

# INTERMEDIATE EXAMINATION - 2015

(ANNUAL)

## CHEMISTRY

Time-3  $\frac{1}{4}$  Hours

Full Marks: 70

### Instruction for the candidates:

- 1) Candidates are required to give their answers in their own words as far as practicable.
- 2) Figures in the right hand margin indicate full marks.
- 3) While answering the question, candidate should adhere to the word limit as far as practicable
- 4) 15 Minutes of extra time has been allotted for the candidates to read the questions carefully
- 5) This question paper is divided into two sections- **Section-A** and **Section-B**
- 6) In **Section-A**, there are **28 objective type questions** which are compulsory, each carrying **1 mark**. Darken the circle with blue/ black ball pen against the correct option on OMR Sheet provided to you.  
**Do not use Whitener/ Liquid/ Blade/Nail on OMR Paper, otherwise the result will be invalid.**
- 7) In **Section- B**, there are **11 short answer type questions** (each carrying 2 marks), out of which any **11 questions are to be answered**. Apart from this, there are **4 long Answer Type questions** (Each Carrying 5 marks). Each question has alternate option.
- 8) Use of any electronic device is prohibited.

### Section-I (Objective Type)

The following Question Nos. 1 to 28 there is only one correct answer against each question.  
For each question mark the correct option on the answer sheet: 28 x1 =28

1.If 96500 coulomb of electricity is passed through  $\text{CuSO}_4$  solution,it will liberate

- |                   |                  |
|-------------------|------------------|
| (a)63.5g of Cu    | (b)31.76 g of Cu |
| (c) 96500 g of Cu | (d)100g of Cu    |

SOL:

Correct option is B

2. The shape of  $\text{XeF}_4$  is

- |                |                  |
|----------------|------------------|
| (a)tetrahedral | (b)square planar |
|----------------|------------------|

(c)pyramidal

(d) linear

SOL:

Correct option is B

3.Which one of the following is the strongest Lewis acid?

(a)  $BF_3$

(b)  $BCl_3$

(c)  $BBr_3$

(d)  $BI_3$

SOL;

Correct option is A

4. In chemical equation  $\mu_0 n_1 l_1 \times n_2 l$  the equilibrium-constant R depends on

(a) total pressure

(b)catalyst used

(c)amount of  $H_2$  and  $I_2$

(d) temperature.

SOL:

Correct option is C

5. If the rate of a reaction is expressed by,  $\text{Rate} = K [A]^2[B]$ , then the order of reaction will be

(a)2

(b)3

(c)1

(d)0

SOL:

Correct option is B

6. If 2g of NaOH is present in 200ml of its solution, its molarity will be

(a)0.25

(b)0.5

(c)5

(d)10

SOL:

Correct option is A

7. Which one of the following does not form hydrogen bonding?

(a)  $NH_3$

(b)  $H_2O$

(c)  $HCl$

(d)  $HF$

SOL:

Correct option is C

8. Main source of helium is

(a) air

(b) radium

(c) monazite

(d) water

SOL:

Correct option is C

9. Which one of the following elements is liquid at normal temperature ?

(a) Zinc

(b) Mercury

(c) Bromine

(d) Water

SOL:

Correct option is B

10. Which one of the following is least basic?

(a)  $NI_3$

(b)  $NBr_3$

(c)  $NI_3$

(d)  $NF_3$

SOL:

Correct option is D

11.  $H_2SO_4$  is a/an

(a) acid

(b) base

(c) alkali

(d) salt

SOL:

Correct option is A

12. Which one of the following is called green vitriol?



(d) None of these

SOL:

Correct option is A

13. Which block of elements are known as transition elements?

(a) p-block

(b) s-block

(c) d-block

(f) f-block

SOL:

Correct option is C

14. Concentration of sulphide ore is done by

(a) Froth flotation process

(b) electrolysis

(c) Roasting

(d) none of these

SOL:

Correct option is A

15. Sodium is a member of which of group in periodic table?

(a) Group I

(b) Group II

(c) Group IV

(d) None of these

SOL:

Correct option is A

16. Most abundant element in earth's crust is

(a) Si

(b) Al

(c) Zn

(d) Fe

SOL:

Correct option is B

17. Malachite is an ore of

(a) iron

(b) copper

(c) zinc

(d) silver

SOL:

Correct option is B

18. Formula of copper pyrite is

(a)  $Cu_2S$

(b)  $CuFeS$

(c)  $CuFeS_2$

(d)  $Cu_2Fe_2S_2$

SOL:

Correct option is C

19.

20.

21. General formula of Alkene is

(a)  $\mu_0 n_1 l_1 \times n_2 l$

(b)  $\mu_0 n_1 l_1 \times n_2 l$

(c)  $\mu_0 n_1 l_1 \times n_2 l$

(d) none of these

SOL:

Correct option is A

22.

23. Dry distillation of calcium formate gives

(a) HCHO

(b) HCOOH

(c)  $\mu_0 n_1 l_1 \times n_2 l$

(d)  $\mu_0 n_1 l_1 \times n_2 l$

SOL:

Correct option is A

24. Volume of one mole of any gas at NTP is

- (a) 11.2 litre (b) 22.4 litre  
(c) 10.2 litre (d) 22.8 litre

SOL:

Correct option is B

25. Avogadro's number (N) is equal to

- (a)  $\mu_0 n_1 l_1 \times n_2 l$  (b)  $\mu_0 n_1 l_1 \times n_2 l$   
(c)  $\mu_0 n_1 l_1 \times n_2 l$  (d)  $\mu_0 n_1 l_1 \times n_2 l$

SOL:

Correct option is B

26. Number of  $\mu_0 n_1 l_1 \times n_2 l$  bonds in ethyne is

- (a) One (b) two  
(c) Three (d) four

SOL:

Correct option is B

27. Modern periodic table is given by

- (a) Debonair (b) Mendeleeef  
(c) Mendel (d) none of them

SOL:

Correct option is D

28. Which one of the following is an alkaline earth element?

- (a) Carbon (b) Sodium  
(c) Zinc (d) Iron

SOL:

Correct option is B

## Section-II (Non-Objective Type)

Question Nos. 1 to 11 are short answer type. Each question carries 2 Marks. 11 x 2 =22

1. Explain in which of the following compounds, the chemical bond would have less ionic character: LiCl or KCl

Sol:

Due to large size of k, KCl compound has less ionic character. LiCl covalent then  $\text{Li}^+$  has higher polarization capacity.

2. What is activation energy? Establish the relation between rate constant of a reaction and activation energy.

Sol:

**Vital index-** The ratio of birth to deaths within a population during a given time is called vital index formula for vital index,

$$V.I = \frac{B}{D}$$

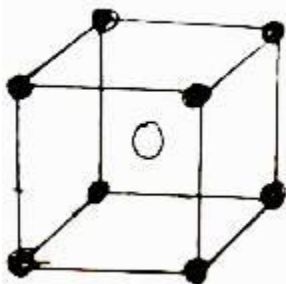
If  $V.I < 100$ , then population is decreasing.

If  $V.I > 100$ , then population is increasing.

3. Discuss briefly the structure of CsCl.

Sol:

CsCl (Caesium Chloride) is body centred unit cell. In this kind of unit cell particles are located at the centers and also at the centre within the body.



**4. The osmotic pressure of sugar solution is 2.46 atm at 27°C. Calculate the concentration of the solution.**

Sol:

Given,

$$T = 27^{\circ}C = 273 + 27 = 300K$$

$$\pi = 2.46 \text{ atm.}$$

$$C = ?$$

We know that,

$$\pi V = nST$$

$$\pi = \frac{n}{V} ST$$

$$\pi = CST$$

$$\therefore C = \frac{ST}{\pi} = \frac{0.082 \times 300}{2.46} = \frac{24.6}{2.46} = 10 \text{ g / litre}$$

**5. How is molarity of a solution different from molality?**

Sol:

Molality (m) is the number of moles of the solute dissolved per kg of the solvent while molarity (M) is the number of moles of the solute dissolved per litre of the solution.

**6. Discuss Raoult's law of relative lowering of vapour pressure.**

Sol:

**Raoult's law:** Relative lowering of vapour pressure is equal to mole-fraction of the solvent which must be nonvolatile and non-electrolyte.

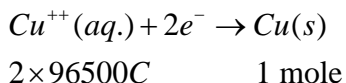
If  $P^0$  is vapour pressure of solvent  $p$  is vapour pressure of solution and  $X$  is mole fraction of solvent.

$$\text{then } \frac{P^0 - p}{P^0} = X \text{ as } \frac{P^0 - p}{P^0} = \frac{n}{N + n}$$



**7. How many moles of Cu will be deposited by passing 24125 coulombs of electric current from CuSO<sub>4</sub> solution?**

Sol:



$\therefore$  Charge of  $2 \times 96500C$  cu deposited = 1mole

$$\therefore 24125 \text{ of } 2 \times 96500C \text{ cu} = 1 \times \frac{24125}{2 \times 96500} = 0.125 \text{mole}$$

**8. If in a chemical reaction  $A + B \rightarrow \text{product}$ , rate law is given by  $R = K[A]^{\frac{1}{2}}[B]^{\frac{3}{2}}$ , find the order of reaction.**

Sol:

$$\text{Order of reaction} = \frac{1}{2} + \frac{3}{2} = \frac{4}{2} = 2(2nd \text{ order})$$

**9. What is Tyndall effect? Discuss.**

Sol:

Tyndall effect: When a beam of light is passed through a colloidal solution the path of beam is illuminated such phenomena are not observed in true solution. Tyndall effect is observed when a beam of sunlight enter a dark room. Illuminating dust particles in beam scatter light.

**10. Give the names of two copper ores.**

Sol:

Cuprite-  $\text{Cu}_2\text{O}$

**11. How will you convert the following?**

**(a) Ethyl alcohol from ethylamine**

**(b) Ethylamine from ethyl alcohol.**

Sol: Protandry- A state in herma- phroditic systems that is characterized by the development of male organs or maturation of their products before the appearance of the corresponding female product thus inhibiting self-fertilization and that encountered commonly in mints, legumes and composites and among diverse group of invertebrate animals.

**12. Name two important ores of iron. How is iron extracted from its ore chemical equations?**

Sol:

Seed- this is the grains or ripened ovules of plants. This fertilized ripened ovule of a flower plant containing an embryo and capable normally of germination to produce a new plant. The formation of the seed completes the process of reproduction in seed plants (started with the development of flowers and pollination) with the embryo developed from the zygote and the seed coat from the integuments of the ovule.

Process of pollen seed formation – (i) The cells within the pollen sac are microspore mother cells.

(ii) Each microspore mother cell is diploid.

(iii) Each microspore mother cell is divided by meiosis to produce four microspores.

(a) This culture of four microspores.

(b) Each microspore in the tetrad is haploid.

(iv) Each microspore divides once by mitosis to form either a 2-celled microspore or a binucleated microspore depending upon the species of plant.

(v) Each microspore differentiates into a pollen grain by developing a heavy thick and sculptured wall around itself.

**Or, Write the names of important ores of aluminium. Discuss the principle of extraction of it from ore.**

Sol:

Function of Female reproductive system of different part of human are following

(Internal part)-

- (i) **Vagina-** The vagina is a canal that joins the cervix (The lower part of uterus) to the outside of the body.
  - (ii) **Uterus (womb) -** The uterus is a hollow, pear-shaped organ that is the home to a developing of the body.
  - (iii) **Ovaries-** The ovaries are small, oval shaped glands that are located on either side of the uterus. It produces eggs and hormones.
  - (iv) **Fallopian tubes-** These are narrow tubes that are attached to upper part of the uterus and serves as tunnels for the ova (egg) to travel from the ovaries to the uterus.
- The main external structures of the female reproductive system include-
- (i) **Labia majora-** The labia majora and protect the other external reproductive organs.
  - (ii) **Libia minora-** The labia minora can be very small or up to 2 inch wide. They lie just inside the labia majora and surround the opening to the vagina.
  - (iii) **Bartholins gland-** These glands are located besides the vaginal opening and produce a fluid (m48-(48) secretion.

- (iv) **Clitoris-** The two labia minora meet at the clitoris, a small, sensitive protrusion that is comparable to the penis in males. Like penis, the clitoris is very sensitive to stimulation and can become erect.

**13. How does nitric acid react with the following? Give equation.**

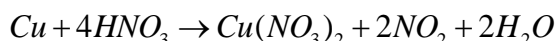
(i) Copper

(ii) Iron

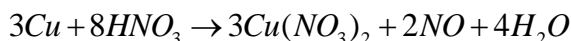
Sol:

**Reaction with Cu:** Copper reacts with nitric acid under different conditions.

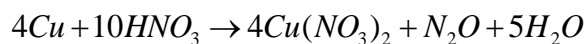
- (a) Copper reacts with Conc.  $HNO_3$ , to produce  $NO_2$



- (b) Copper reacts with cold and 50%  $HNO_3$  to form  $NO$  gas.

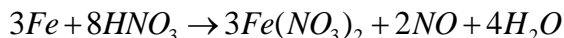


- (c) Copper reacts with very dil.  $HNO_3$  to give  $N_2O$  gas.

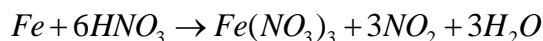


**Reaction with Fe:**

- (a) Iron reacts with cold and 50% dil.  $HNO_3$  to produce nitric oxide.



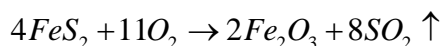
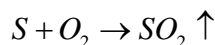
- (b) Iron reacts with Conc.  $HNO_3$  to give  $NO_2$ .



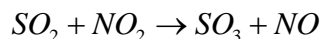
**Or, How is sulphuric acid prepared by lead chamber process? Give its principles.**

Sol;

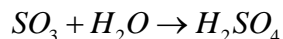
**Lead chamber process:** In this process,  $SO_2$  is produced by burning sulphur or iron pyrites.



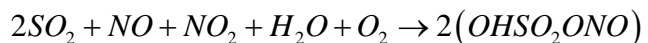
The  $SO_2$  so, obtained is oxidized to  $SO_3$  by means of  $NO_2$



The  $SO_3$  so, obtained is treated with steam when sulphuric acid is formed.

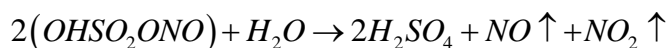


The flow of steam is less white chamber crystals are formed.



Chamber crystals

When chamber crystals appear the flow of steam is increased when there are converted to sulphuric acid.

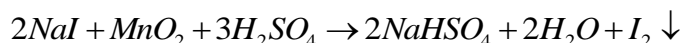


**Or, What are the main sources of iodine? How is iodine extracted from sea weeds?**

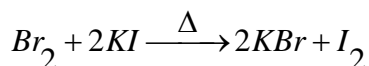
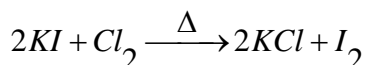
Sol:

Natural sources of iodine: Due to its reactivity iodine is not found in nature in Free State. Its main sources are (i) Sea weeds (ii) Chile salt power (iii) Natural brine

**Extraction of Iodine from sea weeds:** Sea weed, laminaria contains iodine sea weed is well dried and burnt in deep pits carefully so, that iodine is not destroyed. The obtained ash is called 'kelp'. Which contains 0.4 to 1.3% iodine. Kelp is dissolved in water and solution is partially crystallised when less soluble KI and NaI remain in the mother liquor. Conc.  $H_2SO_4$  is added when basic sulphides deposit at the bottom, which is filtered and removed. Now the filtrate is mixed with  $MnO_2$  and Conc.  $H_2SO_4$  and heated in an iron vessel. Iodine vapourises due to the reaction and is collected in Aludel. Iodine is now collected as solid after condensation.



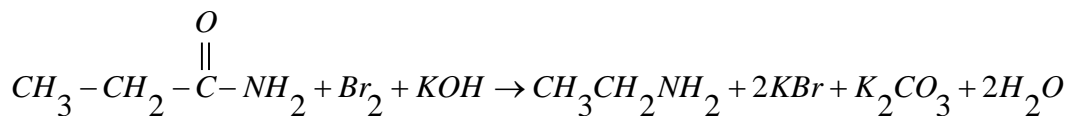
Iodine obtained by this method contains  $Cl_2$  and  $Br_2$  as impurities. It is treated with KI to obtain pure iodine.



**14. How will you prepare ethylamine in laboratory?**

Sol:

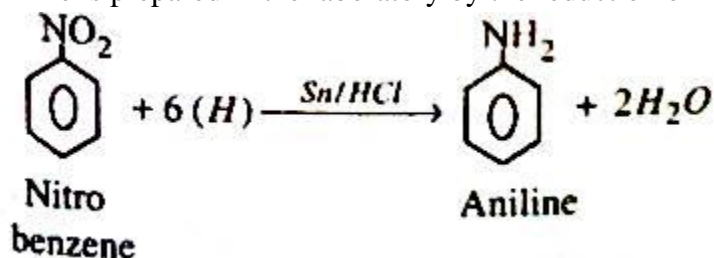
Ethyl amine is prepared in the laboratory by Hoffmann's bromo amide reaction. When propionamide is treated with bromine or chlorine and caustic potash, ethyl amine is formed in good yield.



**Or, How will you prepare aniline in laboratory?**

Sol:

Aniline is prepared in the laboratory by the reduction of nitrobenzene with tin and HCl.

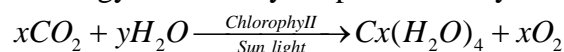


Hydrochloric acid is gradually added to a mixture of tin and nitrobenzene. The addition is carried out between 50 - 60°. The mixture obtained is refluxed at 100°C, until, the smell of nitrobenzene has disappeared. It is then cooled and treated with aqueous NaOH solution. The liberated aniline is separated from the reaction mixture by steam distillation. The obtained aniline is further purified by simple distillation method.

**Or, What are carbohydrates? How are they classified?**

Sol:

Carbohydrates: They are naturally occurring organic compounds and are a major source of energy to our body. In plant carbohydrates are formed as a result for photosynthesis.



Carbohydrate

Classification of carbohydrates: Carbohydrates have been classified in a number of ways-

**(a) Based on molecular size:** On the basis of the molecular size, carbohydrates have been classified into three types. These are

(i) Monosaccharide's (ii) Oligosaccharides and (iii) Polysaccharides

**(b) Based on taste:** Carbohydrates with sweet taste are called sugar while these without a sweet taste are called non-sugars. It may be noted that all mono and oligosaccharides are sugars while polysaccharides are non-sugars.

**(c) Reduction and non-reduction sugars:** Carbohydrates which reduce Tollen's reagent (Ammoniacal silver nitrate) and Fehling solution are called reducing sugars while those which do not reduce these are called non-reducing sugars. For example, both glucose and fructose are reducing sugar while sucrose is a non-reducing sugar.

**15. Explain why**

**(A) Boiling point of  $\text{NH}_3$  is higher than  $\text{PH}_3$ .**

Sol:

This is because there is intermolecular hydrogen bonding present in  $\text{NH}_3$  (Due to small size and high electronegativity of N) and not in  $\text{PH}_3$  (due to large size and less electronegativity of P).

**(B) Chloroacetic acid is stronger than acetic acid.**

Sol:

Chloroacetic acid is stronger than acetic acid due to the electron-withdrawing effect of chlorine.

**(C) Only Xe forms chemical compound among inert gases.**

Sol:

Xe has 5s and 5p orbitals in the formation of bond value of free energy is lower. So, Xe forms with  $\text{F}_2$  and  $\text{O}_2$  and gives stable compounds.  $\text{XeF}_2$ ,  $\text{XeF}_4$ ,  $\text{XeF}_6$  etc.

**(D) HF is weaker than HI in acetic acid.**

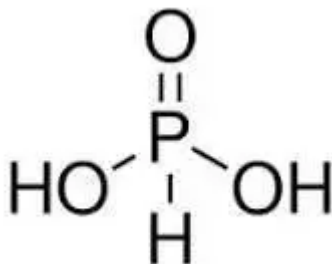
Sol:

Xe atom has larger radi, therefore the electron attraction to the nucleus is weaker in comparison to attraction to the nucleus is weaker in comparison to shell can pair to another electron of non-metal atom and form bond. Thus noble gas xenon forms real chemical compounds.

**(E)  $\text{H}_3\text{PO}_3$  is a di-protic acid.**

Sol:

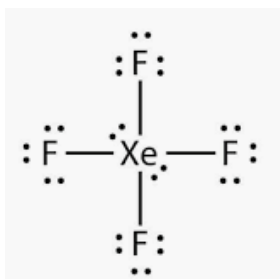
Molecular structure of  $\text{H}_3\text{PO}_3$  is as following



A diprotic acid is an acid that contains within its molecular structure two hydroxyl group (O-H) from that  $\text{H}_3\text{PO}_3$  it is clear that  $\text{H}_3\text{PO}_3$  have hydroxyl group is bounded with P.

Hence  $\text{H}_3\text{PO}_3$  is diprotic acid.

Strutural formulae of  $\text{XeOF}_4$

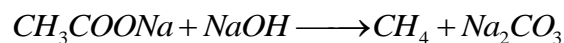


**Or, what happens when----**

**(A) Sodium acetate is heated with soda lime?**

Sol:

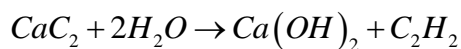
When sodium acetate is heated with soda-lime, Methane gas is liberated.



**(B) Calcium carbide is allowed to react with water?**

Sol:

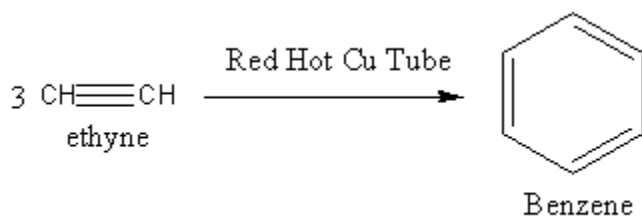
When calcium carbide is allowed to react with water then give hydroxide and ethene.



**(C) Acetylene is passed through red hot copper tube?**

Sol:

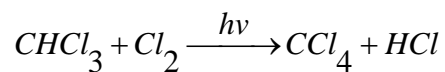
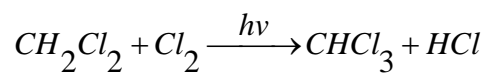
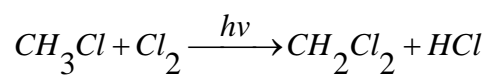
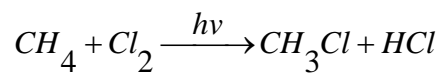
When acetone reacts with iodine and base, it liberates iodoform yellow Ppt



**(D) Methane reacts with chlorine in diffused sunlight?**

Sol:

When Acetylene is passed through red hot cu-tube, formation of benzene takes place.



**(E) Ethyl alcohol is oxidized?**

Sol:

We know that Ethyl alcohol is generally known as alcohol. It is made from corn, barley and grain, it is the product of fermentation of substances containing sugar.

