

TED(10)-1003 B

Reg No.....

(REVISION-2010)

Signature.....

FIRST SEMESTER DIPLOMA EXAMINATION IN ENGINEERING

TECHNOLOGY-OCTOBER,2011

APPLIED SCIENCE-1 (Chemistry)

(Common except DCP and CABM)

[Time:1¹/₂ 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)Write down the molecular formula of (2)

1) Aluminium phosphate 2) Ammonium carbonate

(b)Mention plasma process (2)

(2x2=4)

Answers

I) a)

1) $Al_3(PO_4)_3$

= $Al(PO_4)$

2) $(NH_4)_2(CO_3)$

b) Plasma Process: Here CH_4 is passed through a plasma Torch (ie; high temperature producing substance).So that C-H bond breaks from 'c' atom binds with other 'c' atoms from nano tube lattice.

PART-B

(Maximum marks:16)

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

II)

(a) Explain the terms

1) symbol

2) molecular formula 4

(b) Define equivalent weight of bases and acids. Calculate the equivalent weight of

i) Sulphuric acid

ii) calcium hydroxide

(4)

III)

(a) How do water become hard? Define degree of hardness. 4

(b) Explain the application of carbon nano materials in medicine 4

IV)

a) Account for the following 4

(i) pH of the blood remain constant

(ii) When acid is added to water pH value of water decreases?

b) Calculate the normality of HCl which contains 2.281g of the acid in 200ml. find out the volume of this solution required to neutralize exactly 50ml of 0.12 N sodium hydroxide solution? (4)

Answers

II)

a)

i) Symbol = Short hand representation of an element eg: Hydrogen =H

ii) Molecular formula(MF):

Actual number of various elements in a molecular or symbolic representation of a molecule eg: for water is H₂O

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

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

$$= 98/2$$

$$= 49$$

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

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

$$= 74/2$$

$$= 37$$

III)

a) 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)

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)

(i) Because Blood is buffer or due to combined action of $\text{HCO}_3^-/\text{CO}_3^{2-}$ buffer

(ii) When acid is added to water , H^+ ion concentration increases this cause decrease in pH of water

$$\text{b) } N = \frac{w_2 \times 1000}{\text{equivalent weight} \times \text{volume in ml}}$$

$$= \frac{2.281 \times 1000}{36.5 \times 200}$$

$$= 0.312N$$

$$N_1 = 0.312 \quad V_1 = ? \quad N_2 = 0.12 \quad V_2 = 50 \text{ ml}$$

$$\begin{aligned} \text{There for } V_1 &= \frac{N_2 \times V_2}{N_1} \\ &= \frac{0.12 \times 50}{0.312} \\ &= 19.23 \text{ ml} \end{aligned}$$

PART -C

(Maximum marks : 30)

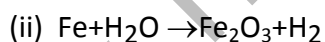
(Answer one full question from each unit. Each question carries 15 marks)

UNIT-1

V)

(a) What are radicals? Classify them with two examples for each type 4

(b) Balance the following equation: (4)



(c) Calculate the oxidation number of manganese in any two compounds and in one radical. 3

(d) Explain redox reaction taking a suitable example. mention different concept also. (4)

OR

VI)

(a) Define ionic product of water. How will you arrive its value? (3)

(b) A solution is prepared by dissolving 0.49 of NaOH in 500 ml .What is the pH of the solution? (4)

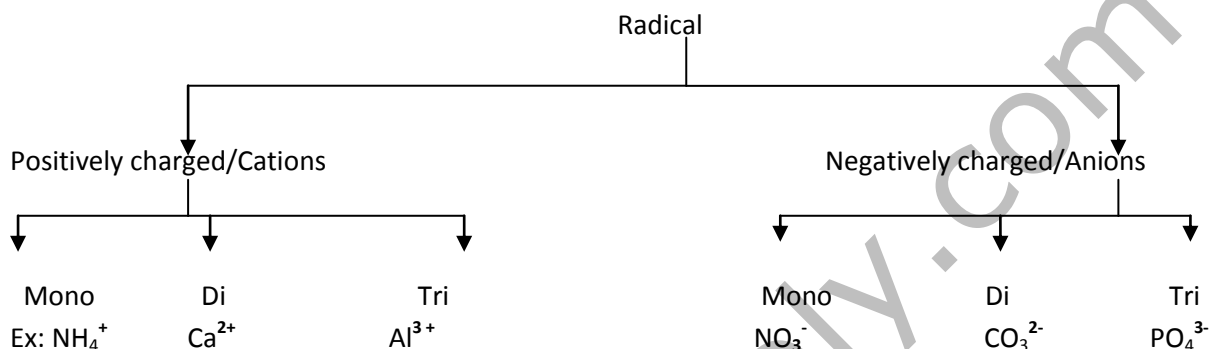
(c) What is meant by indicator range? Give two examples. (4)

(d) How many moles how many grams of sodium chloride are present in 250ml of 0.25 M NaCl solution ? 4

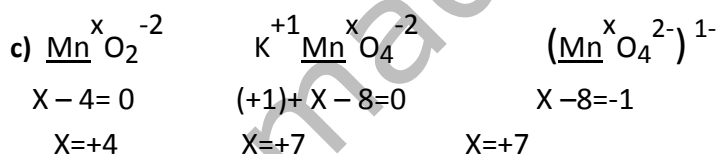
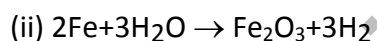
Answers

v)

a) Charged atom or atom groups are called **Radical** Ex: NH_4^+ , Cl^- etc. Radicals are classified as shown below

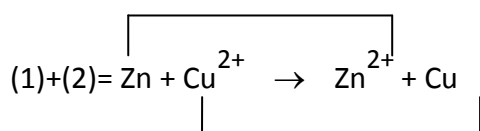
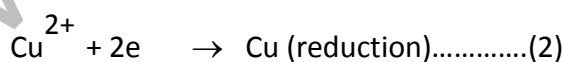
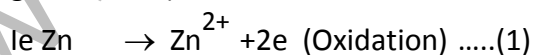


b)



d) Redox reaction:

Oxidation and reduction together is known as redox reaction eg: Daniel cell (Zn-Cu galvanic cell)



Oxidation: Losing of electron is known as Oxidation. During Oxidation , Oxidation number increases eg: $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$

Reduction: Gaining of electrons is called reduction. During reduction, Oxidation number decreases eg: $\text{Cu}^{2+} + 2\text{e} \rightarrow \text{Cu}$

OR

VI)

a) **Ionic product of water [Kw]** is the product of concentration of H^+ and OH^- ions in water.

It was experimentally found that at 25°C , $[\text{H}^+] = [\text{OH}^-] = 10^{-7}$ mol/liter.

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

OR

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

b)
$$M = \frac{W_2 \times 1000}{M_2 \times \text{volume in ml}}$$
$$= \frac{.49 \times 1000}{40 \times 500}$$
$$= 0.0245 \text{ mol/L}$$
$$= [\text{OH}^-]$$

So
$$[\text{H}^+] = 10^{-14} / [\text{OH}^-]$$
$$= 10^{-14} / 0.0245$$
$$= 4.08 \times 10^{-13}$$

$$\text{pH} = -\log [\text{H}^+]$$
$$= -\log [4.08 \times 10^{-13}]$$
$$= 12.38$$

c) **Indicator range**: it is the range of pH in which an indicator changes the colour
methyl orange 3.1 to 4.5

Phenolphthalein 8.3 to 10

d) we have
$$M = \frac{W_2 \times 1000}{M_2 \times \text{volume in ml}}$$

or

$$W_2 = \frac{0.25 \times 58.5 \times 250}{1000}$$

$$= 3.65\text{g}$$

no. of moles $= W_2 / M_2$

=3.65/58.5

=0.0623

UNIT-II

VII)

- (a) What are the advantage and disadvantage of soft and hard water? (4)
- (b) Describe two methods of synthesis of carbon nano tube (4)
- (c) Explain different types of filtration used in water treatment (4)
- (d) Give any three application of carbon nano tube (3)

OR

VIII)

- (a) Explain different methods of used for the removal of hardness in water. (4)
- (b) What are the properties of carbon nano tubes? (3)
- (c) Give four characteristics of portable water. Draw a flow chart for the production of portable water for municipal supply. (4)
- (d) What are carbon nano tube? Comment on its structure. (4)

Answers

VII)

a)

SOFT WATER	HARD WATER
<ul style="list-style-type: none"> • Gives lather readily with soap • Advantage: Used for <ul style="list-style-type: none"> ➤ Cooking ➤ Bathing ➤ In boiler ➤ In laundry purpose etc • Disadvantage: <ul style="list-style-type: none"> ➤ It dissolves Pb of lead pipe which cause poisness ➤ Do not contain Ca^{2+}, Mg^{2+} ions required for health 	<ul style="list-style-type: none"> • Gives lather readily with soap .it contain dissolved impurities like HCO_3^-, Cl^-, SO_4^{2-}, Ca and Mg Advantage: <ul style="list-style-type: none"> ➤ Form insoluble scum with soap ➤ Contain Ca^{2+}, Mg^{2+} ions required for health • Disadvantage: Not Used for <ul style="list-style-type: none"> ➤ Cooking ➤ Bathing ➤ In boiler ➤ In laundry purpose etc

b)

a) High pressure Carbon Monoxide Deposition Method (HiPCO):

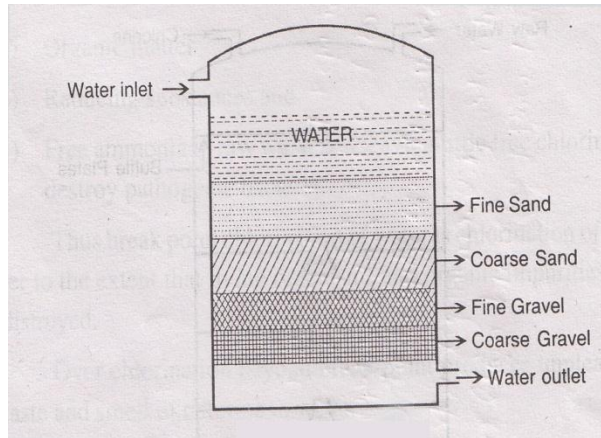
$\text{CO}(\text{g})$ & atoms of iron cluster are heated in a chamber at high pressure. So that Fe breaks the CO molecules as C & O_2 by acting as a catalyst. This 'C' atom bind with other 'C' atoms form nanotube lattice. O_2 react with unburnt CO form CO_2

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

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.

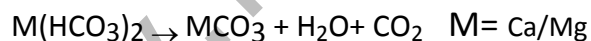
d) i) It strengthen composite material. ii) Act as a molecular size test tube& capsules for drug delivery. iii) Can act as conductor & semiconductor based on their size. iv) As a tips for analysis of DNA & Proteins by Atomic force Microscopy.

OR

VIII)

a) Different type of hardness are

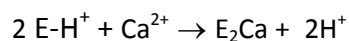
Temporary hardness: It is due to HCO_3 of Ca and Mg. it can be removed by boiling.



Permanent hardness: It is due to Cl^- , SO_4^{2-} , Ca and Mg. 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

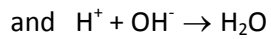
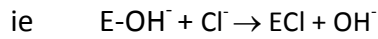
Step 1:

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 $[\text{E}-\text{OH}^-]$

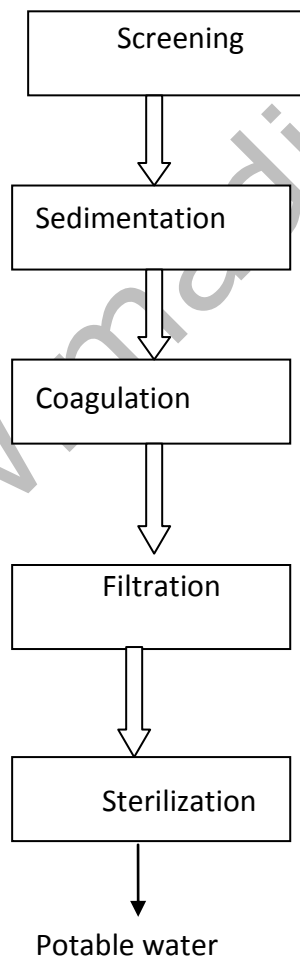


- b)**
1. Very strong
 2. High tensile strength & thermal conductivity
 3. High Young's modulus (force required to bent a material)
 4. High electrical conductivity

c) Portable water: Water which safe to drink. it is need not be pure like distilled water.

Characteristics:

- 1) It should be clear and odourless
- 2) it should free from micro organism like bacteria etc..
- 3) it should free from dissolved gases like H_2S , CO_2 and minerals like NO_3^{1-} , NO_2^{1-} etc



d) 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

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