# SAMPLE PAPER 7

## 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.** Which of the catalyst is used in the manufacture of $H_2SO_4$ by contact process ?

(a) $Al_2O_3$ (b) $Cr_2O_3$
(c) $V_2O_5$ (d) $MnO_2$

**2.** A particular solid is very hard and has a high melting point. In solid state, it is a non-conductor and its melt is a conductor of electricity.
Identify the solid.

(a) Metallic (b) Molecular
(c) Ionic (d) Network

**3.** Among the following, maximum number of compounds are known in the case of

(a) neon (b) xenon
(c) krypton (d) argon

**4.** Consider the following :

$$C_2H_5Cl + 'X' \longrightarrow C_2H_5OH$$

Here, *X* is

(a) alcoholic KOH (b) aqueous KOH
(c) water (d) aqueous $KMnO_4$

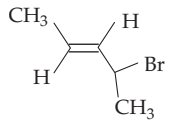
**5.** Identify the compound,
"Nitrogen forms three oxoacids. Among these, one is the most important in terms of the laboratory and industrial applications. It is a strong oxidising agent."
(a) $H_2N_2O_2$ (b) $HNO_3$
(c) $HNO_2$ (d) $H_3NO_3$

**6.** Strongest oxy acid of chlorine is
(a) $HClO_4$ (b) $HClO_2$
(c) HOCl (d) $HClO_3$

**7.** A nucleoside on hydrolysis gives
(a) an aldopentose and phosphoric acid
(b) an aldopentose and a nitrogenous base
(c) an aldopentose, a nitrogenous base and phosphoric acid
(d) a nitrogenous base and phosphoric acid

**8.** Benzene sulphonic acid and *p*-nitrophenol are treated with $NaHCO_3$, the gases released respectively are
(a) $N_2$, $CO_2$ (b) $CO_2$, $SO_2$ (c) $N_2$, $SO_2$ (d) $CO_2$, $CO_2$

**9.** Consider the compound :




IUPAC name of the given compound is
(a) 2-bromo-4-ene (b) 2-bromopent-3-ene
(c) 4-bromopent-2-ene (d) 2-bromopent-1-ene

**10.** Which of the following fluoride does not exist?
(a) $XeF_4$ (b) $HeF_4$ (c) $SF_4$ (d) $CF_4$

**11.** For an ideal solution with $p_A > p_B$, which of the following is true relation?
(a) $(X_A)_{liquid} = (X_A)_{vapour}$ (b) $(X_A)_{liquid} > (X_A)_{vapour}$
(c) $(X_A)_{liquid} < (X_A)_{vapour}$ (d) $(X_A)_{liquid}$ and $(X_A)_{vapour}$

**12.** Least preferred method used for the preparation of alkyl halides in laboratory is
(a) treatment of alcohols
(b) addition of hydrogen halides to alkenes
(c) halide exchange
(d) direct halogenation of alkanes

**13.** Choose the incorrect match.
(a) F > Cl > Br > I (Ionisation energy) (b) F > Cl > Br > I (Electronegativity)
(c) I > Br > Cl > F (Density) (d) F > Cl > Br > I (Electron affinity)

**14.** An azeotropic solution of the two liquids has boiling point lower than either of the two liquids when it
(a) shows no deviation from Raoult's law
(b) shows a negative deviation from Raoult's law
(c) shows a positive deviation of from Raoult's law
(d) is saturated

**15.** An organic compound dissolved in dry benzene evolved hydrogen on treatment with sodium. It is .....

(a) a ketone
(b) an aldehyde
(c) a tertiary amine
(d) an alcohol

**16.** Equimolar solutions in the same solvent have

(a) different boiling point and different freezing point
(b) same boiling point and same freezing point
(c) same freezing point but different boiling point
(d) same boiling point but different freezing point

**17.** Which of the following is correct for total volume of atoms present in a fcc unit ?

(a) $\frac{12}{3}\pi r^3$
(b) $\frac{16}{3}\pi r^3$
(c) $\frac{20}{3}\pi r^3$
(d) $\frac{24}{3}\pi r^3$

**18.** A heterocyclic amino acid is

(a) tryptophan
(b) phenylalanine
(c) glycine
(d) alanine

**19.** When ethyl alcohol ($C_2H_5OH$) reacts with thionyl chloride, in the presence of pyridine, the product obtained is

(a) $CH_3CH_2Cl + HCl$
(b) $C_2H_5Cl + HCl + SO_2$
(c) $CH_3CH_2Cl + H_2O + SO_2$
(d) $CH_3CH_2Cl + HCl + SO_2$

**20.** Sulphur in + 3 oxidation state is present in

(a) dithionous acid
(b) pyrosulphuric acid
(c) sulphurous acid
(d) thiosulphuric acid

**21.** The sharp melting point of crystalline solids as compared to amorphous solids is due to

(a) same arrangement of constituent particles in different directions
(b) a regular arrangement of constituent particle observed over a sheet distance in the crystal lattice
(c) different arrangement of constituent particles in different directions
(d) a regular arrangement of constituent particle observed over a long distance in the crystal lattice

**22.** The incorrect characteristic of interhalogen compounds is

(a) they are more reactive than halogens
(b) they are quite unstable but none of them is explosive
(c) they are covalent in nature
(d) they have low boiling points and are highly volatile

**23.** Which of the following product is formed, when phenyl magnesium bromide reacts with methanol?

(a) A mixture of anisole and Mg(OH)Br
(b) A mixture of phenol and Mg(Me)Br
(c) A mixture of benzene and Mg(OMe)Br
(d) A mixture of toluene and Mg(OH)Br

**24.** Which of the following statement is incorrect ?

(a) Glucose exists in two crystalline forms $\alpha$ and $\beta$
(b) The cyclic structure of glucose is correctly represented by Haworth structure.
(c) Five membered cyclic structure of glucose is called as pyranose structure.
(d) Glucose and fructose are monosaccharides.

**25.** Which of the following reactants are used in Finkelstein reaction?

(a) $NaI + C_2H_5OH$ (b) NaF + acetone
(c) $NaBr + CH_3OH$ (d) $NaI + C_2H_5Br$

## 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.** Density of a 2.05 M solution of acetic acid in water is 1.02 g/mL. The molality of the solution is

(a) 1.14 mol $kg^{-1}$ (b) 3.28 mol $kg^{-1}$
(c) 2.28 mol $kg^{-1}$ (d) 0.44 mol $kg^{-1}$

**27.** The edge length of fcc cell is 508 pm. If radius of cation is 110 pm then calculate the radius of anion.

(a) 110 pm (b) 220 pm
(c) 285 pm (d) 144 pm

**28.** Which of the following is not correct match ?

| | (i) Solute | (ii) Solvent | (iii) Example |
|---|---|---|---|
| (a) | Gas | Solid | Hydrogen in palladium |
| (b) | Solid | Solid | Alloys like bronze |
| (c) | Gas | Liquid | Oxygen in water |
| (d) | Gas | Gas | Chloroform mixed with nitrogen gas |

**29.** Which of the following characteristics is/are possessed by non-polar molecular solids ?

(a) Atoms or molecules are held by weak dispersion forces or London forces
(b) They are soft and non-conductor of electricity
(c) They have low melting point and are usually in liquid or gaseous state at room temperature and pressure
(d) All of the above

**30.** $BrF_3$ molecule has ...(i)... geometry and ...(ii)... . The ...(iii)... lone pairs will occupy the equatorial positions.

| | (i) | (ii) | (iii) |
|---|---|---|---|
| (a) | Trigonal bipyramidal | T-shape | 2 |
| (b) | Pyramidal | *See-saw* shape | 1 |
| (c) | Trigonal bipyramidal | Bent T-shape | 1 |
| (d) | Pyramidal | *See-saw* shape | 2 |

**31.** Which of the following statements is false?
(a) Units of atmospheric pressure and osmotic pressure are the same
(b) In reverse osmosis, solvent molecules move through a semipermeable membrane from a region of lower concentration of solute to a region of higher concentration
(c) The value of molal depression constant depends on nature of solvent
(d) Relative lowering of vapour pressure is a dimensionless quantity

**32.** Consider the following reactions :

$$C_2H_5Cl + AgCN \xrightarrow{EtOH/H_2O} \underset{(Major)}{X}$$

Which one of the following statements is true for *X* ?
(a) It give propanoic acid on hydrolysis
(b) It has an ester of functional group
(c) In has a nitrogen linked to ethyl carbon
(d) It has a cyanide group

**33.** Which of the following is the correct order of N-compounds in its decreasing order of oxidation states?
(a) $HNO_3$, NO, $N_2$, $NH_4Cl$
(b) $HNO_3$, NO, $NH_4Cl$, $N_2$
(c) $HNO_3$, $NH_4Cl$, NO, $N_2$
(d) $NH_4Cl$, $N_2$, NO, $HNO_3$

**34.** Consider the following route map.

$$A \xleftarrow[\Delta]{Cu} CH_3CH_2OH \xrightarrow[\Delta]{Al_2O_3} B.$$

*A* and *B* respectively are
(a) alkanal, alkene
(b) alkyne, alkanal
(c) alkene, alkanal
(d) alkene, alkyne

**35.** Which of the following statements is incorrect?
(a) $O_3$ molecule is bent
(b) $OF_2$ is an oxide of fluorine
(c) ONF is isoelectronic with $NO_2$
(d) $Cl_2O_7$ is an anhydride of perchloric acid

**36.** The reagent that converts propene to 1-propanol is
(a) *aq.* KOH
(b) $H_2O_2$, $H_2SO_4$
(c) $MgSO_4$, $NaBH_4/H_2O$
(d) $B_2H_6$, $H_2O_2$, $\bar{O}H$

**37.** The products formed in the following reaction

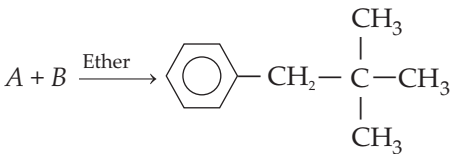
$$C_6H_5—O—CH_3 + HI \xrightarrow{\text{Heat}} \text{are}$$

(a) $C_6H_5—I$ and $CH_3—OH$ (b) $C_6H_6$ and $CH_3OI$
(c) $C_6H_5—CH_3$ and HOI (d) $C_6H_5—OH$ and $CH_3—I$

**38.** The set of compounds in which the reactivity of halogen atom in the ascending order is
(a) vinyl chloride, chloroethane, chlorobenzene
(b) vinyl chloride, chlorobenzene, chloroethane
(c) chloroethane, chlorobenzene, vinyl chloride
(d) chlorobenzene, vinyl chloride, chloroethane

**39.** When copper is heated with conc. $HNO_3$ it produces?
(a) $Cu(NO_3)_2$ and $N_2O$ (b) $Cu(NO_3)_2$ and $NO_2$
(c) $Cu(NO_3)_2$ and NO (d) $Cu(NO_3)_2$, NO and $NO_2$

**40.** The best yield of given product can be obtained by using which set of reactants *A* and *B* respectively




(a) PhLi + Neopentyl chloride (b) *t*-Bu – MgBr + Benzyl bromide
(c) PhMgBr + Neopentyl bromide (d) Benzylchloride + *t*-butyl chloride

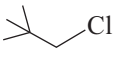
**41.** Which of the following reactions are not shown by glucose ?
(a) Reaction with $NH_3$ (b) Reaction with 2, 4-DNP reagent
(c) Reaction with Grignard reagent (d) All of these

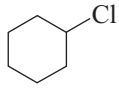
**42.** How many alcohol with molecular formula $C_4H_{10}O$ are chiral in nature?
(a) 1 (b) 2 (c) 3 (d) 4

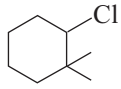
**43.** Which of the following statements is not correct about the amino acid ?
(a) L in amino acids represented by writing the $—NH_2$ group on the left side
(b) There are 25 essential amino acids
(c) The amino acids which are not synthesised in our body are called as non-essential amino acid
(d) Only α-amino acids are obtained on hydrolysis of proteins

**44.** Which one of the following species will be most reactive in $S_N2$ reaction?

(a) 

(b) 

(c) 

(d) 


**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** A tetrahedral void is surrounded by four spheres whereas an octahedral void is surrounded by six spheres.

**Reason** The number of tetrahedral voids is double the number of close packed spheres and number of octahedral voids is equal to number of close packed spheres.

**46.** **Assertion** Larger the value of cryoscopic constant of the solvent, lesser will be freezing point of the solution.

**Reason** Extent of depression in the freezing point depends on the nature of solvent.

**47.** **Assertion** $CH_3CH_2OH$ can be distinguished by haloform test.

**Reason** Haloform test is given hy 2° alcohol.

**48.** **Assertion** Benzyl bromide when kept in acetone and $H_2O$ produces benzyl alcohol.

**Reason** The reaction follow $S_N2$ mechanism.

**49.** **Assertion** Glucose gets oxidised to gluconic acid on reaction with mild oxidising agent.

**Reason** Glucose contains a ester group.

## 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 following Column I with column II and mark the Correct code that are given below.

| | **Column I** (Primitive unit cell) | | **Column II** (Axial angles and distances) |
|---|---|---|---|
| A. | Orthorhombic | 1. | $\alpha = \beta = 90°, \gamma = 120°$ and $a = b \neq c$ |
| B. | Monoclinic | 2. | $\alpha = \beta = \gamma = 90°$ and $a = b = c$ |
| C. | Hexagonal | 3. | $\alpha = \gamma = 90°, \beta \neq 90°$ and $a \neq b \neq c$ |
| D. | Cubic | 4. | $\alpha = \beta = \gamma = 90°$ and $a \neq b \neq c$ |

**Codes**

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

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

**51.** Complete the following analogies.

At certain temperature for a given volume of solvent, amount of gas dissolved is proportional to partial pressure of gas : *A* : : For a solution of volatile liquids the partial vapour pressure of each component in the solution is directly proportional to its mole fraction : *B*.

(a) *A* : Raoult's law : : *B* : Dalton's law

(b) *A* : Dalton's law : : *B* : Raoult's law

(c) *A* : Henry's law : : *B* : Raoult's law

(d) *A* : Raoult's law : : *B* : Gay-Lussac's law

**52.** Which of the following analogies are incorrectly matched ?

*A* : Formula of interhalogen compound/Xenon compound

*B* : Structure

| | *A* | *B* |
|---|---|---|
| (a) | $ClF_3$ | Bent-T shaped |
| (b) | $IF_5$ | Square pyramidal |
| (c) | $IF_7$ | Pentagonal bipyramidal |
| (d) | $XeO_3$ | Square planar |

**Direction** (Q. No. 53-55) *Read the following passage and answer the following questions.*

The last group of elements in the periodic table is the noble gases. It contains seven noble gases. These noble gases are colourless, odourless, tasteless and non-flammable gases.

They have closed-shell electronic configuration and are monoatomic gases under normal conditions. The low boiling points of the lighter noble gases are due to weak dispersion forces between the atoms and the absence of other interatomic interactions.

The direct reaction of xenon with fluorine leads to a series of compounds with oxidation numbers + 2, + 4 and + 6. $XeF_4$ reacts violently with water to give $XeO_3$. The compounds of xenon exhibit rich stereochemistry and their geometries can be deduced considering the total number of electron pairs in the valence shell.

Xenon reacts directly with fluorine to give binary fluorides such as $XeF_2$, $XeF_4$ and $XeF_6$. These are colourless crystalline solids and sublime readily at 298 K. They are powerful fluorinating agent.

**53.** Argon is used in arc welding because of its

(a) low reactivity with metal

(b) ability to lower the melting point of metal

(c) flammability

(d) high calorific value

**54.** Consider the following reaction,

$$XeF_6 + 2H_2O \longrightarrow$$

The product formed in above reaction is

(a) $XeO_2F_2 + HF$ (b) $XeO_3 + HF$

(c) $XeOF_4 + HF$ (d) $Xe + XeO_3 + HF + O_2$

**55.** Xenon hexafluoride reacts with silica to form a xenon compound *X*. The oxidation state of xenon in *X* is

(a) + 2 (b) + 4

(c) + 6 (d) 0

## Answers

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

## EXPLANATIONS

**1.** $V_2O_5$ (vanadium pentoxide) catalyst are used for the manufacture of $H_2SO_4$ by contact process.

**2.** A particular solid which is very hard and has high melting point is an ionic solid. It is a non-conductor and in molten state it is a conductor of electricity.

**3.** Xenon form maximum number of compounds like $XeF_2$, $XeF_4$,$XeF_6$ , $XeO_3$, $XeO_4$ etc.

**4.** When ethyl chloride is boiled with KOH then ethyl alcohol is produced.

$$\underset{\text{Ethyl chloride}}{C_2H_5Cl} + Aq.KOH \longrightarrow \underset{\text{Ethyl alcohol}}{C_2H_5OH} + KCl$$

Aqueous KOH is generally used for dehydro-halogenation.

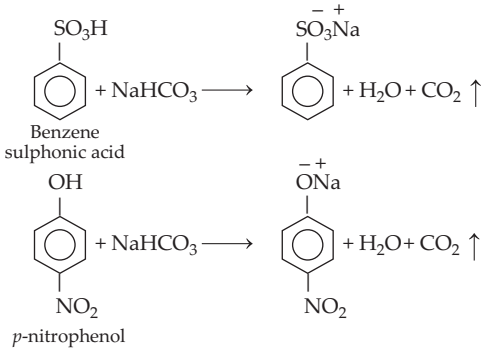
**5.** Nitrogen forms three oxoacids such as hyponitrous acid ($H_2N_2O_2$), nitrous acid ($HNO_2$) and nitric acid ($HNO_3$). Among these, $HNO_3$ is the most important in terms of the laboratory and industrial applications. It is a very strong oxidising agent.

**6.** Strongest oxo-acid of chlorine is $HClO_4$. In $HClO_4$, the oxidation state of Cl is + 7. Larger the oxidation state, strongest will be oxy-acid.

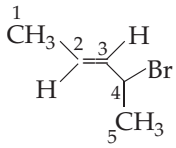
In the other given oxo-acids the oxidation state is +3 in $HClO_2$, +1 in HOCl and + 5 is in $HClO_3$.

**7.** Nucleoside on hydrolysis gives an aldopentose and a nitrogenous base which has heterocyclic ring.

**8.** Both the given acids are stronger than $H_2O_3$, thus, they are capable of evolving $CO_2$ with $NaHCO_3$.




**9.**




The IUPAC name of the given compound is 4-bromopent-2-ene.

**10.** Reactivity of noble gas is very low therefore they don't react with other elements to compound (except Xe).

Among the given fluorides, the one which does not exist is $HeF_4$.

**11.** As *A* is more volatile, vapour phase would be richer in *A*.

Hence, $(X_A)_{\text{liquid}} < (X_A)_{\text{vapour}}$.

**12.** Preparation of alkyl halides in laboratory is least preferred by addition of hydrogen halides to alkenes because it forms more than one products.

**13.** The property with incorrect match is in the option (d). The correct order of electron affinity is Cl > F > Br > I.

Explanation of the order of given property are as follows

- **Ionisation enthalpy** On moving down the group, the ionization enthalpies progressively decreases as the size of the halogen increases from F to I. Thus, the given order is correct.

  F > Cl > Br > I

- **Electronegativity** Due to small size and higher nuclear charge, each halogen has the highest electronegativity in its period. Thus, halogen are highly electronegative elements. As we move down the group from fluorine to iodine, electronegativity decreases due to a corresponding increase in the size of the atom. Thus, the given order is correct.

  F > Cl > Br > I

- **Density** It increases as we move down the group as mass increases down the group (as compare to the volume). Thus, the given order is correct.

$$I > Br > Cl > F$$

- **Electron gain enthalpy** Halogen has the largest negative electron gain enthalpies. On moving down the group, it becomes less and less negative as the size of the halogen increases.
But electron gain enthalpy of fluorine is less negative than that of chlorine. This is due to the small size of fluorine atom. As a result of which strong electron-electron repulsion are present in the relatively compact $2p$-orbitals of fluorine. Thus, the given order is incorrect and the correct order is Cl > F > Br > I.

**14.** Azeotropes are constant boiling mixtures. Minimum boiling azeotropes are formed from non-ideal solutions showing large positive deviations and such solution have boiling point lower than either of their two components.
Whereas, maximum boiling azeotropes are formed from non-ideal solutions showing large negative deviations and such solutions have boiling point higher than either of their two components.

**15.** An organic compound which dissolved in dry benzene evolved hydrogen on treatment with sodium is an alcohol.

$$\underset{\text{Alcohol}}{R\text{—OH}} + \underset{\text{Sodium metal}}{Na} \xrightarrow[\text{benzene}]{\text{Dry}} R\text{—}\overset{-}{O}\overset{+}{N}a + \underset{\text{Hydrogen gas}}{H_2\uparrow}$$

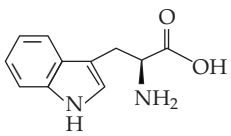
**16.** Boiling point and freezing point depend on $K_b$ (molal elevation constant) and $K_f$ (molal depression constant) of the solvent. Thus, equimolar solution (of the non-electrolyte), will have same boiling point and also same freezing point.

$$\Delta T_f = K_f \times \text{molality}$$
$$\Delta T_b = K_b \times \text{molality}$$

**Note** In this question, nature of solute has not been mentioned. Hence, we have assumed that solute in non-electrolyte.

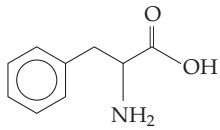
**17.** Total volume of atoms present in a fcc unit cell of atom with radius $r$ is $16/3\pi r^3$.

**18.** Tryptophan is a heterocyclic amino acid.
Its structure is as follows :

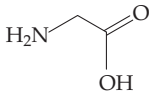


Structure of other amino acid are as follows :

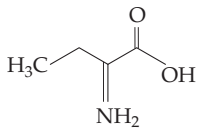
- **Phenylalanine**



- **Glycine**



- **Alanine**



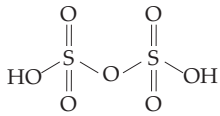
**19.** When ethyl alcohol ($C_2H_5OH$) reacts with thionyl chloride in the presence of pyridine, then chloroethane, sulphur dioxide and hydrochloric acid are formed.

$$\underset{\text{Ethanol}}{C_2H_5OH} + \underset{\text{Thionyl chloride}}{SOCl_2} \xrightarrow{\text{Pyridine}} \underset{\text{Chloroethane}}{C_2H_5Cl} + \underset{\text{Sulphur dioxide}}{SO_2} + \underset{\text{Hydrochloric acid}}{HCl}$$

**20.** Dithionous acid ($H_2S_2O_4$) has sulphur in + 3 oxidation state.

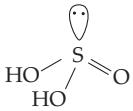
$$2(+1) + 2x + 4(-2) = 0$$
$$2x = 8 - 2$$
$$x = +3$$

(b) Pyrosulphuric acid (oleum), $H_2S_2O_7$



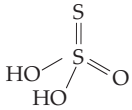
$$2 + 2x - 14 = 0$$
$$\Rightarrow \quad 2x = 12 \Rightarrow x = +6$$

(c) Sulphurous acid, $H_2SO_3$



$$2 + x - 6 = 0$$
$$x = +4$$

(d) Thiosulphuric acid, $H_2S_2O_3$



0 oxidation for the terminal S and +4 oxidation state for central S-atom.

**21.** In crystalline solid, constituent particles are arranged in a regular manner over a long distance.

**22.** Among the given characteristics, option (d) is represents incorrect characteristic of interhalogen compound. Its correct form is:

Interhalogen compounds are mostly liquid or solid at room temperature and are not highly volatile.

**23.** When phenyl magnesium bromide reacts with methanol then a mixture of benzene and Mg(OMe)Br is formed.

$$\underset{\text{Phenyl magnesium bromide}}{C_6H_5MgBr} + \underset{\text{Alcohol}}{HOCH_3} \longrightarrow \underset{\text{Benzene}}{C_6H_6} + Mg\begin{<}Br\\OCH_3\end{>}$$

**24.** The six membered cyclic structure of glucose is called pyranose structure ($\alpha$ or $\beta$) in analogy with pyran.

**25.** In Finkelstein reaction, $C_2H_5Br$ and NaI reactants are used to produce $C_2H_5I$ and NaF. Complete reaction is as follows:

$$\underset{\text{(Ethyl bromide)}}{C_2H_5Br} + NaI \longrightarrow \underset{\text{Ethyl iodide}}{C_2H_5I} + NaF$$

**26.** Molality $(m) = \dfrac{M}{1000d - MM_1} \times 1000$

$M$ = molarity

$M_1$ = molecular mass

$d$ = density

$$= \frac{2.05}{(1000 \times 1.02) - (2.05 \times 60)} \times 1000$$

$$= 2.28 \text{ mol kg}^{-1}$$

**27.** Given,

Edge length $(a) = 508$ pm

Radius of cation $(r_+) = 110$ pm

Radius of anion $(r_-) = ?$

For fcc, $2(r_+ + r_-) = a$

$$2(110 + r_-) = 508$$

$$r_- = \frac{508}{2} - 110$$

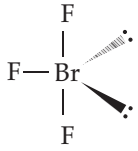
$$= 144 \text{ pm}$$

**28.** Option (d) is not a correct match.

| Solute | Solvent | Example |
|---|---|---|
| Gas | Gas | Air, which is mostly mixture of nitrogen and oxygen gases. |

**29.** In non-polar molecular solids, the constituent particle are either atoms (noble gas—Ar, He) or the monoatomic molecule (like $H_2$, $Cl_2$ and $I_2$). In these solids, atoms or molecules are held together by weak dispersion forces or London forces. Therefore, they are soft non-conductors of electricity and have low melting point and exist in gaseous or liquid state at room temperature and pressure.

**30.**



Trigonal bipyramidal (T-shaped), $sp^2d$-hybridised

$BrF_3$ molecular geometry is said to be trigonal bipyramidal (with T-shaped). Bond angle is 86.2° which is slightly smaller than the usual 90°. This angle formed is due to the repulsion generated by the electron pairs which is greater than that of the Br—F-bonds.

Thus, i → trigonal bipyramidal, ii → shaped and iii → 2 lone pairs.

**31.** Among the given statements only statement (b) is incorrect while other are correct. Its correct form is as follows :

In reverse osmosis, solvent molecules move from higher concentration of solute to lower concentration of solute.

**32.** $\underset{\text{Chloroethane}}{C_2H_5—Cl} + AgCN \xrightarrow{EtOH/H_2O} \underset{X}{C_2H_5NC} + AgCl$

In '$X$' a nitrogen is linked to ethyl carbon.

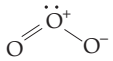
**33.** The correct order of N-compounds in its decreasing order of oxidation states is $\overset{+5}{H}\overset{}{N}\overset{}{O_3}$, $\overset{+2}{NO}$, $\overset{0}{N_2}$, $\overset{-3}{NH_4Cl}$

**34.** $\underset{\text{Acetaldehyde}}{\underset{(A)}{CH_3CHO}} \xleftarrow[\Delta]{Cu} \underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow[\Delta]{Al_2O_3} \underset{\text{Ethene}}{\underset{(B)}{CH_2 = CH_2}}$

Ethanol on reacting with $Al_2O_3$ gives ethene(s) and on reacting with Cu in the presence of heat, then acetaldehyde ($A$) is formed.

**35.** Only statement (b) is incorrect. However, other statements are correct.

(a) $O_3$ molecule is bent.



(c) ONF is isoelectronic with $O_2N^-$ as both have same number of electrons, i.e. 24.

(d) $Cl_2O_7$ is the anhydride of $HClO_4$ (Perchloric acid).

$$2HClO_4 \xrightarrow{-H_2O} Cl_2O_7$$

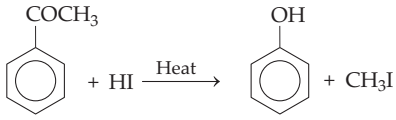
$OF_2$ is a fluoride of oxygen and not oxide of fluorine because EN of florine is more than oxygen $OF_2$ is oxygen difluoride.

**36.** *Aq.* KOH is used to convert propene to 1-propan-ol.

$$\underset{\text{Propene-1}}{CH_3CH=CH_2} + Aq.KOH \longrightarrow \underset{\text{Propanol}}{CH_3CH_2CH_2OH}$$

**37.** Anisole reacts with HI to give phenol and methyl iodide ( not iodobenzene and methyl alcohol). Bond between O—$CH_3$ is weaker than the bond between O—$C_6H_5$, this is because of the partial double bond character generated between the oxygen and carbon of the benzene ring.

The reaction is as follows :



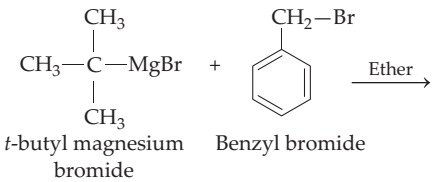
**38.** In chlorobenzene and vinyl chloride, the C—Cl bond aquires some double-bond character due to resonance. Hence, they are less reactive than chloroethane. Thus, the order of reactivity of halogen in the given compounds is

chlorobenzene < vinyl chloride, < chloroethane.

**39.** When Cu is heated with conc. $HNO_3$, $Cu(NO_3)_2$ and brown gas of $NO_2$ is produced.

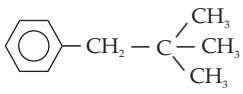
$$\underset{\text{Conc.}}{Cu + 4HNO_3} \longrightarrow Cu(NO_3)_2 + \underset{\text{Brown gas}}{2NO_2\uparrow} + 2H_2O$$

**40.**

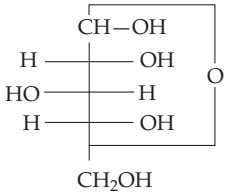


*t*-butyl magnesium bromide

Benzyl bromide



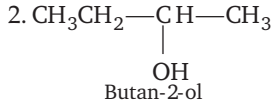
**41.** All the given reactions are not shown by the glucose. Because glucose is a cyclic compound, its aldehyde group is not free.



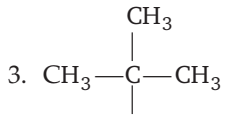
Cyclic structure of glucose

**42.** Three isomers of butanol are possible but only one have possess chiral centre.

1. $\underset{\text{Butan-1-ol}}{CH_3CH_2CH_2CH_2OH}$

2. 

Butan-2-ol

3. 

2-methyl propan-2-ol (chiral)

**43.** Among the given statements only (b) is incorrect while other are correct statements. Correct form of (b) is as follows :

There are 9 essential amino acids.

**44.** $S_N2$ is an inversion reaction, so will be favoured by least sterically hindered carbon atom or a primary carbon atom. Hence,  will be most reactive in $S_N2$ reaction.

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

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

**47.** Assertion and Reason both are true but Reason is not the correct explanation of the Assertion.

Haloform test is used to identify the alcohol or carbonyl compounds. In this reaction, alcohols (or aldehydes and ketones) on heating with $X_2$ ( $Cl_2$, $Br_2$ and $I_2$) and $\bar{O}H$ form $CHX_3$ test (haloform). The alcohols containing the $CH_3CHOH$ group, linked to carbon or hydrogen atom can be distinguished from other alcohols by this test. Thus, ethanol gives positive haloform test.

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

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

Glucose on mild oxidation gives six carbon carboxylic acid (gluconic acid) which indicates it contains aldehydic group.

**50.** A → 4, B → 3, C → 1, D → 2.

**51.** Raoult's law states that ''at a given temperature for a solution of volatile liquids, the partial vapour pressure of each component of the solution is directly proportional to its mole fraction present in solution''.

i.e. For component $i$ $p_i \propto \chi_i$

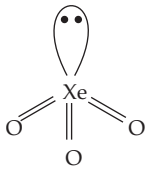
or $p_i = p_i^{\circ}\chi_i$

Henry's law states that, ''at certain temperature for a given volume of solvent, amount of gas dissolved is proportional to partial pressure of gas''.

$$p = K_H \cdot \chi$$

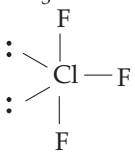
**52.** Option (d) is not correctly matched. Its correct structure is as follows :

$A$ : $XeO_3$ $B$ : Pyramidal



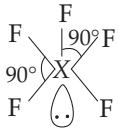

$XeO_3$

(a) Structure of $ClF_3$ is as follows :



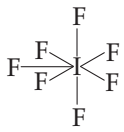

Bent T-shaped
(Trigonal bipyramidal)

(b) Structure of $IF_5$ is as follows :




Square pyramidal

(c) Structure of $IF_7$ is as follows




Pentagonal bipyramidal

**53.** Argon is used for providing inert atmosphere in the welding of metals or alloys that are easily oxidised as it is very less reactive towards metals.

**54.** Hydrolysis of $XeF_4$ and $XeF_6$ with water gives $XeO_3$.

$$6XeF_4 + 12H_2O \longrightarrow 4Xe + 2XeO_3 + 24HF + 3O_2$$

$$XeF_6 + 3H_2O \longrightarrow XeO_3 + 6HF$$

Partial hydrolysis of $XeF_6$ gives oxyfluorides $XeOF_4$ and $XeO_2F_2$.

$$XeF_6 + H_2O \longrightarrow XeOF_4 + 2HF$$

$$XeF_6 + 2H_2O \longrightarrow XeO_2F_2 + 4HF$$

**55.** Xenon hexafluoride reacts with silica to form $XeOF_4$ as

$$2XeF_6 + SiO_2 \longrightarrow 2XeOF_4 + SiF_4$$

This oxidation state of xenon in $XeOF_4$ is + 6 as calculated below.

Let the oxidation state of Xe is $a$

$\therefore \quad a + (-2) + 4 \times (-1) = 0$

$$a = +2 + 4 = 6$$