

TED (10)-1003 B

Reg No.....

(REVISION-2010)

Signature.....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING

TECHNOLOGY-MARCH, 2014

APPLIED SCIENCE-1 (Chemistry)

(Common except DCP and CABM)

[Time:1½ hours]

(Maximum marks:50)

PART-A

(Maximum marks: 4)

Marks

I) Answer the following questions in one or two sentences. Each question carries 2 marks

(a) Define Normality.

(b) Give reason for the hardness of water.

(2x2=4)

Answers

I)

a) It is the number of gram equivalent of solute present in one liter (1000ml) of the solution.

Gram equivalents of solute _____

ie; Normality, $N = \frac{\text{Volume of solution in Litre}}{\text{Gram equivalents of solute}}$

OR $N = \frac{W_2 \times 1000}{E \times \text{Volume in ml}}$

E = Equivalent weight

b) It is due to dissolved impurities like HCO_3^- , Cl^- , SO_4^{2-} of Ca and Mg

PART-B

(Maximum marks: 16)

(Answer any two full questions. Each question carries 8 marks)

II)

(a) The concentration of a glucose ($C_2H_{12}O_6$) in normal blood is approximately 90 mg. Per 100 ml. What is the molarity of the glucose? 4

(b) What are radicals? Give two examples. 4

III)

(a) Explain redox reaction with an example. 4

(b) Draw a flow chart for the production of potable water for municipal supply. 4

IV

a) Explain the disadvantages of hard water? 4

b) What are the application of carbon nanotubes? 4

Answers

II

$$\text{(a) Molarity} = \frac{W_2 \times 1000}{M_2 \times \text{Volume in ml}}$$
$$= \underline{\underline{180}}$$

$$\text{ie } M = \frac{90 \times 10^{-3} \times 1000}{180 \times 100 \text{ml}}$$

$$= \underline{\underline{0.005M}}$$

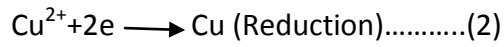
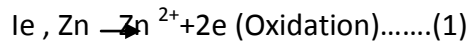
$$M_2 = (6 \times 12) + (12 \times 1) + (6 \times 16)$$
$$= 72 + 12 + 96$$

(b) Charged atom or atom groups are called radicals : NH_4^+ , Cl^- etc.

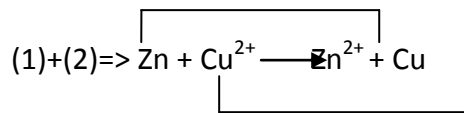
III

a) **Redox reaction**:- Oxidation and reduction together known as Redox reaction.

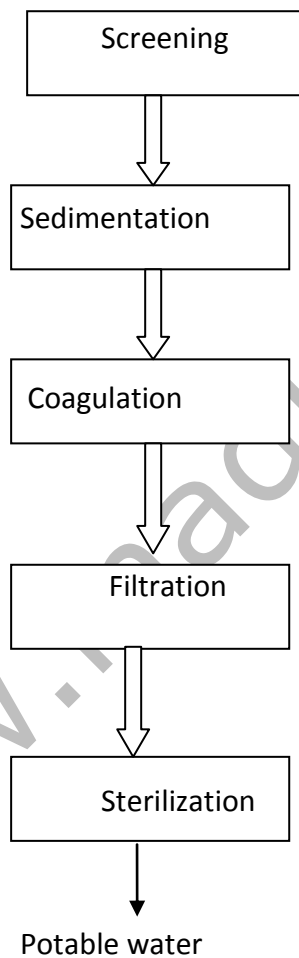
Ex:-Daniel cell (ie; Zn-Cu Galvanic cell)



Redox Reaction



b)



IV

a)

1) In laundry :

i) **Wastage of soap:** because While washing with hard water, soap from lather only after removing all dissolved impurities, so cause wastage of soap.

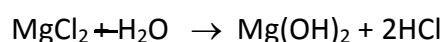
ii) It cause spot and streak on the cloth.

II) In steam boiler :

i) Wastage of fuel:- Hard water cause a hard deposit on boiler called scale. It cause wastage of fuel

ii) Cause explosion of boiler: Due to intense heat , the scale may crack and Cause explosion of boiler (because it is a heat insulating one.)

iii) Cause corrosion of the boiler: Because of the formation of HCl as shown below.



III) Not use for cooking, bathing etc.

b) i) It strengthen composite material. ii) Act as a molecular size test tube & capsules for drug delivery. iii) Can act as conductor & semiconductor based on their size. iv) As a tips for analysis of DNA & Proteins by Atomic force Microscopy.

PART -C

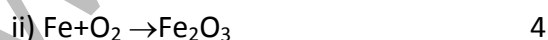
(Maximum marks : 30)

(Answer one full question from each unit. Each question carries 15 marks)

UNIT-1

v)

(a) Balance the following equation :



b) Write down the molecular formula of following compounds :

(i) Calcium Sulphate (iii) Potassium carbonate

(ii) Ammonium phosphate (iv) Magnesium nitrate 4

(c)

(i) Calculate the pH of an aqueous solution that has an OH^- concentration of 1.9×10^{-3} M.

(ii) Calculate the pH of a 0.025M HNO_3 solution.

(d) Explain neutralization reaction with an example

OR

VI

(a) Classify the following as Lewis acid and Lewis base

H_2O , Al^{3+} , Cl^- , NH_3 , Fe^{2+} , OH^- , BF_3 , Na^+ 4

(b) Calculate the molecular weight of following compounds:

(i) $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (iii) Fe_2O_3

(ii) H_2SO_4 (iv) $\text{C}_4\text{H}_8\text{O}_2$ 4

(c) A bottle of 12.0N hydrochloric acid has only 35.7ml left in it. What will the HCl concentration be if the solution is diluted to 250.0ml ? 4

(d) Define ionic product of water. Write its expression ? 3

Answers

V)

(a) (i) $4\text{NH}_3 + \text{Cl}_2 \rightarrow \text{N}_2\text{H}_4 + 2\text{NH}_4\text{Cl}$

(ii) $2\text{Fe} + 3\text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$

(b) (i) CaSO_4 (iii) $\text{K}_2(\text{CO}_3)$

(ii) $(\text{NH}_4)_3(\text{PO}_4)$ (iv) $\text{Mg}(\text{NO}_3)_2$

(c) (i) Given

$$[\text{OH}^-] = 1.9 \times 10^{-3} \text{ M}$$

$$\text{We have } [\text{H}^+][\text{OH}^-] = 10^{-14}$$

$$\therefore [\text{H}^+] = \frac{10^{-14}}{1.9 \times 10^{-3}} = 5.263 \times 10^{-12}$$

$$\therefore \text{pH} = -\log[\text{H}^+] = -\log(5.263 \times 10^{-12}) \\ = \underline{\underline{11.279}}$$

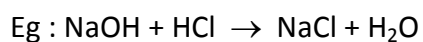
(ii) Given $[\text{H}^+] = 0.025\text{M}$.

$$\therefore \text{pH} = -\log(0.025) \\ = \underline{\underline{1.602}}$$

(d) According to Arrhenius concept Neutralization is the reaction of H^+ from acid and OH^- from base form water. Ex: $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$

OR

It is the reaction of acid with base form salt and water



OR

VI)

a)

Lewis Acid	Lewis Base
Al^{3+}	H_2O
Fe^{2+}	Cl^-
BF_3	NH_3
Na^+	OH^-

(b) (i) $(12 \times 12) + (22 \times 1) + (11 \times 16)$

$$= 144 + 22 + 176$$

$$= \underline{\underline{342}}$$

(ii) $(2 \times 1) + 32 + (4 \times 16)$

$$= 2 + 32 + 64$$

$$= \underline{\underline{98}}$$

(iii) $(2 \times 56) + (3 \times 16)$

$$= 112 + 48$$

$$= \underline{\underline{160}}$$

(iv) $(4 \times 12) + (8 \times 1) + (2 \times 16)$

$$= 48 + 8 + 32$$

$$= \underline{\underline{88}}$$

c)

$$N_1 = 12\text{N}$$

$$V_1 = 35.7\text{ml}$$

$$N_2 = ?$$

$$V_2 = 250\text{ml}$$

$$N_1 V_1 = N_2 V_2$$

$$N_2 = \frac{12 \times 35.7}{250}$$

$$= 1.7136N$$

$$= \underline{1.7136N}$$

(d) **Ionic product of water [K_w]** is the product of concentration of H⁺ and OH⁻ ions in water.

It was experimentally found that at 25°C, [H⁺]=[OH⁻]=10⁻⁷ mol/liter.

So K_w = 10⁻⁷ x 10⁻⁷ mol/liter at 25°C

OR

$$K_w = 10^{-14} \text{ mol}^2/\text{liter}^2$$

UNIT-11

VII)

- (a) List the properties of carbon nanotube? 4
- (b) What is sterilization of water? Mention the different methods of is sterilization water? 4
- (c) Explain chemical vapor deposition method for the synthesis of carbon nanotube 3
- (d) Explain different types of filtration used in water treatment 4

OR

VIII)

- (a) What are characteristics of potable water? 4
- (b) Explain ion exchange method? 4
- (c) What are the applications of nanomaterials in medicine? 4
- (d) Explain high pressure carbon monoxide deposition method for the synthesis of carbon nanotube? 4

Answers

VII)

a)

1. Very strong
2. High tensile strength & thermal conductivity
3. High Young's modulus (force required to bent a material
4. High electrical conductivity

(b) Sterilization it is the destroying of disease causing bacteria and micro organism using fertilizers or disinfectant like bleaching powder etc. These are

1. Chlorination :

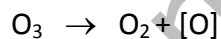
By passing chlorine gas or water. So the hypochlorous acid formed kills the germs .It need less space Cl_2 available in pure form are advantages, but excess Cl_2 cause unpleasant smell, taste etc.

2 .Using bleaching powder :

Mix 1Kg $CaOCl_2$ with 1000 kilo liter water. By oxidizing action of Cl , It kills the germs.

3. By passing Ozone(O_3).

On passing O_3 through water, following reaction occur.



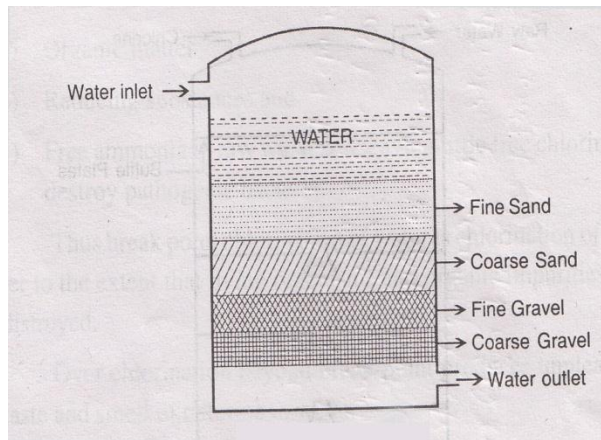
Here nascent oxygen produces killed the germs by oxidizing action. Its excess is not armful

(c) **Chemical Vapor Deposition Method(C V D) :** Here CH_4 heated in a chamber containing Fe as catalyst at high temperature. So that C-H bond breaks form 'C' atom. This C atom bind with other C atom form nanotube lattice.

(d) **Filtration:** Used to remove colloidal and bacterial impurities from water. These are

1. Operation of gravity sand filter method:

It is done as shown below



2. Operation of pressure filter method:

Here filtering medium is essentially same as above. Filtering materials is kept in a closed cylinder and water is forced into filter under pressure. It is used for hot water, require less space.

OR

VIII)

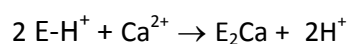
(a)

- It should be clear and order less.
- It should be free from micro organisms like bacteria etc.
- It should be free from dissolved gases like H_2S, CO_2 etc. and minerals like NO_3^{1-}, NO_2^{1-} etc.
- It should be free from suspended impurity.
- pH should be in between 6.5 to 8.5

(b) It can be removed by using synthetic resins like Cation exchanger $[E-H^+]$ or anion exchanger $[E-OH^-]$ as shown below

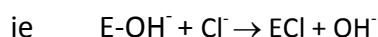
Step 1:

Hard water passed through a tank containing $[E-H^+]$ so the following occur



Step 2:

This water coming out of cation exchanger is then passed through anion exchanger [E-OH⁻]



and $H^{+} + OH^{-} \rightarrow H_2O$

(c)

1. Act as molecular type test-tube and capsule for drug delivery
2. As a tips for analysis of DNA and proteins by a atomic force microscopy.
3. Can detect and locate tumors accurately.
4. Nano shell attaching only to cancer shell and destroy tumor
5. Can deliver right amount of medicine to exact spot of the body using nano technology.

(d) **High pressure Carbon Monoxide Deposition Method (HiPCO):** CO(g) & atoms of iron cluster are heated in a chamber at high pressure. So that Fe breaks the CO molecules as C & O₂ by acting as a catalyst. This 'C' atom bind with other 'C' atoms form nanotube lattice. O₂ react with unburnt CO form CO₂

