SAMPLE PAPER 3

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. Formation of which of the following fluoride of xenon is impossible ?
(a) XeF_6 (b) XeF_4 (c) XeF_3 (d) XeF_2

2. Select the incorrect statement for CsCl crystal.
(a) Co-ordination number for Cs^+ and Cl^- is 6
(b) $\frac{r_{Cs^+}}{r_{Cl^-}} = 0.732$
(c) The structure changes to NaCl at 760 K
(d) Cl^- ions are present at cubic series

3. Most efficient packing is present in which pair of the following unit cell?
(a) hcp and bcc (b) hcp and ccp
(c) bcc and ccp (d) bcc and simple cubic cell

4. Among the following, peroxoacids of sulphur are
(a) H_2SO_5 and $H_2S_2O_8$ (b) H_2SO_5 and $H_2S_2O_7$
(c) $H_2S_2O_7$ and $H_2S_2O_8$ (d) $H_2S_2O_6$ and $H_2S_2O_7$

5. On reaction with ammonia Cu^{2+} give …… colour.
(a) blue (b) red (c) green (d) orange

6. Identify the isoelectronic species : $ICl_2, ClO_2, BrO_2^-, BrF_2^+, CN^-, O_3$. Choose the correct option.

(a) ICl_2, ClO_2 (b) BrO_2^-, BrF_2^+

(c) ClO_2, BrF (d) CN^-, O_3

7. In a compound, element '*Y*' forms ccp lattice and atom '*X*' occupies $\frac{1}{3}$ rd of tetrahedral voids. The formula of a compound is

(a) X_3Y_2 (b) X_2Y_3 (c) XY (d) XY_3

8. On reaction with water, fluorine gives

(a) HF and O_2 (b) HF and OF_2

(c) HF and O_2 (d) HF, O_2 and O_3

9. The least basic trihalide of nitrogen is

(a) NF_3 (b) NCl_3

(c) NBr_3 (d) NI_3

10. Which of the following order of halogen and its compound is not correct according to the property state against it?

(a) $F_2 > Cl_2 > Br_2 > I_2$: Bond dissociation enthalpy

(b) $F_2 > Cl_2 > Br_2 > I_2$: Oxidising power

(c) Hl > HBr > HCl > HF : Acidic property in water

(d) $F_2 > Cl_2 > Br_2 > I_2$: Electronegativity

11. Which one of the following compound is more easily hydrolysed by KOH?

(a) $CH_3CHClCH_2CH_3$ (b) $CH_3CH_2CH_2Cl$

(c) CH_3Cl (d) CH_3CH_2Cl

12. Which one undergoes S_N2 substitution reaction faster?

(a) 

(b) 

(c) 

(d) 

13. Although chlorine is an electron withdrawing group, yet it is *ortho*, *para*-directing in electrophilic aromatic substitution reactions because of

(a) resonance (b) + *I* effect

(c) hyper conjugation (d) electromeric effect

14. The structure of 1-bromo-2-methylprop-1-ene is

(a) $CH(Br)=C(CH_3)-CH_3$ (b) $CH_2=C(CH_3)-CH_2Br$

(c) $CH_2(Br)=C(CH_3)-C_2H_5$ (d) $CH_2=C(CH_3)-Br$

15. For the reaction, $R-OH + HCl \xrightarrow{ZnCl_2} R-Cl + H_2O$

What is the correct order of reactivity of alcohols?

(a) 1° > 2° > 3° (b) 1° > 3° > 2°

(c) 3° > 2° > 1° (d) 3° > 1° > 2°

16. The conversion of alkyl halides into alcohol is which type of reaction?
(a) Addition reaction
(b) Substitution reaction
(c) Dehydrohalogenation reaction
(d) Rearrangement reaction

17. The crystal structure is obtained by associating structural motifs with lattice points. Each repeated motif has
(a) same structure but different spatial arrangement
(b) same spatial arrangement but different structure
(c) different structure and different spatial arrangement
(d) same structure and same spatial arrangement

18. Which of the following is temperature dependent ?
(a) Molality
(b) Molarity
(c) Mole fraction
(d) Weight percentage

19. The value of Henry's law constant for helium (He) , hydrogen (H_2) and oxygen (O_2) are respectively 144.97 K bar, 69.16 K bar, and 34.86 K bar at 293 K. The correct order of their solubility is
(a) $O_2 < He < H_2$
(b) $He < O_2 < H_2$
(c) $He < H_2 < O_2$
(d) $H_2 < He < O_2$

20. The solution which show large positive deviation from Raoult's law form
(a) maximum boiling azeotrope at a specific composition
(b) maximum freezing azeotrope at a specific composition
(c) minimum boiling azeotrope at a specific composition
(d) minimum freezing azeotrope at a specific composition

21. Which of the following statement is correct regarding solution of bromoethane and chloroethane ?
(a) The solution obeys Raoult's law over the entire range of concentration
(b) It is a non-ideal solution
(c) It has $\Delta_{mix} V \neq 0$
(d) All of the above

22. Zinc oxide is white in colour but on heating turns yellow. This is due to
(a) metal excess defect due to cationic vacancies
(b) metal excess defect due to anionic vacancies
(c) metal excess defect due to extra cations
(d) metal excess defect due to extra anion

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

24. Select the correct statement(s).

(a) Alcohols are weaker acids than water

(b) Water is a better proton donor than alcohol

(c) Sodium ethoxide is a stronger base than sodium hydroxide

(d) All of the above

25. Select the base which is not common between DNA and RNA.

(a) Adenine (A) (b) Guanine (G)

(c) Cytosine (C) (d) Uracil (U)

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. Identify the type of crystal system of the following (*A*) KNO_3; (*B*) $CaCO_3$; (*C*) $CaSO_4$; (*D*) $CuSO_4 \cdot 5H_2O$

(a) *A*-Cubic; *B*-Triclinic; *C*-Hexagonal; *D*-Rhombohedral

(b) *A*-Tetragonal; *B*-Monoclinic; *C*-Triclinic; *D*-Hexagonal

(c) *A*-Orthorhombic; *B*-Trigonal; *C*-Tetragonal; *D*-Triclinic

(d) A-Rhombohedral; *B*-Hexagonal; *C*-Trigonal; *D*-Orthorhombic

27. For a binary ideal liquid solution, the total pressure of the solution is given as,

(a) $p_{\text{Total}} = P_A^* + (P_A^* - P_B^*)X_A$ (b) $p_{\text{Total}} = P_B^* + (P_A^* - P_B^*)X_A$

(c) $p_{\text{Total}} = P_A^* + (P_B^* - P_A^*)X_A$ (d) $p_{\text{Total}} = P_B^* + (P_B^* - P_A^*)X_A$

28. Reverse osmosis is a process in which applied pressure to the solution side, is …(i)… than the osmotic pressure. In this, solvent moves from solution of …(ii)… concentration to solution of …(iii)… concentration. It is use for …(iv)…

(i) (ii) (iii) (iv)

(a) larger ; higher ; lower ; desalination of sea water

(b) smaller ; lower ; higher ; desalination of sea water

(c) smaller; higher; lower ; desalination of sea water

(d) larger ; lower ; higher ; desalination of sea water

29. $NH_4Cl(aq) + A \longrightarrow B + 2H_2O(l) + NaCl(aq)$

In the above reaction, *A* and *B* respectively are

(a) $NaNO_3(aq)$, $N_2(g)$ (b) $NaNO_2(aq)$, $H_2(g)$

(c) $NaNO_2(aq)$, $N_2(g)$ (d) None of the above

30. Give the products of the following reactions,

$$\text{I. } Li + N_2 \xrightarrow{\Delta} \qquad \text{II. } Mg + N_2 \xrightarrow{\Delta} \qquad \text{III. } N_2(g) + H_2(g) \overset{773\ K}{\rightleftharpoons}$$

Here, products of I, II and III are refer to

	I	II	III
(a)	Li_2N	Mg_3N_2	NH_3
(b)	Li_2N	Mg_3N	NH_3
(c)	Li_3N	Mg_3N	$2NH_3$
(d)	$2Li_3N$	Mg_3N_2	$2NH_3(g)$

31. All the hydrides (of group 16 elements) except one possess reducing property. Identity the hydride

(a) H_2Se (b) H_2O

(c) H_2S (d) H_2Te

32. Which of the following compound contains bond(s) between sulphur atoms?

(a) $H_2S_2O_3$ (b) $H_2S_4O_6$

(c) $H_2S_2O_4$ (d) All of these

33. The compound '*A*' is used in the estimation of carbon monoxide. Here, *A* refers to

(a) I_2O_5 (b) I_2O_7

(c) BrO_2 (d) BrO_3

34. Chlorine can be prepared by the action of HCl on

(a) potassium permanganate

(b) common salt

(c) manganese trioxide

(d) potassium dichromate

35. 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

36. Which of the following statements is incorrect about oxygen?

(a) O_2 is colourless and odourless gas

(b) Oxygen atom has three stable isotopes, ^{16}O, ^{17}O and ^{18}O

(c) O_2 is diamagnetic due to presence of even number of electrons

(d) O_2 combines with metals, non-metals and other compounds

37. Consider the following reaction.

$CH_3CH = CH_2 + HI \longrightarrow$ '*X*' and '*Y*'

The product '*X*' and '*Y*' respectively are :

(a) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-I$ (minor) and $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_3$ (major)

(b) $CH_3CH_2CH_2I$ (minor) and $CH_3-\underset{\displaystyle I}{\underset{|}{CH}}-CH_3$ (major)

(c) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-I$ (major) and $CH_3-\underset{\displaystyle I}{\underset{|}{CH}}-CH_3$ (minor)

(d) None of the above

38. Which of the following statements is correct for the alkyl halide?

(a) Alkyl halides are formed by the replacement of hydrogen atom in hydrocarbon by halogen atom

(b) Alkyl halide has no polar bond

(c) In haloalkane, halogen is attached to sp^2-hybridised carbon atom

(d) All above statements are correct

39. Alcohol that will give most stable carbocation during dehydration is

(a) butan-1-ol (b) 2-methylpropan-1-ol

(c) 2-methylpropan-2-ol (d) butan-2-ol

40. The structure of protein which refers to the shape in which a long polypeptide chain can exist is

(a) primary structure

(b) secondary structure

(c) tertiary structure

(d) quaternary structure

41. Copper crystallises with face-centered cubic unit cell. If the radius of copper atom is 127.8 pm, then density of copper metal is

(Atomic mass of Cu = 63.55 g/mol and Avogardo's number $N_A = 6.02 \times 10^{23}$ mol^{-1}).

(a) 8.9 g/cm^{-1} (b) 9.1 g/cm^{-1}

(c) 8.5 g/cm^{-1} (d) 7.1 g/cm^{-1}

42. The reagent used for the given reaction,

$$CH_3CH_2CH_2CH_3 \longrightarrow CH_3CH_2CH_2CH_2CHCl + CH_3CH_2CHClCH_3$$

(a) Cl_2/UV light (b) $NaCl + H_2SO_4$

(c) Cl_2 gas in dark (d) Cl_2 gas in the presence of iron in dark

43. How ethanal can be produced from ethanol?

(a) Catalytic hydrogenation

(b) Treatment with $LiAlH_4$

(c) Treatment with pyridinium chlorochromate

(d) Treatment with $KMnO_4$

44. The density of 10% by mass of KCl solution is 1.06 cm^{-3}. Then, the molarity of the solution is

(a) 1.42 (b) 1.82 (c) 2.42 (d) 0.98

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** S_N1 reactions are generally carried out in polar protic solvents like water, alcohol, acetic acid, etc.

Reason In S_N1 reaction, $C_6H_5CH(C_6H_5)Br$ is less reactive than $C_6H_5CH(CH_3)Br$.

46. **Assertion** The boiling points of alcohol are higher than ethers.

Reason There is no hydrogen bonding in ether.

47. **Assertion** $HClO_4$ is a stronger acid than $HClO_3$.

Reason Greater the number of electronegative atoms present in oxyacid, make the acid stronger.

48. **Assertion** Alcohols are more soluble in water than phenols.

Reason Phenols do not have hydrogen bonding.

49. **Assertion** Xenon can form fluoride.

Reason Xenon has 5*d*-orbitals for valence shell expansion in presence of electronegative elements.

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 IUPAC names given in Column I with their common names given in Column II and choose the correct option from the codes given below.

	Column I (IUPAC name)		**Column II** (Common name)
A.	4-methylphenol	1.	Catechol
B.	Benzene-1,4-diol	2.	Quinol
C.	Benzene-1,2-diol	3.	*o*-cresol
D.	2-methyl phenol	4.	*p*-cresol

Codes

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

51. Select the correct pair of analogies.

	***A* : Oxoacids**	***B* : Molecular formula**
(a)	Sulphurous acid	H_2SO_3
(b)	Sulphuric acid	H_2SO_5
(c)	Caro's acid	H_2SO_4
(d)	Marshall's acid	H_2SO_6

52. Which of the given analogy is correct?

(a) Monosaccharides : Glucose : : Polysaccharide : Glycogen

(b) Monosaccharides : Sucrose : : Polysaccharide : Ribose

(c) Acidic amino acids : Glycine : : Basic amino acid : Glutamic acid

(d) Essential amino acid : Glycine : : Non-essential : Valine amino acid

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

Monosaccharides are the building blocks of disaccharides such as sucrose and lactose and polysaccharides such as cellulose and starch .

They are carbohydrates that cannot be hydrolysed further and are also called simple sugars. Monosaccharides have general formula $[C(H_2O)]_n$. Glucose reacts with hydroxylamine to form oxime and with HCN to form cyanohydrin. These reactions indicate the presence of carbonyl group in glucose. Glucose gets oxidised to gluconic acid with mild oxidising agents like bromine water suggesting that the carbonyl group is an aldehydic group and it occupies one end of the carbon chain.

When oxidised using strong oxidising agent such as conc. nitric acid gives glucaric acid (saccharic acid) suggesting the other end is occupied by a primary alcohol group. Glucose is oxidised to gluconic acid with ammonical silver nitrate (Tollen's reagent) and alkaline copper sulphate (Fehling's solution). Tollen's reagent is reduced to metallic silver and Fehling's solution to cuprous oxide wihich appears as red precipitate. These reactions further confirm the presence of an aldehyde group.

53. Which of the following reaction is correct regarding glucose ?

(a) Glucose on treatment with HNO_3 give saccharic acid

(b) It gives gluconic acid on treatment with bromine water

(c) It does not react with NH_3, and Grignard reagent

(d) All of the above statements are correct

54. With which of the following reagent, presence of six carbon containing long chain is determined in glucose by reduction reaction ?

(a) HNO_3 (b) Br_2 water

(c) HI (d) HCN

55. In the following reaction, which group of glucose is involve?

Glucose + HCN $\longrightarrow$ Cyanohydrin

(a) —CHO (b) —OH

(c) —COOH (d) Ketonic

Answers

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

EXPLANATIONS

1. Electronic configuration of Xe = $[Kr]d^{10}5s^2 5p^6$. In this, all the electrons are paired. When one, two or three electrons are promoted from $5p$ (filled) to $5d$ (empty) orbital it gives two, four and six half-filled orbitals.

Xenon can combine with even number of F atoms to form XeF_2, XeF_4, XeF_6 but not XeF_3 as it has odd number of F-atoms.

2. Only (a) statement is incorrect while other statements are correct. Correct form of this statement is as follows :

Coordination number of Cs^+ and Cl^- is 8.

3. In hcp and ccp packing efficiency is 74%.

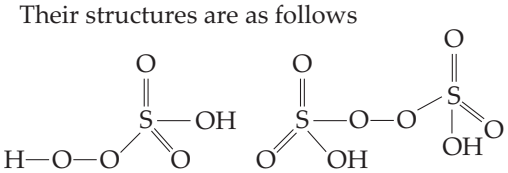
The order of packing efficiency is as follows :

ccp/fcc/hcp > bcc > scc

4. H_2SO_5 and $H_2S_2O_8$ are peroxoacids of sulphur.

Peroxy linkage means in a compound there should be single bond between oxygen and oxygen (O—O).

Their structures are as follows



H_2SO_5 $\qquad\qquad$ $H_2S_2O_8$

5. Cu^{2+} on reaction with ammonia form tetraamminecopper (II) ion, which is blue in colour.

$$Cu^{2+} + 4NH_3 \longrightarrow \underset{\text{Blue colour}}{[Cu(NH_3)_4]^{2+}}$$

6. Compounds having same number of electrons are called isoelectronic.

Both $BrO_2^-(35 + 2 \times 8 + 1 = 52)$ and BrF_2^+ $(35 + 2 \times 9 - 1 = 52)$ have 52 electrons.

Thus, they are isoelectronic pair.

7. Suppose number of atoms of Y present in the packing = n

Then, tetrahedral voids = $2n$

Atoms of X present in the tetrahedral voids

$$= \frac{1}{3} \times 2n = \frac{2n}{3}$$

Ratio of $X : Y = \frac{2n}{3} : n = \frac{2}{3} : 1 = 2 : 3$

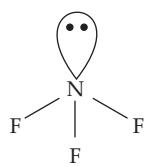
Hence, the formula of the compound is X_2Y_3.

8. On reaction with water fluorine gives hydrogen fluoride as follows :

$$2F_2 + 2H_2O \longrightarrow 4HF + O_2$$

$$3F_2 + 3H_2O \longrightarrow 6HF + O_3$$

9. NF_3



NF_3 is least basic as due to high electronegativity of fluorine atom the lone pair present on nitrogen atom is not easily available for donation.

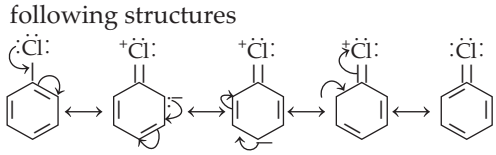
10. Correct bond dissociation energy order is $Cl_2 > Br_2 > F_2 > I_2$.

A electron density is greater in 'F' due to smaller size its Bond dissociation energy decreases because of electronic repulsion.

11. $CH_3CHClH_2CH_2CH_3$ will be easily hydrolysed as the cation formed in this case will be secondary, which is more stable as compared to primary cation which is formed in other cases.

12. (*a*)  reacts faster in S_N2 reaction due to low C—I bond dissociation energy. As a result, iodine act as a better leaving group.

13. (*a*) Chlorobenzene is a resonance hybrid of following structures



I $\qquad$ II $\qquad$ III $\qquad$ IV $\qquad$ V

As a result, electron density is maximum at *ortho*-and *para*-position. Therefore, it is *o*, *p*-directing in electrophilic substitution reaction.

14. The structure is $Br-\overset{*}{\overset{1}{C}}H=\overset{2}{C}(CH_3)-\overset{3}{C}H_3$

1-bromo-2-methylprop-1-ene

15. In the given reaction, carbocation will form. Higher the stability of carbocation more will be the reactivity. So, the correct order of reactivity of alcohols are : $3° > 2° > 1°$. This reaction is known as Lucas test.

On performing this test, tertiary alcohol shows turbidity immediately, secondary alcohol shows turbidity within five minutes while primary alcohol not show turbidity at room temperature with Lucas reagent.

16. In substitution reaction, one of the group or atom is replaced by other group.

$$\underset{\text{Alkyl halide}}{R-X} \xrightarrow{OH^-} \underset{\text{Alcohol}}{R-OH}$$

17. As the motifs are the structural unit of a crystal lattice. Therefore, to form a crystal lattice each motif must have same structure and same spatial arrangement.

18. Molarity and normality are temperature dependent because they involve volume of solution which is temperature dependent.

Whereas molality, mole fraction and weight percentage do not depend on temperature as they involve masses of solute and solvent.

19. Higher the value of Henry's law constant, lower is the solubility of gas in water (or in liquid solvent).

The order of K_H value is

$$\underset{144.97\text{ K bar}}{He} > \underset{69.16\text{ K bar}}{H_2} > \underset{34.86\text{ K bar}}{O_2}$$

Thus, the order of solubility is

$$He < H_2 < O_2$$

20. The solution which shows large positive deviation from Raoult's law forms minimum boiling azeotrope at a specific composition, e.g. ether-acetone, ethanol-water etc.

21. Solution of bromomethane and chloroethane forms an ideal solution and, hence obey's Raoult's law over the entire range of concentration.

22. Zinc oxide is white in colour at room temperature. On heating, it loses oxygen and turns yellow.

$$ZnO \xrightarrow{\text{Heating}} Zn^{2+} + \frac{1}{2}O_2 + 2e^-$$

Now, there is excess of zinc in the crystal and its formula becomes $Zn_{1+x}O$. The excess Zn^{2+} ions move to interstitial sites and the electrons to neighbouring interstitial sites.

Thus, on heating ZnO changes colour due to metal excess defect due to presence of extra cations.

23. Statement (d) is incorrect. It's correct form is as follows :
OF_2 is a fluoride of oxygen because electronegativity of fluorine is more than that of oxygen. It is named as oxygen difluoride.

Rest other statements are correct.

24. All the given statements are correct.

Explanation of given statement is as follows :

(a) Alcohols are weaker acids than water as shown below :

$$\underset{\text{Base}}{RO^{\ominus}} + \underset{\text{Acid}}{H_2O} \longrightarrow \underset{\text{Conjugate acid}}{R-O-H} + \underset{\text{Conjugate base}}{OH^-}$$

This reaction shows that water is better proton donor (i.e. stronger acid) than alcohols.

(b) An alkoxide ion is a better proton acceptor than hydroxide ion which suggests that alkoxides are stronger bases.

(c) Sodium ethoxide is a stronger base than sodium hydroxide.

25. DNA contains four bases, i.e. adenine (A), guanine (G), cytosine (C) and thymine (T). RNA also contains four bases, the first three bases are same as in DNA, but the fourth one is uracil (U). So, uracil is not common between DNA and RNA.

26.
(A) KNO_3 — Orthorhombic
(B) $CaCO_3$ — Trigonal
(C) $CaSO_4$ — Tetragonal
(D) $CuSO_4 \cdot 5H_2O$ — Triclinic

27. We known that,

$$p_T = p_A^* X_A + p_B^* X_B$$
$$= p_A^* X_A + p_B^*(1 - X_A)$$
$$p_T = p_B^* + (p_A^* - p_B^*)X_A$$

28. Reverse osmosis is a process in which direction of osmosis is reversed, if a pressure larger than the osmotic pressure is applied to the solution.

It is a process in which solvent moves from solution of higher concentration to solution of lower concentration.

This method is used in desalination of sea water.

29. $\underset{\text{Ammonium chloride}}{NH_4Cl(aq)} + \underset{\text{Sodium nitrite}}{NaNO_2(aq)} \longrightarrow \underset{(A)}{}$

$$\underset{(B)}{N_2(g)} + 2H_2O(l) + NaCl(aq)$$

Small amounts of NO and HNO_3 are also formed in this reaction which can be removed by passing the gas through aqueous sulphuric acid containing potassium dichromate.

Thus , A and B in the reaction are $NaNO_2$ and N_2 respectively.

30. $$6Li + N_2 \xrightarrow{\Delta} \underset{(I)}{2Li_3N}$$

$$3Mg + N_2 \xrightarrow{\Delta} \underset{(II)}{Mg_3N_2}$$

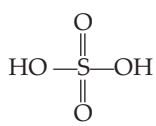
$$N_2(g) + 3H_2(g) \overset{773\ K}{\rightleftharpoons} \underset{(III)}{2NH_3(g)};$$

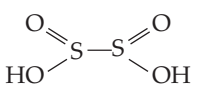
$$\Delta_f H^\circ = -46.1 kJ\ mol^{-1}$$

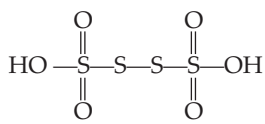
Thus, products of I, II and III reactions are Li_3N, Mg_3N_2 and NH_3 respectively.

31. All the hydrides of group 16 elements except H_2O possess reducing property due to high O—H bond strength which is difficult to break and this character increases from H_2S to H_2Te.

32. In all the given compounds, S—S bond is present. Their structure are as follows

$H_2S_2O_3 \Rightarrow$ 

$H_2S_2O_4 \Rightarrow$ 

$H_2S_4O_6 \Rightarrow$ 

33. I_2O_5 is used in the estimation of carbon monoxide as it is a very good oxidising agent. Thus, A refers to I_2O_5.

34. Chlorine can be prepared by the action of HCl on potassium permanganate. The reaction is given as follows :

$$2KMnO_4 + 16HCl \longrightarrow 2KCl + 2MnCl_2 + 8H_2O + 5Cl_2 \uparrow$$

35. Xenon hexafluoride reacts with silica to form $XeOF_4$ as follows :

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

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

Let the oxidation state of Xe is a.

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

$$a - 2 - 4 = 0$$

$$a = +6$$

36. Statement (c) is incorrect. It's correct form is as follows :

Molecular oxygen , O_2 is unique in being paramagnetic inspite of having even number of electrons.

Rest other statements are correct.

37. The product 'X' is $CH_3CH_2CH_2I$ (minor) and 'Y' is $CH_3CH(I)CH_3$ (major). Propene yields two products, however only one (i.e. Y) is predominates as per Markonikov's rule as shown below

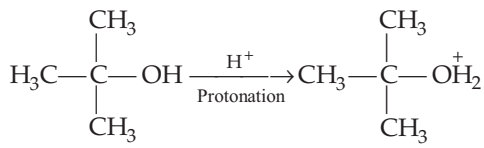
$$\underset{\text{Propene}}{CH_3CH{=}CH_2} + HI \longrightarrow \underset{\substack{\text{1-iodopropane}\\(X,\ \text{Minor})}}{CH_3CH_2CH_2I} + \underset{\substack{\text{2-iodopropane}\\(Y,\ \text{Major})}}{CH_3CHICH_3}$$

38. Statement (a) is correct, while statement (b), (c) and (d) are incorrect. Corrected form are as follows

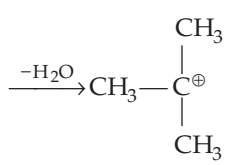
(b) The C— X bond in the alkyl halide is polar.
(c) Haloalkanes contain halogen atom(s) attached to the sp^3-hybridised carbon atom of an alkyl group.

39. Among the given alcohol one that will give most stable carbocation during dehydration is 2-methylpropan-2-ol because it form the tertiary carbocation during dehydration which is more stable as compare to 1° and 2° carbocation.

Reaction involved is shown below



2-methylpropan-2-ol



(3° carbocation)

40. The secondary structure of protein refers to the shape in which a long polypeptide chain can exist.

These structures arise due to the regular folding of the backbone of the polypeptide chain due to hydrogen bonding between —$\overset{\overset{O}{\|}}{C}$—and —NH—groups of the peptide bond.

41. Given, radius of copper atom (r) = 127.8 pm

Avogadro's number (N_A) = 6.02×10^{23} mol^{-1}

Number of atom in face centered unit cell (Z) = 4

Atomic mass of copper (M) = 63.55 g/mol.

Density of copper (d) = ?

For fcc, $r = \frac{a}{2\sqrt{2}}$

Edge length (A) = $2 \times \sqrt{2} \times r$

$= 2 \times 1.414 \times 127.8 = 361.47$ pm

We know, density (d) = $\frac{Z \times M}{a^3 \times N_A}$

$= \frac{4 \times 63.55}{(361.47 \times 10^{-10})^3 \times 6.02 \times 10^{23}}$

$= 8.9\ g/cm^3$

42. Chlorine in presence of sunlight react with alkane to give haloalkanes as follows

$CH_3CH_2CH_2CH_3$ (Butane) $\xrightarrow{Cl_2/UV\ light}$ $CH_3CH_2CH_2CH_2Cl$ (1-chlorobutane) + $CH_3CH_2CHClCH_3$ (2-chlorobutane)

43. As pyridinium chlorochromate (PCC) is an oxidising agent ethanol can be oxidised to ethanal.

$$\underset{\text{Ethanol}}{CH_3CH_2OH} \xrightarrow{PCC} \underset{\text{Ethanal}}{CH_3CHO}$$

44. Given, Mass of solution = 100 g

Density of solution = 1.06 g cm^{-3}

Volume of solution = $\frac{\text{Mass of solution}}{\text{Density}}$

$= \frac{100\ g}{106\ g\ cm^{-3}} = 94.34\ cm^3$

Molarity of solution (M)

$= \frac{\text{Mass of KCl / molar mass of K}}{\text{Volume of solution (in } dm^3)}$

Mass of KCl = 10 g;

Molar mass of KCl = 39 + 35.5 = 74.5 g mol^{-1}

Volume of solution = 94.34 cm^3

$= \frac{94.34}{1000} = 0.0943\ dm^3$

Molarity (M) = $\frac{10\ g/(74.59\ mol^{-1})}{(0.0943\ dm^3)}$

$= 1.42\ mol\ dm^{-3} = 1.42\ M$

45. Assertion is true but Reason is false.
Carbocation of $C_6H_5CH(C_6H_5)Br$ is more stable than $C_6H_5CH(CH_3)Br$ because its carbocation is stabilised by two phenyl groups and therefore, it is more reactive in S_N1 reaction.

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

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

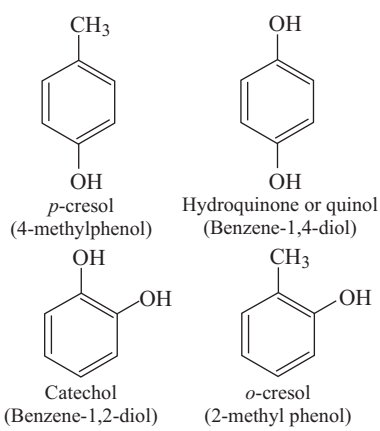
48. Assertion is true but Reason is false.
Phenols also form hydrogen bonding like alcohols.

But due to larger non-polar hydrocarbon part (benzene) present in phenol molecules, phenols are less soluble in water than that of alcohols.

49. Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
Xenon form fluorides because only fluorine and oxygen are electronegative enough to excite electron of xenon into its vacant 5d-orbitals and allow the bonding.

50. The correct match is

A → 4, B → 2, C → 1, D → 3



p-cresol (4-methylphenol) | Hydroquinone or quinol (Benzene-1,4-diol) | Catechol (Benzene-1,2-diol) | *o*-cresol (2-methyl phenol)

51. The correct analogy is

	A	***B***
(a)	Sulphurous acid	H_2SO_3
(b)	Sulphuric acid	H_2SO_4
(c)	Caro's acid	H_2SO_5
(d)	Marshall's acid	H_2SO_8

52. Option (a) is the correct analogy.

Correct analogies of other options are as follows

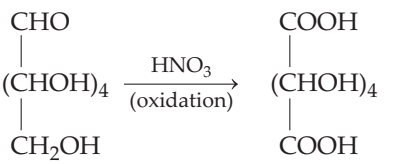
(b) Monosaccharides : Ribose : : Polysaccharides : Glycogen

(c) Acidic amino acid : Glutamic acid : : Basic amino acid : Lycine :

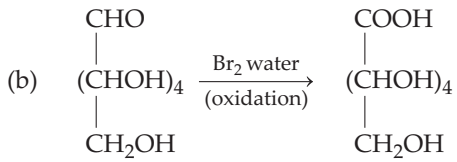
Glycine is the neutral amino acid

(d) Essential amino acid : Valine : : Non-essential amino acid : Glycine

53. All the given statements are correct

(a) 

Glucose Saccharic acid

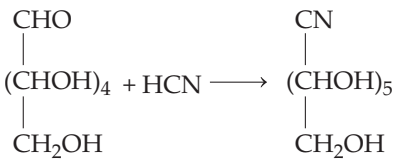
(b) 

Gluconic acid

(c) Glucose does not react with NH_3, 2-4-DNP and Grignard reagent.

54. $C_6H_{12}O_6 + HI \xrightarrow{\Delta} CH_3—CH_2—CH_2—CH_3$
Glucose
$-CH_2\ -CH_3$
n-hexane

55. Aldehyde (—CHO) group of glucose is involved in the given reaction.



Glucose Cyanohydrin