# Board Paper of Class 12-Science 2021
# Chemistry Term-I Delhi(Set 4) - Solutions

**Total Time: 90**

**Total Marks: 35.0**

## Section A

### Solution 1

At the molecular level, ideal behavior of the solutions can be explained by considering two components A and B. If the intermolecular attractive forces between A-A and B-B are nearly equal to those between A-B, this leads to the formation of an ideal solution. The solution of n-hexane and n-heptane is an ideal solution.

Hence, the correct answer is option (C).

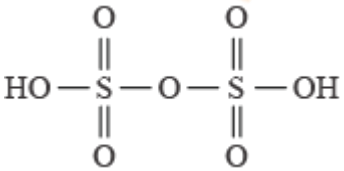
### Solution 2

In amorphous solids, the arrangement of constituent particles (atoms, molecules or ions) has only short-range order. In such an arrangement, a regular and periodically repeating pattern is observed over short distances only. Glass, plastic and rubber are examples of amorphous solids.

Hence, the correct answer is option (D).

### Solution 3

The structure of pyrosulphuric acid ($H_2S_2O_7$) is as follows:



Hence, the correct answer is option (C).

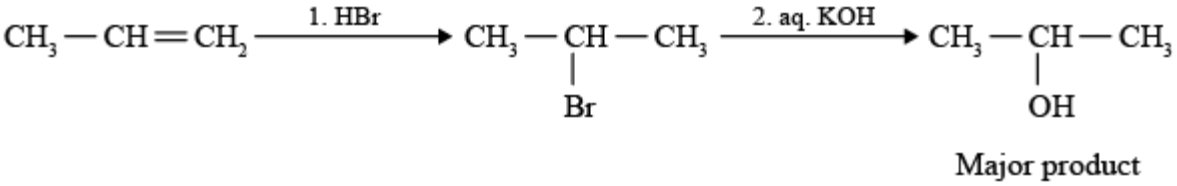
### Solution 4

The bond angle in alcohols is slightly less than the tetrahedral angle (109°28′). It is due to the repulsion between the unshared electron pairs of oxygen.

Hence, the correct answer is option (B).

**Solution 5**

When HBr is added to an alkene, addition takes place through Markonikov's rule. Aqueous KOH is added to convert haloalkane to alcohol by nucleophilic substitution reaction. The reaction is as follows:




Major product

Hence, the correct answer is option (A).

**Solution 6**

A unit formed by the attachment of a base to 1′ position of sugar is known as a nucleoside. Therefore, nucleosides are composed of a pentose sugar and a nitrogeneous base.

Hence, the correct answer is option (C).

**Solution 7**

The stability of the −2 oxidation state decreases down the group. Since the electronegativity of oxygen is very high, it shows only a negative oxidation state of −2, except in $OF_2$, where it shows a +2 oxidation state.

Hence, the correct answer is option (A).

**Solution 8**

Crystalline solids are anisotropic in nature which means some of their physical properties like electrical resistance or refractive index show different values when measured along different directions in the same crystals.

Hence, the correct answer is option (D).

**Solution 9**

According to Raoult's law when the solute is non-volatile, only the solvent molecules are present in vapour phase and contribute to vapour pressure. Therefore, the correct expression is given as follows:
$P_{Total} = P_{solvent}$

Hence, the correct answer is option (C).

**Solution 10**

When a solution shows positive deviation from Raoult's law, the intermolecular forces present are weaker than those present in the ideal solution. The total vapour pressure of the solution is greater than the total vapour pressure of the

ideal solution.  Also, the vapour pressure of each component is greater than that predicted from Raoult's law. Hence, the azeotropic mixture of two liquids boils at a lower temperature than either of them.

Hence, the correct answer is option (A).

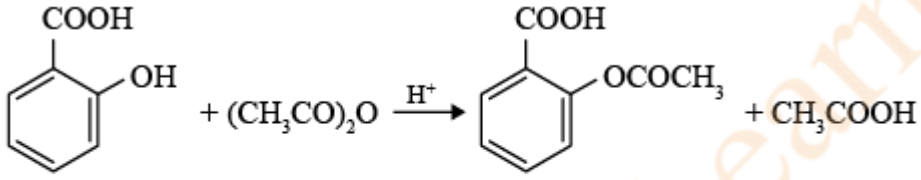
**Solution 11**

Metal excess defects may be caused by extra cations which occupy the interstitial sites. Zinc oxide is white in colour at room temperature. On heating it loses oxygen and turns yellow. This is because the excess $Zn^{2+}$ ions move to interstitial sites and the electrons to neighbouring interstitial sites.

Hence, the correct answer is option (D).

**Solution 12**

Acetylation of salicylic acid produces aspirin.




Salicylic acid

Acetylsalicylic acid
(Aspirin)

Hence, the correct answer is option (B).

**Solution 13**

Oxygen atom has a smaller size than sulphur due to which the O-O bond length is short which results in the repulsion of lone pairs on O making it unstable and the bond can be easily cleaved. However, due to the larger size of S atom, no such repulsion is present and the S-S bond is stronger than that between O-O.

Hence, the correct answer is option (D).

**Solution 14**

Essential amino acids cannot be made by the body. As a result, they must be taken through diet.

Hence, the correct answer is option (B).

**Solution 15**

In vinyl halide, the halogen atom is bonded to an $sp^2$-hybridised carbon atom of a carbon-carbon double bond (C = C).

Hence, the correct answer is option (D).

**Solution 16**

The interparticle force between acetone and chloroform increases due to hydrogen bonding. These form a solution with negative deviation from Raoult's law. Therefore, $\Delta V_{mix}$ becomes negative. So, the volume of the resulting solution will have a lower volume than 50 mL.

Hence, the correct answer is option (A).

**Solution 17**

Since steric hindrance in alkyl halides increases in the order of 1° < 2° < 3°, the increasing order of reactivity towards $S_N2$ reaction will be 3° < 2° < 1°. Also, the aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides because of resonance stabilization in aryl halide. Hence, the correct order of reactivity towards $S_N2$ reaction is : II > I > III

Hence, the correct answer is option (C).

**Solution 18**

Oxygen molecule has two oxygen atoms with configuration $1s^2 2s^2 2p^4$. These atoms share their electrons and form double bond, one of which is sigma bond and the other is a pi bond. As these pi bonds are produced by the overlapping of p orbitals it is called a $p\pi$ - $p\pi$ bond.

Hence, the correct answer is option (D).

**Solution 19**

$F_2$ is a strong oxidising agent because it accepts an electron readily due to its small size, high electron-negativity, low dissociation energy and high hydration energy.

Hence, the correct answer is option (B).

**Solution 20**

Glucose is a simple sugar with six carbon atoms and one aldehyde group. This monosaccharide has a chemical formula $C_6H_{12}O_6$ and is also known as dextrose.

Hence, the correct answer is option (A).

**Solution 21**

Cu reacts with dilute $HNO_3$ to evolve nitric oxide gas. The reaction for the same is given below:

$3Cu + 8HNO_3(dilute) \rightarrow 3Cu(NO_3)_2 + 2NO + 4H_2O$

Hence, the correct answer is option (C).

**Solution 22**

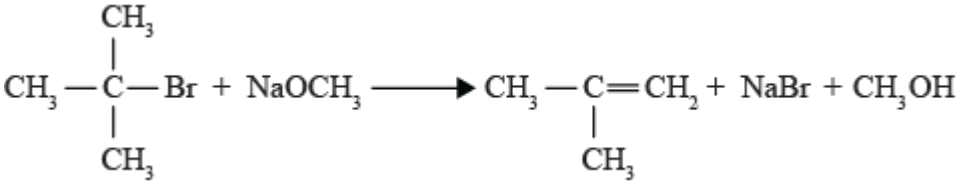
Silicon dioxide ($SiO_2$), quartz, is a network solid that contains covalently

bonds.

Hence, the correct answer is option (B).

**Solution 23**

The reaction is as follows:



Hence, the correct answer is option (D).

**Solution 24**

Chlorine forms a mixture of chloride and hypochlorite with cold and dilute alkalies. The reaction of chlorine with cold and dilute NaOH is as follows:

$$\underset{(\text{Cold and dilute})}{2\,\text{NaOH}} + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$$

Hence, the correct answer is option (B).

**Solution 25**

The formula for elevation in boiling point is given as:

$$\Delta \text{T}_\text{b} = \frac{\text{K}_\text{b} \times 1000 \times W}{\text{M} \times w}$$

where,

$\text{K}_\text{b} = \text{molal elevation constant}$

$w = \text{weight of solvent}$

$W = \text{weight of solute}$

$\text{M} = \text{molar mass of solute}$

So, the elevation of boiling point is inversely proportional to the molar mass of the solute (M).

Hence, the correct answer is option (C).

**Section B**

**Solution 26**

According to Henry's law

$$\text{p} = K_H x$$

$$2.5 = K_H \times 0.04 \qquad \ldots\ldots (\text{i})$$

If the pressure is doubled,

$2.5 \times 2 = K_H \times x$

$5 = K_H \times x \qquad \ldots\ldots (ii)$

On dividing (i) by (ii)

$\frac{2.5}{5} = \frac{K_H \times 0.04}{K_H \times x}$

$x = 0.08$

Hence, the correct answer is option (A).

**Solution 27**

The base which is present in DNA but not in RNA is thymine.

Hence, the correct answer is option (D).

**Solution 28**

The reaction is as follows:

$$\mathrm{CH_3 - CH = CH - CH_2 - OH \xrightarrow{PCC} CH_3 - CH = CH - CHO}$$

Hence, the correct answer is option (C).

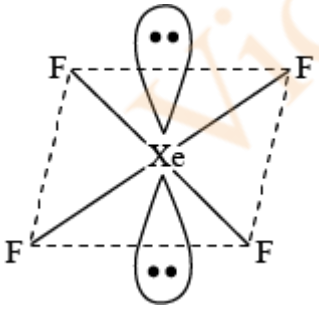
**Solution 29**

Enantiomers have identical physical and chemical properties, but they differ in configuration. Therefore, they rotate the plane polarised light in opposite directions.

Hence, the correct answer is option (B).

**Solution 30**

The structure of $XeF_4$ is given below:




The number of lone of electrons in $XeF_4$ is two.

Hence, the correct answer is option (C).

**Solution 31**

Due to the low volatility of sulphuric acid, it is used in the preparation of more volatile acids from their corresponding salts.

Hence, the correct answer is option (B).

**Solution 32**

The formula for calculating density of an element is as follows:

$d = \frac{Z\mathrm{M}}{\mathrm{N_A}a^3}$

$\mathrm{M} = \frac{\mathrm{N_A} \times a^3 \times d}{Z}$

where,

$\mathrm{M} = \text{ molar mass}$

$\mathrm{N_A} = 6 \times 10^{23} \text{ mol}^{-1}$

$a = 4 \times 10^{-8} \text{ cm}$

$\mathrm{Z} = 4, \text{ for fcc unit cell}$

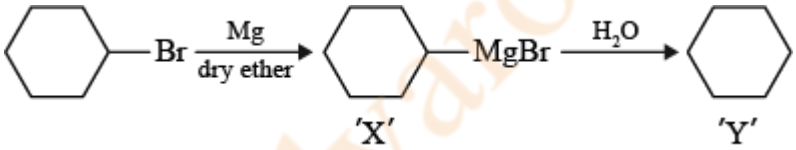
$\mathrm{M} = \frac{6 \times 10^{23} \times \left(4 \times 10^{-8}\right)^3 \times 6}{4}$

$\mathrm{M} = 57.6 \text{ g mol}^{-1}$

Hence, the correct answer is option (A)

**Solution 33**

The reaction is as follows:




Hence, the correct answer is option (C).

**Solution 34**

The reducing character of the hydrides increases on going down the group in the modern periodic table. Ammonia is only a mild reducing agent while $BiH_3$ is the strongest reducing agent amongst all the hydrides.

Hence, the correct answer is option (A).

**Solution 35**

The elevation in the boiling point of water can be calculated as,

$$\Delta T_b = K_b m$$
$$\Delta T_b = 0.52 \times 0.2$$
$$\Delta T_b = 0.104\ K\ =\ 0.104\ ^\circ C$$

The boiling point of water is 100 °C. So, the elevated boiling point of the solution will be (100 + 0.104) = 100.104 °C

Hence, the correct answer is option (C).

**Solution 36**

Nucleic acids are also called as polynucleotides as they consist of long-chain polymers of nucleotides.

Hence, the correct answer is option (C).

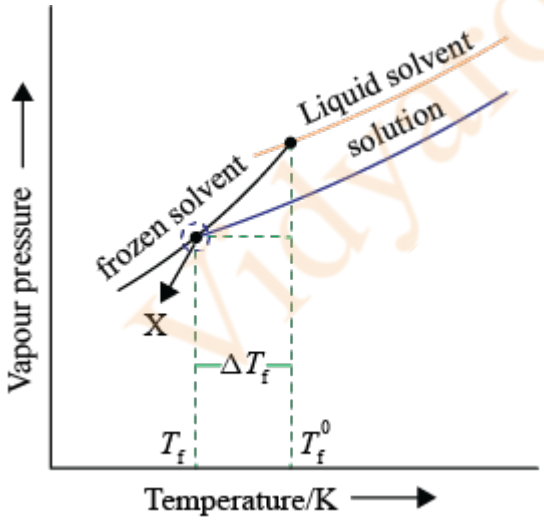
**Solution 37**

$NO_2$ gas consists of odd number of valence electrons. So, it is unstable. On dimerisation, it is converted to stable $N_2O_4$ molecule with an even number of electrons.

Hence, the correct answer is option (B).

**Solution 38**

In the given diagram point 'X' represents the freezing point of solution.




Hence, the correct answer is option (D).

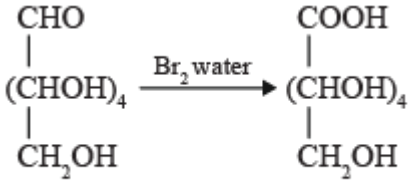
**Solution 39**

The reaction of $XeF_6$ with NaF gives $Na^+[XeF_7]^-$. The reaction is as follows:
$XeF_6 + NaF \rightarrow Na^+[XeF_7]^-$

Hence, the correct answer is option (A).

**Solution 40**

The reaction of glucose with $Br_2$ water gives gluconic acid. The reaction is as follows:




Gluconic acid

Hence, the correct answer is option (C).

**Solution 41**

The compound butan-2-ol has a chiral centre with different groups present on the carbon atom. However, a racemic mixture of this compound would contain both the enantiomers in equal amounts. The optical activity, would thus, be cancelled and the mixture will be optically inactive.

Hence, the correct answer is option (C).

**Solution 42**

The interhalogen compounds are generally more reactive than the constituent halogens. This is due to the X-X' bond in interhalogen compounds being weaker than the X-X bond in halogens.

Hence, the correct answer is option (B).

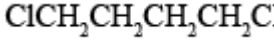
**Solution 43**

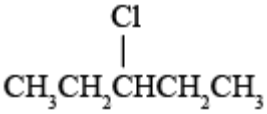
With an increase in the size and mass of the halogen atom, the magnitude of van der Waals forces increases. This causes an increase in the boiling point of the haloalkane. Thus, out of alkyl halides with the same alkyl group, iodides have the highest boiling point.

Hence, the correct answer is option (D).

**Solution 44**

An alkyl halide will give different isomeric products depending on the different types of carbon atoms present in the alkane. There are three type of carbon atoms in n-pentane. Thus, this compound will give three different isomeric monochlorides as follows:





Hence, the correct answer is option (B).

**Solution 45**

When a raw mango is placed in a concentrated salt solution (saline), it loses water due to osmosis and shrivels to form pickle.

Hence, the correct answer is option (C).

**Solution 46**

In the hydrides of group 16, the bond dissociation enthalpy decreases from oxide to telluride. This causes an increase in the acidic character as we move from $H_2O$ to $H_2Te$.

Hence, the correct answer is option (A).

**Solution 47**

The electron pairs on the chlorine atom are in conjugation with π-electrons of the ring. The C—Cl bond acquires a partial double bond character due to resonance. As a result, the bond cleavage becomes difficult and hence, chlorobenzene is less reactive towards nucleophilic substitution reaction. The presence of an electron-withdrawing group ($-NO_2$ ) at ortho- and para-positions increases the reactivity of chlorobenzene.

Hence, the correct answer is option (B).

**Solution 48**

The Schottky defect is basically a vacancy defect in ionic solids. In order to maintain electrical neutrality, the number of missing cations and anions is equal. Therefore, the density decreases in the Schottky defect.

Hence, the correct answer is option (D).

**Solution 49**

Due to high electronegativity and small size, fluorine forms only one oxoacid, HOF known as fluoric (I) acid or hypofluorous acid.

Hence, the correct answer is option (A).

**Section C**

**Solution 50**

Schottky defects and Frenkel defects are stoichiometric defects. Crystalline solids have a long range order. The fcc structure has an arrangement of the type ...ABC ABC ABC... In metal excess defect due to anionic vacancies, F-centres are created. Thus, the correct match is as follows:

(i)-(c), (ii)-(a), (iii)-(d), (v)-(b)

Hence, the correct answer is option (B).

**Solution 51**

The correct analogy is as follows:
moist $SO_2$ : Reducing agent :: $Cl_2$ : bleaching agent
The incorrect analogies can be corrected as follows:
$XeF_2$ : linear :: $XeF_6$ : distorted octahedral
$N_2$ : Inert at room temperature:: $F_2$ : reactive gas
$NH_3$ : weak base :: HI : strong acid

Hence, the correct answer is option (B).

**Solution 52**

When milk curdles, there are changes in the secondary and tertiary structures of proteins. The primary structure remains intact. Thus, this involves denaturation of proteins. The secondary structure of a protein can be either of α-helix type or β-pleated sheet structure.

Hence, the correct answer is option (D).

**Solution 53**

Tertiary alcohols do not undergo oxidation easily under normal conditions. These are highly resistant to oxidation. Primary alcohols oxidise to give aldehydes while secondary alcohols give ketones on oxidation.

Hence, the correct answer is option (A).

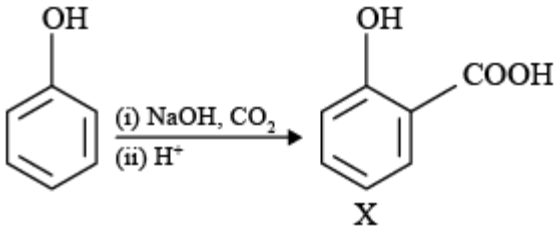
**Solution 54**

The acidic character of phenols is increased by the presence of electron withdrawing groups. The nitro group is electron withdrawing in nature and thus, increases the acidic character of phenol.

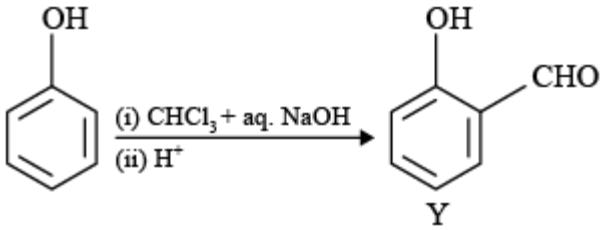
Hence, the correct answer is option (C).

**Solution 55**

The reactions involved are as follows:




X




Y

Hence, the correct answer is option (D).