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## **Chemistry Question Bank**

### **UNIT - I: Water and its treatment**

#### **LONG ANSWER QUESTIONS:**

1. Define hardness. Why hardness is expressed in terms of  $\text{CaCO}_3$  equivalents? Distinguish between temporary and permanent hardness.
2. How hardness of water is estimated by EDTA method?
3. The following chemicals are dissolved in a litre of water. Calculate the temporary & total hardness of sample water.  $\text{CaSO}_4 = 20.0\text{mg}$ ,  $\text{Mg}(\text{HCO}_3)_2 = 14.6\text{mg}$  &  $\text{MgCl}_2 = 12.5\text{mg}$ ,  $\text{NaCl} = 58.5\text{mg}$  and  $\text{CaCl}_2 = 11.1\text{mg}$ . Express the hardness in the ppm,  $\text{mg/l}$ ,  $^\circ\text{Cl}$  &  $^\circ\text{Fr}$ .
4.  $0.5\text{g}$  of  $\text{CaCO}_3$  was dissolved in dil.  $\text{HCl}$  and diluted to  $1000\text{ml}$ .  $50\text{ml}$  of this solution required  $48\text{ml}$  of EDTA solution for titration.  $50\text{ml}$  of water sample consumed  $15\text{ml}$  EDTA solution.  $50\text{ml}$  of water sample after boiling, filtering consumed  $10\text{ml}$  of EDTA solution. Calculate total, temporary & permanent hardness.
5. Define potable water. What are specifications of potable water?
6. Describe the various stages involved in purification of municipal water.
7. What is disinfection of water? Discuss various disinfection methods.
8. Explain internal treatment of boiler feed water in detail.
9. Illustrate the softening of hard water using ion exchange resins with a neat labelled diagram.
10. Explain how brackish water desalinated by reverse osmosis method with the help of diagram.
11. Explain determination of  $\text{F}^-$  ion by ion- selective electrode method.

#### **SHORT ANSWER QUESTIONS:**

1. What is hardness of water?
2. Which salts are responsible for the temporary hardness?
3. Which salts are responsible for the permanent hardness?
4. Give different units of hardness.
5. Write the EDTA full name and its structure.
6. How is potable water disinfected by ozonisation?
7. Give any two specifications of potable water.
8. What are disinfectants?

9. What is the significance of breakpoint chlorination in the treatment of municipal water?
10. Define Defluoridation.
11. Sample water contains 11.1mg/L of  $\text{CaCl}_2$ , find the hardness of water.
12. List out methods for internal treatment of boiler feed water.
13. Give examples of coagulants.
14. Give any 2 boiler troubles?
15. Define Scale.
16. Define Sludge.
17. Write calgon chemical name?
18. How exhausted ion-exchange resins are regenerated.
19. What is desalination?
20. Define reverse osmosis.

## **UNIT-II: Battery Chemistry & Corrosion**

### **LONG ANSWER QUESTIONS:**

1. What is a battery? Give its classification with examples and discuss the basic requirements of commercial batteries.
2. Explain the construction, working and applications of zinc-air battery.
3. Discuss the construction, working and applications of lithium ion battery.
4. What is a fuel cell? Explain the construction, working and applications of  $\text{MeOH-O}_2$  fuel cell.
5. Write a detailed note on solar cells.
6. Explain wet or electrochemical corrosion by evolution of hydrogen method.
7. Discuss electrochemical corrosion by absorption of oxygen method.
8. Write a detailed account on the various factors affecting the rate of corrosion.
9. Write a detailed note on sacrificial anode method.
10. Write a detailed note on impressed current cathode method.
11. Explain the electroless plating in detail with the help of an example.

### **SHORT ANSWER QUESTIONS:**

1. What is the working principle of a battery?
2. Give any two differences between primary and secondary cells.
3. What is reserve battery?
4. Write any two basic requirements of commercial batteries.
5. Write any two applications of zinc-air battery.
6. Give any two advantages of lithium ion battery.
7. How does a fuel cell differ from a battery?
8. Give any two advantages of fuel cells.
9. What is solar cell?
10. Write any two applications of solar cells.
11. Give any two differences between chemical and electrochemical corrosion.
12. What is chemical corrosion?

13. What is pitting corrosion?
14. What is galvanic corrosion?
15. Define waterline corrosion.
16. What is the basic principle involved in cathodic protection?
17. Give the effect of the temperature factor on the rate of corrosion of metals.
18. Write the effect of the humidity on the rate of corrosion of metals.
19. Write any two applications of sacrificial anode method.
20. What is electroless plating?
21. Give any two advantages of electroless plating.

### **UNIT-3: Polymeric materials**

#### **LONG ANSWER QUESTIONS:**

1. How do you classify the polymers? Explain in detail.
2. Differentiate thermoplast and thermoset plastics.
3. Write down the preparation, properties and engineering applications of Bakelite.
4. Differentiate Addition and Condensation polymerization.
5. Write down the preparation, properties and engineering applications of PVC & Teflon.

#### **SHORT ANSWER QUESTIONS:**

1. What is polymerization?
2. Define addition polymerization
3. What is condensation polymerization?
4. What are Homomers?
5. Define co-polymer.
6. Write any two applications of PVC.
7. Write the monomer of Teflon.
8. Write any two applications of Bakelite.
9. Mention the monomers of Bakelite.
10. Define plastics with example.

## **Chemistry Question Bank**

### **UNIT – 3**

#### **POLYMER CHEMISTRY**

##### **I. Long answer question:**

1. Write the preparation, properties and applications of BuNa-S and Thiokol Rubber.
2. What is Vulcanization of rubber? Explain with chemical reaction?
3. Explain how conductivity of poly acetylene increased by doping?
4. What are conducting polymers? How conducting polymers are classified?
5. What are biodegradable polymers? Write the preparation, properties and applications of PLA and Poly vinyl alcohol.

##### **II. Short answer questions:**

1. What is an Elastomer?
2. Write down the preparation of Butyl rubber.
3. Define conducting polymers.
4. Define biodegradable polymers.
5. Name the structural unit of natural rubber.
6. Write the structure of isoprene.
7. Write the advantages of vulcanized rubber.
8. Why natural rubbers possess elasticity?
9. Write the applications of conducting polymers.
10. Write down the applications of Butyl rubber.

##### **III. MULTIPLE CHOICE QUESTIONS:**

1. Polymer commonly used in textile industry is
  - a) Rubber
  - b) Nylon
  - c) PVC
  - d) Bakelite
2. Natural rubber is basically a polymer of
  - a) Propylene
  - b) Ethylene
  - c) Isoprene
  - d) Chloroprene
3. Which of the following is an elastomer
  - a) PVC
  - b) Nylon
  - c) Polystyrene
  - d) Butyl rubber
4. Most commonly used reagent for vulcanization of natural rubber is
  - a) Graphite
  - b) Sulphur
  - c) Carbon black
  - d) Dry ice
5. The fibre obtained by the step polymerization of hexamethylene diamine and adipic acid is
  - a) Decron
  - b) Nylon-6,6
  - c) Rayon
  - d) Terylene
6. The following polymer has ester links in its structure
  - a) Nylon
  - b) Bakelite
  - c) PVC
  - d) Terylene

7. The only rubber which cannot be vulcanized is  
a) Butyl rubber      b) Thiokol rubber  
c) Neoprene          d) Nitrile rubber
8. Butyl rubber is produced by co-polymerization of  
a) isobutene and chloroprene      b) isobutene and isoprene  
c) isoprene and chloroprene      d) isoprene and ethylene glycol
9. Which of the following is a conducting polymer?  
a) Polyethylene      b) Polystyrene  
c) Polyacetylene      d) Polypropylene
10. Poly vinyl alcohol is prepared from  
a) Vinyl alcohol      b) Poly vinyl acetate  
c) Vinyl chloride      d) Vinyl cyanide

## **UNIT – 4**

### **ENERGY SOURCES**

#### **I. LONG ANSWER QUESTIONS**

1. Explain proximate analysis of coal and its significance.
2. Explain ultimate analysis of coal in detail
3. Discuss the significance of ultimate analysis of coal in detail.
4. Discuss the refining of crude oil in detail with a neat diagram.
5. What is cracking? Explain fluid or moving bed catalytic cracking with a neat labelled diagram.
6. What is synthetic petrol? Discuss Fisher-Tropsch method with a neat labelled diagram.
7. Write a detailed note on natural gas, LPG and CNG.
8. Define bio diesel? How is it prepared by transesterification of oil/fat? Give its advantages.
9. Explain knocking in IC or petrol engines.
10. Calculate the gross and net calorific value of a coal sample having the following composition  
C = 80 %, H = 7 %, O = 3 % and S = 3.5 %.

#### **II. SHORT ANSWER QUESTIONS**

1. What is calorific value of fuel?
2. Differentiate between HCV and LCV.
3. Give the relationship between HCV and LCV.
4. What is Dulong's formula?
5. Give the significance of moisture content and volatile matter percentage in coal.
6. Write the determination of nitrogen in ultimate analysis.
7. What is the significance of carbon and nitrogen percentage in coal?
8. Write the classification of fuels.
9. Define fractional distillation.
10. What is cracking? Give an example.
11. Write the composition of catalyst in moving bed catalytic cracking.

12. What is knocking of petrol engine?
13. Define octane and cetane number.
14. Give the significance of octane and cetane numbers.
15. Why CNG is preferred over LPG?
16. Write the composition and uses of natural gas.
17. Give the composition and uses of LPG.
18. What is CNG? Give its uses.
19. Write the advantages of biodiesel.
20. Write the equation of trans esterification of biodiesel.

### **III. MULTIPLE CHOICE QUESTIONS**

1. Which gas is responsible for combustion of fuel?  
 a) Oxygen                      b) Hydrogen  
 c) Methane                    d) Nitrogen
2. Bio diesel is prepared from oil/fat by \_\_\_\_\_  
 a) Fischer-Tropsch process                      b) Bergius process  
 c) Catalytic cracking process                    d) Trans esterification process
3. Good fuel should contain \_\_\_\_\_  
 a) High moisture                      b) High calorific value  
 c) High percentage of ash                    d) All
4. The percentage of nitrogen in coal is determined by \_\_\_\_\_  
 a) Kjeldahl method                      b) Cottrell's process  
 c) Fractional distillation                    d) Knocking
5. Octane number of gasoline is defined as the percentage of iso-octane in the mixture of  
 a) octane and hexane                      b) hexadecane and octane  
 c) iso-octane and n-heptane                    d) 2-methyl naphthalene and isooctane
6. Cetane number is defined as the percentage of hexadecane (n-cetane) present in a mixture of  
 a) 2-methyl naphthalene and isooctane                    b) octane and hexane  
 c) iso-octane and n-heptane                    d) hexadecane and 2-methyl naphthalene
7. The chemical formula of water gas is \_\_\_\_\_  
 a) C + H<sub>2</sub>                      b) CO<sub>2</sub> + H<sub>2</sub>O                    c) H<sub>2</sub>O + H<sub>2</sub>                    d) CO + H<sub>2</sub>
8. The largest component of LPG is \_\_\_\_\_  
 a) Decane                      b) Ethane                      c) Methane                    d) Butane
9. LPG is  
 a) Liquefied Petroleum Gas                    b) Liquid Petrol Gas  
 c) Liberated Petroleum Gas                    d) Liquid Powerful Gas
10. Fischer-Tropsch method is used to produce \_\_\_\_\_  
 a) Kerosene                    b) Natural petrol                    c) Synthetic petrol                    d) LPG
11. Octane number is the rating of \_\_\_\_\_  
 a) Petrol knocking                    b) Kerosene knocking  
 c) Diesel knocking                    d) Natural gas knocking

12. \_\_\_\_\_ is the process by which the higher hydrocarbons are decomposed into lower hydrocarbons  
 a) Knocking                      b) Cracking                      c) Doping                      d) Fractional distillation
13. Cottrell's process involves the removal of \_\_\_\_\_ from crude oil.  
 a) Sulphur                      b) Water                      c) CO<sub>2</sub>                      d) Methane
14. In moving bed catalytic cracking, catalyst is \_\_\_\_\_  
 a) Al<sub>2</sub>O<sub>3</sub>                      b) NaOH                      c) CaCO<sub>3</sub>                      d) FeSO<sub>4</sub>
15. Anhydrous CaCl<sub>2</sub> \_\_\_\_\_  
 a) Absorbs H<sub>2</sub>O vapours    b) absorbs CO<sub>2</sub> gas    c) Sulphur gas                      d) Carbon gas

## **UNIT – 5**

### **ENGINEERING MATERIALS**

#### **I. LONG ANSWER QUESTIONS**

1. Write a note on setting & hardening of cement with equations.
2. Define lubricant. Make a note on classification of lubricants.
3. Discuss extreme pressure lubrication in detail.
3. Explain thin layer or boundary mechanism of lubrication with a diagram.
4. Discuss thick layer or hydrodynamic mechanism of lubrication.
5. Make a note on various properties of lubricant.
6. List out the various engineering applications of smart materials.
7. Write down the preparation, properties & applications of poly L-lactic acid.
8. Write down the preparation, properties and applications of poly acryl amides.
9. Discuss preparation, properties and applications of poly vinyl amides.
10. Differentiate between thick film and thin film lubrication mechanism of lubricant.

#### **II. SHORT ANSWER QUESTIONS**

1. What is portland cement?
2. Write the composition of Portland cement?
3. What is hydraulic property of cement?
4. Defining setting of cement.
5. Defining hardening of cement.
6. What is the role of gypsum in cement?
6. List out various functions of lubricant.
7. Write the characteristics of good lubricant.
8. Differentiate between flash point and fire point
9. Define cloud point of lubricant.
10. Define pour point of lubricant.
11. Define smart materials.
12. What are thermo response materials?
13. Define shape memory materials.
14. Define viscosity and how it varies with temperature?
15. Give examples for extreme pressure additives.
16. Which mechanism of lubrication is observed when a shaft starts from rest with heavy load?
17. Which lubrication mechanism is observed at high temperature and pressure conditions?
18. Which apparatus is used to determine flash and fire point of lubricant?
19. Name the apparatus used in determination of viscosity.
20. Define viscosity index.

### III. MULTIPLE CHOICE QUESTIONS

1. Raw materials for Portland cement
  - a) lime stone & gypsum
  - b) lime stone & alumina
  - c) clay & limestone
  - d) lime stone, clay, gypsum & coal powder
2. Major component of Portland cement is
  - a) CaO
  - b) MgO
  - c)  $3\text{CaO} \cdot \text{SiO}_2$
  - d)  $\text{SiO}_2$
3. In the final stage of setting of cement, clinkers are mixed with gypsum
  - a) to increase the rate of setting
  - b) to reduce the rate of setting
  - c) to make the cement soft & porous
  - d) to make the cement more brittle
4. Tobermonite gel is chemically
  - a) hydrated tricalcium aluminate
  - b) hydrated tricalcium silicate
  - c) hydrated tetracalcium silicate
  - d) slaked lime
5. The constituent of cement having least setting time
  - a) C3A
  - b) C3S
  - c) C4A
  - d) C4S
6. Argillaceous material is rich in
  - a) lime
  - b) silica & alumina
  - c) gypsum
  - d) clay
7. Calcareous materials are rich in
  - a) lime
  - b) silica
  - c) gypsum
  - d) clay
8. In the case of liquid lubricants, fire point ----- than flash point
  - a) more
  - b) less
  - c) moderate
  - d) no change
9. Pensky martin apparatus is used to determine
  - a) cloud and pour point
  - b) viscosity
  - c) flash and fire point
  - d) aniline point
10. Pour point of lubricant should be
  - a) high
  - b) low
  - c) unpredictable
  - d) sometimes high and low
11. Boundary film lubrication takes place by
  - a) absorption of lubricant on the surface
  - b) adsorption of lubricant on the surface
  - c) chemical reaction of lubricant with surface
  - d) internal penetration of lubricant
12. With increase in temperature, the viscosity of lubricating oil
  - a) decreases
  - b) increases
  - c) first increases then decreases
  - d) remains un altered
13. The lubricant used in boundary lubrication is
  - a) Graphite
  - b)  $\text{MoS}_2$
  - c) oil suspension of both
  - d) all the above
14. A lubricant used for thick film lubrication
  - a) Hydrocarbon oils
  - b) Graphite
  - c) mixture of polymoline and castor oil
  - d)  $\text{MoS}_2$
15. A lubricant can decompose due to
  - a) Oxidation
  - b) Hydrolysis
  - c) Pyrolysis
  - d) All the above