SAMPLE PAPER 10

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 following halide is not correct according to the name and classification ?
(a) $(H_3C)_3C—CH_2Cl$, 1-chloro-2, 2-dimethyl propane, primary haloalkane
(b) $(H_3C)_2CH—Br$, 2-bromopropane, secondary haloalkane
(c) $H_3CC(Cl)(C_2H_5)CH_2CH_3$, 2-chloro-2-ethylbutane, secondary haloalkane
(d) $CH_3CH_2C(CH_3)_2CH_3I$, 1-iodo-2, 2-dimethylbutane, primary haloalkane

2. Water is oxidised to oxygen by which of the following reagents ?
(a) H_2O_2 (b) $KMnO_4$
(c) ClO_2 (d) F

3. The example of minimum boiling azeotropes are
(a) aniline + acetone
(b) acetic acid + pyridine
(c) HCl + water
(d) cyclohexane + ethanol

4. Schottky defect occur in solids due to
(a) missing cation (b) missing anion
(c) Both (a) and (b) (d) None of these

5. Identify the reaction,

''Alkyl halide on reaction with NaI, dry acetone gives alkyl iodide'.

(a) Sandmeyer reaction (b) Gattermann reaction
(c) Finkelstein reaction (d) Swarts reaction

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

(a) Lysine (b) Glycine
(c) Leucine (d) Glutamine

7. The correct order of reactivity of hydrogen halides with ethyl alcohol is

(a) HF > HCl > HBr > HI (b) HCl > HBr > HF > HI
(c) HBr > HCl > HI > HF (d) HI > HBr > HCl > HF

8. S_N1 reaction of alkyl halides causes

(a) retention of configuration (b) inversion of configuration
(c) racemisation (d) conjugation

9. Acid catalysed hydration of 3-methyl but-1-ene leads to the formation of

(a) mixture of secondary and teritary alcohols
(b) mixture of primary and secondary alcohols
(c) secondary or tertiary alcohol
(d) primary alcohol

10. Iodine is a

(a) electrovalent solid (b) atomic solid
(c) molecular solid (d) covalent solid

11. The reaction of phenol with excess of bromine water gives

(a) *m*-bromophenol (b) *o*-and *p*-bromophenol
(c) 2 4-dibromophenol (d) 2, 4, 6-tribromophenol

12. The unit cell with dimensions $\alpha = \beta = \gamma = 90°$, $a = b \neq c$ is

(a) cubic (b) triclinic
(c) hexagonal (d) tetragonal

13. An ether is more volatile than an alcohol having the same molecular formula. This is due to

(a) dipolar character of ethers
(b) alcohols having resonance structures
(c) intermolecular hydrogen bonding in ethers
(d) intermolecular hydrogen bonding in alcohols

14. Which of the following parts has bleaching property?

(a) O_2 and NO_2 (b) O_2 and H_2S
(c) SO_2 and Cl_2 (d) Cl_2 and NO_3

15. Which one of the following statements is correct ?

(a) All amino acids except lysine are optically active
(b) All amino acids are optically active
(c) All amino acids except glycine are optically active
(d) All amino acids except glutamic acids are optically active

16. An incorrect statement with respect to S_N1 and S_N2 mechanisms of alkyl halide is

(a) a strong nucleophile in an aprotic solvent increases the rate or favours S_N2 reaction
(b) competing reaction for a S_N2 reaction is rearrangement
(c) S_N1 reaction can be catalysed by some Lewis acids
(d) a weak nucleophile and aprotic solvent increases the rate or favours S_N1 reaction

17. Which reagents would you use to carry out the reaction ethyl benzene $\longrightarrow$ 2 and 4-chloro-l-ethyl benzene ?

(a) Cl_2, light and heat
(b) Cl_2, $FeCl_3$
(c) $SOCl_2$
(d) C_2H_5Cl, $AlCl_3$

18. Among the following molecule, which has the zero dipole moment ?

(a) BF_3
(b) H_2O
(c) NF_3
(d) ClO_2

19. Equimolar solution in the same solvent have

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

20. Conversion of oxygen into ozone is non-spontaneous at

(a) all temperature
(b) high temperature
(c) room temperature
(d) low temperature

21. Carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called

(a) monosaccharide
(b) oligosaccharide
(c) polysaccharide
(d) None of these

22. Nitrogen forms N_2 but phosphorus when form P_2 readily converted into P_4.

This is due to

(a) triple bond present between phosphorus
(b) $p\pi$-$p\pi$ bonding is weak
(c) $p\pi$-$d\pi$ bonding is weak
(d) multiple bond form easily

23. In phenol, carbon atom attached to —OH group have

(a) sp^3-hybridisation
(b) sp-hybridisation
(c) sp^2-hybridisation
(d) no hybridisation

24. The most stable hydride is

(a) NH_3
(b) PH_3
(c) AsH_3
(d) SbH_3

25. A solution containing components *A* and *B* follows Raoult's law

(a) *A* — *B* = attraction force is less than *A* — *A* and *B* — *B*
(b) *A* — *B* = attraction force is more than *A* — *A* and *B* — *B*
(c) *A* — *B* = attraction force remains same as *A* — *A* and *B* — *B*
(d) volume of solution is different form sum of volumes of solute and solvent

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 molality of a solution of glucose in water which is 10 % *w*/*w* is

(a) 0.253 m (b) 0.613 m

(c) 0.617 m (d) 1.623 m

27. When $CH_3CH_2CHCl_2$ is treated with $NaNH_2$, the product formed is

(a) $CH_3 - CH = CH_2$ (b) $CH_3 - C \equiv CH$

(c) $CH_3CH_2CH(NH_2)(NH_2)$ (d) $CH_3CH_2CH(Cl)(NH_2)$

28. Which of the following has $p\pi$- $d\pi$ bonding?

(a) NO_3^- (b) SO_3^{2-} (c) BO_3^{3-} (d) CO_3^{2-}

29. Which is not true statement ?

(a) α-carbon of α-amino acid is asymmetric

(b) All proteins are found in L -form

(c) Human body can synthesise all proteins they need

(d) At pH = 7 both amino and carboxylic groups exist in ionised form

30. Ethylene can be converted into alcohol by treatment with

(a) *Aq.* KOH (b) H_2SO_4 as catalyst

(c) Moist silver oxide (d) Zn / HCl

31. Extra pure N_2 can be obtained by heating

(a) NH_2 with CuO (b) NH_4NO_3 (c) $(NH_4)_2, Cr_2O_7$ (d) $Ba(N_3)_2$

32. In a face centered cubic lattice, atom *A* occupies the corner positions and atom *B* occupies the face centered positions. If one atom of *B* is missing from one of the face centered points, the formula of the compound is

(a) A_2B (b) AB_2 (c) A_2B_3 (d) A_2B_5

33. A carbon compound *A* in the presence of sulphuric acid with the reaction of acetic acid forms ester *B*. *A* on mild oxidisation gives *C*. *C* on reaction with 50% KOH solution gives *A* and *D* after acidification with dil. HCl. Identify *A*, *D*.

(a) methanol, formic acid (b) acetic acid, methanol

(c) methanol, acetic acid (d) None of these

34. A crystalline solid ....(i) ..... reacts with dil. HCl to liberate a gas *Y*. *Y* decolourises acidified $KMnO_4$. When a gas .....(ii)..... is slowly passed into aqueous solution of *Y*, colloidal sulphur is obtained .....(i)..... and .....(ii)..... could be respectively.

(a) Na_2S, SO_3 (b) Na_2SO_4, H_2S

(c) Na_2SO_3, H_2S (d) Na_2SO_4, SO_2

35. Osmotic pressure of a solution at a given temperature

(a) increases with concentration

(b) decreases with concentration

(c) remains same

(d) initially increases and then decreases

36. Following compounds are given :

A. CH_3CH_2OH B. CH_3COCH_3

C. $CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle |}{C}}HOH$ D. CH_3OH

Which of the compound(s), on being warmed with iodine solution and NaOH, will give iodoform?

(a) A, C and D (b) Only B

(c) A, B and C (d) A and B

37. The correct trend of first ionisation energies of group 16 elements is

(a) increases regularly from oxygen to tellurium

(b) decreases sharply from oxygen to sulphur and then decreases regularly and less sharply from sulphur to tellurium

(c) increases slightly from oxygen to sulphur and then fall regularly from sulphur to tellurium

(d) decreases regularly from oxygen to tellurium

38. A metal has bcc structure and the edge length of its unit cell is 3.04 Å. The volume of the unit cell in cm^3 will be

(a) $1.6 \times 10^{-21} cm^3$ (b) $2.81 \times 10^{-23} cm^3$

(c) $6.02 \times 10^{-23} cm^3$ (d) $6.6 \times 10^{-24} cm^3$

39. Which of the following order is not in accordance with the property stated against it ?

(a) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$ (Reducing property)

(b) $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$ (Tendency to donate lone pairs)

(c) $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$ (Thermal stability)

(d) $NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$ (Bond angle)

40. Consider the following reaction

$$C_2H_5OH + H_2SO_4 \longrightarrow \text{Product}$$

Among the following, which one cannot be formed as a product under any conditions?

(a) Ethyl hydrogen sulphate (b) Ethylene

(c) Acetylene (d) Diethyl ether

41. From amongst the following alcohols the one that would react fastest with conc. HCl and anhydrous $ZnCl_2$ is

(a) 2-butanol (b) 2-methyl propan-2-ol

(c) 2-methylpropanol (d) 1-butanol

42. Which of the following statements is true?

(a) H_3PO_3 is a stronger acid than H_2SO_3

(b) In aqueous medium HF is a stronger acid than HCl

(c) $HClO_4$ is a weaker acid than $HClO_3$

(d) HNO_3 is a stronger acid than HNO_2

43. In the reaction, $A \xrightarrow[H_2SO_4]{K_2Cr_2O_7}$ acetone $\xrightarrow{\text{Oxidation}}$ acetic acid

A is

(a) 1-propanol (b) 2-butanol

(c) 2-propanol (d) ethanol

44. Major product obtained when 2-bromopentane is heated with potassium ethoxide in ethanol is trans-2-pentene.

(a) *cis*-2-pentene (b) trans-2-pentene

(c)1-pentene (d) 2-ethoxypentane

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** When glucose is treated with methanol in the presence of dry HCl gas, then α- and β-methyl glucosides are formed.

Reason Glucose reacts with phenyl hydrazine to produce crystalline osazone.

46. **Assertion** The alkyl halides are hydrolysed by moist silver oxide to alcohols.

Reason Alkyl chloride is hydrolysed to alkyl hydroxide easily but reactions slow down on addition of KI.

47. **Assertion** The normality of 1.5 M sulphuric acid is 3N.

Reason Normality is equal to the product of molarity and basicity.

48. **Assertion** NO_3^- is planar while NH_3 is pyramidal in shape.

Reason The N-atom in NO_3^- is sp^2-hybridised but in NH_3, it is sp^3-hybridised.

49. **Assertion** The value of resistance is different in different directions in crystalline solids.

Reason Crystalline solids are isotropic in nature.

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 Column I (Molecules) with Column II (Boiling points) and select the correct answer.

	Column I		Column II
A.	NH_3	1.	290 K
B.	PH_3	2.	211 K
C.	AsH_3	3.	186 K
D.	SbH_3	4.	254 K
E.	BiH_3	5.	240 K

Codes

	A	B	C	D	E
(a)	3	2	5	4	1
(c)	1	4	5	2	3

	A	B	C	D	E
(b)	5	3	2	4	1
(d)	1	2	3	4	5

51. Which of the following analogy is correct ?

(a) NO : Paramagnetic : : N_2O : Diamagnetic

(b) NF_3 : More bond angle : : NH_3 : Less bond angle

(c) H_3PO_2 : Hyperphosphorus acid : : H_3PO_3 : Hypophosphorus acid

(d) None of the above is correct

52. Complete the following analogy:

Finkelstein reaction : *A* : : Swarts reaction : : *B*

(a) *A* : NaI, acetone — *B*. Hg_2F_2

(b) *A* : NaF — *B* : HgF_2

(c) *A* : NaI, acetone — *B* : HgF_2

(d) *A* : NaI — *B*. Hg_2F_2

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

Unit cell is the smallest portion of a crystal lattice which when repeated in different directions, generates the entire lattice. It is used to usually simplify the crystalline patterns solids. When the unit cell repeats itself, the network is called a lattice in crystallography, crystal structure is a description of the ordered arrangement of atoms, ions or molecules in a crystalline material. Ordered structures occur from the intrinsic nature of the constituent particles from symmetric patterns.

Unit cells are broadly divided into two categories, i.e. primitive unit cells and centered unit cells. There are seven types of primitive unit cells. Their characteristic along with centered unit cells. These are as follows:

System	Primitives or axial distances	Interfacial or axial angles	Maximum elements of symmetry	Examples
Cubic	$a = b = c$	$\alpha = \beta = \gamma = 90°$	9 planes, 13 axis, 1 centre	NaCl, KCl, ZnS, Ag
Tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90°$	5 planes, 5 axis	SnO_2, $NiSO_4$, ZnO_2, Sn
Orthorhombic	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90°$	3 planes, 3 axis	Rhombic S, $BaSO_4$, KNO_3, $PbCO_3$
Monoclinic	$a \neq b \neq c$	$\alpha = \gamma = 90°, \beta \neq 90°$	1 plane, 1 axis	Monoclinic S, $CaSO_4 \cdot 2H_2O$
Triclinic	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma \neq 90°$	No plane, no axis	$CuSO_4 \cdot 5H_2O$, H_3BO_3
Hexagonal	$a = b \neq c$	$\alpha = \beta = 90°, \gamma = 120°$	7 planes, 7 axis	ZnO, SiO_2 (silica), HgS
Rhombohedral or trigonal	$a = b = c$	$\alpha = \gamma = 90°, \beta \neq 90°$	7 planes, 7 axis	Calcite, $NaNO_3$

53. Number of atoms per unit cell of bcc is

(a) 1 (b) 2 (c) 8 (d) 4

54. For a crystal system, $a = b = c$ and $\alpha = \beta = \gamma \neq 90°$

(a) tetragonal (b) hexagonal

(c) rhombohedral (d) monoclinic

55. Number of atoms in the unit cell of Na (bcc type crystal) and Mg (fcc type crystal) are respectively

(a) 4, 4 (b) 4, 2

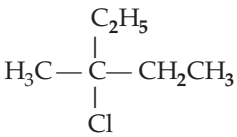
(c) 2, 4 (d) 1, 1

Answers

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

EXPLANATIONS

1. Option (c) is not according to the name and classification.



The IUPAC name of the given compound is 2-chloro-2-ethylbutane. It is not secondary haloalkane. It is a tertiary haloalkane.

2. As oxygen is very strong oxidising agent, it can be oxidised by more electronegative element, which is flourine (F).

3. In cyclohexane and ethanol, the intermolecular interactions are weaker than those between cyclohexane-cyclohexane and ethanol-ethanol. Therefore, shows positive deviation from Raoult law and hence forms minimum boiling azeotropes.

4. Schottky defect occurs due to missing cation or anion. However, equal numbers of cations and anions are missing so as to maintain electrical neutrality. However, Schottky defect results in decrease of density of crystal lattice.

5. Alkyl bromide reacts with sodium iodide (in acetone or methanol) to form alkyl iodides. This is called Finkelstein reaction.

$$CH_3CH_2CH_2Br \xrightarrow[\text{Dry acetone}]{NaI} CH_3CH_2CH_2I + NaBr$$

The high reactivity of alkyl halide is due to highly polarised covalent C—*X* bond.

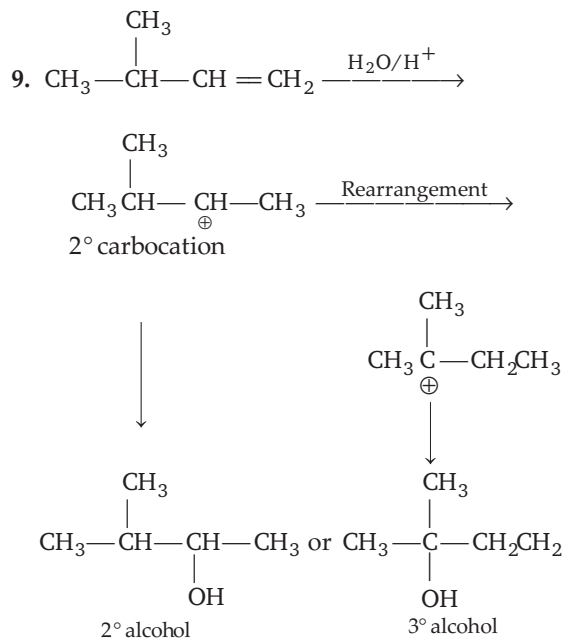
6. Except glycine (Gly), all the other naturally occurring α-amino acids are optically active.

7. Among hydrogen halides, as the size of halide ion increases, its reactivity towards ethyl alcohol also increases. Thus, the order of reactivity of hydrogen halides is

$$HI > HBr > HCl > HF.$$

8. In S_N1 reaction, the planar carbocation is formed which can be attacked from both sides by a nucleophile. Hence, a racemic mixture is formed and complete solution becomes optically active.

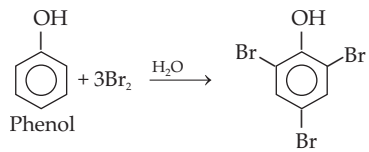
9.



Thus, best alternate is (c).

10. Iodine is a molecular solid because weak van der Waals' forces are found between its molecules.

11. Phenol reacts with excess of bromine water to yield precipitate of 2, 4, 6-tribromophenol.



12. The unit cell with dimensions $a = b \neq c$, $\alpha = \beta = \gamma = 90°$ is tetragonal.

13. Alcohol has polar H which makes intermolecular H-bonding possible. Ether is non-polar hence no H-bonding. Lack of H-bonding in ether makes it more volatile than alcohol.

14. The part of SO_2 and Cl_2 has bleaching property.

In the presence of moisture, SO_2, acts as a bleaching agent.

$$SO_2 + 2H_2O \longrightarrow H_2SO_4 + 2\,[H]$$

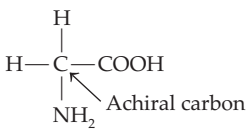
The nascent hydrogen bleaches colour of the substance, thus SO_2 bleaches by reduction while Cl_2 bleaches by oxidation.

$$H_2O + Cl_2 \longrightarrow HCl + HClO$$

$$HClO \longrightarrow HCl + [O]$$

$$[O] + \text{Coloured substances} \longrightarrow \text{Colourless substances}$$

15. (c) Glycine is α-amino acetic acid with no chiral carbon, thus optically inactive.

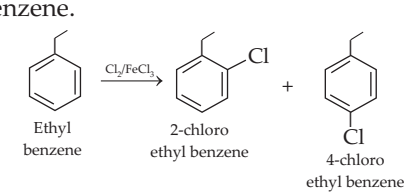


16. This problem includes concept of S_N1 and S_N2 reaction and factor affecting S_N1 and S_N2 reaction. During S_N2 reaction of alkyl halide, inversion of configuration takes place instead of rearrangement.

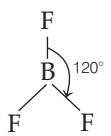
While S_N I reaction occurs through the formation of carbocation intermediate which is favoured by the presence of Lewis acid and aprotic solvent. Rearrangement of product is also possible in this case.

$$CH_3X + KOH\,(aq) \longrightarrow CH_3OH + KX$$

17. Ethyl is *o* / *p* directing group. Direct chlorination of ethyl benzene with Cl_2 / $FeCl_3$ will give mixture of 2 and 4-chloroethyl benzene.



18. BF_3 has symmetrical structure in which the three B—F bonds are oriented at an angle of 120° to one another. Also, the three bonds lie in one plane and the dipole moments of these bonds cancel one another giving net dipole moment equal to zero.



19. 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.

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

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

20. Ozone is not stable at high temperature, so it decomposes into oxygen at high temperature $2O_3 \longrightarrow 3O_2$.

Thus, the reverse of this reaction is non-spontaneous at high temperature.

21. A carbohydrate that cannot be hydrolysed further to give simpler unit of polyhydroxy aldehyde or ketone is called monosaccharide.

22. Nitrogen form N_2 but phosphorus form P_2 which readily converted into P_4 because larger size of phosphorous atom, P is unable to make π-bonds which is present in N_2, $p\pi$-$p\pi$ bond is weaker in P_2. Hence, P forms P_4.

23. In phenol, carbon atom attached to —OH group have sp^2-hybridisation because, this C-atom is bonded with 3σ-bond and 1π-bond.

24. Thermal stability of the hydrides decreases gradually from NH_3 to BiH_3. This is due to the reason that atomic size of the element increases down the group *M*—H bond strength decreases. Hence, NH_3 is most stable hydride.

25. Raoult's law is valid for ideal solution only. These two components *A* and *B* follows the Raoult's law if the force of attraction between *A* and *B* is equal to the force of attraction between *A*—*A* and *B*—*B*.

26. 10 g of glucose is present in 1000 g of solution.

Then, mass of water = 100 − 10 = 90 g

Now, molality,

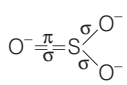
$$m = \frac{\text{no. of moles of solute}}{\text{mass of the solvent}}$$

$$= \frac{10 \times 1000}{180 \times 90} = 0.617 \text{ m}$$

27. When 1, 1-dichloropropane is treated with $NaNH_2$, then propyne is formed $NaNH_2$ acts as reducing agent in this reaction.

$$CH_3—CH_2—CHCl_2 \xrightarrow[\Delta]{NaNH_2} CH_3—C \equiv CH$$

28. In SO_3^{2-}, the S is sp^3 - hybridised, so



$$_{16}S = 1s^2, 2s^2 2p^2, \underbrace{3p_x^1 3p_y^1 3p_z^1}_{sp^3 \text{ hybridisation}}\ 3d_{xy}^1$$

(Sulphur atom in excited state) (Unhybridlsed)

In 'S' the three *p*-orbitals forms σ -bonds with three oxygen atoms and unhybridised *d*-orbital is involved in π- bond formation

$_{16}O = 1s^2, 2s^2 2p_x^2, 2p_y^1 2p_z^1$

In oxygen, two unpaired *p*-orbitals are present, one is involved in σ- bond formation while other is used in π -bond formation.

Thus, in SO_3^{2-}, $p\pi$ and $d\pi$ orbitals are involved for $p\pi$ -$d\pi$ bonding.

29. All proteins are not found in L-form but they may be present in form of D or L.

30. $\underset{\text{Ethylene}}{CH_2 = CH_2} \xrightarrow{\text{Dil. } H_2SO_4} CH_3 - \overset{+}{C}H_2HSO_4^- \xrightarrow[\text{warm}]{H_2O} \underset{\text{Ethyl alcohol}}{CH_3CH_2OH}$

31. $Ba(N_3)_2 \xrightarrow{\text{Heat}} Ba(s) + 3N_2(g)$

Azide salt of barium can be obtained in purest form as well as the decomposition product contain solid Ba as by-product along with gaseous nitrogen, hence no additional step of separation is required. Other reactions are

$NH_4NO_3 \xrightarrow{\text{Heat}} N_2O + 2H_2O$

$2NH_3 + 3CuO \xrightarrow{\text{Heat}} 3Cu + 3H_2O + N_2$

$(NH_4)_2Cr_2O_7 \xrightarrow{\text{Heat}} Cr_2O_3 + 4H_2O + N_2$

32. In face centred cubic lattice number of atoms at corner position $(A) = \frac{1}{8} \times 8 = 1$

Number of atoms at face centred position (B) (as one atom is missing) $= \frac{1}{2} \times 5 = \frac{5}{2}$

$\therefore \quad A = 1, B = \frac{5}{2}$

$\therefore$ Formula of the compound is $A_1B_{5/2}$ or A_2B_5.

33.

Carbon compound (*A*) + Acetic acid

(*A*) → (*C*)

Acetic acid → (*B*) Ester

(*C*) $\xrightarrow[\text{HCl}]{\text{50\% KOH solution}}$ (*A*) + (*D*)

$CH_3OH + CH_3COOH \xrightarrow{H_2SO_4} CH_2COOCH_3$ (*B*) Ester

(*A*) → (*C*) HCHO (Mild)

(*C*) $\xrightarrow[\text{(ii) HCl}]{\text{(i) 50\% KOH solution}}$ CH_3OH (Methanol, *A*) + HCOOH (Formic acid, *D*)

34. Na_2SO_3 (i) reacts with dil. HCl to liberate SO_2 gas (Y). This SO_2 gas decolourises acidified $KMnO_4$. On passing H_2S gas (ii) into aqueous solution of SO_2 (i.e. H_2SO_3), colloidal sulphur is obtained.

Complete reactions are as follows :

$\underset{\text{(i)}}{Na_2SO_3} + 2HCl \longrightarrow 2NaCl + H_2O + \underset{(Y)}{SO_2}$

$2KMnO_4 + 2H_2O + 5SO_2 \longrightarrow K_2SO_4 + \underset{\text{Colourless}}{2MnSO_4} + 2H_2SO_4$

$H_2O + \underset{(Y)}{SO_2} \longrightarrow \underset{\text{Aqueous solution of } Y}{H_2SO_3}$

$H_2SO_3 + \underset{\text{(ii)}}{2H_2S} \longrightarrow \underset{\text{Colloidal sulphur}}{2S} + 3H_2O$

35. According to the Boyle-van't Hoff law, at constant temperature the osmotic pressure of a solution is directly proportional to its concentration and inversely proportional to its dilution. Thus, $\pi \propto C$ (where, C = concentration).

Hence, the osmotic pressure of a solution at a given temperature increases with concentration.

36. Compounds having either $CH_3\overset{O}{\overset{\|}{C}}-$ group or $\left(CH_3-\underset{OH}{\underset{|}{CH}}-\right)$ group, give iodoform when warmed with I_2 and NaOH.

Thus,

$CH_3\underset{H}{\underset{|}{C}}HOH,\ CH_3-\overset{O}{\overset{\|}{C}}-CH_3,\ CH_3-\underset{CH_3}{\underset{|}{C}}HOH$

give, iodoform when warmed with I_2 and NaOH. (Remember, NaOI oxidises CH_3CH_2OH to CH_3CHO, thus it gives positive iodoform test.)

37. The first ionisation energies of group 16 elements decreases sharply from oxygen to sulphur and then decreases regularly and less sharply from sulphur to tellurium.

38. Edge length, $a = 3.04$ Å$= 3.04 \times 10^{-8}$ cm

Volume of bcc (cubic) cell = a^3

$= (3.04 \times 10^{-8})^3 = 2.81 \times 10^{-23}$cm^3

39. The reducing property of the hydrides of 15 group increases from NH_3 to BiH_3.

$NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$.

The tendency to donate lone pair or basic strength decreases from NH_3 to BiH_3.

$NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$.

Thermal stability of 15 group hydrides decreases from NH_3 to BiH_3.

$NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$.

Bond angle of 15 group hydrides decreases from NH_3 of BiH_3.

$NH_3 > PH_3 > AsH_3 > SbH_3 > BiH_3$

40. $C_2H_5OH + H_2SO_4 \xrightarrow{\text{Room temp.}}$ $C_2H_5HSO_4$ (Ethyl hydrogen sulphate)

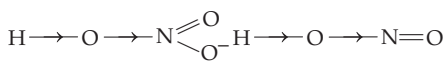
$C_2H_5HSO_4 \xrightarrow[-H_2SO_4]{140^\circ,\ C_2H_5OH}$ $C_2H_5OC_2H_5$ (Diethyl ether)

$C_2H_5HSO_4 \xrightarrow[-H_2SO_4]{170^\circ}$ $CH_2{=}CH_2$ (Ethene)

(a), (b), (d) may be formed but (c) is never formed. Hence, correct choice is (c).

41. The reaction of alcohol with conc. HCl and anhydrous $ZnCl_2$ following S_N1 pathway, so greater the stability of carbocation formed faster is the reaction. 2-methyl propan-2-ol rapidly with conc. HCl and anhydrous $ZnCl_2$ (Lucas reagent).

42.



Polarity of O—H bond in HNO_3 is more in comparison to — O—H in HNO_2 .

Hence, HNO_3 is stronger acid than HNO_2.

43. $CH_3{-}\underset{\underset{OH}{|}}{CH}{-}CH_3 \xrightarrow[H_2SO_4]{K_2Cr_2O_7} CH_3COCH_3$ (Acetone)

(2-propanol (*A*)) $\xrightarrow[\text{Oxidation}]{}$ CH_3COOH (Acetic acid)

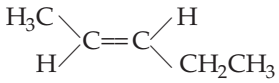
44. When 3-bromopentane is heated with potassium ethoxide in ethanol, then 2-pentene is formed. Since, *trans*-2-pentene is more symmetrical than *cis*-2-pentene, hence, it is the main product.

$CH_3{-}\underset{\underset{Br}{|}}{CH}{-}CH_2{-}CH_2{-}CH_3$ (2-bromopentane)

$C_2H_5{-}O^-K^+$ (Potassium ethoxide) $\xrightarrow[-KBr]{C_2H_5OH}$

$CH_3{-}CH{=}CH{-}CH_2{-}CH_3$

or



(*trans*-2-pentene)

45. Both Assertion and Reason is true but Reason is not the correct explanation of Assertion.

The reaction between glucose and methanol, in the presence of dry HCl, gives α- and β-methyl glycosides.

$C_6H_{12}O_6$ (Glucose) + CH_3OH (Methanol) $\longrightarrow$ α-$C_6H_{11}O_6CH_3$ (α-methyl glucoside) + β-$C_6H_{11}O_6CH_3$ (β-methyl glucoside)

46. Assertion is true but Reason is false.

KI reacts with alkyl chloride, *R*Cl to form alkyl iodide, *R*I. This alkyl iodide are more reactive than alkyl chloride. Thus, the reaction becomes faster on addition of KI.

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

Normality = Molarity × Basicity

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

49. Assertion is true but Reason is false.

Crystalline solids are anisotropic in nature.

50. Except ammonia (NH_3), the boiling point generally increases down the group due to increase in magnitude of van der Waals' forces. Ammonia shows intermolecular hydrogen bonding, hence its boiling point is higher than AsH_3, but lower than SbH_3.

NH_3	PH_3	AsH_3	SbH_3	BiH_3
238.5 K	185.5 K	210.6 K	254.6 K	290 K

51. NO is paramagnetic in gaseous state because in gaseous state, it has one unpaired electron.

Total no. of electron present = $7 + 8 = 15e^-$

$\therefore$ NO is odd electron species, hence it is paramagnetic.

N_2O molecule is diamagnetic. Total number of electrons = 14 + 8 = 22. All electrons are paired as they are even in number.

52. In Finkelstein reaction, NaI and acetone are reacted with alkyl halide, and gives alkyl iodide.

$CH_3{-}\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}{-}Cl$ (Ethyl chloride) + NaI (Sodium iodide) $\xrightarrow{\text{Acetone}}$ $I{-}\overset{\overset{H}{|}}{\underset{\underset{H}{|}}{C}}{-}CH_3$ (Ethyl iodide) + $NaCl$ (Sodium chloride)

In swarts reaction, alkyl chloride or bromide is heated with AgF, Hg_2F_2 or SBF_3 and gives alkyl fluoride.

$$CH_3{-}Br + AgF \longrightarrow CH_3F + AgBr$$

53. For bcc unit cell number of atoms at corners (per unit cell) = $\frac{1}{8} \times 8 = 1$

Number of atoms at body centre = 1

$\therefore$ Total number of atoms = 1 + 1 = 2

54.

Crystal system	Axial distance	Axial angles
Tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90^\circ$
Hexagonal	$a = b \neq c$	$\alpha \neq \beta = 90^\circ, \gamma = 120^\circ$
Rhombohedral	$a = b = c$	$\alpha = \beta = \gamma \neq 90^\circ$
Monoclinic	$a \neq b \neq c$	$\alpha = \gamma = 90, \beta \neq 90^\circ$

55. Number of atoms in unit cell of Na are 2 (bcc). Number of atoms in unit cell of Mg (fcc) are 4.