# SAMPLE PAPER 8

## CHEMISTRY

*A Highly Simulated Practice Questions Paper*
*for CBSE **Class XII** (Term I) Examination*

### Instructions

(i) This question paper contains three sections.
(ii) Section A has 25 questions. Attempt any 20 questions.
(iii) Section B has 24 questions. Attempt any 20 questions.
(iv) Section C has 6 questions. Attempt any 5 questions.
(v) Each questions carry 0.77 mark.
(vi) There is NO negative marking.

Roll No.

*Maximum Marks : 35*
*Time allowed : 90 min*

## Section A

*This section consists of 25 multiple choice questions with overall choice to attempt **any 20** questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.*

**1.** The number of octahedral void(s) per atom present in a simple cubic close packed structure is

(a) 1        (b) 3        (c) 2        (d) 4

**2.** Each ion or atom that forms an fcc unit cell is surrounded by

(a) eight octahedral voids and four tetrahedral voids
(b) six octahedral voids and six tetrahedral voids
(c) eight octahedral voids and six tetrahedral voids
(d) six octahedral voids and eight tetrahedral voids

**3.** Which of the following is an example of network solid?

(a) $SO_2$ (solid)      (b) $I_2$      (c) Diamond      (d) $H_2O$ (ice)

**4.** In a solid lattice, the cation has left a lattice site and is located at an interstitial position, the lattice defect is

(a) Frenkel defect    (b) deficiency defect    (c) *F*-centre defect    (d) Schottky defect

**5.** Anoxia is a condition, generally seen in climbers because of

(a) high concentration of oxygen at high altitudes
(b) high concentration of air at high altitudes
(c) high partial pressure of oxygen at high altitudes
(d) low partial pressure of oxygen at high altitudes

6. Raoult's law becomes a special case of Henry's law, when
   (a) $K_H = p_i^\circ$     (b) $K_H > p_i^\circ$     (c) $K_H < p_i^\circ$     (d) $K_H \geq p_i^\circ$

7. Select the incorrect statement.
   (a) Solution of chloroform and acetone shows negative deviation from Raoult's law
   (b) Solution of ethanol and acetone shows positive deviation from Raoult's law
   (c) In case of solution of phenol ($A$) and aniline ($B$), $A—A$ and $B—B$ interactions are stronger than $A—B$ (i.e. phenol and aniline) interactions
   (d) Azeotropes are constant boiling mixtures, which are separated by azeotropic distillation.

8. Among the following, the azeotropic mixture is
   (a) $CCl_4 + CHCl_3$
   (b) $C_6H_{14} + C_7H_{16}$
   (c) $C_2H_5Br + C_2H_5Cl$
   (d) chlorobenzene + bromobenzene

9. Which one of the following statements regarding Henry's law is not correct?
   (a) Different gases have different $K_H$ (Henry's law constant) values at the same temperature
   (b) Higher the value of $K_H$ at a given pressure, higher is the solubility of the gas in the liquids
   (c) The value of $K_H$ increases with increase of temperature and $K_H$ is function of the nature of the gas
   (d) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution

10. Water is much less volatile than $H_2S$ because
    (a) $H_2O$ has a bond angle of nearly $150°$
    (b) hydrogen is loosely bonded with the sulphur
    (c) S-atom is less electronegative than O-atom
    (d) S-atom is more electronegative than O-atom

11. Which of the following oxides is amphoteric in nature?
    (a) $Cl_2O_7$                          (b) $Na_2O$
    (c) $N_2O$                             (d) $Al_2O_3$

12. $H_2SO_4$ is used in
    (a) petroleum refining
    (b) manufacturing of paints, pigments and dyestuff intermediates
    (c) detergent industry
    (d) All of the above

13. The anomalous behaviour of fluorine is due to
    (a) its small size
    (b) its highest electronegativity
    (c) low $F—F$ bond dissociation enthalpy and non-availability of $d$-orbitals in valence shell
    (d) All of the above

14. $4HCl + O_2 \xrightarrow{\text{CuCl}_2} 2Cl_2 + 2H_2O$

    The above reaction of chlorine preparation is of
    (a) Deacon's process                   (b) contact process
    (c) electrolytic process               (d) None of these

**15.** Which of the following rare gas is most abundant in air?

(a) He    (b) Ne    (c) Ar    (d) Kr

**16.** The structure of $IF_7$ is

(a) square pyramidal    (b) trigonal bipyramidal

(c) octahedral    (d) pentagonal bipyramidal

**17.** Which of the following is an example of *vic*-dihalide?

(a) Dichloromethane    (b) 1,2-dichloroethane

(c) Ethylidine chloride    (d) Allyl chloride

**18.** Which of the following has no dipole moment?

(a) $CH_3Cl$    (b) $CHCl_3$    (c) $CH_2Cl_2$    (d) $CCl_4$

**19.** In $CH_3CH_2OH$, the bond that undergoes heterolytic cleavage most readily is

(a) C—C    (b) C—O    (c) C—H    (d) O—H

**20.** Consider the reaction given below :

$$CH_3—CH_2—CH_2—Br \xrightarrow{\text{Alc. KOH}}$$

Final product is

(a) propene    (b) propanol    (c) cyclopropane    (d) propan-1, 2-diol

**21.** Which of the following reagent is used to reduce carboxylic acids to primary alcohols?

(a) Pd    (b) $R$—OH    (c) $LiAlH_4$    (d) Ni

**22.** The order of reactivity of given hydrogen halides with ether is

(a) HBr > HI > HCl    (b) HCl > HBr > HI

(c) HI > HBr > HCl    (d) HCl > HI > Br

**23.** Which of the following amino acids is not optically active?

(a) Lysine    (b) Glycine

(c) Leucine    (d) Glutamine

**24.** Which of the following combination is correct between nucleic acid and its respective sugar base?

(a) DNA → β-D-3-deoxyribose    (b) DNA → β-D-1-deoxyribose

(c) RNA → β-D-ribose    (d) RNA → β-D-3-deoxyribose

**25.** Glucose and galactose are having identical configuration in all the position except ........ position

(a) C-3    (b) C-4    (c) C-2    (d) C-5

# Section B

*This section consists of 24 multiple choice questions with overall choice to attempt **any 20** questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.*

**26.** The following acids have been arranged in the order of decreasing acidic strength. Identify the correct order from the given options.

ClOH (I), BrOH (II), IOH (III)

(a) I > II > III    (b) II > I > III    (c) III > II > I    (d) I > III > II

**27.** The nitrogen base which is present in RNA and absent in DNA is
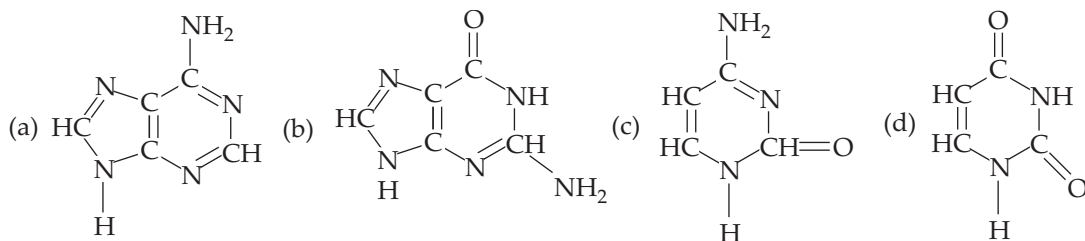


**28.** The alcohol that produce turbidity immediately with Lucas reagent at room temperature is
(a) 1-hydroxybutane 
(b) 2-hydroxybutane
(c) 2-hydroxy-2-methylpropane 
(d) 1-hydroxy-2-methylpropane

**29.** Which of the following compounds is likely to show both Frenkel and Schottky defects in its crystalline form?
(a) AgBr 
(b) CsCl 
(c) KBr 
(d) ZnS

**30.** Which of the following use of noble gases is incorrect?
(a) Liquid helium is used as cryogenic agent for carrying out various experiments at low temperature
(b) Liquid helium is used to produce and sustain powerful superconducting magnets
(c) Neon is used in the laboratory for handling substances that are air-sensitive
(d) Xenon and krypton are used in light bulbs designed for special purposes

**31.** The number of S—S bonds in sulphur trioxide, trimer, $(S_3O_9)$ is
(a) three 
(b) two 
(c) one 
(d) zero

**32.** Which of the following statement is incorrect about amino acids?
(a) Amino acids are usually colourless, crystalline solids
(b) They are soluble in water
(c) They behave like a salts
(d) Melting point of amino acids are very low

**33.** 138 g of ethyl alcohol is mixed with 72 g of water. The ratio of mole fraction of alcohol to water is
(a) 1 : 1 
(b) 1 : 4 
(c) 1 : 2 
(d) 3 : 4

**34.** Which of the following has —O—O— linkage?
(a) $H_2S_2O_6$ 
(b) $H_2S_2O_8$ 
(c) $H_2S_2O_3$ 
(d) $H_2S_4O_6$

**35.** The molal elevation constant depends upon
(a) nature of solute 
(b) vapour pressure of the solution
(c) nature of the solvent 
(d) None of these

**36.** The conversion of *m*-nitrophenol to resorcinol involves respectively
(a) hydrolysis, diazotisation and reduction 
(b) diazotisation, reduction and hydrolysis
(c) hydrolysis, reduction and diazotisation 
(d) reduction, diazotisation and hydrolysis

**37.** Toluene on reaction with $Cl_2$ in presence of $FeCl_3$ gives predominantly.
(a) benzoyl chloride 
(b) benzyl chloride
(c) *o*- and *p*-chlorotoluene 
(d) *m*-chlorotoluene

**38.** What will be the molecular mass of protein, if osmotic pressure of a solution containing 2 g dissolved protein per $300\,cm^3$ of solution in 20 mm of Hg at 27°C ?

(a) $6239.6\,g\,mol^{-1}$ 　　　　　　　　　(b) $3692.1\,g\,mol^{-1}$
(c) $12315.5\,g\,mol^{-1}$ 　　　　　　　　(d) $7368.4\,g\,mol^{-1}$

**39.** Which of the following alcohols give the best yield of dialkyl ether on being heated with a trace of sulphuric acid ?

(a) 1-pentanol 　　　(b) Cyclopentanol 　　　(c) 2-pentanol 　　　(d) 2-propanol

**40.** The reactants '$A$' and '$B$' which give 2, 2-dibromopropane are

(a) $A\text{-}CH_3\!\!-\!\!C\!\equiv\!CH;\ B\text{-}2HBr \longrightarrow$ 　　　(b) $A\text{-}CH_3CH\!=\!CHBr;\ B\text{-}HBr \longrightarrow$
(c) $A\text{-}CH\!\equiv\!CH;\ B\text{-}2HBr \longrightarrow$ 　　　(d) $A\text{-}CH_3\!\!-\!\!CH\!=\!CH_2;\ B\text{-}HBr \longrightarrow$

**41.** The number of $p\pi$ - $d\pi$ 'pi' bonds present in $XeO_3$ and $XeO_4$ molecules are .............. and ............. respectively.

(a) 3, 4 　　　(b) 4, 2 　　　(c) 2, 3 　　　(d) 3, 2

**42.** Henry's law constant for molality of methane in benzene at 298 K is $4.27\times10^5$. What will be the mole fraction of methane in benzene at 298 K under 760 mm Hg ?

(a) 2.813 　　　(b) 17.43 　　　(c) 0.1143 　　　(d) $1.78\times10^{-3}$

**43.** Consider the following reaction :
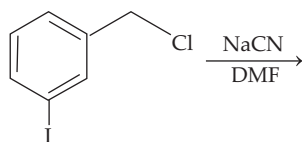


The structure of the major product formed in the given reaction is
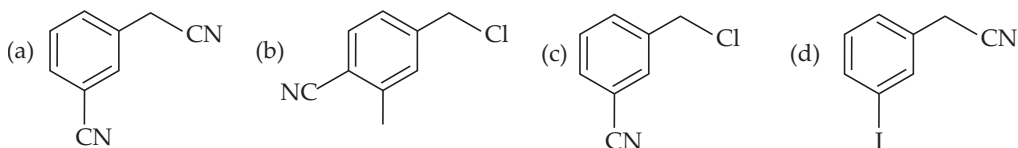


**44.** Consider the following compounds
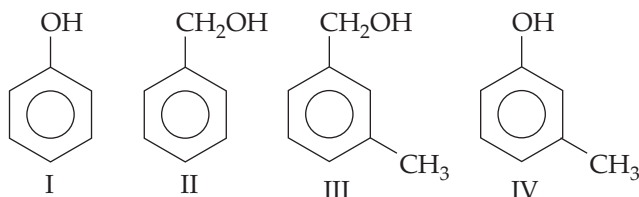


Among the above given compounds, aromatic alcohols is/are

(a) I and II 　　　　　　　　　　(b) II and III
(c) Only I 　　　　　　　　　　(d) I and IV

**Direction** (Q. Nos. 45-49) *For given questions two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.*

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

**45. Assertion** For ideal solution, $A$—$A$ and $B$—$B$ interaction are similar to $A$—$B$ interaction.

**Reason** In case of negative deviations from Raoult's law, $A$—$A$ forces are stronger than $A$—$B$ and $B$—$B$ forces.

**46. Assertion** $F_2$ has high reactivity than $Cl_2$ instead of smaller size.

**Reason** F—F bond has low bond dissociation enthalpy than Cl—Cl bond dissociation enthalpy.

**47. Assertion** Frenkel defect is shown by ionic substances in which cation and anion are of almost similar sizes.

**Reason** Frenkel defect is also called dislocation defect.

**48. Assertion** Increasing rate of $S_N1$ reaction in the following compounds



(A)                    (B)                    (C)

is $B < A < C$.
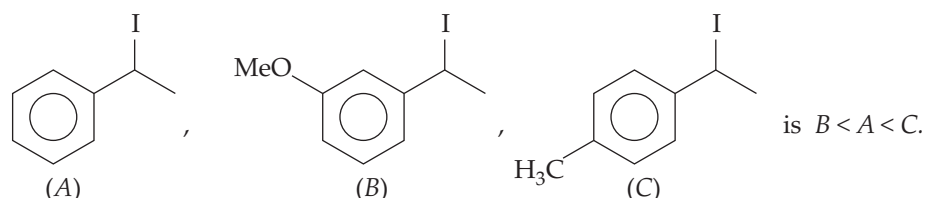
**Reason** More stable is the carbocation intermediate, higher will be the rate of $S_N1$ reaction.

**49. Assertion** The ease of dehydration of the following alcohol is
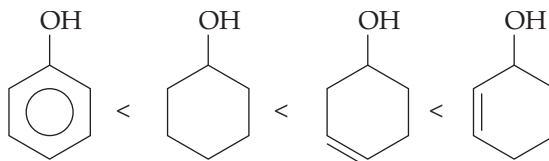


**Reason** Alcohols leading to conjugated alkenes are dehydrated to a greater extent.

# Section C

*This section consists of 6 multiple choice questions with an overall choice to attempt **any 5**. In case more than desirable number of questions are attempted, ONLY first 5 will be considered for evaluation.*

**50.** Match the species given in Column I with the shape given in Column II and mark the correct option.

| | Column I | | Column II |
|---|---|---|---|
| A. | $SF_4$ | 1. | Tetrahedral |
| B. | $BrF_3$ | 2. | Pyramidal |
| C. | $BrO_3^-$ | 3. | *Sea-saw* shaped |
| D. | $NH_4^+$ | 4. | Bent T-shaped |

**Codes**

|     | A | B | C | D |     |     | A | B | C | D |
|-----|---|---|---|---|-----|-----|---|---|---|---|
| (a) | 3 | 2 | 1 | 4 |     | (b) | 3 | 4 | 2 | 1 |
| (c) | 1 | 2 | 3 | 4 |     | (d) | 1 | 4 | 3 | 2 |

**51.** Which of the following analogy is correct regarding ?

$A$ : Elements $B$ : Electronic configuration

|  | $A$ | $B$ |
|---|---|---|
| (a) | Pnicogens | $ns^2p^3$ |
| (b) | Chalcogens | $ns^2np^5$ |
| (c) | Halogens | $ns^2np^3$ |
| (d) | Noble gas | $ns^2np^2$ |

**52.** Complete the following analogies:
(a) 1° alkyl halide : $S_N 2$ reaction : : Aryl halide : $S_N 2$ reaction
(b) 3° alkyl halide : $S_N 1$ reaction : : 1° alkyl halide : $S_N 2$ reaction
(c) Benzyl halide : $S_N 1$ reaction : : 3° alkyl halide : $S_N 2$ reaction
(d) None of the above

**Case** *Read the passage given below and answer the following questions (53-55)*

On the basis of the nature of order present in the arrangement of their constituent particles, solids are classified into two categories, i.e. crystalline solids and amorphous solids.

The adjective, 'crystalline' when applied to solids, implies an ideal crystal in which the structural units, termed as unit cells, are repeated regularly and indefinitely in three dimensions in space. In other words, solid which acquire a definite or regular shape regardless of their size is called as crystalline solid. The unit cell, containing at least one molecule, has a definite orientation and shape defined by the translational vectors $a$, $b$ and $c$.

The unit cell therefore has a definite volume $V$ that contains the atoms and molecules necessary for generating the crystal. Every crystal can be classified as a member of one of the seven possible crystal systems or crystal classes that are defined by the relationships between the individual dimensions $a$, $b$ and $c$ of the unit cell and between the individual angles, $\alpha$, $\beta$ and $\gamma$ of the unit cell.

The structure of the given crystal may be assigned to one of the 7 crystal systems, to one of the 14 Bravais lattices, and to one of the 230 space groups. These uniquely define the possible ways of arranging atoms in a three dimensional solid. Based on these observations, seven crystal systems were identified; triclinic, monoclinic, trigonal or rhombohedral, tetragonal, hexagonal, rhombic or orthorhombic and cubic.

**53.** The unit cell with dimensions $a \neq b \neq c$, $\alpha = \beta = \gamma = 90°$, is
(a) orthorhombic           (b) monoclinic
(c) hexagonal              (d) triclinic

**54.** The example of triclinic crystal system is
(a) NaCl                   (b) $K_2Cr_2O_7$
(c) rhombic sulphur        (d) graphite

**55.** The crystal system of a compound with unit cell dimensions, $a = 0.48$ nm , $b = 0.48$ nm, $c = 0.48$ nm, and $\alpha = \beta = \gamma \neq 90°$ is
(a) rhombohedral           (b) triclinic
(c) monoclinic             (d) tetragonal

# ANSWERS

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** (a) | **2.** (d) | **3.** (c) | **4.** (a) | **5.** (d) | **6.** (a) | **7.** (c) | **8.** (a) | **9.** (b) | **10.** (c) |
| **11.** (d) | **12.** (d) | **13.** (d) | **14.** (a) | **15.** (c) | **16.** (d) | **17.** (b) | **18.** (d) | **19.** (d) | **20.** (a) |
| **21.** (c) | **22.** (c) | **23.** (b) | **24.** (c) | **25.** (b) | **26.** (a) | **27.** (d) | **28.** (c) | **29.** (a) | **30.** (c) |
| **31.** (d) | **32.** (d) | **33.** (d) | **34.** (b) | **35.** (c) | **36.** (d) | **37.** (c) | **38.** (a) | **39.** (a) | **40.** (a) |
| **41.** (a) | **42.** (d) | **43.** (d) | **44.** (b) | **45.** (c) | **46.** (a) | **47.** (d) | **48.** (a) | **49.** (a) | **50.** (b) |
| **51.** (a) | **52.** (b) | **53.** (a) | **54.** (b) | **55.** (a) | | | | | |

## EXPLANATIONS

1. Number of octahedral voids = Number of atom in the close packed structure

   Since, number of atom =1

   ∴ No. of octahedral void =1

2. In fcc unit cell, a corner atom is surrounded by 8 unit cells.

   In each cube, at a distance of $\sqrt{3}\,a/4$ from corner atom, there is tetrahedral void; it implies that each atom is surrounded by eight tetrahedral voids.

   At the centre of edge, there is an octahedral void. Each corner can support six edges and hence it is surrounded by six octahedral voids.

3. Diamond is a gaint molecule in which constituent atoms are held together by covalent bond.
   Hence, it is a network solid.

   $SO_2$ (solid), $H_2O$ (ice) and $I_2$ are the examples of molecular solid.

4. When an ion (generally cation due to its small size) is missing from its normal position or lattice site and occupy an interstitial site between the lattice points, the lattice defect obtained is known as Frenkel defect, which is also called dislocation defect.

5. At high altitudes, the partial pressure of oxygen is less than that at the ground level. This leads to low concentration of oxygen in the blood and tissues of climbers which results in a medical condition known as anoxia.

6. According to Raoult's law, the vapour pressure of a volatile component in a given solution is

   $$p_i = p_i^\circ \chi_i$$

   If in the solution of a gas in liquid, the volatile component exists as a gas, then according to Henry's law,

   $$p = K_H \cdot \chi$$

   Therefore, Raoult's law becomes a special case of Henry's law when $K_H$ becomes equal to $p_i^\circ$.

7. Statement (c) is incorrect.

   Its correct form is as follows :

   In the mixture of phenol and aniline, the intermolecular hydrogen bonding between phenolic proton and lone pair on nitrogen atom of aniline is stronger than the respective intramolecular hydrogen bonding between similar molecules.

   Rest other statements are correct.

8. Only non-ideal solutions form azeotropic mixtures (constant boiling mixtures). Among the given, only $CCl_4$ and $CHCl_3$ form non-ideal solution, thus they form azeotropic mixture.

9. Statement (b) is incorrect.
   Its correct form is as follows :

   At constant temperature, solubility of a gas (S) varies inversely with Henry's law constant ($K_H$)

   $$K_H = \frac{\text{Pressure}}{\text{Solubility of a gas in a liquid}} = \frac{p}{S}$$

   Thus, higher the value of $K_H$ at a given pressure, the lower is the solubility of the gas in the liquid.

   Rest other statements are correct.

10. Water ($H_2O$) is much less volatile than $H_2S$ because sulphur atom is less electronegative than O-atom and, hence does not form H-bonding like water.

11. This $Al_2O_3$ oxide is amphoteric in nature oxides exhibit a dual behaviour. It show characteristics of both acidic as well as basic oxides.

12. $H_2SO_4$ is used in petroleum refining, manufacture of pigments, paints and dyestuff intermediates, detergent industry, etc.

13. The anomalous behaviour of fluorine is due to its small size, highest electronegativity, low F—F bond dissociation enthalpy and non-availability of $d$-orbitals in its valence shell.

14. The given reaction of chlorine preparation is of Deacon's process

$$4\,HCl + O_2 \xrightarrow{\;CuCl_2\;} 2Cl_2 + 2H_2O$$
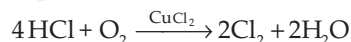
In this reaction oxidation of hydrogen chloride gas by atmospheric oxygen in the presence of $CuCl_2$ at 723 K take place to give chlorine.

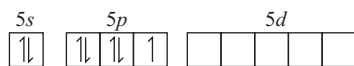15. The compositions of rare gases in air are :

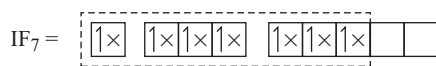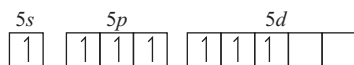|     | % by volume | % by weight |
| --- | --- | --- |
| He  | 0.0005 | 0.000037 |
| Ne  | 0.0015 | 0.001 |
| Ar  | 0.932 | 1.285 |
| Kr  | 0.0001 | 0.00028 |
| Xe  | 0.0001 | 0.00004 |

So, Ar is the most abundant noble gas in air.

16. The structure of $IF_7$ is pentagonal bipyramidal.

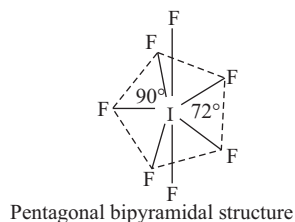It can be depicted as follows :
I (Z = 53) (Ground state) =

I (Excited state) =

$$IF_7 = $$

$sp^3d^3$- hybridisation
(7 electrons of iodine shared with fluorine atoms)

Here, $X$ denotes electrons of F-atoms.
The structure of $IF_7$ is shown below:

Pentagonal bipyramidal structure
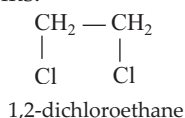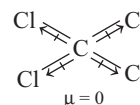
17. 1, 2-dichloroethane is an example of *vic*-dihalide.
In *vic*-dihalide, the halogen atoms are present at adjacent C-atoms.
e.g.

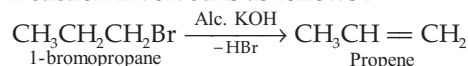$$\begin{array}{ccc} CH_2 & — & CH_2 \\ | & & | \\ Cl & & Cl \end{array}$$

1,2-dichloroethane

18. $CCl_4$ being symmetrical has no dipole moment.

19. In $(O—H)$ bond, oxygen and hydrogen has maximum electronegativity difference that's why in $CH_3CH_2OH$, this bond undergoes heterolytic cleavage most readily.

20. When haloalkane containing $\beta$-hydrogen atom is heated with alc. KOH solution, then alkene is formed as a result of elimination.

Reaction involved is as follows :

$$\underset{\text{1-bromopropane}}{CH_3CH_2CH_2Br} \xrightarrow[\text{–HBr}]{\text{Alc. KOH}} \underset{\text{Propene}}{CH_3CH = CH_2}$$

21. Carboxylic acids are reduced to primary alcohols by lithium aluminium hydride $(LiAlH_4)$, a strong reducing agent.

The reaction is as follows :

$$RCOOH \xrightarrow[\text{(ii) } H_2O]{\text{(i) } LiAlH_4} RCH_2OH$$
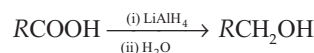
22. The correct order is HI > HBr > HCl.
The cleavage of ether takes place with conc. HI or HBr at high temperature.
This is because the stability of these halides decreases down the group due to decrease in bond-dissociation enthalpy.

23. Glycine (Gly) is not optically active amino acid. It does have a chiral carbon due to the presence of two identical groups. (hydrogen)
The structure is as follows :

Glycine
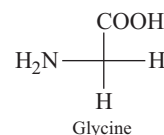
24. Option (c) is the correct combination. In DNA molecule, the sugar moiety is $\beta$-D-2-deoxyribose whereas in RNA molecule, it is $\beta$-D-ribose.

25. Glucose and galactose are having identical configuration at all the positions except at C-4 position.

Both of them are diastereomers that differ in configuration at only one chiral centre.

Hence, these are called epimers. Structures of glucose and galactose are as follows:

D-glucose     D-galactose

**26.** Amongst oxyacids of a given halogen, more electronegative atom present, stronger is the acid or acidity increases with electronegativity. Hence, $IOH < BrOH < ClOH$.

**27.** The four bases present in DNA are adenine (A), guanine (G), cytosine (C) and thymine (T). In RNA, uracil (U) is present in place of thymine (T).

Structure of all these, bases are given below:



Adenine (A)    Guanine (G)



Cytosine (C)    Thymine (T)    Uracil (U)

**28.** Tertiary alcohol gives turbidity immediately with Lucas reagent. Among the given options, 2-hydroxy-2-methylpropane is a tertiary alcohol.

**29.** AgBr shows both Schottky and Frenkel defects. Because the $\dfrac{r_+}{r_-}$ (radius of cation and radius of anion) ratio in AgBr is neither very large or nor very small.

**30.** Statement (c) is incorrect. Its correct form is as follows :

Argon is used in the laboratory for handling substances that are air-sensitive.

Rest other statements are correct.

**31.** The structure of $S_3O_9$ is



It has no S—S linkage.

∴ Number of S—S linkage is zero.

**32.** Statement (d) is incorrect. The correct statement is as follows :

Melting point of amino acids is very high due to high ionic attractions among the compounds.

**33.** Molecular mass of $C_2H_5OH = 46$ g/mol

Number of moles of $C_2H_5OH = \dfrac{138}{46} = 3$

Number of moles of $H_2O = \dfrac{72}{18} = 4$

$[\because M_{H_2O} = 18$ g/mol]

Mole fraction, $\chi_{C_2H_5OH} = \dfrac{3}{3+4} = \dfrac{3}{7}$

$\chi_{H_2O} = \dfrac{4}{3+4} = \dfrac{4}{7}$

$\dfrac{\chi_{C_2H_5OH}}{\chi_{H_2O}} = \dfrac{3/7}{4/7} = 3/4 = 3:4$

**34.** $H_2S_2O_8$ is a peroxy acid, has —O—O— linkage.



Peroxodisulphuric acid

**35.** The molar elevation constant depend upon nature of the solvent.

**36.** The conversion of *m*-nitrophenol to resorcinol take place as follows



∴ Steps involved are reduction, diazotisation hydrolysis

**37.**



Toluene → (Cl₂, FeCl₃, (Cl⁻), Electrophilic chlorination) → p-chlorotoluene + o-chlorotoluene
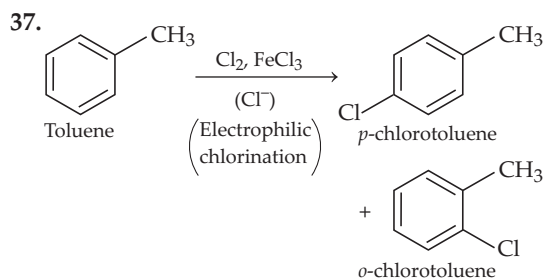
**38.** Osmotic pressure $(\pi)$ is given by, $\pi = \dfrac{n_B RT}{V}$ ;

where, $n_B$ = number of moles of protein

$R$ = gas constant

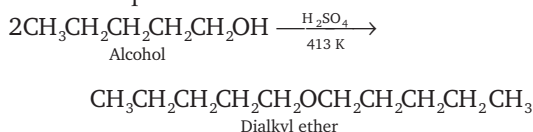$T$ = temperature in kelvin

$V$ = volume of solution (in L)

$$\pi = \frac{w_B}{M_B} \times \frac{RT}{V} \qquad \left[\because n_B = \frac{w_B}{M_B}\right]$$

$$M_B = \frac{w_B}{V} \times \frac{RT}{\pi}$$

$$= \frac{2 \times 0.0821 \times 300 \times 760}{0.3 \times 20}$$

$$= 6239.6 \text{ g mol}^{-1}$$

**39.** 1° alcohols readily formed ethers when heated with conc. $H_2SO_4$. Thus, 1-pentanol gives the best yield of dialkyl ether when heated with a trace of sulphuric acid.

$$2CH_3CH_2CH_2CH_2CH_2OH \xrightarrow[413 \text{ K}]{H_2SO_4}$$
Alcohol

$$\underset{\text{Dialkyl ether}}{CH_3CH_2CH_2CH_2CH_2OCH_2CH_2CH_2CH_2CH_3}$$

**40.** Propyne on reaction with 2 moles of HBr gives 2, 2-dibromopropane as follows :
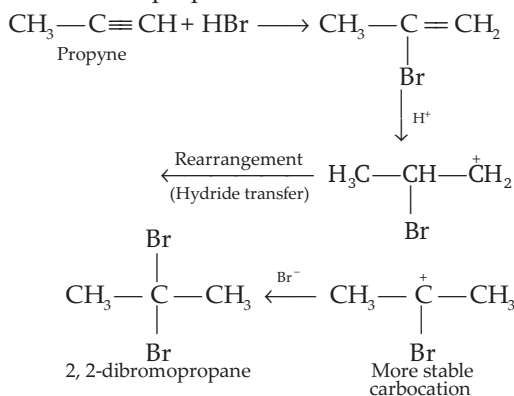


**41.** Structure of $XeO_3$
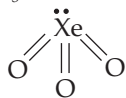


Hence, $3\,p\pi\text{-}d\pi$ bonds are present.

Structure of $XeO_4$
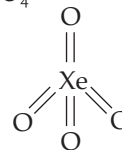


Hence, $4\,p\pi\text{-}d\pi$ bonds are present.

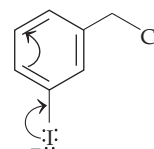**42.** According to Henry's law,

$$p = K_H \cdot \chi$$

where, $p$ = vapour pressure of gas

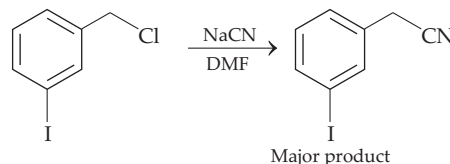$\chi$ = mole fraction of gas

$K_H$ = Henry's constant

$$\chi = \frac{p}{K_H} = \frac{760}{4.27 \times 10^5} = 1.78 \times 10^{-3}$$

**43.** Chloride present on 1° aliphatic carbon can be substituted easier than iodide because I is attached to benzene ring. Lone pair of $e^-$ of I is involved in delocalisation with $\pi - e^-$ of benzene.



Hence, I is difficult to substitute.

∴ The reaction take place as follows



**44.** Among the given options I are IV are the aromatic alcohols as they are directly attached to benzene ring. while II and III are attached 1° carbon atom.

**45.** Assertion is true but Reason is false.

Correct Reason statement is as follows :

In case of negative deviations from Raoult law, $A$—$B$ forces are stronger than $A$—$A$ and $B$—$B$ forces.

**46.** Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Fluorine is the most reactive among all the halogens due to its low bond dissociation enthalpy.

**47.** Assertion is false but Reason is true.

Frenkel defect is called dislocation defect because smaller ion (generally the cation) is

dislocated from its normal lattice site to an interstitial site.

It is shown by ionic substances in which there is large difference in the size of ions, e.g. ZnS, AgCl.

**48.** Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

More stable the carbocation intermediate, higher will be the rate of $S_N1$ reaction.

The reaction involving carbocation intermediate formation for the given compounds are as follows :
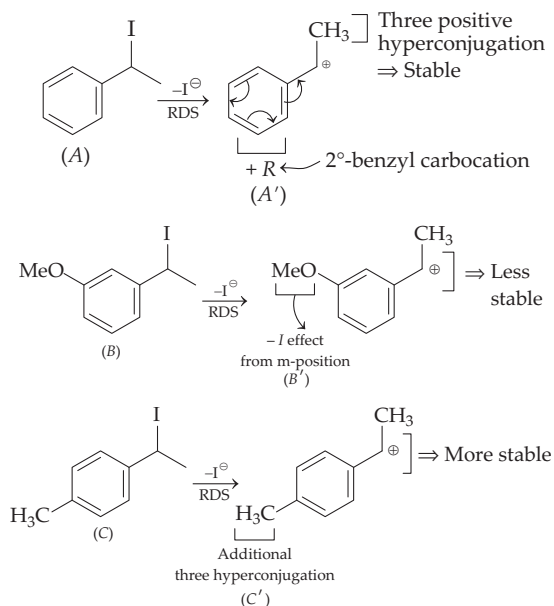


Stability of intermediates will follow the order

$$\underset{(-1)}{B'} < \underset{(-HPC=3)}{A'} < \underset{(+HPC=6)}{C'}$$

So, the rate of $S_N1$ reaction with the given compounds will be, $B < A < C$.

**49.** Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

Phenol is least reactive towards dehydration due to resonance stabilisation.

2-cyclohexanol undergoes dehydration more readily as it gives conjugated alkenes. Alcohols leading to conjugated alkenes are dehydrated more readily.

**50.** The correct match is A → 3; B → 4; C → 2; D → 1

| Species | Number of bps and lps | Shape | Structure |
|---|---|---|---|
| A. $SF_4$ | $4bp + 1lp$ | *Sea-saw* shaped |  |
| B. $BrF_3$ | $3bp + 2lp$ | Bent T-shaped |  |
| C. $BrO_3^-$ | $3bp + 1lp$ | Pyramidal |  |
| D. $NH_4^+$ | $4bp$ | Tetrahedral |  |

**51.** The correct analogies are as follows :

| Elements | Elecromic configuration |
|---|---|
| (a) Pnicogens | $ns^2p^3$ |
| (b) Chalcogens | $ns^2np^4$ |
| (c) Halogens | $ns^2np^5$ |
| (d) Noble gas | $ns^2np^6$ |

Hence, option (a) is correct.

**52.** The complete analogies are as follows**:**

(a) 1° alkyl halide : $S_N2$ reaction

(b) 3° alkyl halide : $S_N1$ reaction

(c) Benzyl halide : $S_N1$ reaction

(d) Aryl halide : ES reaction

**53.** The unit cell with dimensions $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$ is orthorhombic.

**54.** The example of triclinic crystal system is $K_2Cr_2O_7$ with dimensions $\alpha \neq \beta \neq \gamma \neq 90°$, $a \neq b \neq c$.

**55.** The given crystal is an example of rhombohedral as its edge lengths are equal to each other but its axial angles are $\alpha = \beta = \gamma \neq 90°$.