Sample Paper

Chemistry

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.

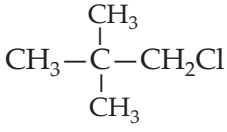
1. Relationship between atomic radius (r) and the edge length 'a' of a body centred cubic unit cell is.

(a) $r = \frac{a}{2}$ (b) $r = \sqrt{\frac{a}{2}}$ (c) $r = \frac{\sqrt{3}}{4}a$ (d) $r = \frac{3a}{2}$

2. Osmotic pressure of a dilute solution is given by :

(a) $P = P_0x$ (b) $pV = nRT$ (c) $p = VRT$ (d) None of these

3. What is the IUPAC name of



(a) 2-dimethylchloropropane (b) 1-chloro-2-dimethyl-pentane
(c) 2, 2-dimethyl-chlorobutane (d) 1-chloro-2, 2-dimethyl propane

4. Oxygen molecule is :

(a) Paramagnetic (b) Diamagnetic (c) Ferromagnetic (d) Ferrimagnetic

5. When oxalic acid is heated with glycerol we get:

(a) Formic acid (b) Acetic acid (c) Lactic acid (d) Tartaric acid

6. The disease albinism is caused by the deficiency of enzyme:

(a) trypsin (b) tyrosinase
(c) phenylalanine hydroxylase (d) none of these

7. Ethylene chloride and ethylidene chloride are isomers. Identify the correct statements.

(a) Both the compounds form same product on treatment with alcoholic KOH.
(b) Both the compounds form same product on treatment with aq.NaOH.
(c) Both the compounds form same product on reduction.
(d) Both the compounds are optically active.

8. Which of the following has lowest reducing character?

(a) H_2O (b) H_2S (c) H_2Te (d) H_2Se

9. An example of intensive property is:

(a) Number of moles (b) Mass (c) Volume (d) Density

10. Amino acids are:

(a) acidic (b) basic (c) amphoteric (d) neutral

11. Alkyl halides are prepared from alcohols, which are easily accessible. The hydroxyl group of an alcohol is replaced by halogen on reactions with certain compounds. Which one of the below compounds is inappropriate as a reagent?

(a) Concentrated halogen acid (b) Sodium dihalide
(c) Thionyl chloride (d) Phosphorus halides

12. In the complex ion $[AuXe_4]^{2+}$, Xe acts as :

(a) central atom (b) ligand (c) chelating agent (d) electrophile

13. What is the percentage of empty space in a body centred cubic arrangement?
(a) 74 (b) 68 (c) 26 (d) 32

14. Which of the following is not an Electrophilic substitution reaction of haloarenes?
(a) Sulphonation (b) Nitration (c) Halogenation (d) Wurtz-Fittig reaction

15. Hybridisation shown by Au in $[AuXe_4]^{2+}$ is :
(a) sp^3 (b) sp^3d (c) sp^3d^2 (d) sp^2

16. The solutions which obey Raoult's law are known as:
(a) Ideal solutions (b) Non-ideal solutions (c) Azeotropes (d) Binary solutions

17. Compounds of noble gases except___are known.
(a) Krypton (b) Radon (c) Helium (d) Xenon

18. The reaction of a primary alcohol with which of the following gives purely a haloalkane?
(a) Phosphorus trichloride (b) Phosphorus pentachloride
(c) Thionyl chloride (d) Sulphuryl chloride

19. Xe is a_____ligand:
(a) ambidentate (b) bidentate (c) unidentate (d) hexadentate

20. What happens when an aldehyde is treated with lithium aluminium hydride?
(a) Primary alcohol is formed (b) Secondary alcohol is formed
(c) Tertiary alcohol is formed (d) No reaction

21. Which noble gas was discovered in chromosphere?
(a) He (b) Ar (c) Xe (d) Rn

22. Why the solutions show deviation from the Raoult's law?
(a) Interaction in the molecular level (b) Interaction in the atomic level
(c) Interaction in the ionic level (d) Both (a) and (b)

23. Which of the following carbohydrates is not a sugar?
(a) Glucose (b) Fructose (c) Lactose (d) Cellulose

24. Which law is followed to increase the solubility of CO_2 in the soft drinks?
(a) Henry's law (b) Raoult's law
(c) Le Chatelier's principle (d) Avogadro's law

25. What is the general formula for haloalkanes? (X=halogen atom, n = 1, 2, 3…).
(a) $C_nH_{2n}X$ (b) $C_nH_{2n+1}X$ (c) $C_nH_{2n-1}X$ (d) $C_nH_{2n-3}X$

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 low bond energy is best explained by:
(a) The attainment of noble gas configuration
(b) The low electron affinity of F
(c) Repulsion by electron pairs on F
(d) The small size of F

27. What is the correct order of the packing efficiency in different types of unit cells?
(a) fcc < bcc < simple cubic (b) fcc < bcc > simple cubic
(c) fcc > bcc > simple cubic (d) bcc < fcc > simple cubic

28. Glucose is prepared commercially from the hydrolysis of _____ by boiling it with dilute H_2SO_4 at 393K under pressure.
(a) starch (b) sucrose (c) galactose (d) dextrose

29. The oxo-acid of halogen with maximum acidic character is:
(a) $HClO_4$ (b) $HClO_3$ (c) $HClO_2$ (d) HClO

30. Which of the following point defects are shown by AgBr(s) crystals?

(A) Schottky defect (B) Frenkel defect

(C) Metal excess defect (D) Metal deficiency defect

(a) (A) and (B) (b) (C) and (D) (c) (A) and (C) (d) (B) and (D)

31. Which of the following are the most suitable conditions for electrophilic substitution of arenes?

(a) UV light and heat (b) Cold and dark

(c) 40°C temperature and dark (d) Room temperature and sunlight

32. The maximum amount of a substance that can be dissolved in a specific amount of solvent at a specified temperature is known as:

(a) Solubility (b) Liquidity (c) Fluidity (d) Viscosity

33. Alcohols have higher boiling point than their corresponding parent alkanes due to:

(a) Intramolecular hydrogen bonding (b) Intermolecular hydrogen bonding

(c) Van der Waals forces (d) Covalent bonding

34. Which of the following reaction will not occur spontaneously?

(a) $F_2 + 2Cl^- \longrightarrow 2F^- + Cl_2$ (b) $I_2 + 2Br^- \longrightarrow 2I^- + Br_2$

(c) $Br_2 + 2I^- \longrightarrow 2Br^- + I_2$ (d) $2I^- + Cl_2^- \longrightarrow 2Cl^- + I_2$

35. Appearance of the violet or lilac in colour on the addition of the excess of potassium ions in the KCl crystal is because of:

(a) Some of the anionic sites are occupied by an unpaired electron.

(b) Some of the anionic sites are occupied by a pair of electrons.

(c) There are vacancies at some anionic sites.

(d) F-centres are created which impart colour to the crystals.

36. Identify the monosaccharide from the following.

(a) Deoxyribose (b) Sucrose (c) Maltose (d) Fructose

37. Which of the following is not a colligative property?

(a) Osmotic pressure (b) Depression in freezing point

(c) Lowering of vapour pressure (d) Depression in boiling point

38. Which entities are formed during the free radical mechanism?

(a) Carbanion (b) Carbocation (c) Free radicals (d) Atoms

39. The high viscosity and high boiling point of HF is due to:

(a) Low dissociation energy of F_2 molecule

(b) Associated nature due to hydrogen bonding

(c) Ionic character of HF

(d) High electronegativity of fluorine

40. Which defect is not found in pure alkali metal halides?

(a) Frenkel defect (b) Schottky defect (c) Both (a) and (b) (d) Point defect

41. Which of the following alcohol is most soluble in water?

(a) Propanol (b) Butanol (c) Pentanol (d) Hexanol

42. What happens when a non-volatile solute is added to a solution?

(a) Vapour pressure of the solvent decreases

(b) Vapour pressure of the solvent increases

(c) Vapour pressure of the solvent remains constant

(d) Both (a) and (b)

43. Which of the following disaccharides gives two same monosaccharide units on hydrolysis?

(a) Maltose (b) Sucrose (c) Lactose (d) Lactulose

44. Why ZnS shows dislocation defect?

(a) Small size of both the ions (b) Equal size of both the ions

(c) Zn^+ ion is larger in size (d) Zn^+ ion is smaller in size

45. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: The haloalkanes are slightly soluble in water.
Reason: Energy is required to overcome the attractions between the haloalkanes molecules.
Select the most appropriate answer from the options 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.

46. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: When NaCl is added to water a depression in freezing point is observed.
Reason: The lowering of vapour pressure of a solution causes no depression in the freezing point.
Select the most appropriate answer from the options 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.

47. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: Acidic character of group 16 hydrides increases from H_2O to H_2Te.
Reason: Thermal stability of hydrides decreases down the group.
Select the most appropriate answer from the options 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.

48. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: Quartz glass is crystalline solid and quartz is an amorphous solid.
Reason: Quartz glass has no long range order.
Select the most appropriate answer from the options 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.

49. Given below are two statements labelled as Assertion (A) and Reason (R)
Assertion: Interhalogen compounds are more reactive than halogens (except fluorine).
Reason: They all undergo hydrolysis giving halide ion derived from the smaller halogen and anion derived from larger halogen.
Select the most appropriate answer from the options 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.

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. In an orthorhombic crystal system axial angles $\alpha = \beta = ¥$ are:
(a) Equal to 90° (b) Less than 90° (c) Greater than 90° (d) None of these

51. Which of the following is not a solid solution?

(a) Brass (b) Bronze (c) Hydrated salts (d) Aerated drinks

52. Diamond, silica and silicon carbide are:

(a) Ionic solid (b) Covalent solid (c) Metallic solid (d) Molecular solid

CASE 1: Read the passage given below and answer the following questions 53-55

Experimental kinetic data on reactions of the chlorine atom with halogenated derivatives of methane and ethane (37 reactions) have been analyzed by the intersecting-parabolas method. The following five factors have an effect on the activation energy of these reactions: the enthalpy of reaction, triplet repulsion, the electronegativities of the reaction center atoms, the dipole–dipole and multidipole interactions between the reaction center and polar groups, and the effect of π electrons in the vicinity of the reaction center. The increments characterizing the contribution from each factor to the activation energy of the reaction have been calculated. The contribution from the polar interaction, $\Delta E\mu$, to the activation energy depends on the dipole moment of the polar group and obeys the following empirical equation: $\ln(\Delta E\mu/\Sigma\mu) = -0.74 + 0.87(\Delta E\,\mu/\Sigma\mu) - 0.084(\Delta E\mu/\Sigma\mu)^2$.

Source: Denisov, E.T., Denisova, T.G. (2017). Reactivity of haloalkanes in their reactions with the chlorine atom. Kinetics and Catalysis, 58, 219–226.

53. Nucleophilic reactions are the most useful classes of organic reactions of alkyl halides in which halogens are bonded to _____hybridized carbon.

(a) sp_2 (b) sp^3 (c) *sp* (d) *pp*

54. The spatial arrangement of four groups (valences) around a central carbon atom is tetrahedral and if all the substituents attached to that carbon are different, and then such a carbon is called ____

(a) Achiral (b) Chiral (c) Asymmetric (d) Symmetric

55. In alkyl halides, due to greater polarity as well as higher molecular mass, as compared to the parent hydrocarbon, the intermolecular _____ and _____ of attraction are stronger in the halogen derivatives.

(a) dipole-dipole and van der Waals forces (b) Hydrogen bond and dipole-dipole forces

(c) van der Waals and hydrogen bond forces (d) dipole-dipole and London forces.

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Answers

Sample Paper

Section-A

1. (c) $r = \frac{\sqrt{3}}{4}a$

Explanation: Usually, the length of the cell edge is represented by a.
The direction from a corner of a cube to the farthest corner is called body diagonal (say bd).

$$\text{Face diagonal} = fd$$

$$bd^2 = fd^2 + a^2$$

$$= a^2 + a^2 + a^2 = 3a^2$$

Atoms along the body diagonal (say bd) touch each other. Thus, the body diagonal has a length that is four times the radius of the atom, R.

$$bd = 4\text{R}$$

The relationship between a and R can be worked out by the Pythagorean theorem.

$$(4\text{R})^2 = 3a^2$$

Thus,

$$4\text{R} = \sqrt{3}a$$

and

$$r = \frac{\sqrt{3}}{4}a$$

2. (b) $p\text{V} = n\text{RT}$.

Explanation: We know that

$$\pi v = n\text{RT}$$

$$\pi = \frac{n}{v}\text{RT}$$

$$\pi = p \text{ and } c = \frac{n}{v}$$

thus $pv = n\text{RT}$

3. (d) 1-chloro-2, 2-dimethyl propane

Explanation: As per the IUPAC nomenclature, the numbering of the compound should begin with functional group and then lowest "Locant Rule" should be followed. Hence, the IUPAC name of the compound is 1-Chloro-2, 2-dimethyl propane.

4. (a) Paramagnetic

Explanation: Due to the presence of two unpaired electrons, oxygen molecule is paramagnetic in nature.

5. (a) Formic acid

Explanation: When oxalic acid is heated with glycerol we get Formic acid.

6. (b) Tyrosinase

Explanation: The disease albinism is caused by the deficiency of tyrosinase enzyme. Albinism is an inherited disorder that is characterized by little or no production of the pigment melanin, due to lack of tyrosine enzyme. This enzyme helps the body to change the amino acid tyrosine into melanin pigment. In albinism suffering person, the enzyme is inactive and no melanin is produced, leading to white hair and very light skin colour.

7. (a) Both the compounds form same product on treatment with alcoholic KOH.

Explanation: Ethylene chloride and ethylidene chloride on treatment with alc. KOH show elimination reaction and form ethyne as the product and both these compounds form same products(ethane) on reduction.

8. (a) H_2O

Explanation: Among the following, the hydride which is not a reducing agent is H_2O. Except H_2O all others are reducing agent. The reducing nature of an atom or compound depends on how easily it donates or releases electrons. The reducing nature of hydrides increases so the order is $H_2O < H_2S < H_2Se < H_2Te$.

9. (d) Density

Explanation: Density is an intensive property because there is a narrow range of densities across the samples. No matter what the initial mass was, densities were essentially the same. Since intensive properties do not depend on the amount of material, the data indicate that density is an intensive property of matter.

10. (c) amphoteric

Explanation: Amino acids are amphoteric, which means they have acidic and basic tendencies. The carboxyl group is able to lose a proton and the amine group is able to accept a proton.

11. (b) sodium dihalide

Explanation: Alkyl halides are prepared from alcohols and the hydroxyl group of an alcohol is replaced by halogen on reactions with certain reagents such as concentrated halogen acids, phosphorus halides or thionyl chloride. Thionyl chloride is most preferred because in this reaction alkyl halide is formed along with gases SO_2 and HCl which are escapable, hence, the reaction gives pure alkyl halides. Whereas, the reactions of primary and secondary alcohols with HCl require the presence of a catalyst, $ZnCl_2$. With tertiary alcohols, the reaction is conducted by simply shaking the alcohol with concentrated HCl at room temperature. Phosphorus tribromide and triiodide are usually generated in situ (produced in the reaction mixture) by the reaction of red phosphorus with bromine and iodine respectively. Thus, the reagent which is not used in for replacing the hydroxyl group of an alcohol is sodium dihalide.

12. (a) central atom

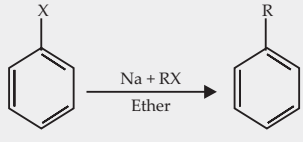
Explanation: In the complex ion $[AuXe_4]^{2+}$, Xe acts as a central atom and gold acts as a ligand.

13. (d) 32

Explanation: The packing efficiency of the Body centred cubic arrangement is 68% thus the percentage of the empty space available will be:
The overall packing efficiency of an ideal crystal will be 100%
Thus percentage of the empty space available will be: 100-68%= 32%

14. (d) Wurtz-Fittig

Explanation: The type of reactions in which an electrophile substitutes another electrophile in any organic compound is known as electrophilic substitution reaction. Out of the given options,nitration, halogenation and sulphonation are examples of electrophilic substitution reaction.Whereas, in Wurtz-Fittig reaction , a mixture of alkyl halide reacts with an aryl halide in the presence of dry ether and sodium to form alkyl arene.



15. (b) sp^3d

Explanation: The Au atom in the complex $[AuXe_4]^{2+}$ is sp^3d hybridised.

16. (a) Ideal solutions

Explanation: Ideal solutions are the once which obey the Raoult's law over the entire range of concentration. The vapour pressure of such a solution is either higher or lower than that predicted by the Raoult's law.

17. (c) Helium

Explanation: All noble gases have full *s* and *p* outer electron shells, except helium, which has no *p* sublevel), and so do not form chemical compounds easily. This is because of its inert nature, the atom does not readily accept any extra electrons nor join with anything to make covalent compounds.

18. (c) Thionyl Chloride

Explanation: The reaction of alcohol with $SOCl_2$ gives a chloroalkane along with gases SO_2 and HCl which are easily escapable, leaving behind the pure alkyl chloride.

19. (c) unidentate

Explanation: Xenon is a unidentate ligand.

20. (a) Primary alcohol is formed

Explanation: $LiAlH_4$ acts as a reducing agent which reduces an aldehyde by adding hydrogen atoms to it which result in the formation of a primary alcohol.

21. (a) He

Explanation: The noble gas discovered in the chromosphere of the sun was Helium (He). In 1868, Lockyer discovered a new element looking at the chromosphere of the sun, during a solar eclipse, later that element was found to be noble gas Helium.

22. (a) Interaction in the molecular level

Explanation: The solutions show the deviation from the Raoult's law due to the nature of the interactions at the molecular level.

23. (d) Cellulose

Explanation: Glucose, fructose and lactose are examples of compounds that are sweet in taste and are called sugars. Cellulose is a non-sugar that is tasteless, water insoluble and amorphous.

24. (a) Henry's law

Explanation: Henry's law states that at a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid.

25. (b) $C_nH_{2n-1}X$

Explanation: The general formula for haloalkanes is $C_nH_{2n+1}X$ where X is a halogen atom and n = 1, 2, 3... The formulae $C_nH_{2n-1}X$ and $C_nH_{2n-3}X$ are that of haloalkanes and haloalkynes respectively.

Section-B

26. (c) Repulsion by electron pairs on F

Explanation: Due to smaller bond length of fluorine, the lone pairs are nearer and thus the inter electronic repulsions between the lone pairs is more so it has low bond energy.

27. (c) fcc > bcc > simple cubic

Explanation: Packing efficiency is the percentage of total space filled by the constituent particles in the unit cell.
Packing efficiency = Packing Factor × 100.

The most efficient packing occurs in the hcp and ccp crystal lattice with the efficiency of 74% compared to BCC crystal lattice of 68% and simple cubic structure of 52.4%. Thus the trend will be fcc > bcc > simple cubic.

28. (a) Starch

Explanation: An aqueous solution of corn starch is acidified with dilute H_2SO_4. This is then heated under pressure (2-3 bar) for hydrolysis to take place. After this, the liquid is neutralised with sodium carbonate and the resulting solution is concentrated under reduced pressure to get glucose crystals. This process is also used for obtaining glucose from cellulose.

29. (a) $HClO_4$

Explanation: The acidic strength of oxyacids of chlorine will be in the order $HClO < HClO_2 < HClO_3 < HClO_4$.

30. **(a)** (A) and (B)

Explanation: Schottky defect is a type of point defect or imperfection in solids which is caused by a vacant position that is generated in a crystal lattice due to the atoms or ions moving out from the interior to the surface of the crystal. AgBr shows both Frenkel defect and Schottky defect as in AgBr, Ag^+ ion is small in size than Br^- ion and when removed from lattice point they can occupy interstitial sites and hence shows both Frenkel and Schottky defects.

31. (c) 40° C temperature and dark

Explanation: The most suitable conditions for electrophilic substitution of arenes is that such reactions are carried out in the dark at ordinary temperatures of 40°C in the presence of a Lewis acid catalyst.

32. (a) Solubility

Explanation: The maximum amount of a substance that can be dissolved in a specific amount of solvent at a specified temperature is known as its solubility.

33. (b) Intermolecular hydrogen bonding

Explanation: Intermolecular Hydrogen Bonding occurs when the hydrogen bonding is between H-atom of one molecule and an atom of the electronegative element of another molecule.

34. (b) $I_2 + 2Br^- \longrightarrow 2I^- + Br_2$ reaction will not occur spontaneously.

Explanation: A spontaneous reaction is a reaction that favours the formation of products at the conditions under which the reaction is occurring. A roaring bonfire is an example of a spontaneous reaction. Whereas a non spontaneous reaction is a reaction that does not favour the formation of products at the given set of conditions.

35. (a) Some of the anionic sites are occupied by an unpaired electron.
(d) F-centres are created which impart colour to the crystals.

Explanation: Anionic sites are always occupied by unpaired electrons and never by the paired electrons. Since in the KCl molecule the anionic sites are occupied by an unpaired electron thus there will be no vacant sites in the molecule.

36. (a) Deoxyribose

Explanation: Monosaccharides are the simplest carbohydrates which cannot be hydrolysed into simpler units. Deoxyribose ($C_5H_{10}O_4$) is a monosaccharide.

37. (c) Lowering of vapour pressure.

Explanation: Since the lowering in freezing point is not dependent on the number of moles thus it is not a colligative property while the rest of the three options depends on the number of moles thus they all are the colligative properties.

38. (c) Free radicals

Explanation: Free radicals are generated which contain the lone pair of electrons.

39. (b) Associated nature due to hydrogen bonding

Explanation: Hydrogen fluoride does not boil until 20°C in contrast to the heavier hydrogen halides, which boil between −85°C (−120°F) and −35°C (−30°F). This hydrogen bonding between HF molecules gives rise to high viscosity in the liquid phase and lowers than expected pressure in the gas phase.

40. (a) Frenkel defect.

Explanation: The cations of the alkali metals are larger in size due to which they cannot dislocate and occupy an interstitial site within the lattice thus the pure alkali metal halides does not show the Frenkel defect because creation of the vacancy and occupying the interstitial site is essential for the creation of the Frenkel defect.

41. (a) Propanol

Explanation: Propanol is most soluble in water because the lower alcohols are highly soluble in water due to the presence of –OH group in the alcohols it forms H-bond with itself and molecular association takes place which causes the increase in the boiling point of the corresponding alcohols due to the increase in the number of carbon atoms and thus high temperature is required to break this association of bonds and thus the solubility in water increases. The extent of the hydrogen bonding in alcohols depends on the number of the carbon atoms attached in the chain.

42. (a) Vapour pressure of the solvent decreases

Explanation: The vapour pressure of a solvent is lowered by the addition of a non-volatile solute to form a solution. This decrease in vapour pressure can be explained by using the entropy differences of the liquid and gas phases along with the position of dissolved particles after the addition of the solute.

43. (a) Maltose

Explanation: When any carbohydrate undergoes hydrolysis and produces two separate units of monosaccharides, it is a disaccharide. The used units that are produced may be same. Maltose on hydrolysis gives two units of glucose itself.

44. (d) Zn^+ ion is smaller in size

Explanation: ZnS shows the dislocation defect because the size of the cation Zn^{2+} is smaller than the size of the corresponding anion S^{2-} and for the dislocation defect to occur the cation needs to leaves the crystal lattice and creates a vacancy defect at its place in the lattice and interstitial defect within the same crystal and in ZnS the vacancy and interstitial defect are created simultaneously thus it shows the Dislocation defect.

45. (a) Both A and R are true and R is the correct explanation of A.

Explanation: The haloalkanes are slightly soluble in water. Less energy is released when new attractions are set up between the haloalkanes and the water molecules as these are not as strong as the original hydrogen bonds in water. As a result, the solubility of haloalkanes in water is low. Thus both assertion and reason are true and reason is the correct explanation of the assertion.

46. (c) A is true but R is false.

Explanation: On addition of non-volatile solute (viz. NaCl) to water, NaCl solution is formed. Due to relatively lesser number of water molecules at the surface of liquid, the solution exerts a lower vapour pressure as compared to that of pure water. It is because of this lowering of vapour pressure that a depression in freezing point of water is observed. Thus Assertion is true but reason is false statement.

47. (b) Both A and R are true but R is not the correct explanation of A.

Explanation: The acidic character increases down the group and thermal stability of hydrides decreases down the group due to decrease in bond (H—E) dissociation enthalpy down the group. Thus both assertion and reason are true but reason is not the correct explanation of assertion.

48. (d) A is false but R is true.

Explanation: The structure of quartz is crystalline and that of quartz glass is amorphous. The two structures are almost identical yet in case of amorphous quartz glass, there is no long range order. Thus assertion is false but reason is true.

49. (b) Both A and R are true but R is not the correct explanation of A.

Explanation: Interhalogen compounds are more reactive than halogens because X—X′ bond in interhalogens is weaker than X—X bond in halogen (except F—F bond). Thus both assertion and reason are true but reason is not the correct explanation of assertion.

Section-C

50. (a) Equal to 90°

Explanation: For orthorhombic system axial ratios are a = b = c and the axial angles are $\alpha = \beta = \gamma = 90°$. Thus, all the three edge lengths are unequal but all the angles are equal. They are equal to 90°.

51. (d) Aerated drinks

Explanation: A solid solution is a solid-state solution of one or more solutes in a solvent. Brass, bronze, and hydrated salts are examples of solid solutions. Aerated drinks are examples of liquid solutions (gas in liquid).

52. (b) Covalent solid

Explanation: A network solid or covalent network solid is a chemical compound in which the atoms are bonded by covalent bonds in a continuous network extending throughout the material.

53. (b) sp^3

Explanation: As the substitution reaction is initiated by a nucleophile, it is called nucleophilic substitution reaction. It is one of the most useful classes of organic reactions of alkyl halides in which halogen is bonded to sp^3 hybridised carbon atom.

54. (c) Asymmetric

Explanation: The spatial arrangement of four groups (valencies) around a central carbon is tetrahedral and if all the substituents attached to that carbon are different such a carbon is called asymmetric carbon or steriocentre.

55. (a) dipole-dipole and van der Waals forces

Explanation: In alkyl halides, due to greater polarity as well as higher molecular mass, as compared to the parent hydrocarbon, the intermolecular dipole-dipole and van der Waal's forces of attraction are stronger in the halogen derivatives.