TED (10)-1003 B   Reg. No.................

(REVISION-2010)   Signature..............

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING

TECHNOLOGY-MARCH,2012

APPLIED SCIENCE-1 (Chemistry)

(Common except DCP and CABM)

[*Time*:$1\frac{1}{2}$ hours]

(Maximum marks: 50)

PART-A

(Maximum marks:4)   Marks

(Answer the question in one or two sentences. Each question carries 2 marks)

I)

1) Write down the molecular formula of two compounds where iron shows variable valency ?   2

2) What is nanosize? Name three nanosized materials ? 2

(2x2)

Answers

I)

1) $FeCl_2$ (valence=2) & $FeCl_3$ (valence=3)

2) It is the study of material having the size 1-100nm range (nm=Nano meter, $1nm=10^{-9}m$). Examples for nano sized materials are DNA width (2nm), Bucky ball(C_{60})(1nm), Carbon Nano tube(1.3nm), E-collie bacteria

PART-B

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

II)

1) Balance the following equation:

(a)$Mg_3N_2+H_2O$ $\rightarrow$ $Mg(OH)_2+NH_3$

(b) $Al_4C_3+ H_2O$ $\rightarrow$ $Al(OH)_3+CH_4$
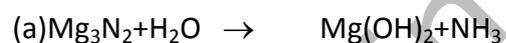
2) Explain redox reaction taking Daniel cell as an example? 4

III)

1) You had a sample of hard water. How can you prepare soft water and deionised water from it? 4

2) Calculate equivalent weight of H_2SO_4 and Na_2CO_3 using different chemical equations. 4

IV)

1) Which indicator will you use in the following titrations? Why?

H_2SO_4 x Na_2CO_3 & CH_3COOH x NaOH 4

2) Calculate the weight of zinc required to produce enough hydrogen combine completely with 6.4 g of oxygen to from water [At.wt.of Zn=65.4] 4
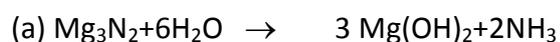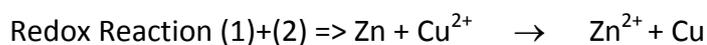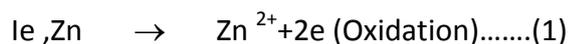
(2x8=16)

Answers

II)

1)

(a) $Mg_3N_2 + 6H_2O \rightarrow 3\,Mg(OH)_2 + 2NH_3$

(b) $Al_4C_3 + 12H_2O \rightarrow 4Al(OH)_3 + 3CH_4$

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

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

Ie ,$Zn \rightarrow Zn^{2+} + 2e$ (Oxidation)…….(1)

$Cu^{2+} + 2e \rightarrow Cu$ (Reduction) ……….. (2)

Redox Reaction (1)+(2) => $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

III)

1) By removing hardness. It is done either by heating OR By ion exchange method as shown below.

by boiling, the following reaction will occure

ie $M(HCO_3)_2 \rightarrow MCO_3 + H_2O + CO_2$ M= Ca/Mg
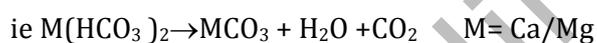
In ion exchange method hardness can be removed by using synthetic resins like Cation exchanger $[E\text{-}H^+]$ or anion exchanger $[E\text{-}OH^-]$ as shown below
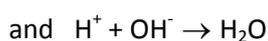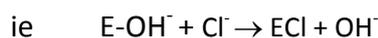
Step 1:

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

$2\,E\text{-}H^+ + Ca^{2+} \rightarrow E_2Ca + 2H^+$
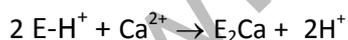
Step 2:

This water coming out of cation exchanger is then passed through anion exchanger $[E\text{-}OH^-]$

ie $E\text{-}OH^- + Cl^- \rightarrow ECl + OH^-$

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

2) Equivalent Weight of H_2SO_4 = Molecular mass/Basicity

$= 98/2$

$= \underline{49}$

Equivalent Weight of Na_2CO_3 = Molecular mass/Acidity

$$= 106/2$$

$$= \underline{53}$$

IV)

1) For H_2SO_4 & Vs Na_2CO_3 we use methyl orange indicator. Because for the titration of strong acid+ Vs weak base, pH range at the end point is 3.5 to 7.5.

For CH_3COOH Vs $NaOH$, we use phenolphthalein indicator. because for the titration of weak acid Vs strong base,pH range at the end point is 6.5-10

2) Question is not correct

PART-C

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

UNIT-1

V)

1) Calculate the pH and specify the nature of the following solutions :

(a) [H+] =0.0123 mol/l

(b) [H+] = 1x10-7 mol/l

(c) [H+] = 5x10-13 mol/l   4

2) Using Arrhenius concept and Lewis concept, describe the neutralisation reaction in acid and bases. ?   4

3) Mention different units used for expressing the concentration of chemical solutions.   3

4) Propose any two industrial and Biological applications of pH ?   4

OR

VI)

1) What buffer solutions? Classify them.   4

2) Calculate the normality and molarity of the following solutions:

   (a) NaOH solution containing 20 g in 500 ml.

   (b) 0.63 g of oxalic acid (H2C2O4.2H2O) in 250 ml.   4

3) Calculate the molecular weight of :

   (a) Cane sugar

   (b) Ferrous Ammonium Sulphate.   3

4) Briefly explain volumetric analysis.   4

Answers

V)

1)

   a) $pH = -\log[H^+]$ b) $pH = -\log[H^+]$

      $= -\log(0.0123)$ $= -\log(1 \times 10^{-7})$

      $= 1.91$, acidic $= 7$, Neutral

   c) $pH = -\log[H^+]$
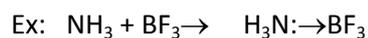
      $= -\log(5 \times 10^{-3})$

      $= 12.3$,   basic

2) According to Arrhenius concept Neutralization is the reaction of H^+ from acid and OH^- from base form water.

   Ex: $H^+ + OH^- \rightarrow H_2O$

   According to Lewis concept Neutralisation is the reaction of Lewis acid with Lewis base form corresponding products

   Ex: $NH_3 + BF_3 \rightarrow H_3N:\rightarrow BF_3$

3) **Molarity (M):** it is the number of moles of solute present in one litter (1000) of the solution

   ie , Molarity M= $\underline{\text{moles of solute}}$

                     Volume of solution in L

   OR   M = $\dfrac{W_2 \times 1000}{\rule{3cm}{0.4pt}}$

$$M_2 \times \text{Volume in ml}$$

Normality: It is the number of gram equivalent of solute present in one

litter(1000ml) of the solution

ie, Normality.N = $\dfrac{\text{Gram equivalent of solute}}{\text{volume of solution in L}}$

$$N = \dfrac{W2 \times 1000}{\text{equivalent mass} \times \text{Volume in ml}}$$

4) * pH of blood is very important. Small change in its pH results even death

* pH of human gas tic juice is in b/w 1-3. Increase of pH generally cause

Vomiting

* In textile industry : acidity of water used for bleaching cotton is harmful.

So they should control

* Chemical industry : The effluents from chemical factories should be neutralizing before they discharging to river. Because they are either acidic or basic

OR

VI)

1) Buffer solution: Solution which resist change in pH when small amount of acid or base added to it. Ex: Blood, $NH_4OH + NH_4Cl$

2)

(a)

$$N = \dfrac{W_2 \times 1000}{\text{equivalent mass} \times \text{Volume in ml}}$$

$$= \dfrac{20 \times 1000}{40 \times 500}$$

$$= \underline{1\ N}$$

$$M = \dfrac{W_2 \times 1000}{M_2 \times \text{Volume in ml}}$$

$$= \frac{20 \times 1000}{40 \times 500}$$

$$= \underline{1 \text{ M}}$$

(b) $N = \dfrac{0.63 \times 1000}{63 \times 250}$

$$= \underline{0.04 \text{ N}}$$

$M = \dfrac{0.63 \times 1000}{126 \times 250}$

$$= \underline{0.02 \text{ M}}$$

3)

(a) Cane sugar = $C_{12}H_{22}O_{11}$ = (12x12)+(22x1)+(11x16)

$$= \underline{342}$$

(b) Ferrous Ammonium Sulphate= $FeSO_4$ $(NH_4)_2SO_4.6H_2O$

=56+32+64+(2x14)+(8x1)+(32x64)+(12x1)+(6x16)

$$= \underline{392}$$

4) Determination of volume of a standard solution (taken in burette) used to react quantitatively with a so known volume of a solution (taken in pipette) to be estimated is called **VOLUMETRIC ANALYSIS** and the process is called titration.

Different terms used in Volumetric analysis are **Standard solution, End point, Indicator etc.** An indicator changes the colour at a particular pH range.

Principle of Volumetric Analysis: If N_1 and V_1 are the normality and volume of first solution and N_2 and V_2 are the normality and volume of the second solution, then according to Normality equation $N_1 V_1 = N_2 V_2$. This is the Principle of Volumetric Analysis

UNIT-II

VII)

1) What are the disadvantages of hard water ?   4

2) List the peculiar properties of carbon nanotubes. What are their applications.   4

3) Compare the sterilization of water using bleaching powder and ozone. ?   3

4) How can carbon nanotubes be synthesized? (any two methods)   4

OR

VIII)

1)Give any four application of nanotechnology.   ?   4

2)Explain the sterilization of water using chlorine ?   4

3) Discribe EDTA method of determination of hardenes of water. ?   4

4) Classify different nanotubes. ?   3

Answers

VII)

1)

I) **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.

$$MgCl_2 + H_2O \rightarrow Mg(OH)_2 + 2HCl$$
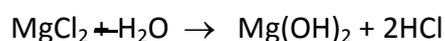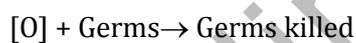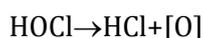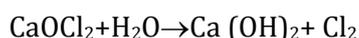
III) Not use for cooking, bathing etc.

2) It is the study of material having the size 1-100 nm range Examples for nano materials are DNA width, Carbon Nano tube (CNT) etc. Its structure seemed to be formed by rolling the sheet of graphite in to the shape of cylindrical tube either closed or open at the end. **Properties of CNT:**

1)Very strong **2**)High Tensile strength & Thermal conductivity   **3**) High young's modulus(force required to bend a material) **4**)High electrical conductivity **5**)it is light weight6)It is sticky(due to Vander Waal's Force)

Applications of CNT : a) It strengthen composite material   **b)**Act as a molecular type test tube& capsules for drug delivery   **c)**Can act as conductor& semiconductor based on their size **d)**As a tips for analysis of DNA & Proteins.

3)

a)Using Bleaching Powder : Mix 1kg $CaOCl_2$ with 1000 kilo liter water. By oxidizing action of Cl, it kills the germs as shown below

$CaOCl_2 + H_2O \rightarrow Ca(OH)_2 + Cl_2$

$Cl_2 + H_2O \rightarrow HOCl$ (Hypo chlorous acid)

$HOCl \rightarrow HCl + [O]$

$[O] + Germs \rightarrow$ Germs killed

b) By Passing Ozone(O_3): On passing O_3 through water , following reaction occure.

$O_3 \rightarrow O_2 + [O]$
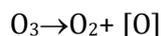
Here nascent oxygen produces killed the germs as shown below by oxidizing action

$[O] + Germs \rightarrow$ Germs killed
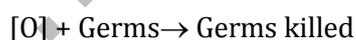
Its excess is not harmful

4)

a) 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&O_2 by acting as a catalyst. This 'C' atom bind with other 'C' atoms form nanotube lattice. O_2 react with unburnt CO form CO_2

b) Chemical Vapor deposition Method (CVD): Here CH_4 is heated in a chamber containing Fe as catalyst at high temperature. So that C-H bond

breaks from 'C' atom. This 'C' atom binds with other 'C' atoms form nano tube lattice.

VIII)

1)

**a)** Can detect & locate tumors accurately

b) Nano shell attaching only to cancer shell & destroy tumor

c) Can deliver right amount of medicine to exact spot of the body using nano technology
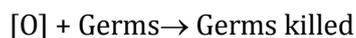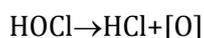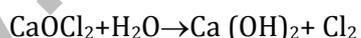
d) Analysis of DNA & Proteins

2) **Sterilization :** It is the destroying of disease causing bacteria and micro organism using fertilizers or disinfectant like bleaching powder etc. These are

   a) Chlorination: By passing chlorine gas or chlorine water. Here Hypo chlorous acid produced killed the germs as shown below

   $Cl_2 + H_2O \rightarrow HOCl$ (Hypo chlorous acid)

   $HOCl \rightarrow HCl + [O]$

   $[O] + Germs \rightarrow$ Germs killed
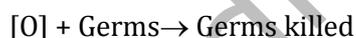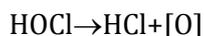
   It need less space, Cl_2 available in pure form are advantages, but excess Cl_2 cause unpleasant smell, taste etc

   b) Using Bleaching Powder : Mix 1kg $CaOCl_2$ with 1000 kilo liter water. By oxidizing action of Cl, it kills the germs as shown below

   $CaOCl_2 + H_2O \rightarrow Ca(OH)_2 + Cl_2$

   $Cl_2 + H_2O \rightarrow HOCl$ (Hypo chlorous acid)

   $HOCl \rightarrow HCl + [O]$

   $[O] + Germs \rightarrow$ Germs killed

3) Not included in Syllabus

4) **Carbon Nano Tube(CNT):** Its structure seemed to be formed by rolling the sheet of graphite in to the shape of cylindrical tube either closed or open at the end

   Two varieties of CNT are **SWNT** [Single Walled Carbon Nano Tube, It is like single cylinder] and **MWNT** [Multi Walled Carbon Nano Tube, It contains multiple concentric nano tube cylinder].

Based on orientation of lattice , nano tubes are **Classified** in to three types
1)Arm Chair

2) Zig Zag.

3) Chiral