

Total No. of Questions : 11]

SEAT No. :

PC5149

[Total No. of Pages : 4

[6351]-113

F.E.

**BSC - 103 - BES : ENGINEERING CHEMISTRY
(2024 Pattern) (Credit System) (Semester - I)**

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve Q.2 or Q.3, Q.4 or Q.5, Q.6 or Q.7, Q.8 or Q.9, Q.10 or Q.11.

Q1) Multiple Choice Questions.

[10]

- a) The colour of Metal -EDTA complex is _____
- | | |
|-----------|----------------|
| i) blue | ii) wine red |
| iii) pink | iv) colourless |
- b) The process of removing salts from brackish water is _____
- | | |
|-------------------|--------------------|
| i) desalination | ii) degasification |
| iii) distillation | iv) degradation |
- c) Which of the following electronic transition requires the highest energy
- | | |
|----------------------------------|---------------------------------|
| i) $\sigma \rightarrow \sigma^*$ | ii) $\eta \rightarrow \pi^*$ |
| iii) $\pi \rightarrow \pi^*$ | iv) $\eta \rightarrow \sigma^*$ |
- d) In conductometric titration between strong acid and strong base reaction, the conductance of the solution _____
- | |
|--|
| i) decreases upto endpoint & then increases |
| ii) increases upto endpoint & then decreases |
| iii) increases upto endpoint & then remains constant |
| iv) decreases upto end point & then remains constant |
- e) Polymers that do not become soft on heating & hard on cooling are _____
- | | |
|-----------------------------|----------------------------|
| i) thermoplastic polymers | ii) thermosetting polymers |
| iii) thermoelastic polymers | iv) thermotropic polymers |

P.T.O.

- f) Graphene is _____ nanomaterial.
- i) zero dimensional ii) one dimensional
 iii) two dimensional iv) three dimensional
- g) Kjeldahl's method is used for determination of _____
- i) % N ii) % C
 iii) % O iv) % Ash
- h) $NCV = GCV - \text{_____} \times H \times 587 \text{ cal/gm.}$
- i) 0.9 ii) 0.09
 iii) 9.0 iv) 90.0
- i) PBR gives an idea regarding _____
- i) Nature of oxide film formed ii) Rate of neutralisation
 iii) quality of fuel iv) pH
- j) The process of coating tin on steel to prevent it from rusting is called as _____
- i) tinning ii) galvanisation
 iii) annealing iv) silver plating

- Q2)** a) What are scales & sludges? Explain the causes of scale formation in boiler. **[6]**
- b) Explain reverse osmosis process with figure. **[3]**
- c) The hardness of 50,000 litres of a water sample was removed by passing it through a zeolite softener. The softener required 250 litres of NaCl containing 100 gm/lit of NaCl for regeneration. Calculate hardness of water. **[3]**

OR

- Q3)** a) What is hardness of water? Explain the procedure of EDTA method for determination of total hardness. Give formula for total hardness and reactions involved. **[6]**
- b) Give cation & anion exchange reaction for deionisation of water containing $MgCl_2$. **[3]**
- c) 100 ml of water sample on titration with N/50 HCl required 7.6 ml for phenolphthalein end point & 15.2ml for total alkalinity reading. Identify type & amount of alkalinity present in water sample. **[3]**

- Q4)** a) State Beer's law and Lambert's law. Draw diagram of double beam spectrophotometer & state the function of any 2 components of spectrophotometer. [6]
- b) Draw a labelled diagram of calomel electrode. Write its cell representation & give any 2 disadvantages. [3]
- c) Define:- [3]
- i) Specific conductance
 - ii) Molar conductance
 - iii) Cell constant

OR

- Q5)** a) Explain various stages of pH metric titration for strong acid and strong base with titration curve and reaction involved. Give any 2 applications of pH metry. [6]
- b) Explain any 3 applications of conductometry. [3]
- c) Define:- [3]
- i) Auxochrome
 - ii) Hypso chromic shift
 - iii) Hyper chromic shift

- Q6)** a) What are bio degradable polymers? Explain factors responsible for bio degradation. Draw structure of (biopol) PHBV & give its 2 applications. [6]
- b) Give structure, 2 properties & 2 applications of polycarbonate. [3]
- c) What are quantum dots? Give any 2 types of quantum dots. Write any 2 applications of it. [3]

OR

- Q7)** a) Explain structure of graphene with diagram. Give its 3 properties and 3 applications. [6]
- b) What are nanomaterials? Classify it on the basis of zero and one dimensional with respect to example of each. [3]
- c) Define conducting polymers. Explain p-doping with reaction. [3]

- Q8) a)** What is proximate Analysis? Explain the procedure with formula used for determination of various constituents. [6]
- b) What are Li ion batteries? Explain its construction. [3]
- c) The following observations were noted in Boy's gas calorimeter experiment- [3]

Volume of gas burnt at STP = 0.1 m^3 ,

Mass of cooling water used = 27kg,

Temperature of inlet & outlet water are 24°C & 29°C respectively.

Mass of steam condensed = 0.04kg

Find GCV and NCV of the fuel

OR

- Q9) a)** Explain production of hydrogen gas by steam reforming of methane & coke with reaction conditions & method for removal of CO_2 gas. [6]
- b) Give preparation with reaction of power alcohol. [3]
- c) 2.4 gm of coal in quantitative analysis gave 0.20 gm of BaSO_4 . Calculate % S in the coal. [3]

- Q10)a)** What is wet corrosion? Give the conditions under which wet corrosion occurs. Explain hydrogen evolution mechanism of wet corrosion. [6]
- b) i) Explain any 3 factors affecting rate of corrosion with respect to nature of metal. [3]
- ii) What are anodic & cathodic coatings? Which is better? [3]

OR

- Q11)a)** Explain cathodic protection method using sacrificial anode with figure. Give any 2 advantages & any 2 applications of it. [6]
- b) i) Explain the process of galvanising on steel with the help of suitable diagram. [3]
- ii) Give the reaction & type of oxide film formed in the oxidation corrosion of Cr & Mo metal. [3]

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