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

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MAY 2022 (INSEM+ ENDSEM) EXAM
F.Y. B. TECH. (SEMESTER - II)
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) Which of the following statements are **not** 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 & iv
b) iii & iv
c) i & ii
d) ii & iii

ii) An exhausted Zeolite softener was regenerated by passing 50 litres of NaCl solution having strength of 5% NaCl. Calculate the $CaCO_3$ equivalent hardness retained on zeolite bed which was replaced by NaCl solution. [2]

a) 2136.75 gm
b) 2136.75 mg
c) 213.675 mg
d) 213.675 gm

iii) 100 ml of standard hard water containing 1 mg/ml $CaCO_3$ when titrated against EDTA using EBT indicator required 40 ml EDTA for the end point. Hence 1 ml of EDTA solution reacts with _____of $CaCO_3$ hardness. [2]

a) 2.5 mg
b) 25 mg
c) 250 mg
d) 0.25 mg

iv) 100 ml of water sample requires 38 ml of 1M EDTA during titration, whereas 100 ml of boiled water sample required 27 ml of same EDTA solution in the [2]

titration. Calculate total, permanent and temporary hardness of water sample.
a) 190, 135 and 55 ppm
b) 38000, 27000 and 11000 ppm
c) 19000, 13500 and 5500 ppm
d) 380, 270 and 110 ppm

v) A sample of hard water has a hardness of 540 mg/L. Convert this hardness in degree French, degree Clarke and ppm respectively. [2]
a) 37.8, 54 and 540
b) 54, 37.8 and 540
c) 54, 37.8 and 270
d) 37.8, 54 and 540

vi) Calculate temporary and permanent hardness of water from following data. [2]
$Ca(HCO_3)_2$ = 16.2 ppm, Mg $(HCO_3)_2$ = 7.3 ppm, $CaSO_4$ = 13.6 ppm, $MgCl_2$ = 9.5 ppm and NaCl = 10 ppm.
a) 20 and 15 ppm
b) 40 and 30 ppm
c) 15 and 20 ppm
d) 30 and 40 ppm

vii) A Zeolite softener was 100% exhausted, when 10,000 litres of hard water was passed through it, the softener required 200 liter of NaCl solution of strength 50 g NaCl/liter of solution. What is the hardness of water? [2]
a) 10000.00 ppm
b) 85470.08 ppm
c) 854.70 ppm
d) 188.05 ppm

viii) The hardness of 150000 litres of sample of water was completely removed by passing it through a Zeolite softener. This softener then required 550 litres of NaCl solution containing 100 g/liter of NaCl for regeneration. Calculate the hardness of water. [2]
a) 55000.00 ppm
b) 47008.54 ppm
c) 313.39 ppm
d) 543.57 ppm

ix) Match the following for composition in Portland cement: [2]

P	Tricalcium silicate	I	45%
Q	Dicalcium silicate	II	25%
R	Tricalcium aluminate	III	1%
S	Tetracalcium aluminoferrate	IV	9%

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

x) Match the following for ISI specification of Portland cement: [2]

P	Lime saturation factor	I	Less than 4%
Q	Insoluble residue	II	Less than 6%
R	Weight of magnesia	III	Less than 2%
S	Loss on ignition	IV	0.66 to 1.02

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

xi) 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), (iv)

b) (i), (ii), (iii)

c) (ii), (iii), (iv)

d) (i), (ii), (v)

xii) _____ is used for thermal insulation in construction industry and _____is used for core of Polymer optical fibers respectively [2]

a) Polyethylene and Polyurethane

b) Expanded Polystyrene and Polymethyl Methacrylate

c) PPV and Nylon 6,6

d) Polycarbonate and Nylon 6,6

xiii) Match the following for the types of nanomaterials: [2]

P	Zero dimensional nanomaterial	I	nanofilms
Q	One dimensional nanomaterial	II	multinanolayers
R	Two dimensional nanomaterial	III	nanoparticles
S	Three dimensional nanomaterial	IV	nanowires

a) P-I, Q-II, R-III, S-IV

b) P- II, Q-III, R – IV, S-I

c) P-III, Q-IV, R – I, S-II

d) P- III, Q-IV, R-II, S-I

xiv) Which of the following is not applicable for liquid crystal display [2]

(i) It is an electronic display device that operates by applying a varying electric voltage to a layer of liquid crystal

(ii) LCDs are commonly used for portable electronic games

(iii) Liquid crystal display screen works on the principle of emitting light.

(iv) It uses nematic liquid crystals

(v) It uses ITO as anode and Aluminium as cathode

a) (i) and (iii)

b) (iii) and (iv)

c) (ii) and (iv)

d) (iii) and (v)

xv) In Primary Lithium battery, _____is used as cathode and _____is used as electrolyte respectively. [2]

a) Wet paste of Manganese dioxide and Lithium salts dissolved in aqueous inorganic solvent

b) Wet paste of Manganese dioxide and KOH dissolved in organic solvent

c) Heat treated Manganese dioxide and Lithium salts dissolved in aqueous organic solvent

d) Heat treated Manganese dioxide and Lithium salts dissolved in non-aqueous organic solvent

Q.2 Solve any three out of four

a) 1) Explain: [5]
How intermolecular and intramolecular hydrogen bonding can be identified by IR spectrum?
2) Write forbidden electronic transitions in UV Visible region.
3) Identify Chromophores and Auxochromes from following functional groups.
(i) N=O (ii) $-NH_2$ (iii) C=C (iv) –OH

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]
i) HCl vs NaOH (NaOH taken in burette)
ii) CH_3COOH vs NH_4OH (NH_4OH taken in burette)

c) 1) What are the possible electronic transitions in the following molecules when they are exposed to UV-Visible radiations? [5]
i) CH_3- CO-OCH_3
ii) C_6H_6
iii) C_4H_{10}
2) Why the trans cinnamic acid shows absorption at longer wavelength than cis cinnamic acid?

d) Calculate possible number of fundamental vibrations in C_6H_{12}, H_2O, CO_2, C_6H_6 & NH_3 [5]

Q.3 Solve any three out of four

a) Identify types of oxide films formed on the surface of following metals (i) Ag (ii) Ca (iii) Zn (iv) Mo (v) Cu. Explain with oxidation reactions. [5]

b) i) Predict the reactions of hydrogen evolution mechanism for following conditions: Anode – steel tank, Cathode - copper piece and Electrolyte- industrial acidic waste solution. (write reactions at anode, cathode and net reaction) [5]
ii) Give conditions under which wet corrosion occurs.

c) Identify the most appropriate and economical hot dipping corrosion protection method for containers used for storing foods, ghee, oils, pickles, medicines. Explain three step process with figure. [5]

d) 1) Predict the reactions of following coating metals during electroplating. [5]
(i) chromium (ii) silver (iii) nickel (write reactions at anode and cathode)
2) Predict the most appropriate and economical corrosion protection method for following examples.
i) nuts, bolts, screws, spanners & screw drivers
ii) buried steel pipelines, ship hull, buried cables
