

TED (10)-1003 B

REG.NO.....

REVISION 2010

SIGNATURE.....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY

MARCH 2013

APPLIED SCIENCE-I [CHEMISTRY]

TIME: 1 1/2hrs

MAXIMUM MARK : 50

PART A

(Answer the each question in one or two sentences.

Each question carries 2 marks)

MARKS

1)

a)  $p^H$  of cold drink is 4.5 what will be its action on blue and red litmus solution?

b) Rain water is the purest form of natural waters. Give reason?

(2×2=4)

**Answers**

1)

a) It turns blue litmus solution to red .But no change on red litmus solution

b) Because it is a distilled water

OR

It Does Not Contain Mg/Ca salts

## PART B

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

II)

- a) Classify the following as Lewis base and Lewis acid.  $\text{NH}_3$ ,  $\text{Cl}^-$ ,  $\text{Ni}^{2+}$ ,  $\text{BF}_3$ ,  $\text{Ag}^+$ ,  $\text{CN}^-$ ,  $\text{H}_2\text{O}$ ,  $\text{CO}_2^{2-}$ .
- b) Explain the role of ion-exchange resins in softening of hard water (4)

III)

- a) Define equivalent weight of bases and acids. Calculate the equivalent weight of  $\text{H}_2\text{SO}_4$  and  $\text{Ca}(\text{OH})_2$  (4)
- b) Explain the application of carbon nano particles in medicine (4)

IV)

- a) Point out the reducing and oxidizing agents in the following reaction



- b) Enumerate the disadvantages of hard water. (4)

(2×8=16)

**Answers**

II

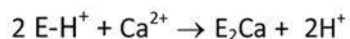
a)

Lewis acid	Lewis base
$\text{Ni}^{2+}$	$\text{NH}_3$
$\text{BF}_3$	$\text{H}_2\text{O}$
$\text{Ag}^+$	$\text{CN}^-$
$\text{CO}_2^{2-}$	$\text{Cl}^-$

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

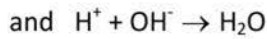
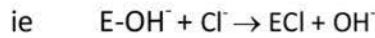
**Step 1:**

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



**Step 2:**

This water coming out of cation exchanger is then passed through anion exchanger [E-OH<sup>-</sup>]



### III

a) Equivalent weight of acid =  $\frac{\text{MOLECULAR MASS}}{\text{BASISITY}}$

$$\text{For H}_2\text{SO}_4 \text{ it is } = \frac{(2 \times 1) + 32 + (4 \times 16)}{2}$$

$$= 49$$

Equivalent weight of BASE =  $\frac{\text{MOLECULAR MASS}}{\text{ACIDITY}}$

$$\text{For Ca(OH)}_2 \text{ it is } = \frac{40 + (2 \times 16) + (2 \times 1)}{2}$$

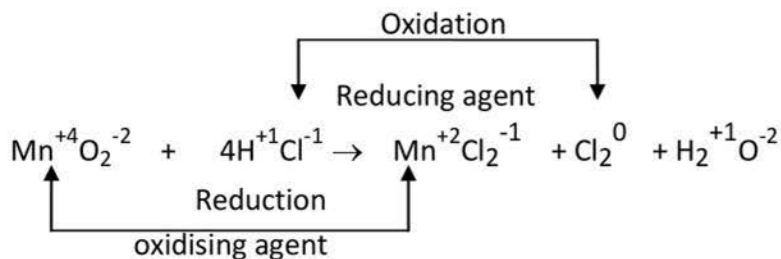
$$= 37$$

### b)

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.

### IV)

#### a)



Oxidizing agent = MnO<sub>2</sub>

Reducing agent = HCl

b) 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.

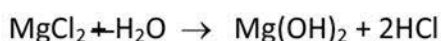
ii) It cause spot and streak on the cloth.

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.



III) Not use for cooking, bathing etc.

**PART C**

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

**UNIT I**

v)

a) Define  $P^H$ . Calculate the  $p^H$  of 0.001 normal NaOH solution

(4)

b) Explain the neutralization reaction according to Arrhenius concept and Lewis concept with suitable example (4)

c) Calculate the mass of zinc required to produce 20g of  $\text{H}_2$  gas at STP using hydrochloric acid (at wt. Zn=65.5) (4)

d) Applying the following equation. Calculate the equivalent mass of  $\text{NH}_4\text{OH}$ ;



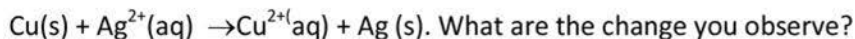
**OR**

VI)

a) What are the different types of buffer solutions? Give example

(4)

b) Silver nitrate solution is taken in a beaker and copper metal rod is dipped in it. The following reaction occurs;



(3)

c) Calculate the mass of NaOH required to make 0.01 normal 250ml solution.

(4)

d) Define Standard and Normal Solutions

(4)

### Answers

V

a)  $P^H$  is the negative logarithm of  $H^+$  ion concentration

$$\text{ie } P^H = -\log[H^+]$$

Given  $[OH^-] = 0.001N$

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

$$[H^+] = 10^{-14} / 0.001$$

$$= 10^{-11}$$

$$\text{So } P^H = -\log [10^{-11}]$$

$$= 11$$

b) According to Arrhenius concept neutralization is the reaction of  $H^+$  from acid and  $OH^-$  from base form water



c) Balanced Equation is  $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

65.5

2

?

20g

$$\text{So Mass of Zn required to produce 20g } H_2 \text{ STP} = \frac{65.5 \times 20}{2}$$

$$= 655g$$

d)  $NH_4OH + HCl \rightarrow NH_4Cl + H_2O$  here Weight of the  $NH_4OH$  required to be neutralized by one equivalent of  $HCl = 14 + 4 + 35.5$

$$= 53.5$$

So equivalent weight of  $\text{NH}_4\text{OH} = 53.5$

OR

VI)

a) There are two types

**Acidic buffer:**

Here  $\text{p}^{\text{H}}$  is less than 7 and is formed by combination of a weak acid and its salt with a strong base eg:  $\text{CH}_3\text{COOH} + \text{CH}_3\text{COONa}$

**Basic buffer:**

Here  $\text{p}^{\text{H}}$  is greater than 7 and is formed by combination of a weak base and its salt with a strong acid Eg:  $\text{NH}_4\text{OH} + \text{NH}_4\text{Cl}$

b) it is a redox reaction here **Cu** replaces **Ag** from its solution so its colour change and developed a blue color of  $\text{CuSO}_4(\text{aq})$

c) We have  $N = \frac{W_2 \times 1000}{\text{equi.mass} \times \text{volume in ml}}$

$$W_2 = \frac{N \times \text{equi.mass} \times \text{volume in ml}}{1000}$$

$$= \frac{0.01 \times 40 \times 250}{1000}$$

$$= 0.1 \text{g NaOH}$$

d) Solution whose concentration is known is called *Standard solution* and one normal solution is called *normal solution*. Normality is the number of gram equivalent of solute present in one litre (1000ml) of the solution

## UNIT II

VII)

a) Define ionic product of water. how will you obtain this value? (4)

b) Comment on the structure of nano tube (4)

c) What is sterilization of water? Mention any two methods of sterilization of water (4)

d) Distinguish between temporary hardness and permanent hardness of water (3)

## OR

VIII)

- a) What are the characteristics of portable water? (4)
- b) Explain chemical vapour deposition method for the synthesis of carbon nano tubes (3)
- c) Write down the EDTA titration method for the estimation of hardness of water (4)
- d) Explain the different filtration techniques used in water treatment (4)

(2×15=30)

### Answers

VII)

a) Ionic product of water [K<sub>w</sub>] is the product of concentration of H<sup>+</sup> and OH<sup>-</sup> ions in water.

It was experimentally found that at 25<sup>o</sup>C, [H<sup>+</sup>]=[OH<sup>-</sup>]=10<sup>-7</sup> mol/liter.

So K<sub>w</sub> =10<sup>-7</sup> x 10<sup>-7</sup> mol/liter at 25<sup>o</sup>C

OR

K<sub>w</sub> = 10<sup>-14</sup> mol<sup>2</sup>/liter<sup>2</sup>

b) 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 a 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

c) 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  $\text{Cl}_2$  available in pure form are advantages, but excess  $\text{Cl}_2$  cause unpleasant smell, taste etc.

2 .**Using bleaching powder** : Mix 1Kg  $\text{CaOCl}_2$  with 1000 kilo liter water. By oxidizing action of  $\text{Cl}$  , It kills the germs.

3. **By passing Ozone( $\text{O}_3$ )**. On passing  $\text{O}_3$  through water, following reaction occur.



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

d) **Temporary hardness**: It is due to  $\text{HCO}_3$  of Ca and Mg. It can be removed by boiling.

**Permanent hardness**: It is due to  $\text{Cl}^-$ ,  $\text{SO}_4^{2-}$  Of Ca and Mg. It can be removed by ion exchange method using synthetic resins like cation exchanger ( $\text{E-H}^+$ ) or anion exchanger( $\text{E-OH}^-$ )

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  $\text{H}_2\text{S}$ ,  $\text{CO}_2$  etc. and minerals like  $\text{NO}_3^{1-}$ ,  $\text{NO}_2^{1-}$  etc.
- It should be free from suspended impurity.
- pH should be in between 6.5 to 8.5

b) **Chemical Vapor Deposition Method (CVD)** : Here  $\text{CH}_4$  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 nano tube lattice.

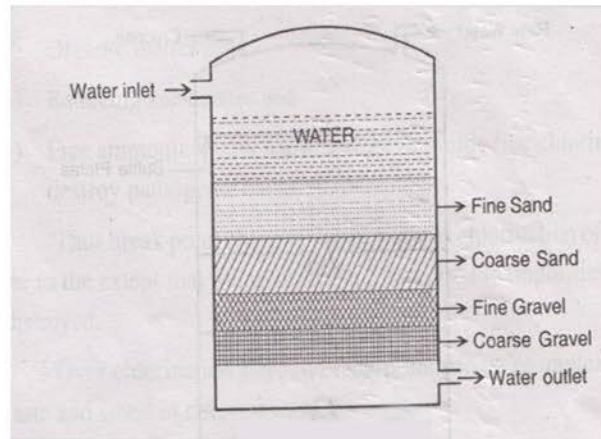
c) Not included in the syllabus

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.