

PE-12174

[Total No. of Pages : 4

[6581]-2405

F.E

BSC-103-BES : Engineering Chemistry
(2024 Pattern) (Semester - I/II)

[Max. Marks : 70]

- 1) Q. No. 1 is compulsory.
- 2) Solve Q2, or Q3, Q4 or Q5 Q6, or Q7 Q8 or Q9 Q10 or Q11.
- 3) Figures to the right indicate full marks.
- 4) Neat diagrams must be drawn wherever necessary.
- 5) Assume suitable data, if necessary.
- 6) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

Q1) Multiple Choice Questions.

- i) Zeolite is regenerated by washing Zeolite bed with solution of _____ [1]
a) NaCl b) $MgCl_2$
c) HCl d) $CaCl_2$
- ii) A semipermeable membrane allows the flow of _____ [1]
a) Solvent molecules
b) Solute molecules
c) Both solute & solvent molecules
d) Neither solute & solvent molecules
- iii) Calomel electrode is made by using _____ [1]
a) Hg with mercurous chloride b) Zn with mercurous chloride
c) Mg with mercurous chloride d) Ca with mercurous chloride
- iv) The ratio of specific conductance to that of observed conductance is called as _____ [1]
a) Specific resistance b) Molar conductance
c) Equivalent conductance d) Cell constant
- v) Quantum dot is _____ nanomaterial. [1]
a) Zero dimensional b) One dimensional
c) Two dimensional d) Three dimensional

P.T.O.

- vi) Biopol is a trade name of _____ [1]
 a) Polylactic acid
 b) Polyacetylene
 c) Polycarbonate
 d) Poly (hydroxy butyrate - hydroxyvalerate)
- vii) Power alcohol is _____ blended with petrol. [1]
 a) Water
 b) Kerosene
 c) Ethanol
 d) Benzene
- viii) Lithium ion battery uses _____ as an anode. [1]
 a) Copper
 b) Aluminium
 c) Porous carbon
 d) Zinc
- ix) Corrosion between dissimilar metals is called as _____. [1]
 a) Galvanic corrosion
 b) Dry corrosion
 c) Oxidation corrosion
 d) Concentration cell corrosion
- x) An example of anodic coating is _____ on iron metal. [1]
 a) Zinc
 b) Chromium
 c) Nickel
 d) Copper

- Q2) a) Define Temporary & Permanent hardness of water. Explain the process for determination of total hardness with suitable chemical reactions involved. [6]
 b) Give the principle of electrodialysis & draw neat labelled diagram. [3]
 c) A water sample was non alkaline to phenolphthalein. However 50 ml of alkaline water sample on titration with 0.02 N H_2SO_4 required 10.5 ml to get methyl orange end point. Find types & amount of alkalinities in water. [3]

OR

- Q3) a) What are scales & sludges? Explain any 3 causes & enlist any 2 disadvantages of scales in boilers. [6]
 b) Give exchange reactions with zeolite if water contains salts like $CaCl_2$, $MgSO_4$, $Ca(HCO_3)_2$. [3]
 c) 25 ml hard water consumed 8.5 ml 0.01 M of EDTA where as 25 ml of boiled water consumed 5 ml of same EDTA. Calculate Total, permanent & temporary hardness of above water sample. [3]

- Q4) a) Explain various stages of conductometric titration for strong acid and strong base with titration curve & reaction involved in it. Also write any 2 applications of conductometry. [6]
- b) Draw a labelled diagram of glass electrode. Write its cell representation & give any 2 advantages. [3]
- c) Define - [3]
- Auxochrome
 - Chromophore
 - Bathochromic shift

OR

- Q5) a) With the help of energy diagram, explain different types of transitions with suitable example, involved in organic molecule after absorbing UV radiations. [6]
- b) Which electrodes are used in pH metric titration? Explain the process for calibration of pH meter. [3]
- c) What are ion selective electrodes? Give construction & diagram of ion selective electrode for fluoride ion determination. [3]

- Q6) a) What are carbon nanotubes? Discuss different types of carbon nanotubes w.r.t. their structure. [6]
- b) Compare polymers on the basis of action of heat. [3]
- c) Give the reaction involved in preparation of polycarbonate. Write any 2 applications of it. [3]

OR

- Q7) a) What is conducting polymer? What are structural requirements of conducting polymers? Explain P-doping & n-doping with reactions. [6]
- b) What are nanomaterials? Classify on the basis of dimensions w.r.t. example (any 2). [3]
- c) Explain the structure of graphene with diagram. Write any 2 applications of it. [3]

- Q8) a) Draw a neat labelled diagram & give construction, working of Bomb calorimeter to determine GCV of a fuel. State the formula for GCV & NCV of a solid fuel. [6]
- b) Explain the process with formula to calculate % C & % H by ultimate analysis of coal. [3]
- c) 1 gm of coal was heated for 1 hr at 110°C , weight of residue was 0.9 gm. The crucible then heated to a constant weight of 0.02 gm. In another expt. 1 gm of sample was heated at 925°C , 7 min, the weight of residue was 0.40 gm. Calculate % of fixed carbon present in coal. [3]

OR

- Q9) a) What is biodiesel? Give preparation reaction of biodiesel. Write any 4 advantages & any 2 limitations. [6]
- b) Explain hydrogen production by steam reforming of coke with reaction conditions. Give process of CO_2 removal. [3]
- c) The following data was obtained in Boy's gas calorimeter experiment
 Volume of gas burnt at STP = 0.1m^3
 Mass of cooling water = 30 kg
 Temperature of water inlet & water outlet = 22°C & 30°C resp.
 Mass of condensed steam = 0.08 kg
 Calculate GCV & NCV of the fuel. [3]

- Q10) a) Explain hydrogen evolution & oxygen absorption mechanism of wet corrosion. [6]
- b) i) Explain the process of cathodic protection using sacrificial anode with diagram. [3]
- ii) What are anti corrosive paints? Give any 4 advantages using nanoparticles in paints. [3]

OR

- Q11) a) Describe Galvanising & Tinning with suitable diagram. [6]
- b) i) Explain any 3 factors affecting rate of corrosion w.r.t. nature of environment. [3]
- ii) Give the reaction & type of oxide film formed in the oxidation of Na & Cr metal. [3]

