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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) 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) i & iii

d) ii & iii

ii) An exhausted Zeolite softener was regenerated by passing 80 litres of NaCl solution having strength of 6% NaCl. Calculate the $CaCO_3$ equivalent hardness retained on zeolite bed which was replaced by NaCl solution. **[2]**

a) 410.256 mg

b) 410.256 gm

c) 4102.56 mg

d) 4102.56 gm

iii) 50 ml of standard hard water containing 1 mg/ml $CaCO_3$ when titrated against EDTA using EBT indicator required 20 ml EDTA for the end point. Hence 1 ml of EDTA solution reacts with _____of $CaCO_3$ hardness. **[2]**

a) 25 mg

b) 2.5 mg

c) 250 mg

d) 0.25 mg

iv) Match the following **[2]**

P	Zeolite softener	I	Regenerated by dil HCl
Q	Cation Exchanger	II	Desalination of water
R	Anion Exchanger	III	Regenerated by NaCl solution
S	Electrodialysis	IV	Regenerated by dil NaOH

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

v) A sample of hard water has a hardness of 510 mg/L. Convert this hardness in degree French, degree Clarke and ppm respectively. **[2]**
a) 35.7, 510 and 51
b) 510, 35.7 and 51
c) 255, 71 and 153
d) 51, 35.7 and 510

vi) A sample of hard water contains following dissolved salts per liter. **[2]**
$Mg(HCO_3)_2$= 73 mgs, $CaCl_2$= 222 mgs, $MgSO_4$= 60 mgs, $Ca(NO_3)_2$= 328 mgs, NaCl = 58.5 mgs. Calculate permanent hardness of water in degree French. (Atomic weight Ca=40, Mg=24, S= 32, Cl=35.5, O=16, N = 14, C=12, Na=23 and H=1).

a) 450 °Fr
b) 31.5 °Fr
c) 45 °Fr
d) 315 °Fr

vii) An exhausted zeolite was regenerated by 300 litre of NaCl having strength 210 gm/litre. How many litres of a hard water having hardness 350 ppm as $CaCO_3$ can be soften by this softener? **[2]**
a) 159915.71 liters
b) 153846.15 liters
c) 151735.36 liters
d) 155915.71 liters

viii) An exhausted Zeolite softener was regenerated by passing 150 litres of NaCl solution having strength of 150 g/litre of NaCl. If the hardness of water sample is 600 ppm, calculate total volume of water that can be softened by this softener. **[2]**
a) 32051.28 liters
b) 22500.00 liters
c) 19230.76 liters
d) 32122.90 liters

ix) 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) (i) and (ii)
b) (ii) and (iii)
c) (iii) and (iv)
d) (i) and (iii)

x) According to ISI specifications of Portland cement, weight of magnesia should not exceed____ and insoluble residue should not exceed _____ **[2]**

respectively

a) 2% and 6%

b) 6% and 2%

c) 6% and 4%

d) 4% and 2%

xi) Structural requirement for intrinsic conducting polymers are _____ and _____. **[2]**

a) Polymers are highly crystalline and has high planarity

b) Polymers are less crystalline and has high planarity

c) Polymers are highly crystalline and has low planarity

d) Polymers are less crystalline and has low planarity

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) Optical fibers are having components in following order. (Select appropriate order) **[2]**

a) Core, Cladding, Buffer, Jacket

b) Cladding, Buffer, Core , Jacket

c) Cladding, Core, Jacket, Buffer

d) Jacket, Buffer, Core, Cladding

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) (iii) and (v)

d) (ii) and (iv)

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]**

i) Acetamide absorbs at 1660 cm^{-1} whereas benzaldehyde absorbs at 1745 cm^{-1}

ii) Ethylene shows absorption at λmax = 171 nm but butadiene shows absorption at λmax=217 nm

2) Write forbidden electronic transitions in UV Visible region.

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) CH_3COOH vs NaOH (NaOH taken in burette)
ii) HCl 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-CH_2-COOH
ii) CH_3COCH_3
iii) CH_3-CH_2-CH_2-CH_2-CH_3
2) Why the absorption band at 280 nm in aniline is disappeared upon addition of hydrochloric acid?

d) Calculate possible number of fundamental vibrations in CO_2, CH_4, H_2O, C_2H_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) Na (ii) Al (iii) Ag (iv) Mo (iv) Cu. Explain with oxidation reactions. **[5]**

b) What are the types of metallic coatings? Which is preferred coating? Why? Identify type of coating involved in following examples. **[5]**
i) Coating of zinc on iron
ii) Coating of tin on iron

c) **Give reason:** **[5]**
i) If the ratio of cathodic area to anodic area is greater, then the rate of wet corrosion is faster.
ii) Smaller the grain size of the metal or alloy, greater is the rate of corrosion
iii) The rate of atmospheric or dry corrosion is faster at higher temperature
iv) The corrosion of metal is fast in humid atmosphere than in dry atmosphere
v) The rate of corrosion is faster due to active impurity present in metal

d) Identify the most appropriate and economical corrosion protection method for following examples. **[5]**
i) ornaments, wrist watches, belts, pens
ii) nuts, bolts, screws, spanners & screw drivers
iii) containers used for storing foods, ghee, oils, pickles, medicines
iv) Chemical reactors, Industrial water coolers, Pipe lines for carrying corrosive liquids or solutions etc.
v) Buried steel pipelines, Ship hull, Buried cables