Total No. of Questions : 6]

SEAT No. :

**PF12251**

[Total No. of Pages : 4

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**F.E.**

# BSC-103-BES : ENGINEERING CHEMISTRY

**(2024 Credit Pattern) (Semester-I/II)**

*Time : 2½ Hours]* *[Max. Marks : 60*

***Instructions to the candidates:***

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Use of logarithmic tables slide rule, mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

***Q1)*** Multiple choice questions. **[10]**

a) In alkalinity experiment, phenolphthalein end point is _____

i) pink to colourless ii) yellow to red

iii) colourless to pink iv) red to yellow

b) In case of reverse osmosis, flow of water through semi permeable membrane from higher conc. to lower conc. takes place when _____

i) applied pressure < osmotic pressure

ii) applied pressure = osmotic pressure

iii) applied pressure > osmotic pressure

iv) applied pressure = 0

c) In conductometric of strong acid strong base titration (base is in burette), the conductance of the solution _____

i) decrease upto endpoint & then increases

ii) increase upto endpoint & then decreases

iii) increases upto endpoint & then remains constant

iv) decrease upto endpoint & then remains constant

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d) In glass electrode, potential is produced across the membrane which is used to measure _____

i) pH of solution
ii) pressure
iii) volume
iv) temperature of solution

e) Carbon nanotubes are _____ nanomaterials.

i) 0 D
ii) 1 D
iii) 2 D
iv) 3 D

f) Thermoplastic polymers _____

i) becomes soft on heating but do not become hard on cooling
ii) becomes soft on heating and hard on cooling
iii) do not become soft on heating
iv) not affected by heat

g) Power alcohol is _____ blended with petrol

i) Water
ii) Kerosene
iii) Ethanol
iv) Benzene

h) _____ is used as an electrolyte in lithium ion battery.

i) Aqueous KOH
ii) Aqueous sodium salt
iii) $NH_4Cl$
iv) Lithium salt in organic solvent

i) According to pilling Bedworth rule, if PBR<1, then oxide film is _____

i) porous
ii) non porous
iii) volatile
iv) unstable

j) An example of tinning is forming a coat of _____ on iron metal.

i) Zinc
ii) Tin
iii) Nickel
iv) Cadmium



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***Q2)*** Solve any two:

a) Define scales. Explain any 3 causes for scale formation & give it's 2 disadvantages. **[5]**

b) What is electrodialysis? Draw a neat labelled diagram of electrodialysis cell. Give any 2 advantages & any 2 limitations of it. **[5]**

c) A zeolite bed was exhausted by passing 4000 litres of water sample. It requires 20 litres of 10% NaCl solution for regeneration. Find hardness of water. **[5]**

d) i) 50 ml of hard water sample required 10 ml of 0.02m of EDTA in titration 50ml same water sample after boiling & filtration on titration with same EDTA required 7 ml of it. Calculate total, temperory & permanent hardness of water. **[3]**

ii) Define temporary hardness & permanent hardness. **[2]**

***Q3)*** Solve any two:

a) What is reference electrode? Explain calomel electrode with the help of diagram, cell representation & write any 2 limitations. **[5]**

b) Explain different types of transitions with suitable example involved in UV visible spectroscopy. **[5]**

c) Explain various stages of pH metric titration for strong acid & strong base with titration curve & reaction involved in it. **[5]**

d) What is conductance? List down any 4 factors affecting conductance & give any 2 applications of conductometry. **[5]**

***Q4)*** Solve any two:

a) Give reaction for preparation of polycarbonate with its any 4 properties & any 2 applications. **[5]**

b) Define biodegradation. Explain the factors responsible for biodegradation & write any 2 applications of biodegradable polymers. **[5]**

c) Explain the structure of graphene with suitable diagram. Give its 2 properties & 2 applications. **[5]**

d) What are nanomaterials? Explain its classification based on dimensions. **[5]**



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***Q5)*** Solve any two:

a) Explain production of hydrogen gas by steam reforming of methane & coke with reaction conditions. **[5]**

b) What is biodiesel? Give procedure & reaction for preparation of biodiesel. **[5]**

c) 1.9 gm of coal when heated in silica crucible in an electric oven at 110ºC 1 hr, the residue weighted 1.80gm. The crucible was the ignited to a constant weight of 0.095gm. In another expt. 1.9 gm of coal when heated in a silica crucible with vented lid at 950ºC, 7 min. The weight of residue was 1.6 gm. Calculate % of fixed carbon by proximate analysis. **[5]**

d) 0.80 gm of coal sample containing 4% H on complete combustion in a bomb calorimeter increased the temperature of water from 22ºC to 25ºC. The calorimeter contains 1800gm of water & the water equivalent of calorimeter is 500 gm. The corrections are cooling correction = 0.015ºC, fuse wire correction - 10cal acid correction = 75cal. Calculate GCV & NCV of coal. **[5]**

***Q6)*** Solve any two:

a) Describe any 5 factors affecting rate of corrosion. **[5]**

b) Explain cathodic protection method using sacrificial anode with figure, any 2 advantages & any 2 applications. **[5]**

c) Define corrosion. Explain hydrogen evolution mechanism of wet corrosion with suitable example. **[5]**

d) Define anodic coating & cathodic coating. Explain the process of galvanising with the help of suitable diagram. **[5]**



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