

TED(10)-1003 B

Reg No.....

(REVISION-2010)

Signature.....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING

TECHNOLOGY-OCTOBER, 2012

APPLIED SCIENCE-1 (Chemistry)

(Common except DCP and CABM)

[Time:1¹/₂ hours]

(Maximum marks: 50)

PART-A

(Answer the following questions in one or two sentences.

Each question carries 2 marks)

Marks

1)

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

2

(b) P^H of cold drink is 5. What will be its action on blue and red litmus solution?

2

Answers

1)

(a) Because it is a distilled water

OR

It Does Not Contain Mg/Ca salts

(b) Here P^H is 5, so acidic. So it turn blue litmus solution to red. But no action on red litmus Solution.

PART-B

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

II)

(a) Find the oxidation number of "Cr" in $K_2 Cr_2 O_7$ and $Cr_2 O_3$. 4

(b) Explain the role of ion-exchange resins in softening of hard water? 4

III)

(a) What is acid-base indicator? What type of indicators are used in the following set of titrations:

(i) HNO_3 X $NaOH$

(iii) $NaOH$ X acetic acid

(ii) $Na_2 CO_3$ X H_2SO_4

4

(b) How does water become hard water? Define degree of hardness of water. 4

IV)

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



4

(b) Enumerate the applications of carbon nanotubes in medicine. 4

Answers

II)

a)

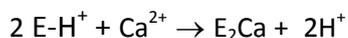
$$\begin{aligned} &+1 \quad x \quad -2 \\ &K_2 \underline{Cr}_2 O_7 \\ &(2 \times 1) + (2 \times x) + (7 \times -2) = 0 \\ &2 + 2x - 14 = 0 \\ &2x - 12 = 0 \\ &2x = 12 \\ &x = 12/2 = \underline{+6} \end{aligned}$$

$$\begin{aligned} &x \quad -2 \\ &\underline{Cr}_2 O_3 \\ &2x + (3 \times -2) = 0 \\ &2x - 6 = 0 \\ &2x = 6 \\ &x = 6/2 = \underline{+3} \end{aligned}$$

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

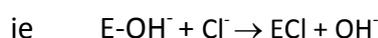
Step 1:

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 $[E-OH^-]$



III)

a) Indicator: Substance added to the conical flask to know the end point. It shows colour change in a particular P^H range. Eg: Methyl orange, Phenolphthalein, Methyl red etc.

- (i) Phenolphthalein/Methyl orange
- (ii) Methyl orange
- (iii) Phenolphthalein

b) It is due to presence of dissolved impurities like HCO_3^- , Cl^- & SO_4^{2-} of Ca and Mg. It Form insoluble scum with soap. There are two types

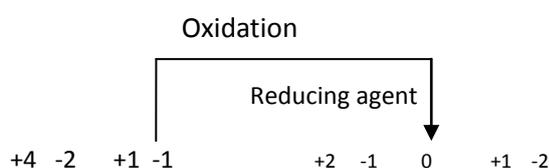
- 1) Temporary Hardness:- It is due to HCO_3^- of Ca and Mg.
- 2) Permanent Hardness:- It is due to Cl^- , SO_4^{2-} of Ca and Mg.

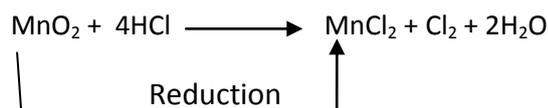
Degree of Hardness:

It is the number of parts by weight of $CaCO_3$ present in one million (10^6) parts by weights of water. Unit= PPM (Parts Per Million)

IV

a)





Reduction

Oxidising agent

So Mn is the Oxidising agent & Chlorine is the Reducing agent.

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

PART-C

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

UNIT-1

V)

- (a) Explain the neutralization reaction according to Arrhenius concept and Lewis concept with suitable example. 4
- (b) Define P^H . Calculate the P^H of 0.001 normal NaOH solution. 4
- (c) Calculate the mass of zinc required to produce 20g of H_2 gas at STP using hydrochloric acid (At. Wt. Zn=65.5). 4
- (d) Applying the following equation. Calculate the equivalent mass of $\text{Ca}(\text{OH})_2$
- $$\text{Ca}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{CaSO}_4 + 2\text{H}_2\text{O} \quad 3$$

OR

VI)

(a) Copper sulphate solution is taken in a beaker and iron metal rod is dipped in it. The following reaction occurs:



What changes you can observe? 3

- (b) What are the different types of buffer solutions? Give examples. 4

Acidic buffer:

Here P^H is less than 7 and is formed by combination of a weak acid and its salt with a strong base eg: $CH_3COOH+CH_3COONa$

Basic buffer:

Here P^H is greater than 7 and is formed by combination of a weak base and its salt with a strong acid Eg: NH_4OH+NH_4Cl

(c) **Standard solution:** Solution whose concentration is known.

Normal solution: Solution in which its normality is one. **Normality** is the number of gram

Equivalent of solute present in one litre(1000ml) of solution

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

(d) Here $N=0.01N$, Volume in ml=200ml

Equivalent weight of $H_2SO_4=98/2=49$; $W_2=?$

$$\begin{aligned} \text{We have } N &= \frac{W_2}{\text{Eqvt weight}} \times \frac{1000}{\text{Vol in ml}} \\ W_2 &= \frac{0.01 \times 49 \times 200}{1000} = \underline{\underline{0.098g}} \end{aligned}$$

UNIT-II

VII)

(a) What are the disadvantages of using hard water?

4

(b) Define ionic product of water. How will you obtain its value?

4

(c) Explain two methods for the synthesis of carbon nanotubes.

4

(d) What is sterilization of water? Mention any two sterilization methods of water.

3

OR

VIII)

(a) Any two advantages of using hard water.

3

(b) Comment on the structure of carbon nanotubes.

4

(c) Explain the different type of filtrations in water treatment.

4

(d) Write down the EDTA titration method for the estimation of hardness of water

4

Answers

VII)

(a)

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.

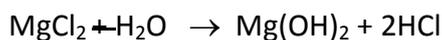
ii) It cause spot and streak on the cloth.

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.

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

It was experimentally found that at 25⁰C , [H⁺]=[OH⁻]=10⁻⁷ mol/liter.

So $K_w = 10^{-7} \times 10^{-7} \text{ mol/liter at } 25^\circ\text{C}$

OR

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

(c)

a) Chemical Vapor Deposition Method (CVD) : 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 nano tube lattice

b) 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

(d) 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(CaOCl_2) :

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

OR

VIII)

(a)

(i) It contains Ca^{2+} and Mg^{2+} ions required for health

(ii) Does not dissolve Pb from lead pipe

(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

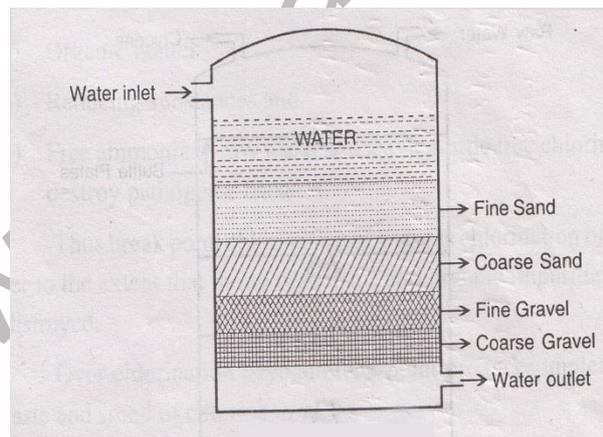
2) Zig Zag

3) Chiral

(c) **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.

(d) Not included in the syllabus