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

G.R. No.	

PAPER CODE	U111 – 204B (BACKLOG)

DECEMBER 2021(INSEM+ ENDSEM) EXAM

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

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 13.6 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) If total hardness of water is 380 ppm and non-carbonate hardness of water is 300 ppm, then permanent hardness of water is **[2]**

a)80 ppm
b)300ppm
c)680 ppm
d)None of the above

iii) A Zeolite softener was exhausted, when 2000 litres of hard water was passed through it, the softener was regenerated by passing NaCl solution which replaced 1500 gm $CaCO_3$ equivalent hardness captured in the bed. What was the hardness of water? **[2]**

a) 0.075ppm
b) 300 ppm
c) 750 ppm
d) 3000 ppm

iv) 50 ml of a sample of water consumes 10 ml of 0.01 M EDTA. Calculate total hardness in ppm. **[2]**

a) 200 ppm
b) 100 ppm
c) 300 ppm
d) 120 ppm

v) Cation exchange resin has functional group____ and anion resin has functional group _____ respectively. [2]

a)–SO_3H &–NMe_3OH

b)–NMe_3OH &–CH_4

c)–CH_4 & –OH

d)–SO_4 & –OH

vi) If 8% NaCl solution is used for regeneration of zeolite, calculate the amount of $CaC0_3$ equivalent hardness which can be removed by one litre of NaCl solution. [2]

a) 68376.06 mg
b) 68.376 mg
c) 6.8376 gm
d) 683.76 gm

vii) Which of the following statements are **not correct**? [2]

i) Disinfection by chlorine is costlier than disinfection by 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 harder.
iv) Bleaching powder is stable and does not deteriorate on keeping.

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

viii) A water sample has hardness of 280 mg/l. After boiling the hardness of water is reduced by 40 mg/l, then the permanent hardness of water is [2]

a) 24 ppm
b) 320 ppm
c) 240 ppm
d) 32 ppm

ix) _____ ingredient imparts colour to cement and _____ helps to retard the setting action of cement respectively. [2]

a) Lime and Silica
b) Silica and Alumina
c) Alumina and Calcium Sulphate
d) Iron oxide and Calcium Sulphate

x) _____ is an example of electroluminescent polymer and _____ is an example of liquid crystal polymer respectively. [2]

a) Xyder and Kevlar
b) PPV and Kevlar
c) PPV and Polyacetylene
d) ABS and Kevlar

xi) _____ is used in security ink and _____ is used in probe of scanning electron microscope respectively. [2]

a) Carbon black and CNT
b) Graphene and Quantum dots
c) Quantum dots and CNT
d) Fullerene and Graphene

xii) 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) Deintercalation and Intercalation
c) Deactivation and Activation
d) Activation and Deactivation

xiii) **Match the following for setting and hardening of Portland cement:** [2]

P	Day 1	I	Hydration of C_2S
Q	Day 7	II	Hydration of C_3S
R	Day 28	III	Hydration of C_3A

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

xiv) The characteristics properties of polymer fiber reinforced composites depend on_____. [2]

(Select the sentences that are applicable)

(i) Nature, orientation and distribution of fibers
(ii) Nature of polymer matrix
(iii) Nature of final material
(iv) Strength of interfacial bonds between fiber phase and polymer matrix phase.
(v) Nature of mould

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

xv) **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

Q2 Solve any three out of four

a) 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]

b) 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 CH_3COOH (CH_3COOH taken in burette)

c) **1) Give reasons:** [5]

i) Acetaldehyde absorbs at 1725 cm^{-1} whereas benzaldehyde absorbs at 1700 cm^{-1}
ii) Trans stilbene absorbs at higher wavelength than its cis isomer
2) Write possible electronic transitions in UV Visible region.

d) Calculate the possible no.of fundamental vibrations in [5]

i) NO ii) CH_4 iii) NH_3 iv) H_2O v)C_6H_6

Q.3 Solve any three out of four

a) Identify the types of oxide films formed on the surface of following metals [5]
i) Mg ii) Cr iii) Mo iv) Al v) Ag
Explain with oxidation reactions

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

c) Identify in the following pairs, which metal will undergo corrosion in case 1 and case 2? In which case there will be faster corrosion and why? [5]

Sr. No.	Case 1	Case 2
1	Zinc in contact with copper in wet atmosphere	Zinc in contact with gold in wet atmosphere
2	Iron in contact with solution of pH 2	Iron in contact with solution of pH 6

d) [5]
1) Give reason:
i) The rate of atmospheric or dry corrosion is faster at higher temperature
ii) The corrosion of metal is fast in humid atmosphere than in dry atmosphere
iii) The rate of corrosion is faster due to active impurity present in metal
2) Identify the most appropriate and economical corrosion protection method for following examples.
i) Chemical reactors, Industrial water coolers, Pipe lines for carrying corrosive liquids or solutions etc.
ii) Buried steel pipelines, Ship hull, Buried cables
