{O}_3 \longrightarrow \text{ClO}^\bullet + \text{O}_2$ $\text{ClO}^\bullet + \text{O} \longrightarrow \text{Cl}^\bullet + \text{O}_2$ $\text{O}_3 \longrightarrow \text{O}_2 + \text{O}$ <p>Effects</p> <p><u>PART-C</u></p>	<p>1m</p> <p>1m</p> <p>2m</p> <p>1m</p>
5)	<p>a) 1000cm^3 of $1\text{M K}_2\text{Cr}_2\text{O}_7 = 48\text{g}$ of O_2</p> <p>7.3cm^3 of $0.00\text{M K}_2\text{Cr}_2\text{O}_7 =$</p> $\Rightarrow \frac{7.3 \times 0.00 \times 48}{1000 \times 1}$ <p>$\Rightarrow 7.008 \times 10^{-3} \text{ g of } \text{O}_2$</p> <p>Converting gm to mg, then we have</p> <p>$\Rightarrow 7.008 \text{ mg of } \text{O}_2$</p> <p>$30\text{cm}^3$ of Effluent sample requires $= 7.008 \text{ mg of } \text{O}_2$</p> <p>$1000\text{cm}^3$ of Effluent sample =</p> $\frac{1000 \times 7.008}{30} \Rightarrow 233.6 \text{ mg of } \text{O}_2/\text{dm}^3$	<p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p>



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
5)	b) Explanation of Exchange of ions with neat labelled diagram. Regeneration reactions (OR)	3m. 1m 1m
6)	a) $\text{COD} = \frac{(X - Y) \times \frac{V}{30} \times 8 \times 1000}{V}$ $\Rightarrow \frac{(28.3 - 18.5) \times 0.05 \times 8 \times 1000}{30}$ $\Rightarrow \frac{9.8 \times 0.05 \times 8000}{30}$ $\Rightarrow \frac{3920}{30}$ $\text{COD} \Rightarrow 130.66 \text{ mg of } O_2 / \text{dm}^3$	1m 1m 1m 2m.
	b) Definition, Diagram Explanation of Secondary sewage treatment Tertiary treatment Any 3 methods <u>PART-D</u>	1m 2m 3m
7)	a) principle of determination of fluoride by SPADNS method Brief procedure	1m 4m

Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
7)	b) principle Instrumentation with diagram Application with explanation model Graph (OR)	1m 1m 2m 1m
8)	a) Any two sources Any three Effects Any three control measures of mercury b) Theory (Beer-Lambert's Law) Instrumentation with diagram Application with explanation <u>PART-E</u>	1m 2m 2m 1m 2m 2m
9)	a) potentiometry: Theory Instrumentation with diagram - Application	1m 2m 2m



Subject Title: Engg Chemistry

Subject Code: 18CHE12

Question Number	Solution	Marks Allocated
9)	b) Synthesis of Nano materials Explanation of Synthesis by all the 5 steps. Neat labelled diagram (OR)	4m 1m
10)	a) Description about fullerene properties of fullerene Any 4 applications	1m 2m 2m
	b) Definition of Nano material Explanation of properties of Size dependant Nano materials	1m 4m.

Amrith 11/3/2021
H.O.D. of Chemistry
S. J. C. I. T.
CHICKBALLAPUR-562 10.

CBCS SCHEME

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18CHE12

First Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define terms : (i) Free energy (ii) Entropy (iii) Cell potential. (06 Marks)
- b. For the cell, $\text{Fe} | \text{Fe}^{2+} (0.01\text{M}) || \text{Ag}^+ (0.1\text{M}) | \text{Ag}$, write the cell reaction and calculate the e.m.f of cell at 298 K, if standard potentials of Fe and Ag electrodes are -0.44V and $+0.8\text{V}$ respectively. (07 Marks)
- c. What are Secondary Batteries? Explain the construction and working of Nickel metal hydride (Ni - MH) battery. Mention its applications. (07 Marks)

OR

- 2 a. Define Primary, Secondary and Reserve batteries with examples. (06 Marks)
- b. What are concentration cells? The cell potential of copper concentration cell $\text{Cu} | \text{CuSO}_4 (0.005\text{M}) || \text{CuSO}_4 (X) | \text{Cu}$ is 0.0295V at 25°C . Calculate the value of X. (06 Marks)
- c. Explain the construction and working of glass electrode giving its application in determination of pH of solution. (08 Marks)

Module-2

- 3 a. Define corrosion. Describe the electrochemical theory of corrosion taking rusting of iron as an example. (07 Marks)
- b. Explain (i) Water line corrosion (ii) Pitting corrosion. (06 Marks)
- c. What is electroless plating? Explain electroless plating of Nickel. (07 Marks)

OR

- 4 a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing. (06 Marks)
- b. Explain the process of (i) Galvanizing (ii) Anodising of Al. (07 Marks)
- c. What is electroplating? Explain electroplating of chromium. Mention why chromium cannot be used as anode. (07 Marks)

Module-3

- 5 a. Define calorific value of fuel. Explain the experimental determination of calorific value of solid / liquid fuel using Bomb calorimeter. (08 Marks)
- b. What are fuel cells? Describe the construction and working of Solid Oxide Fuel Cell (SOFC). (06 Marks)
- What are Solar cells? Explain the construction and working of photovoltaic (PV) cell. (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and or equations written eg. 42, 8 - 50, will be treated as malpractice.

18CHE12

OR

- 6 a. Explain the preparation of solar grade Silicon by Union Carbide process. (07 Marks)
 b. Write a note on (i) Power alcohol (ii) Unleaded petrol. (06 Marks)
 c. 0.75 g of coal sample (Carbon 90%, H_2 5% and ash 5%) was subjected to combustion in Bomb calorimeter. Mass of water taken in calorimeter was 2.5 kg and the water equivalent of calorimeter is 0.65 kg. The rise in temperature was found to be $3.2^\circ C$. Calculate higher and lower calorific values of the sample. Latent heat of steam = 2457 kJ/kg and specific heat of water = $4.187 \text{ kJ/kg}^\circ C$. (07 Marks)

Module-4

- 7 a. What are the causes, effects and disposal methods of e-waste? (07 Marks)
 b. What are the sources, effects and control of lead pollution? (06 Marks)
 c. In a COD test, 30.2 cm^3 and 14.5 cm^3 of 0.05 N FAS solutions are required for a Blank and Sample titration respectively. The volume test sample used was 25 cm^3 . Calculate the COD of the sample solution. (06 Marks)

OR

- 8 a. Explain the sources, effects and control of oxides of nitrogen. (07 Marks)
 b. Explain softening of water by ion exchange method. (07 Marks)
 c. Explain the Activated sludge treatment of sewage water. (06 Marks)

Module-5

- 9 a. Explain the theory, instrumentation and application of Atomic absorption spectroscopy. (07 Marks)
 b. Explain the theory and instrumentation of potentiometry. (07 Marks)
 c. Write a note on Fullerene. Mention its application. (06 Marks)

OR

- 10 a. What are Nanomaterials? Explain the synthesis of nanomaterials by precipitation method. (07 Marks)
 b. Explain the synthesis of Nano materials by Sol-Gel technique. (06 Marks)
 c. Explain the theory and instrumentation of conductometry. (07 Marks)

First/Second Semester B.E. Degree Examination, Dec.2019/Jan.2020
Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define Free Energy. Derive Nernst equation for single electrode potential. (07 Marks)
- b. What are Reference Electrodes? Describe the construction and working of Calomel electrode. (06 Marks)
- c. Explain the construction and working of Ni – Metal Hydride battery. Give the reaction during charging and discharging mode. Give any two applications. (07 Marks)

OR

- 2 a. Describe the construction and working of Lithium – ion battery. Give its applications. (07 Marks)
- b. Write a note on Primary, Secondary and Reserve batteries. (06 Marks)
- c. What are Concentration Cells? EMF of the cell $\text{Ag}/\text{AgNO}_3(\text{C}_1) // \text{AgNO}_3(\text{C}_2 = 0.2\text{m}) / \text{Ag}$ is 0.8V. Calculate C_1 of the cell. (07 Marks)

Module-2

- 3 a. What is Corrosion? Explain the Electrochemical theory of corrosion by taking iron as an example. (07 Marks)
- b. Explain i) Differential Metal Corrosion ii) Pitting Corrosion. (07 Marks)
- c. What do you mean by metal finishing? Mention any five technological importances. (06 Marks)

OR

- 4 a. Define and explain any two terms :
 i) Polarisation ii) Decomposition potential iii) Over voltage. (06 Marks)
- b. What is Electroless Plating? Explain the Electroless plating of copper. (07 Marks)
- c. Explain the process of Galvanization. (07 Marks)

Module-3

- 5 a. What is Knocking? Explain the mechanism. (07 Marks)
- b. On burning 0.96 grams of solid fuel in bomb calorimeter the temperature of 3500 grams of water increased by 2.7°C water equivalent of calorimeter and latent heat of steam are 385 grams and 587 cal/gram respectively. If the fuel contains 5% H_2 , calculate its gross and net calorific value. Specific heat of water = 4.187 kJ/kg K. (06 Marks)
- c. What are Fuel Cells? Describe the construction and working of $\text{CH}_3\text{OH} - \text{O}_2$ fuel cell. (07 Marks)

OR

- 6 a. What are Solar Cells? Explain the construction and working of a typical P.V. Cell. (07 Marks)
- b. Explain the production of solar grade Si by Union Carbide Process. (07 Marks)
- c. Write a note on : i) Power alcohol ii) Unleaded petrol. (06 Marks)

Module-4

- 7 a. What are the main sources, effects and control of lead pollution? (07 Marks)
b. Mention the various causes, effects and disposal methods of e – waste. (07 Marks)
c. 50 ml of an industrial sewage has consumed 11.5 ml of 0.4N $K_2Cr_2O_7$ solution for complete oxidation. Calculate C.O.D of industrial sewage. (06 Marks)

OR

- 8 a. Explain the activated sludge treatment of sewage water. (07 Marks)
b. What is Desalination? Describe the desalination of seawater by reverse Osmosis process. (07 Marks)
c. Write a note on Ozone depletion. (06 Marks)

Module-5

- 9 a. Explain the theory, Instrumentation and Application of Calorimetry. (06 Marks)
b. What is Potentiometric titration? Explain the principle involved in Potentiometric titration. (07 Marks)
c. Write a note on Fullerene. Mention its application. (07 Marks)

OR

- 10 a. What are Nano – materials? Give their synthesis by Sol – gel techniques. (07 Marks)
b. Write a note on Graphenes. Mention their applications. (07 Marks)
c. Explain the theory and applications of Atomic Absorption Spectroscopy. (06 Marks)

CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, June/July 2019
Engineering Chemistry

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What is single electrode potential? Derive Nernst's equation for single electrode potential. (06 Marks)
- b. What are batteries? Demonstrate the construction and working of Ni-MH battery. mention its applications. (07 Marks)
- c. What voltage will be generated by a cell that consists of iron electrode immersed in 0.5M FeSO₄ solution and a copper electrode immersed in 1M CuSO₄ solution at 298 K. Given $E^\circ_{Fe} = -44 \text{ V}$ and $E^\circ_{Cu} = 0.34 \text{ V}$. Write the cell representation and cell reactions. (07 Marks)

OR

- 2 a. What is Battery? Explain primary and secondary with examples. (06 Marks)
- b. Describe the construction and working of Li-ion battery. Mention its applications. (07 Marks)
- c. What are concentration cells? Emf of the cell $\text{Cd} | \text{CdSO}_4 (XM) || \text{CdSO}_4 (0.025M) | \text{Cd}$ at 28°C is 0.035 V. Find the concentration of CdSO₄ at anode. Given $R = 8.314 \text{ J/K/mol}$, $F = 96500 \text{ C}$. (07 Marks)

Module-2

- 3 a. Discuss the following types of corrosion:
 i) Differential metallic corrosion ii) Water line corrosion (06 Marks)
- b. What is corrosion? Illustrate electrochemical theory of corrosion taking iron as an example. (07 Marks)
- c. What is electroless plating? Outline the electroless plating of copper. (07 Marks)

OR

- 4 a. Explain the factors affecting the rate of corrosion:
 i) Nature of corrosion product ii) Ratio of anodic to cathodic areas (06 Marks)
- b. What is meant by metal finishing? Highlight any five technological importance of metal finishing. (07 Marks)
- c. What is electroplating? Discuss the electroplating of chromium. (07 Marks)

Module-3

- 5 a. What are fuel cells? Describe the construction and working of Methanol-Oxygen fuel cell. (06 Marks)
- b. Describe the experimental determination of calorific value of solid fuel using Bomb Calorimeter. (07 Marks)
- c. 0.95 g of coal sample (C = 93%; H₂ = 6% and ash 1%) was subjected to combustion in Bomb calorimeter. Mass of water taken in the calorimeter was 2.6 kg and the water equivalent of calorimeter was 0.75 kg. The rise in temperature was found to be 3.2°C. Calculate the gross and net calorific values of the sample. Latent heat of steam = 2457 kJ/kg/°C and S = 4.187 kJ/kg/°C. (07 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
 2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42/18 = 50, will be treated as malpractice.

18CHE12/22

OR

- 6 a. Explain the preparation of solar grade silicon by union-carbide process. (06 Marks)
b. What are pv-cells? Illustrate the construction and working of a typical pv-cell. (07 Marks)
c. What is knocking? Explain the mechanisms of knocking. Mention its ill effects. (07 Marks)

Module-4

- 7 a. Outline the softening of water by ion-exchange method. (06 Marks)
b. What are the sources, effects and control of lead pollution? (07 Marks)
c. Define COD. In a COD test, 30.6 cm³ and 15.5 cm³ of 0.05N FAS solution are required for blank and sample titration respectively. The volume of the test sample used was 25 cm³. Solve the COD of the water sample solution. (07 Marks)

OR

- 8 a. What is Desalination? Describe the process of reverse osmosis of water. (06 Marks)
b. What is boiler corrosion? Explain the boiler corrosion with CO₂, O₂ and MgCl₂. (07 Marks)
c. Define COD. Illustrate the determination of COD of waste water sample. (07 Marks)

Module-5

- 9 a. Describe the synthesis of nano-material by sol-gel technique. (06 Marks)
b. Discuss the theory and instrumentation of conductometry. (07 Marks)
c. Outline the theory, instrumentation and applications of colorimetry. (07 Marks)

OR

- 10 a. Explain size dependent properties of nano material:
i) Surface area
ii) Electrical
iii) Optical properties (06 Marks)
b. Write a note on fullerenes. Mention its properties and applications. (07 Marks)
c. What are nanomaterials? Explain the synthesis of nanomaterial by chemical vapour deposition method. (07 Marks)

**Model Question Paper-2 with effect from 2018-19
(CBCS Scheme)**

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18CHE12/22

**First/Second Semester B.E. Degree Examination
Engineering Chemistry**

(Common to all Branches)

Time : 3 Hrs

Max.Marks:100

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

Module-I

1. a. What is single electrode potential? Derive Nernst equation for single electrode potential. (6 Marks)
- b. Calculate the emf of a Cd-Cu cell in which Cd is in contact with 0.002 M CdSO_4 and Cu in contact with 0.02 M CuSO_4 solution. The standard emf of the cell is 0.74 V at 298 K (7 Marks)
- c. Explain the construction and working of Ni-MH battery, mention its applications. (7 Marks)

OR

2. a. Explain the construction and working of Li-ion battery. Mention their advantages and applications. (7 Marks)
- b. What are primary and secondary batteries? Explain with examples. (6 Marks)
- c. A concentration cell was constructed by immersing two silver electrodes in 0.05 M and 1M AgNO_3 solutions. Give the cell representation, write the cell reactions and calculate the emf of the cell (7 Marks)

Module-II

3. a. Explain: (i) Water-line corrosion & (ii) Pitting corrosion. (6 Marks)
- b. Explain the process of (i) galvanization & (ii) Anodizing (7 Marks)
- c. What is electrolessplating? Explain the electrolessplating of nickel. (7 Marks)

OR

4. a. What is meant by metal finishing? Mention (any 6) technological importance of metal finishing. (7 Marks)
- b. Define the terms (i) Polarization, (ii) Decomposition potential & (iii) Over voltage. (6 Marks)
- c. What is cathodic protection? Explain (i) Sacrificial anodic & (ii) Impressed current methods (7 Marks)

Module-III

5. a. What are chemical fuels? How are they classified? (6 Marks)
b. What are fuel cells? How does a fuel cell differ from a battery? Give their advantages & disadvantages. (7 marks)
c. Explain the preparation of solar grade silicon by union carbide process. (7 marks)

OR

6. a. What are PV cells? Mention their advantages and limitations. (6 marks)
b. 0.85 g of coal sample (carbon 90%, H₂ 5% and ash 5%) was subjected to combustion in a Bomb calorimeter. Mass water taken in the calorimeter was 2000 g and the water equivalent of calorimeter was 600 g. The rise in temperature was found to be 3.5°C. Calculate gross and net calorific values of the sample. Latent heat of steam = 2457 KJ/Kg. (8 Marks)
c. Write a note on (i) Power alcohol & (ii) Unleaded petrol (6 Marks)

Module-IV

7. a. What are the causes, effects and disposal methods of e-waste? (7 Marks)
b. What are the sources, effects and control of mercury pollution? (7 Marks)
c. In a COD test 30.2 cm³ and 14.5 cm³ of 0.05 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used was 25 cm³. Calculate the COD of the sample solution. (6 Marks)

OR

8. a. Explain the softening of water by ion exchange method. (6 Marks)
b. Explain the activated sludge treatment of sewage of water. (7 Marks)
c. Explain the mechanism of photochemical smog. (7 Marks)

Module-V

9. a. Explain the theory, instrumentation and applications of atomic absorption spectroscopy. (7 Marks)
b. Explain the theory and instrumentation of potentiometry (7 Marks)
c. Explain the synthesis of nano-material by sol-gel technique. (6 Marks)

OR

10. a. Write a note on fullerenes. Mention their applications. (7 Marks)
b. What are nano-materials? Explain the synthesis of nano-materials by chemical vapor deposition. (7 Marks)
c. Explain the theory and instrumentation of colorimetry. (6 Marks)

**Model Question Paper-1 with effect from 2018-19
(CBCS Scheme)**

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18CHE12/22

**First/Second Semester B.E. Degree Examination
Engineering Chemistry**

(Common to all Branches)

Time : 3 Hrs

Max.Marks:100

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

Module-1

1. a. Define the terms: (i) Free energy, (ii) Entropy & (iii) Cell potential (6 Marks)
- b. What are concentration cells? The cell potential of Cu concentration cell $\text{Cu}/\text{CuSO}_4 (0.005\text{M}) // \text{CuSO}_4 (X)/\text{Cu}$ is 0.0295 V at 25° C. Write the cell reaction and calculate the value of X. (7 Marks)
- c. What are batteries? Explain the construction and working of Li-ion battery, mention its applications. (7 Marks)

OR

2. a. Write short notes on primary, secondary and reserve batteries. (6 Marks)
- b. Explain the construction and working of Ni-MH battery. Mention its applications. (7 Marks)
- c. For the cell, $\text{Fe}/\text{Fe}^{2+} (0.01\text{M}) // \text{Ag}^+ (0.1\text{M})/\text{Ag}$ write the cell reaction and calculate the emf of the cell at 298K, if standard electrode potentials of Fe and Ag electrodes are -0.44V and 0.8 V respectively. (7 Marks)

Module-2

3. a. What is metallic corrosion? Describe the electrochemical theory of corrosion taking iron as an example. (7 Marks)
- b. Explain: (i) Differential metal corrosion & (ii) Water-line corrosion (6 Marks)
- c. What is electroplating? Explain the electroplating of chromium (7 Marks)

OR

4. a. What is meant by metal finishing? Mention (any five) technological importance of metal finishing. (6 Marks)
- b. What is electrolessplating? Explain the electrolessplating of copper. (8 Marks)
- c. Explain the factors affecting the rate of corrosion (i) Nature of corrosion product, (ii) Ratio of anodic to cathodic areas & (iii) pH (6 Marks)

Module-3

5. a. Define the term Calorific value of fuel. Explain the experimental determination of calorific value of solid/liquid fuel using Bomb calorimeter. (8 Marks)
 b. What are fuel cells? Describe the construction and working of $\text{CH}_3\text{OH}-\text{O}_2$ fuel cell. (6 marks)
 c. What are solar cells? Explain the construction and working of a typical PV cell. (6 marks)

OR

6. a. Explain the production solar grade Si by union carbide process (6 marks)
 b. 0.75 g of coal sample (carbon 90%, H_2 5% and ash 5%) was subjected to combustion in Bomb calorimeter. Mass water taken in the calorimeter was 2.5Kg and the water equivalent of calorimeter is 0.65Kg. The rise in temperature was found to be 3.2°C . Calculate gross and net calorific values of the sample. Latent heat of steam = 2457KJ/Kg and specific heat of water = $4.187\text{KJ/Kg}^\circ\text{C}$. (8 Marks)
 c. What is knocking? Explain its mechanism. Mention its ill effects. (6 Marks)

Module-4

- 7 a. Explain the mechanism of photochemical smog? (7 Marks)
 b. What are the sources, effects and control of lead pollution? (7 Marks)
 c. Define COD. In COD test 27.5 cm^3 and 13.2 cm^3 of 0.05 N FAS solution are required for blank and sample titration respectively. The volume of the test sample used is 25 cm^3 . Calculate the COD of the sample solution. (6 Marks)

OR

8. a. Define the term COD. Explain the determination of COD. (6 Marks)
 b. What is potable water? Describe the process of reverse osmosis process of water. (7 Marks)
 c. What are the causes, effects and disposal methods of e-waste? (7 Marks)

Module-5

9. a. Explain the theory, instrumentation and applications of flame photometry. (7 Marks)
 b. Explain the theory and instrumentation of conductometry. (7 Marks)
 c. Explain the synthesis of nano-material by sol-gel technique. (6 Marks)

OR

10. a. Write a note on graphenes. Mention its applications. (7 Marks)
 b. What are nano-materials? Explain the synthesis of nano-materials by precipitation method (7 Marks)
 c. Explain the theory and instrumentation of potentiometry. (6 Marks)

Department: Chemistry
 Program: BE
 Course: Engineering Chemistry
 Date: _____

USN	NAME	TEST-1					TEST-2					TEST-3					End Term			
		M1Q1/Q2	M1Q3/4	M1Q5/6		M1Q7/8	M1Q1/Q2	M1Q3/4	M1Q5/6	M1Q7/8	M1Q9/10	M1Q1/Q2	M1Q3/4	M1Q5/6	M1Q7/8	M1Q9/10	ASSIG	Internal	External	
		CO1	CO1	CO1		CO2	CO2	CO2	CO3	CO3	CO3	CO1	CO2	CO3	CO4	CO5	CO1-CO5	CO1-CO5	CO1-CO5	
USN	NAME	12	12	12		14	10	10	10	10	10	10	10	10	10	10	10	30	60	
USN	NAME	TEST-1					TEST-2					TEST-3					End Term			
		M1Q1/Q2	M1Q3/4	M1Q5/6	M1Q7/8	M1Q9/10	M1Q1/Q2	M1Q3/4	M1Q5/6	M1Q7/8	M1Q9/10	M1Q1/Q2	M1Q3/4	M1Q5/6	M1Q7/8	M1Q9/10	ASSIG	Internal	External	
		CO1	CO1	CO1	CO1/CO2	CO2	CO2	CO2	CO3	CO3	CO3	CO4	CO4	CO4	CO4	CO5	CO1-CO5	CO1-CO5	CO1-CO5	
1	ISJ20CV001	Anusha M	8	6	8	5	5	8	8	8	5	0	6	6	10	10	10	10	32	26
2	ISJ20CV002	Archana Shreyi Mj	10	0	0	0	10	0	6	5	4	1	6	0	0	10	2	9	20	21
3	ISJ20CV003	Arshika D	6	3	3	2	6	7	6	6	4	5	6	8	4	6	10	7	25	16
4	ISJ20CV004	Ashika N	6	4	4	4	6	4	7	5	3	0	6	0	10	6	6	8	23	21
5	ISJ20CV005	Balaraj	10	7	2	0	6	7	8	6	0	6	0	6	8	10	4	9	26	32
6	ISJ20CV006	Chandrika. V	7	10	5	5	10	8	8	8	10	0	6	10	10	10	10	7	32	7
7	ISJ20CV007	Dharshan Kumar M	7	0	0	0	2	8	7	6	0	0	4	0	0	1	4	8	20	17
8	ISJ20CV008	Fardeen Pasha	9	1	0	3	0	1	0	3	0	3	6	6	10	10	2	8	24	26
9	ISJ20CV009	Ganavi Gowda S	8	3	3	0	8		3	8	1	0	6	6	9	10	6	10	27	26
10	ISJ20CV010	Gangadhara	4	2	0	0	8	0	0	1	3	0	3	0	0	6	3	8	20	6
11	ISJ20CV011	Gattu Ummer Farud	4	2	0	0	4	7	8	8	8	0	2	0	2	0	5	7	22	29
12	ISJ20CV012	Govaradhan P.n	8	4	4	0	6	8	4	9	5	0	6	0	9	8	6	8	26	29
13	ISJ20CV013	Harshith.b	6	8	7	3	10	7	7	9	4	3	6	0	4	2	6	9	27	21
14	ISJ20CV014	Hem Kumar Bn	4	0	7	0	2	5	0	7	4	0	6	0	2	0	0	9	20	18
15	ISJ20CV015	Kishore K M	0	0	0	0	0	0	0	0	0	0	6	5	0	0	6	8	21	22
16	ISJ20CV016	Mithin Kumar N.r	3	4	3	0	3	2	0	7	2	0	6	6	0	9	0	8	20	17
17	ISJ20CV017	Mohammed Ashwa	6	0	0	0	2	3	3	4	3	1	6	0	1	0	3	8	20	24
18	ISJ20CV018	Naga Tarun S	7	2	0	0	0	8	8	9	0	0	6	10	10	0	0	10	24	32
19	ISJ20CV019	Nandini	4	0	1	2	6	0	0	8	3	0	0	0	0	8	6	9	20	17
20	ISJ20CV020	Naveen Kumar Hs	4	1	0	0	2	3	0	4	2	0	6	0	0	8	2	9	20	11
21	ISJ20CV021	Nithish Kumar S	8	0	0	1	0	4	6	5	2	1	6	0	3	2	5	7	20	26
22	ISJ20CV022	Punith Reddy. Ga	8	10	5	0	6	8	8	9	3	0	6	7	10	10	5	9	29	37
23	ISJ20CV023	Rahul Rs	8	9	0	0	10	6	3	8	10	0	0	0	0	0	0	9	25	21
24	ISJ20CV024	Rakshith R	7	2	4	3	10	8	6	8	2	1	6	4	10	10	6	8	27	27
25	ISJ20CV025	Safreen Taj	8	5	1	0	6	6	7	8	2	0	0	8	10	10	6	9	26	32
26	ISJ20CV026	Sahana Km	8	6	6	0	0	7	7	3	3	0	6	0	0	6	4	8	28	30
27	ISJ20CV027	Sahana.b	6	9	6	0	6	6	6	9	4	0	6	10	10	10	5	8	20	25
28	ISJ20CV028	Saifuddin	6	7	8	0	10	7	8	8	3	0	6	6	2	6	6	9	27	28
29	ISJ20CV029	Sandhya S	4	5	0	4	10	6	4	5	3	0	3	6	0	6	6	9	22	15
30	ISJ20CV030	Shashank Pv	8	2	0	0	10	6	1	5	4	0	0	7	3	10	6	7	21	21
31	ISJ20CV031	Shubash Reddy K S	8	8	0	0	8	8	6	6	2	0	5	0	0	0	0	9	23	33
32	ISJ20CV032	Sreelakshmi.v	3	6	9	0	10	4	4	6	1	0	6	5	3	6	6	8	23	16
33	ISJ20CV033	Srinivas.b	6	0	2	0	3	0	0	8	1	0	0	0	0	10	2	8	20	9
34	ISJ20CV034	Suhas.g	7	1	3	0	10	3	2	4	8	0	5	4	6	10	6	8	23	10
35	ISJ20CV035	Tejar R	3	0	0	0	6	5	0	5	0	0	6	0	0	10	0	8	20	15

36	1SJ20CV036	Thanusha D S	10	0	8	0	5	2	6	8	2	2	6	6	0	8	2	9	23	21
37	1SJ20CV037	Thanushree D.r	8	7	3	0	7	9	8	6	0	2	6	10	10	8	4	9	28	21
38	1SJ20CV038	Vandana R	5	5	0	0	0	4	4	6	2	0	0	8	4	10	0	8	20	21
39	1SJ20CV039	Vani R	4	0	0	0	4	2	4	0	4	0	0	0	10	0	6	8	20	21
40	1SJ20CV040	Vasavi Ts	6	10	9	0	10	8	0	6	4	0	0	0	10	10	6	8	25	18
41	1SJ20CV041	Venu A S	10	10	10	8	10	8	8	9	4	0	6	6	1	10	6	8	30	29
42	1SJ20CV042	Geethanjali P V	8	5	0	0	10	8	6	6	2	0	6	0	0	10	6	8	23	27
43																				
44			CO1	CO1	CO2	CO2	CO1	CO2	CO2	CO3	CO3	CO4	CO4	CO5	CO5	CO6	CO6	CO1-CO6	CO1-CO6	
45			10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	30	60
46		Total No. of Students	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42		42
47		No. of Students scored 60% and above	30	14	10	1	26	23	22	28	4	1	27	18	16	31	20	42		18
48		No. of students absent	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
49		% of students scoring 60% and above Level	0.71	0.33	0.24	0.02	0.62	0.55	0.52	0.67	0.10	0.02	0.64	0.43	0.38	0.74	0.48	1.00		0.43
50																				

M. S. S.