Total No. of Questions – [3] Total No. of Printed Pages: 4

G.R. No.	

PAPER CODE	U112-204B(BE)

DEC **2022(INSEM+ ENDSEM) EXAM**

F.Y. B. TECH. (SEMESTER - 2)

COURSE NAME: ENGINEERING CHEMISTRY

COURSE CODE: ES10204B

(PATTERN 2020)

Time: [2Hr] [Max. Marks: 60]

(*) Instructions to candidates:

1) **Figures to the right indicate full marks.**
2) **Use of scientific calculator is allowed**
3) **Use suitable data where ever required**

Q.1 Solve the following

i) Hardness due to 27.2 mg/L of $CaSO_4$ can be expressed in terms of $CaCO_3$ equivalent as _____. [2]

a) 10 mg/L
b) 5 mg/L
c) 20 mg/L
d) 1 mg/L

ii) Which of the following statements are correct? [2]

i)Disinfection by chlorine is costlier than ozone.
ii) Chloramine is much more lasting than chlorine alone and consequently, it is a better bactericidal than chlorine alone.
iii) Bleaching powder introduces calcium in water, thereby making it more hard.
iv) Bleaching powder is stable and does not deteriorate on keeping.

a) i & ii
b) iii & iv
c) ii & iii
d) i & iii

iii) A Zeolite softener was exhausted, when 1000 liters of hard water was passed through it, the softener was regenerated by passing NaCl solution which replaced 700 gm $CaCO_3$ equivalent hardness captured in the bed. What was the hardness of water? [2]

a) 0.7ppm
b) 0.012 ppm
c) 700 ppm
d) 11.9 ppm

iv) 20 ml of a sample of water consumes 11 ml of 0.05 M EDTA. Calculate total hardness in ppm. [2]
a) 50 ppm
b) 1735 ppm
c) 9090.9 ppm
d) 2750 ppm

v) Exhausted cation exchange resin is regenerated by____ and anion exchange resin by _____ respectively in Ion exchange process of water softening. [2]
a)–SO_3H &–NMe_3OH
b) dil NaOH & dil HCl
c) dil NaCl and dil NaOH
d) dil HCl and dil NaOH

vi) 25 ml of standard hard water containing 1 mg/ml $CaCO_3$ when titrated against EDTA using EBT indicator required 20 ml for the end point. Hence 1 ml of EDTA solution reacts with_____of $CaCO_3$ hardness. [2]
a) 1.25 mg
b) 12.5 mg
c) 2.50 mg
d) 125 mg

vii) Calculate temporary and permanent hardness of water from following data. Ca $(HCO_3)_2$ = 16.2 ppm, Mg $(HCO_3)_2$ = 14.6 ppm, $CaSO_4$ = 13.6 ppm, $MgCl_2$ = 9.5 ppm and NaCl = 5.85 ppm. [2]
a) 20 and 20 ppm
b) 20 and 30 ppm
c) 15 and 30 ppm
d) 20 and 40 ppm

viii) A water sample has hardness of 640 mg/l. After boiling the hardness of water is reduced by 40 mg/l, then the permanent hardness of water is [2]
a) 600 ppm
b) 40 ppm
c) 640 ppm
d) 680 ppm

ix) _____ is used in security ink and _____ is used in probe of scanning electron microscope respectively. [2]
a) Carbon black and CNT
b) Quantum dots and CNT
c) Graphene and Quantum dots
d) Fullerene and Graphene

x) _____ ingredient imparts colour to cement and _____ helps to retard the setting action of cement respectively. [2]
a) Lime and Silica
b) Iron oxide and Calcium Sulphate
c) Alumina and Calcium Sulphate
d) Silica and Alumina

xi) During discharging, Li-ions are dissociated from anode and migrate through electrolyte to cathode which is called as _____ and during charging, lithium from cathodic material is ionized and move towards negative electrode which is called as _____ respectively. [2]
a) Intercalation and Deintercalation
b) Activation and Deactivation

c) Deactivation and Activation

d) Deintercalation and Intercalation

Match the following for the recycling of polymers: [2]

P	Primary recycling	I	energy from plastic by burning or incineration
Q	Secondary recycling	II	chemical or thermal treatment to transform waste plastic into their monomers and fuels
R	Tertiary recycling	III	regrinding, remelting and reforming
S	Quaternary recycling	IV	physical and thermal reprocessing into secondary product

a) P-I, Q-II, R-III, S-IV
b) P- II, Q-III, R – IV, S-I
c) P- III, Q-IV, R-II, S-I
d) P-IV, Q-III, R – II, S-I

xiii) Which of the following is responsible for high strength in cement? [2]
(i) C_2S (ii) C_3S (iii) C_3A (iv) C_4AF
a) (ii) and (iii)
b) (i) and (ii)
c) (iii) and (iv)
d) (i) and (iii)

xiv) Liquid crystal display work on the principle of_____and it uses _____ liquid crystal. [2]
a) blocking light for display and Nematic Liquid crystal
b) emitting light for display and Smectic Liquid crystal
c) generating light for display and Cholesteric Liquid crystal
d) refracting light for display and Nematic Liquid crystal

xv) Select the sentences that are applicable for Glass fiber reinforced polymer [2]
(i) They use glass fibers reinforced in polymer matrix containing nylons, polyesters
(ii) They show very low tensile strength and very low impact resistance
(iii)They show excellent resistance to corrosion and chemicals.
(iv) They are used in making racing bicycles.
(v) They are used in making storage tanks

a) (i), (iii), (v)
b) (i), (ii), (iv)
c) (ii), (iii), (iv)
d) (i), (ii), (iii)

Q2 Solve any three out of four

a) Predict and draw graphs in the following conductometric titration and show equivalence point of titration. Explain the nature of graph before and after equivalence point [5]
1) HCl vs NaOH (NaOH taken in burette)
2) NH_4OH vs HCl (NH_4OH taken in burette)

b) Predict the electrode system used for pH metric titration. If hydrochloric acid is to be titrated with KOH, what will be the steps involved in the titration? Predict and draw the nature of graph of pH verses volume of KOH added from burette. How the end point of the titration is calculated? [5]

c) Calculate the possible no. of fundamental vibrations in [5]
i) NO ii) CH_4 iii) NH_3 iv) H_2O v)C_6H_6

d) **1)**What are the possible electronic transitions in the following molecules when they are exposed to UV-Visible radiations? [5]

i) CH_2=CH– CH_2– CH_2– CH= CH_2

ii) CH_3– CH_2–OH

2) Why trans Stilbene absorbs at higher wavelength than cis Stilbene in UV-Visible spectroscopy?

3)Identify the type of shift in λ_{max} value observed when aniline is treated with acid in UV-Visible spectroscopy.

Q.3 **Solve any three out of four**

a) Identify the type of the oxide films formed on the surface of following metals. Predict whether the film will be corrosion protecting or will not be corrosion protecting [5]
i) Mg ii) Cr iii) Na iv) Al v) Cu

b) Identify & explain the mechanism of wet corrosion if iron bar is exposed to humid atmosphere. [5]
Write reactions that will take place at anode and cathode. Suggest any two methods to minimize the corrosion of the iron bar.

c) Identify in the following pairs, which will undergo faster corrosion out of case 1 and case 2? [5]
why?

Sr. No.	Case 1	Case2
1	Iron plate with galvanized screws	Iron plate with brass screws
2	Iron in contact with solution of pH 2	Iron in contact with solution of pH 6

d) **1) Give reason:** [5]
i) The rate of corrosion of ship hull is faster in sea water than in river water
ii) The corrosion of metal is fast in humid atmosphere than in dry atmosphere
iii) The rate of corrosion is faster if anodic area is smaller than the cathodic area
2) Identify the most appropriate and economical corrosion protection method for following examples.
i) Concentrated hydrochloric acid stored in steel tank, chemical reactors
ii) Buried steel pipelines, Ship hull, Buried cables