Total No. of Questions : 6]

SEAT No. :

PE-12174

[Total No. of Pages : 4

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BSC-103-BES : Engineering Chemistry

(2024 Pattern) (Semester - I/II)

Time : 2½ Hours] *[Max. Marks : 60*

Instructions to the candidates :

1) *All questions are compulsory.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
4) *Assume suitable data, if necessary.*

Q1) Multiple Choice Questions. **[10]**

i) Which of the following is an example of suspended impurities in water?
   a) Dissolved Salt b) Bacteria
   c) CO_2 d) Clay and mud

ii) The process of removing dissolved ionic impurities from water by passing a direct current using electrodes and ion selective membrane pairs is called as ____
   a) Osmosis b) Electrodialysis
   c) Reverse osmosis d) Distillation

iii) The resistance offered by a cube of unit length to the passage of electricity through it is called _____
   a) Specific resistance b) Specific conductance
   c) Resistance d) Conductance

iv) When absorption maxima of a compound shifts to longer wavelength, it is known as _____
   a) Bathochromic shift b) Hyperchromic shift
   c) Hypsochromic shift d) Blue shift

v) Polymers that do not become soft on heating and hard on cooling are _____
   a) Thermosetting polymer b) Thermoplastic polymer
   c) Thermo elastic polymer d) Thermotropic polymer

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vi) Applications of Quantum dots are _____

a) Light emitting diode b) Photo detectors

c) Biological analysis d) All of these

vii) Biodiesel is obtained from vegetable oil by process called as _____

a) Oxidation b) Reduction

c) Transestrification d) Hydrogenation

viii) Caloritic value of gaseous fuel is determined by _____

a) Boys gas calorimeter b) Bomb calorimeter

c) Calorimeter d) Junkers calorimeter

ix) Example of anodic coating is _____

a) Cu on Fe b) Zn on Fe

c) Ag on Fe d) Sn on Fe

x) Electrolyte used for electroplating of copper on iron is _____

a) NaOH b) KOH

c) $CuSO_4$ d) $ZnSO_4$

Q2) **Solve any 2 :**

a) Explain the zeolite process for water softening with a neat diagram. Give exchange and regeneration reactions and any two disadvantages. **[5]**

b) Define scale. Explain any three causes of scale formation. List down any two disadvantages of scale formation. **[5]**

c) i) A 50 ml water sample requires 12.6 ml of 0.02 m EDTA for the end point. The same volume of boiled water requires 7.3 ml of 0.02 m EDTA. Calculate the total hardness, permanent hardness and temporary hardness of the water sample. **[3]**

ii) Define - Hard water and soft water. **[2]**

d) A 25 ml water sample requires 5.4 ml of 0.025 N HCl up to phenolphthalein end point and 8.7 ml of 0.025 N HCl upto the methyl orange end point. Calculate the types and amount of alkalinity present in the water sample. **[5]**

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Q3) **Solve any 2 :**

a) Explain the construction of a calomel electrode with a neat labeled diagram and give its electrode representation and two disadvantages. **[5]**

b) Describe any Four factor affecting conductance. Give any Two applications of conductometry. **[5]**

c) Explain the various stages of pH metric titration of a strong acid with a strong base. Draw the titration curve and write the reaction involved. **[5]**

d) Draw diagram of double beam UV - visible spectrophotometer and state the function of any three components of UV - visible spectrophotometer. **[5]**

Q4) **Solve any 2 :**

a) What are conducting polymers? Explain the structural requirements of conducting polymer. Describe any one process of doping in polymer. **[5]**

b) Give the preparation of polycarbonate. Write any three properties and three applications of polycarbonate. **[5]**

c) Define Nanomaterial. Explain the classification of nanomaterials based on dimension. **[5]**

d) Explain the structure of Grapheme with the help of neat diagram. Mention any two properties and any two applications of Grapheme. **[5]**

Q5) **Solve any 2 :**

a) Explain the working of Bomb calorimeter with diagram for determination of GCV of solid fuel. Give the formula for GCV. **[5]**

b) Write the chemical reactions involved in the production of Ethanol. State any Four advantages and any two disadvantages of power alcohol. **[5]**

c) 1.50 gm of coal sample was heated in silica crucible at 110°c for 1 hour. The weight of the residue was 1.43 gm. The residue was then heated in a crucible covered with a vented lid for exactly 7 minutes at 950°c. The residue weighted 1.03 gm. The crucible was then heated without lid to a constant weight of 0.18 gm. Calculate % moistrue, volatile matter, ash and fixed carbon. **[5]**

d) 0.25 gm of coal sample on burning in a combustion chamber in a current of oxygen increased the weight of KOH u. tube by 0.69 gm and $CaCl_2$ u tube by 0.18 gm. Find % C and % H in coal.

The same coal sample in determination of sulphar gave precipitate of $BaSO_4$ weighing 0.12 gm calculate % S in coal. **[5]**

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Q6) **Solve any 2 :**

a) What is pilling Bedworth ratio? Give its significance. Give the chemical reaction and nature of oxide films formed due to oxygen on metals Na and Al. **[5]**

b) What is the principle of cathodic protection? Explain Cathodic protection by the sacrificial anode with diagram for corrosion protection. Give its two applications. **[5]**

c) What is wet corrosion? Explain the hydrogen evolution mechanism of wet corrosion with a neat labeled diagram. **[5]**

d) Explain any five factors affecting the rate of corrosion. **[5]**

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