Total No. of Questions : 11]

SEAT No. :

PD-4036

[Total No. of Pages : 4

[6401]-2403

F.E.

BSC-103-BES : ENGINEERING CHEMISTRY

(2024 Pattern) (Semester - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve Q.No.2 or Q.No.3, Q.No.4 or Q.No.5, Q.No.6 or Q.No.7, Q.No.8 or Q.No.9, Q.No.10 or Q.No.11.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
6) ***Assume suitable data, if necessary.***

Q1) Multiple Choice Questions :

i) Temporary hardness is also known as _____. **[1]**

a) Non Carbonate hardness b) Carbonate hardness

c) Total hardness d) None alkaline hardness

ii) EDTA method is used to determine hardness of water by _____ titration. **[1]**

a) Precipitation b) Redox

c) Acid base d) Complexometric

iii) The rate in decrease of intensity of radiation is directly proportional the concentration of fixed path length of solution is the statement of _____. **[1]**

a) Beer's Law b) Lamberts Law

c) Beer-Lamberts Law d) None of these

iv) When absorption maxima shifts towards longer wavelength, known as _____ shift. **[1]**

a) Hypsochromic b) Hyperchromic

c) Hypochromic d) Bathochromic

P.T.O.

v) Which among the following is an example of Quantum dots? **[1]**

a) K b) Cdse

c) A_5F_5 d) Se

vi) The oxidising reagent for P-doping is _____ **[1]**

a) Iodine vapours b) $FeCl_2$

c) Lithium metal d) Sodium napthalide

vii) Boys gas calorimeter is used for determination of GCV of _____. **[1]**

a) Solid fuel b) Non volatile liquid

c) Gaseous fuel d) None of above

viii) Reaction taking place on the anodic areas is _____ **[1]**

a) Oxidation b) Reduction

c) Neutralisation d) Addition

ix) Kjeldahls method is used for determination of _____ from coal. **[1]**

a) Hydrogen b) Nitrogen

c) Sulphur d) Carbon

x) Which of the film is protective? **[1]**

a) Non porous b) Porous

c) Volatile d) None of the above

Q2) a) Explain the causes of scales in boiler. Give two disadvantages and two methods of prevention. **[6]**

b) Define reverse Osmosis. Give its two advantages & two limitations. **[3]**

c) 25 ml of hard water sample required 11.2 ml 0.01 MEDIA to reach the end point. 25 ml of the same water sample after boiling and filteration required 7.9 ml of the same EDTA to reach the end point. Calculate total, temporary and permanent hardness of water. **[3]**

OR

Q3) a) Explain Zeolite process for softening of water with figure, process, ion exchange and regeneration reaction, two advantages. **[6]**

b) State the causes of foaming when it takes place in boiler and give remedial measures for its prevention. **[3]**

c) 25 ml water sample requires 3.7ml of 0.01 NHCl up to phenolphthalein end point and 7.4 ml upto methyl arange end point during the titration. Calculate types and amount of alkalinity present in water. **[3]**

Q4) a) Explain pH metric titration curve between strong acid and strong base. Give the reaction, titration curve and calculations. **[6]**

b) Explain any three applications of UV-visible spectroscopy. **[3]**

c) Give the composition of the membrane of the ion selective electrode used to detect **[3]**

i) H^+

ii) F^-

iii) Cl^-

OR

Q5) a) Draw block diagram of Double beam UV-visible spectrophotometer. Explain its any four components and give their function. **[6]**

b) Give the construction with neat, labeled diagram and representation of calomel electrode. **[3]**

c) Define : **[3]**

i) Cell constant

ii) Specific conductance

iii) Equivalent conductance

Q6) a) What is conducting polymer? Give structural requirement for conducting polymer. Explain doping reactions and given two applications. **[6]**

b) What are quantum dots? Give any two types of quantum dots and it's two applications. **[3]**

c) What are carbon nanotubes? Give their types and two applications. **[3]**

OR

Q7) a) Explain the structure of Graphene with diagram and mention it's four properties and two applications. **[6]**

b) Define Biodegradable polymer. Discuss any two factors responsible for biodegradation of polymer. **[3]**

c) Give the structure of polycarbonate. Mention its two properties and two applications. **[3]**

Q8) a) What is power alcohol? Give the procedure and reaction for preparation of ethanol. Give its two advantages and two disadvantages. **[6]**

b) Give any three characteristics of an ideal fuel. **[3]**

c) 1.2 gm of coal sample was heated in silica crucible in an electric oven at 110°C for 1 hr. The residue weighed 1.16 gm. The crucible was ignited to a constant weight of 0.09 gm. In another experiment 1.2 gm of sample was heated in a silica crucible covered with vented lid of 950°C for 7 min. After cooling the residue weighted 0.80 gm. Calculate % m, % VM and % Ash content. **[3]**

OR

Q9) a) Describe the construction and working of Bomb calorimeter with diagram for determination of GCV of fuel. State the formula to calculate GCV. **[6]**

b) Explain the production of hydrogen by steam reforming of hydrocarbon (methane) with reaction conditions. **[3]**

c) 0.24 gm of coal sample on complete combustion gave 0.792 gm of CO_2 and 0.0216 gm of H_2O. Calculate carbon and hydrogen percentage. **[3]**

Q10)a) Explain the mechanism of Dry corrosion with figure give the reaction and types of oxide film formed in Mg, Cr. **[6]**

b) i) Define Electroplating. Give its two application and two disadvantages. **[3]**

ii) Explain the cathodic protection by sacrificial anode for corrosion control and prevention. **[3]**

OR

Q11)a) Define wet corrosion. Give conditions for wet corrosion. Explain hydrogen evolution mechanism of wet corrosion with suitable example. **[6]**

b) i) Discuss any three factors affecting rate of corrosion. **[3]**

ii) What are anodic and cathodic coatings? Which is more protective? **[3]**