



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad-500043

FRESHMAN ENGINEERING

TUTORIAL QUESTION BANK

Course Name	:	ENGINEERING CHEMISTRY
Course Code	:	AHS006
Class	:	I B. Tech I Semester
Branch	:	Common for all branches
Year	:	2016 – 2017
Course Coordinator	:	Ms. V Anitha Rani, Assistant, Professor, Department of Freshman Engineering
Course Faculty	:	Ms. V Anitha Rani, Mr. B Raju, Ms. G Satyakala, Ms. M Malathi Mr. B Mahesh Kumar, Mr. M Praveen, Ms. T Mallika, Mr. V Tarak Rama Rao

OBJECTIVES

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated and taken forward in a systematic manner. Accreditation is the principal means of quality assurance in higher education. The major emphasis of accreditation process is to measure the outcomes of the program that is being accredited.

In line with this, Faculty of Institute of Aeronautical Engineering, Hyderabad has taken a lead in incorporating philosophy of outcome based education in the process of problem solving and career development. So, all students of the institute should understand the depth and approach of course to be taught through this question bank, which will enhance learner's learning process.

SNo	QUESTION	Blooms taxonomy level	Course Outcomes
UNIT – I ELECTROCHEMISTRY AND BATTERIES			
Part - A(Short Answer Questions)			
1	What are conductors? How are they classified?	Remember	1
2	Differentiate metallic and electrolytic conductors?	Analyze	1
3	Define the specific conductance? With units.	Remember	1
4	Explain the term Equivalent conductance? With units.	Remember	1
5	Define Molar conductance? With units.	Remember	1
6	What is single electrode potential?	Remember	2
7	What is EMF of cell? How the emf of cell is calculated?	Remember	2
8	Derive Nernst equation?	Remember	2
9	Differentiate Primary and Secondary cells?	Analyze	2
10	Give the applications of Batteries?	Apply	2
11	Write cell reactions of Daniel cell?	Remember	2
12	Define electrochemical series? Write its applications?	Remember	2

13	Explain the construction of calomel electrode?	Understand	2
14	Write the applications and limitations of quinhydrone electrode?	Understand	2
15	Define a battery? How are they classified?	Remember	2
16	Discuss the working principles of primary batteries?	Understand	2
17	What are the applications of Lead Acid cell and Nickel Cadmium cell?	Apply	2
18	Give two examples of secondary cells write its cell potential?	Remember	2
19	Define Conductance? Write its units?	Remember	1
20	Why specific conductance of an electrolyte decreases where as equivalent conductance increases on dilution?	Apply	1
Part - B (Long Answer Questions)			
1	Define the terms specific, equivalence and molar conductance with their units?	Remember	1
2	Describe the construction and working of calomel electrode?	Remember	1
3	What is Electrochemical cell? Explain the construction and reactions of Daniell cell with a neat diagram?	Remember	2
4	What are reference electrodes? Explain the construction and working of Quinhydrone electrode?	Remember	2
5	Explain How Nernst equation is useful in calculating the electrode potential?	Understand	2
6	What is electrochemical series? Give its applications with suitable examples.	Understand	2
7	Explain the construction and functioning of lead-acid cell and give its applications?	Understand	2
8	Describe the construction of Ni-Cd battery with relevant reactions occurring during the discharging and charging. Mention its applications?	Analyze	2
9	Why the anode of galvanic cell is negative and cathode is positive? Write the different electrode reactions occur at the electrode	Understand	2
10	Explain about the construction and discharging reactions of dry cell?	Understand	2
Part - C (Analytical Questions)			
1	A pair of copper (II) sulphate solutions, one concentrated and dark blue and the other dilute and light blue, is separated by a removable barrier. (a) What will happen when the barrier is removed? Give reason.	Analyze	1
2	when zinc rod is dipped in a solution of aqueous copper sulphate, copper is precipitated out Give reason	Analyze	1
3	If an electrochemical cell with Sn and Cu electrodes was setup, what would be the two half reactions, which would be the cathode and which would be the anode, and what would be the standard cell potential?	Analyze	2
4	Specific conductance of a decinormal solution of KCl is $0.0112 \text{ ohm}^{-1} \text{ cm}^{-1}$. the resistance of a cell containing the solution was found to be 56. what is cell constant?	Evaluate	1
5	The equivalent conductance of 0.005N NaOH solution is $240 \text{ mho cm}^2 \text{ equiv}^{-1}$. what is specific conductance and electrical resistance if the electrodes are 1 cm apart and each have a surface area of 1 cm^2	Evaluate	2
6	Calculate the e.m.f of voltaic cell $\text{Fe} \text{Fe}^{2+}(\text{aq}) \text{Cu}^{2+}(\text{aq}) \text{Cu}$. Given the electrode potentials of copper and iron are 0.34 volt and -0.44 volt respectively.	Evaluate	2
7	The standard reduction potentials of Zn^{2+}/Zn and Cu^{2+}/Cu are -0.76V and +0.34 V respectively. What is the cell e.m.f (inV) of the following cell? $(0.05\text{M})/\text{Zn} // \text{Cu}^{2+}(0.005\text{M}) \text{Cu}$.	Evaluate	2
8	The resistance of 0.1N solution of an electrolyte is 40 Ohms. If the distance between the electrodes is 1.2 cm and area of cross-section is 2.4 cm^2 Calculate equivalent conductance of the electrolyte?	Evaluate	2
9	A solution of salt (1.0N) surrounding two platinum electrodes 2.1 cm apart and 4.2 cm^2 in area was found to offer a resistance of 50 ohms. Calculate the equivalent conductance of the electrolyte?	Evaluate	2

10	Calculate the electrode potential of the copper wire dipped in 0.1 M CuSO ₄ solution at 25°C. The standard electrode potential of copper is 0.34 V.	Evaluate	
UNIT - II CORROSION AND ITS CONTROL			
Part – A (Short Answer Questions)			
1	Define corrosion? Give causes of corrosion?	Understand	3
2	What is oxidation corrosion?	Remember	3
3	State and explain pilling Bed worth rule	Understand	3
4	How corrosion takes place by different gases?	Understand	3
5	Differentiate chemical and electrochemical corrosion?	Analyze	3
6	Explain any two types of corrosion?	Remember	3
7	How do the following factors influence the rate of corrosion? i) Position in galvanic series ii) humidity in air iii) nature of oxide film.	Understand	3
8	Discuss about anodic and cathodic coating?	Understand	3
9	Explain the corrosion control methods?	Understand	4
10	What is cathodic protection? How many types of cathodic protection?	Remember	4
11	What is hot dipping? What are the types?	Remember	4
12	Explain about electroplating?	Understand	4
13	What is paint? Why are drying oil used in paints?	Remember	4
14	Write any three constituents in paint with their functions?	Remember	4
15	Explain about waterline corrosion?	Understand	4
16	Explain about crevice corrosion?	Understand	4
17	What is meant by sacrificial anode?	Remember	4
18	What is impressed current cathodic protection?	Remember	4
19	Write the effects of corrosion?	Understand	4
20	Explain how overvoltage in metal influence the rate of corrosion	Remember	4
Part - B (Long Answer Questions)			
1	Describe the electrochemical theory of corrosion?	Understand	3
2	Explain about chemical theory of corrosion?	Understand	3
3	Explain how nature of corroding environment influences the rate of corrosion?	Analyze	3
4	How nature of metal influences the rate of corrosion?	Analyze	3
5	Explain differential aeration corrosion by illustrating with one example.	Remember	3
6	Describe the mechanism of oxidation corrosion?	Understand	4
7	Explain the process of galvanizing? Mention its applications.	Apply	4
8	Explain the process of tinning? Mention its applications.	Apply	4
9	Write a note on electroplating? Give its applications.	Apply	4
10	What is paint? What are the different constituents of paint and explain their functions.	Understand	4
11	How are metals protected by impressed by current method?	Understand	4
12	Describe briefly cathodic protection by sacrificial anode?	Understand	4
Part - C (Analytical Questions)			
1	Rusting of iron is faster in saline water than in ordinary water Give reason.	Analyze	4
2	Why wire mesh corrodes faster at the joints.	Analyze	4

3	Why does corrosion occur in steel pipe connected to copper plumbing?	Analyze	4
4	Cathodic coating if punctured causes accelerated corrosion of the base metal Give reason	Analyze	4
5	A pipeline buried under water logged soils undergoes corrosion than dry sandy soil Give reason	Analyze	4
6	Iron corrodes faster than aluminium, even though iron is placed below aluminium in the electrochemical series. Why?	Analyze	4
7	Deposition of oil or dust on metal surfaces for a long period is undesirable. Give reason?	Analyze	4

UNIT-III WATER TECHNOLOGY

Part - A (Short Answer Questions)

1	Define hardness of water? What are the causes of hardness?	Understand	8
2	Give the differences between temporary and permanent hardness of water?	Analyze	8
3	Explain the basic principle of estimation of hardness by EDTA method?	Understand	8
4	Define sludge and scale formation in boilers?	Remember	8
5	What are the units of hardness of water?	Remember	8
6	Describe the causes and harmful effects scale formation?	Understand	8
7	Define priming and foaming?	Remember	8
8	Describe the causes and harmful effects sludge formation?	Understand	8
9	What is Winkler's method?	Remember	8
10	What is caustic embrittlement?	Analyze	8
11	Which one is most widely used in chlorination process?	Analyze	8
12	What is meant by softening of water?	Remember	8
13	Discuss break point of chlorination?	Remember	8
14	Explain the following: i. carbonate conditioning, ii. Calgon conditioning iii. phosphate conditioning?	Remember	8
15	Give the differences between zeolite and ion exchange process?	Remember	8
16	Mention the process of reverse osmosis?	Understand	8
17	Write the advantages of ion-exchange process?	Analyze	8
18	Write a short note on zeolite process?	Remember	8
19	What are the steps involved in potable water?	Remember	8
20	What are the specifications of potable water?	Remember	8

Part – B (Long Answer Questions)

1	What is hardness of water? What are the causes of hardness?	Remember	8
2	Distinguish between temporary and permanent hardness of water?	Analyze	8
3	Explain the basic principle of estimation of hardness by EDTA method?	Understand	8
4	Describe sludge and scale formed in boilers?	Understand	8
5	Explain about priming and foaming and caustic embrittlement?	Understand	8
6	Explain the process of scale formation in boilers?	Understand	8
7	Mention the basic principle of estimation of dissolved oxygen by Winkler's method?	Understand	8
8	Discuss the Zeolite process for softening of water?	Understand	8
9	What are the steps involved in treatment of potable water?	Remember	8
10	Describe the Ion exchange process for softening of water?	Analyze	8

11	Explain the sterilization of water by chlorination and ozonization?	Understand	8
Part - C (Analytical Questions)			
1	0.28gm of CaCO_3 was dissolved in dil.HCl and the solution made up to one liter with distilled water. 100ml of the above solution required 28ml of EDTA solution for titration.100ml of the water sample required 33ml of same EDTA solution for titration. After boiling 100ml of this water cooling filtering and then titration required 10ml of EDTA solution Calculate the temporary and permanent hardness of water?	Evaluate	8
2	One liter of water from an underground reservoir in Tirupathi Town in Andhra Pradesh showed the following analysis for its contents: $\text{Mg}(\text{HCO}_3)_2 = 42\text{mg}$; $\text{Ca}(\text{HCO}_3)_2 = 146\text{mg}$; $\text{CaCl}_2 = 71\text{mg}$; $\text{NaOH} = 40\text{mg}$; $\text{MgSO}_4 = 48\text{ mg}$; organic impurities = 100 mg; Calculate temporary, permanent and total hardness of this sample of 10,000 liters of water?	Evaluate	8
3	One liter of water from an underground reservoir in Nalgonda Town in Andhra Pradesh the following analysis. for its contents:: $\text{Mg}(\text{HCO}_3)_2 = 0.0146\text{ gms}$; $\text{Ca}(\text{HCO}_3)_2 = 0.0081\text{ gms}$; $\text{MgSO}_4 = 0.0012\text{ gms}$; $\text{CaSO}_4 = 0.0136\text{ gms}$; $\text{NaCl} = 0.0585\text{ gms}$; Organic impurities = 100 mg; Calculate temporary, permanent and total hardness of this sample of water in degree French?	Evaluate	8
4	One liter of water sample collected from a water source in Andhra Pradesh has shown the Following analysis. $\text{Mg}(\text{HCO}_3)_2 = 14.6\text{ mg}$, $\text{MgSO}_4 = 12\text{mg}$; $\text{Ca}(\text{HCO}_3)_2 = 16.2\text{ mg}$, $\text{CaCl}_2 = 22.2\text{ mg}$, $\text{MgCl}_2 = 9.5\text{ mg}$ and organic impurities 100 mg. Calculate temporary and permanent hardness in Degree French?	Evaluate	8
5	If the water contains $\text{Ca}^{2+}(\text{aq})$ and $\text{HCO}_3^-(\text{aq})$, will it be hard water or soft water? Give reason.	Analyze	8
6	Why is water softened by Zeolite process unfit for use in boilers?	Analyze	8
7	Why is hard water harmful to boiler?	Understand	8
8	Why is calgon conditioning is better than phosphate conditioning?	Understand	8
UNIT-IV MATERIALS CHEMISTRY			
Part – A (Short Answer Questions)			
1	What is polymerization? Write the types of polymerization?	Remember	5
2	Explain chain polymerization? Give examples?	Understand	5
3	Explain step polymerization and give example?	Understand	5
4	What is a plastic? Give examples?	Understand	5
5	Differentiate thermoplastics and thermosetting plastics?	Analyze	5
6	How PVC is prepared and what are its applications?	Apply	6
7	Write a note on preparation and properties of Teflon?	Remember	6
8	Discuss the preparation of Nylon-6, 6?	Remember	6
9	Write a note on properties and uses of Bakelite?	Understand	6
10	Give properties and applications of Dacron?	Apply	6
11	What is natural rubber? Write the repeat unit in natural rubber?	Remember	5
12	Explain the vulcanization process of rubber?	Understand	5
13	What are the elastomers? Give examples?	Remember	5
14	How Buna-S rubber and Thiokol rubber is prepared?	Remember	6
15	Give are the characteristics of refractories?	Remember	7
16	What is the composition of Portland cement?	Remember	7
17	Write the short note on Setting and Hardening of cement	Understand	7
18	What is a lubricant? How they are classified?	Remember	10

19	Define flash and fire point of a lubricant?	Remember	10
20	Define cloud and pour point of a lubricant?	Remember	10
Part – B (Long Answer Questions)			
1	Explain the mechanism of chain polymerization?	Understand	5
2	What is condensation polymerization and give example?	Understand	5
3	Differentiate thermoplastics and thermo set plastics?	Analyze	5
4	Give the preparation, properties and applications of Nylon-6:6?	Apply	6
5	What is natural rubber? Explain the vulcanization process of rubber with advantages?	Understand	5
6	What are elastomers? Give the preparation, properties and application of Buna-S and Thiokol rubber?	Understand	6
7	Explain the mechanism of Setting and Hardening of cement with chemical reactions?	Understand	7
8	Describe the properties of lubricants?	Understand	10
9	Differentiate addition and condensation polymerization?	Analyze	5
10	Give an account of the following (a) Criteria of a good lubricant. (b) Viscosity.	Remember	10
11	Classify refractoriness' with suitable examples?	Understand	7
Part - C (Analytical Questions)			
1	Why are plastics indispensable in everyday life?	Understand	5
2	Why cannot thermosetting plastics be reused and reshaped?	Understand	5
3	Why does rubber become stiff in stretching?	Understand	5
4	Why is Teflon highly chemical resistant?	Understand	5
5	Natural rubber needs vulcanization. Give reason?	Analyze	5
6	PVC is soft and flexible whereas Bakelite is hard and brittle. Give reason?	Analyze	6
7	What is the importance of viscosity and viscosity index of a lubricant?	Understand	10
UNIT-V			
FUELS AND COMBUSTION			
Part - A (Short Answer Questions)			
1	Define a fuel. How chemical fuels are classified?	Remember	9
2	Define calorific value of a fuel?	Remember	9
3	What is gross and net calorific value of a fuel?	Understand	9
4	Write the significance of proximate analysis?	Understand	9
5	Write the significance of ultimate analysis?	Understand	9
6	Explain refining of petroleum?	Remember	9
7	What is cracking of petroleum? Give an example?	Remember	9
8	Explain the fixed bed catalytic cracking?	Understand	9
9	What is knocking? What is the function of ethyl bromide added to petrol?	Analyze	9
10	Define octane number? What is its significance?	Remember	9
11	Define cetane number? What is its significance?	Remember	9
12	Why tetra ethyl lead is mixed with gasoline?	Analyze	9
13	Mention the characteristics of a good fuel?	Remember	9
14	Why a good fuel should possess low ash content?	Analyze	9

15	Arrange n-octane, naphthalene and iso-octane in the order of their knocking tendency?	Understand	9
16	What is the composition and applications of natural gas?	Remember	9
17	Why natural gas is called a fossil fuel?	Remember	9
18	Write a note on LPG with its applications?	Apply	9
19	Write a note on CNG with its applications?	Apply	9
20	How is coal graded?	Understand	9
Part - B (Long Answer Questions)			
1	How fuels are classified? Explain with suitable examples?	Understand	9
2	Explain the proximate analysis of coal? a) Moisture b) volatile matter c) ash content d) fixed carbon.	Analyze	9
3	Distinguish between the following? I) Gross and net calorific value	Understand	9
4	Give the advantages and disadvantages of coal over gaseous fuels?	Understand	9
5	Explain the refining of petroleum by giving the composition, boiling range and uses of various fractions obtained during refining?	Apply	9
6	Explain the composition, properties and applications of LPG and CNG	Remember	9
7	Explain the ultimate analysis of coal? a) Carbon and hydrogen b) Nitrogen c) Sulphur d) Oxygen	Analyze	9
8	What is Octane number and Cetane number? Explain their significance?	Understand	9
9	What is cracking? Explain about Fixed bed catalytic cracking with a neat diagram?	Remember	9
Part - C (Analytical Questions)			
1	Why should an ideal fuel have moderate ignition temperature?	Analyze	9
2	Arrange wood, peat, lignite, bituminous coal and anthracite in increasing order of their moisture content?	Understand	9
3	What is the importance of determining fixed C in coal?	Analyze	9
4	Gasoline containing TEL used in internal combustion engines. Give reason?	Analyze	9
5	Why a good fuel must have low ash content?	Understand	9
6	Why should fuel for cars should not evaporate too easily?	Analyze	9
7	Why is net calorific value less than gross calorific value?	Understand	9
8	Calculate the minimum amount of air required for complete combustion of 1kg of coal sample having the following compositions: C=80%,S=2%,H=5%,N=1% and ash=4%.Oxygen in air is 23% by weight.	Evaluate	9
9	A sample of coal contains the following composition Carbon = 84%, Hydrogen = 12%, Oxygen= 2%, Sulphur = 1% and the remainder being ash. Calculate the gross and net calorific values of the fuel?	Evaluate	9

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