

# Chemistry - 2018

## General Instructions :

- (i) All questions are compulsory. सभी प्रश्न अनिवार्य हैं।
- (ii) Question Nos. 1 to 8 are Multiple Choice Type which carry 1 mark each.  
प्रश्न संख्या 1 से 8 तक बहुविकल्पीय प्रश्न हैं जिनका प्रत्येक का मान 1 अंक है।
- (iii) Question Nos. 9 to 15 are Very Short Answer Type which carry 1 mark each.  
प्रश्न संख्या 9 से 15 तक अति लघु उत्तरीय प्रश्न हैं जिनका प्रत्येक का मान 1 अंक है।
- (iv) Question Nos. 16 to 23 are Short Answer Type-I which carry 2 marks each.  
प्रश्न संख्या 16 से 23 तक लघु उत्तरीय-I प्रश्न हैं जिनका प्रत्येक का मान 2 अंक है।
- (v) Question Nos. 24 to 31 are Short Answer Type-II which carry 3 marks each.  
प्रश्न संख्या 24 से 31 तक लघु उत्तरीय-II प्रश्न हैं जिनका प्रत्येक का मान 3 अंक है।
- (vi) Question Nos. 32 to 34 are Long Answer Type which carry 5 marks each.  
प्रश्न संख्या 32 से 34 तक दीर्घ उत्तरीय प्रश्न हैं जिनका प्रत्येक का मान 5 अंक है।

### (Multiple Choice Type Questions)

Q.1. The total number of particles in a body centred cubic [bcc] unit cell is

- (a) one (b) two  
(c) three (d) four

Ans. (b) two

Q.2. Unit of rate constant of third order reaction,  $k$  is

- (a)  $s^{-1}$  (b)  $mol^{-1} L s^{-1}$   
(c)  $mol^{-2} L^2 s^{-1}$  (d)  $mol L^{-1} s^{-1}$

Ans. (c)  $mol^{-2} L^2 s^{-1}$

Q.3.  $CH_3-CH_2-Cl + NaI \xrightarrow[\text{heat}]{\text{(acetone)}} CH_3-CH_2-I + NaCl$

The reaction is

- (a) Wurtz reaction (b) Fittig reaction  
(c) Finkelstein reaction (d) none of these

Ans. (b) Fittig reaction

Q.4. Cuprite is an ore of

- (a) Fe (b) Cu  
(c) Zn (d) Pb

Ans. (b) Cu

Q.5. Ethanoyl chloride + Ethanol  $\rightarrow$  A

'A' is

- (a) Methyl ethanoate (b) Ethyl ethanoate  
(c) Ethyl methanoate (d) None of these

Ans. (b) Ethyl ethanoate

Q.6. Acid chloride is reduced to aldehyde by which of the following?

- (a) Wurtz reaction (b) Rosenmund reduction  
(c) Fittig reaction (d) None of these

Ans. (b) Rosenmund reduction

Q.7. Enzymes are

- (a) Carbohydrates (b) Proteins  
(c) Vitamins (d) None of these

Ans. (b) Proteins

Q.8.  $CH_3-CN \xrightarrow{Na/C_2H_5OH}$  Product, the product is

- (a)  $CH_3-CH_2-NH_2$  (b)  $CH_3-NH_2$   
(c)  $CH_3-CH_2-CH_2-NH_2$  (d) None of these

Ans. (a)  $CH_3-CH_2-NH_2$

### (Very Short Answer Type Questions)

Q.9. For the reaction  $2HI \rightarrow H_2 + I_2$ , what is the order of reaction?

Ans. Second order reaction

Q.10. Write the diseases caused by deficiency of vitamin K.

Ans. Hemorrhagic disease.

Q.11. What is the particle size of colloidal solution?

Ans. 1 nano meter to 1 micrometers

Q.12. What is the use of polyvinyl chloride?

Ans. For making pipes, electric cables and clothing.

Q.13. Write IUPAC name of  $CH_3-C(C_2H_5)_2-CH_2-Br$ .

Ans. 1-Bromo-2-ethyl-2-methylbutane

Q.14. Give one example of oligosaccharides.

Ans. fructo-oligosaccharides

Q.15. Give an example of antibiotic.

Ans. Penicillin-resistance enterococcus.

### (Short Answer I Type Questions)

Q.16. Distinguish between electronic conduction and electrolytic conduction.

Ans. Electronic

1. Electronic conduction is due to the movement of electrons
2. No change is observed in the chemical properties of the conductor
3. It does not involve only net transfer of matter.
4. Electronic conduction decreases with increase in temperature.
5. The conductivity of metallic conductor is generally high.

Electrolytic

1. Electrolytic conduction is due to the movements of ions.
2. It involves a chemical change resulting in the decomposition of the electrolyte.
3. It involves the transfer of matter in the form of ions.
4. Electrolytic conduction increase with increase in temperature.
5. The conductivity of electrolytic conduction is

generally low

Q.17. Explain the following :

(a) Metallurgy (b) Flux.

Ans. (a) Metallurgy - It is a domain of materials science and engineering that studies the physical and chemical behavior of metallic elements, their inter metallic compounds, and their mixtures, which are called alloys."

(b) Flux - Flux is a chemical cleaning agent, fluxes may have more than one function at a time. They are used in both extractive metallurgy and metal joining.

Q.18. Why does  $\text{NH}_3$  form hydrogen bonding while  $\text{PH}_3$  does not?

Ans. The key to it is charge distribution. The nitrogen, being more electronegative, withdraws the bonding electrons between N and H ends of the molecule more positive and increasing the electrostatic attraction between the H and other nearby molecules.

In the case of phosphine ( $\text{PH}_3$ ), phosphorus is neither small enough nor electronegative enough to make H positive enough to create the intermolecular attraction known as hydrogen bonding.

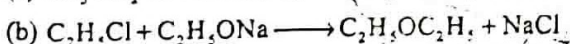
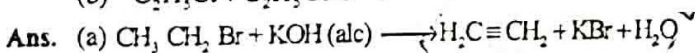
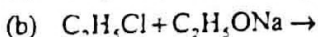
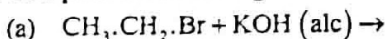
Q.19. Predict which of the following ions will be coloured in aqueous solution. Give reason for each:

$\text{Cu}^+$  and  $\text{Fe}^{3+}$ .

Ans.  $\text{Cu}^+$  ions does not produce colour in aqueous solution. It is because  $\text{Cu}^+$  ions has  $3d^{10}$  configuration so, it has no d-d transition of electron.

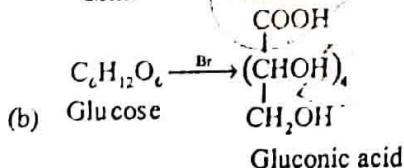
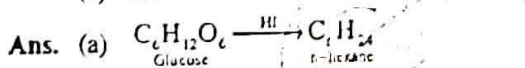
In case of  $\text{Fe}^{3+}$ , it produce pale violet or purple colour. This is because  $\text{Fe}^{3+}$  ion have electrons in d-orbitals and d-d transition is possible.

Q.20. Complete the following:



Q.21. What happens when glucose is treated with the following reagent?

(a) HI (b) Bromine



Q.22. Write any two differences between thermoplastics and thermosetting polymers.

Ans.

	Thermoplastics Polymers	Thermosetting Polymers
1	Upon heating, they soften readily and can regain their shape or even remould upon cooling.	Upon heating, they do not soften. Once melted, they cannot be remoulded.
2	These are generally long chain linear polymers.	These are generally cross linked in nature.
3	They are formed as a result of addition polymerisation.	These are formed by Condensation polymerisation.
4	These are generally weak, soft and little brittle.	Strong and brittle in nature.

Q.23. Write briefly with one example.

(a) Disinfectants (b) Antacids

Ans. (a) Disinfectants : It may be defined as the chemical substances which kill micro-organism but are not safe for contact with living tissues are known as disinfectants. These are used only on non-living objects.

Ex- Phenyl.

(b) Antacids: It may be defined as the chemical substance which can reduce or neutralize the acidity in stomach and raise the PH to some appropriate level.

Ex- Sodium hydrogen carbonate.

(Short Answer II Type Questions)

Q.24. Write the properties of Transition element with reference to (a) Oxidation state and (b) Magnetic properties.

Ans. Properties of transition element with reference to

(a) Oxidation state: Transition elements show variable oxidation state due to the participation of ns and (n-1)d electrons in bonding because the energies of ns and (n-1)d-sub shells are quite close. In general, lower oxidation state is exhibited when ns electrons participate in bonding and higher oxidation states are shown when ns as well (n-1)d-electrons take part in bonding.

(b) Magnetic properties : Transition metal compounds are paramagnetic when they have one or more unpaired d-electrons. Some compounds are diamagnetic. These include octahedral, low-spin,  $d^6$  and square-planar  $d^8$  complexes.

Q.25. Differentiate between order and molecularity of reaction.  
Ans.



Order of Reaction	Molecularity of Reaction
1 It is the sum of the co-efficients of the reacting species involved in the rate equation.	It is a number of reacting species involved in simultaneous collisions in an elementary reaction
2 It is determined experimentally	It is theoretical in nature
3 It is derived from the rate equation	It is derived from mechanism of reaction
4 It depends upon pressure and temperature.	It is independent of pressure and temperature.
5 It may be fractional in some cases.	It is always a whole number
6 It can be zero.	It cannot be zero

Q.26. Define the following terms :

- (a) Adsorbent  
(b) Brownian movement.

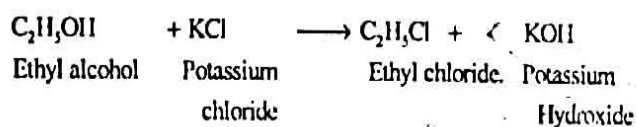
Ans. (a) Adsorbent : The solid substance on the surface of which adsorption occurs is known as adsorbent.

(b) Brownian Movement : In 1828, an English Botanist Brown observed that pollen grains suspended in water execute a continuous zig-zag motion. He named this phenomenon as Brownian movement. Later on, it was found that the particles of the dispersed phase of all colloidal solution also execute a continuous zig-zag motion. It is defined as the dispersed phase particles in a colloidal sol follow zig-zag path.

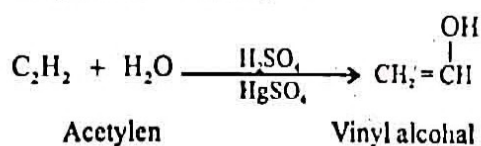
Q.27. How will you bring about the following transformations?

- (a) Ethyl alcohol to Ethyl chloride  
(b) Acetylene to acetaldehyde  
(c) Aniline to Benzene diazonium chloride.

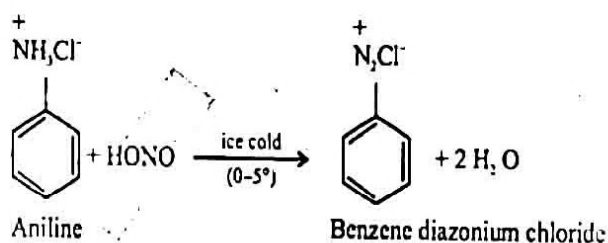
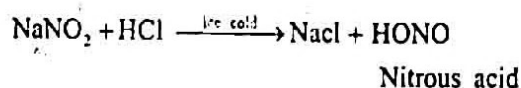
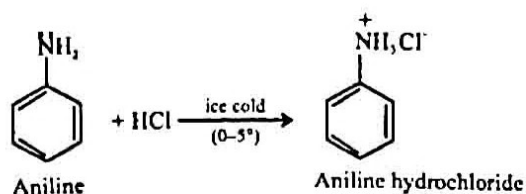
Ans. (a) Ethyl alcohol to Ethyl chloride.



(b) Acetylene to acetaldehyde.

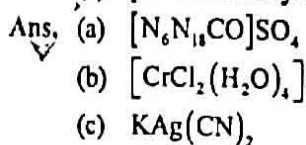


(c) Aniline to Benzene diazonium chloride.



Q.28. Using IUPAC norms, write the formulae for the following:

- (a) hexa-ammine cobalt (III) sulphate  
(b) tetra-aquadichlorido-chromium (III) ion  
(c) potassium dicyanoargentate (I).



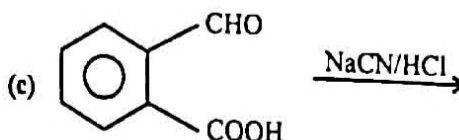
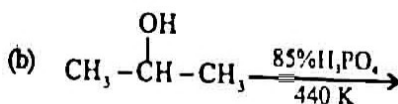
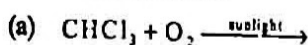
Q.29. What is salt bridge ? Mention its functions.

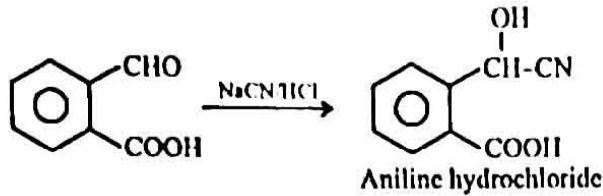
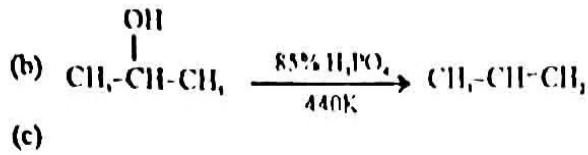
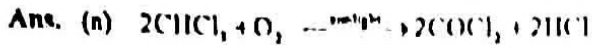
Ans. Salt Bridge : It is an inverted U-Shaped glass tube which contains in it a suitable salt in the form of a thick paste made in agar-agar.

Its functions:

- (i) A salt bridge completes the inner cell circuit.  
(ii) A salt bridge prevents the transference of electrolyte from one half cell to the other.  
(iii) A salt bridge maintains the electrical neutrality of the electrolytes in the two half cells.

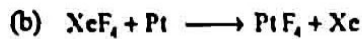
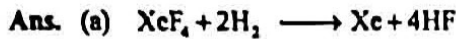
Q.30. Predict the product:





31. Complete the following reactions:

- (a)  $\text{XeF}_4 + \text{H}_2$   
 (b)  $\text{XeF}_4 + \text{Pt} \rightarrow$   
 (c)  $\text{XeOF}_4 + 3\text{H}_2 \rightarrow$



(Long Answer Type Questions)

32. An antifreeze solution is prepared from 222.6 g of ethylene glycol,  $\text{C}_2\text{H}_4(\text{OH})_2$ , and 200 g of water. Calculate the molality of the solution. If the density of the solution is  $1.072 \text{ g mL}^{-1}$ , then what shall be the molarity of the solution?

Ans. Molar mass of C = 12

Molar mass of H = 1

Molar mass of O = 16

Molar mass of  $\text{C}_2\text{H}_4\text{O}_2 = 62$

No of moles of ethylene glycol =  $\frac{222.6}{62} = 3.59 \text{ moles}$

Molality of the solution =  $\frac{3.59 \times 200}{1000}$

$= \frac{3.59}{0.2}$   
 $= 17.95$

Volume of the solution

$= \frac{\text{mass}}{\text{density}}$   
 $= \frac{222.6 + 200}{1.072}$   
 $= 394.216 \text{ mL}$

Molarity of the solution =  $\frac{3.59 \times 394.21}{1000}$   
 $= 3.59 \times 0.394$   
 $= 9.107$

OR

Show that for a first order reaction the time required for 99% completion of a reaction is twice the time required to complete 90% of the reaction.

Ans. Given,

Order of reaction is first.

Let, Initial amount = 100g

Amount in % after 90% completion =  $(100 - 90)\% = 10\%$

Amount in gram [R] = 10% of 100g = 10g

Amount in % after 99% completion =  $(100 - 99)\% = 1\%$

Amount in gram [R] = 1% of 100g = 1g

Using the formula of first order reaction,

$k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$

Time required for the completion of 90% of reaction

$t_1 = \frac{2.303}{k} 10g \frac{100}{10} = \frac{2.303}{k} \log 100 = \frac{2.303}{k} \times 2$  ... (i)

Time required for 99%

$t_2 = \frac{2.303}{k} 10g \frac{100}{10} = \frac{2.303}{k} \log 10 = \frac{2.303}{k}$  ... (ii)

From (i) and (ii)

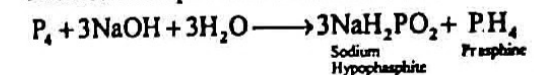
we observe that,  $t_2 = 2t_1$

Hence, for a first order reaction, time required for 99% completion is twice the time required for the completion of 90% of reaction.

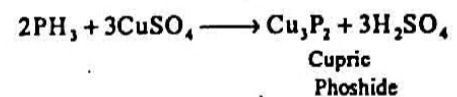
33. How is phosphine prepared in laboratory? How does it react with (a)  $\text{CuSO}_4$  and (b)  $\text{HgCl}_2$

Ans. Preparation of phosphine in laboratory

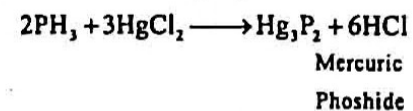
In the laboratory, phosphine can be prepared by heating white phosphorus with strong solution of caustic soda in an inert atmosphere of carbon dioxide.



(a) Reaction with  $\text{CuSO}_4$ :



(b) Reaction with  $\text{HgCl}_2$ :



OR

Discuss the general characteristics of group 16 elements with reference to (a) atomic size, (b) ionisation enthalpy and (c) electronegativity.



Ans. General characteristics of group 16 elements with reference to:

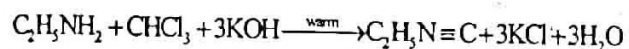
- (a) Atomic size : The elements of the group-16 have smaller atomic radii as compared to the corresponding elements of the group - 15 present in the same group. These increase down the group.
- (b) Ionisation Enthalpy : If we compare the ionization enthalpy of the members of group-15 and group 16 present in the same period, we observe that ionization enthalpy values of elements of group-15 are higher while group - 16 has smaller values. Down the group, the ionization enthalpies of the elements decreases.
- (c) Electro negativity: The elements of the group-16 are electro-negativity in nature. Oxygen is the second most electro negativity element after fluorine. This is due to its very small size. These values decrease down the group due to increase in atomic size.

34. Write short notes on the following:

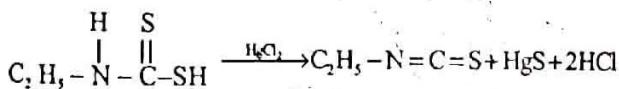
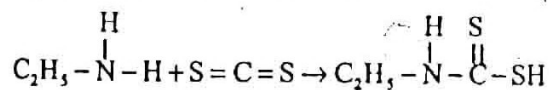
- (a) Carbylamine reaction  
 (b) Hofmann's bromamide reaction  
 (c) Gattermann reaction.

Ans. (a) Carbylamine Reaction : Primary amines, both aliphatic and aromatic, form isocyanides or carbylamines with extremely unpleasant smell on warming with chloroform and alcoholic solution of KOH.

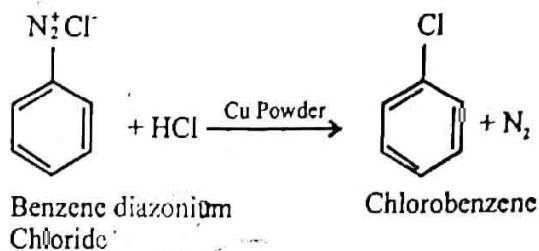
For Example :



(b) Hofmann's Bromamide Reaction : Aliphatic primary amines reacts with carbon disulphide upon warming to form dithioalkyl carbonic acid which decompose upon heating with mercuric chloride to give alkyl isothiocyanates with unpleasant smell of mustard oil.



(c) Gatterman Reaction : In this reaction, benzene diazonium chloride is treated with copper powder and halogen acid to form the corresponding haloarene as the product.



OR

Identify 'X', 'Y' and 'Z' in the following :

