SAMPLE PAPER 2

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. Thymine is held by two H-bonds with the base
(a) guanine (b) cytosine
(c) uracil (d) adenine

2. In the following reaction, $CO + H_2 \xrightarrow[X\ (\text{catalyst})]{300°C/300\ \text{atm}} CH_3OH$, the catalyst used is
(a) Cr_2O_3 / ZnO (b) V_2O_5
(c) Al_2O_3 (d) Fe

3. The mixture of conc. HCl and HNO_3 made in 3 : 1 ratio contains .....
(a) NOCl (b) NCl_3
(c) N_2O_4 (d) ClO_2

4. Identify the name of the reaction,
"Bromoalkanes are prepared by refluxing the silver salts of acids with bromine in CCl_4".
(a) Borodine-Hunsdiecker reaction
(b) Finkelstein reaction
(c) Swarts reaction
(d) Balz-Schiemann reaction

5. When nitric acid reacts with nitric oxide, a gas is released, which converts H_2S into .....

(a) $S_2O_5^{2-}$ (b) S (c) S^{2-} (d) SO_4^{2-}

6. The central dogma of molecular genetics states that the genetic information flows from

(a) DNA $\rightarrow$ RNA $\rightarrow$ proteins

(b) DNA $\rightarrow$ carbohydrates $\rightarrow$ proteins

(c) amino acids $\rightarrow$ proteins $\rightarrow$ DNA

(d) DNA $\rightarrow$ RNA $\rightarrow$ carbohydrates

7. Among the given compound, Frenkel defect is present in

(a) NaI (b) NaOH

(c) AgBr (d) Both (a) and (b)

8. Which of the following is the correct statement regarding nitrogen as compare to other member of the group ?

(a) It has small atomic radius

(b) Its electronegativity is fairly high

(c) Dissociation energy of its molecule is fairly high

(d) All of the above

9. On heating a mixture of NH_4Cl and KNO_2, we get

(a) NH_4NO_3 (b) NO

(c) N_2 (d) $NH_4(NO_3)_2$

10. An unripe mango placed in a concentrated salt solution to prepare pickle, shrivels because

(a) it loses water due to osmosis

(b) its gains water due to reverse osmosis

(c) it loses water due to reverse osmosis

(d) it gains water due to osmosis

11. Nitrogen dioxide and sulphur dioxide have some properties in common. The property which is shown by one of these compounds, but not by the other is

(a) one is used as a food-preservative other not

(b) one is a reducing agent but other not

(c) one is soluble in water but other is not

(d) one form acid-rain but other is not

12. Amalgams are the example of

(a) liquid in liquid solution (b) liquid in solid solution

(c) solid in solid solution (d) gas in solid solution

13. Which of the following noble gas can diffuse through rubber and glass easily?

(a) Ar (b) He (c) Kr (d) Ne

14. Effect of adding a non-volatile solute to a solvent is

(a) to decrease the osmotic pressure (b) to lower the vapour pressure

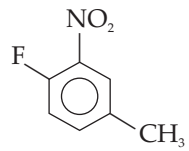
(c) to increase the freezing point (d) to decrease the boiling point

15. On heating of phenyl-methyl ethers with HI, …… is formed.

(a) benzene (b) phenol

(c) ethyl chlorides (d) iodobenzene

16. Which of the following is the correct IUPAC name of the compound ?



(a) 2-fluoro-5-methyl-1-nitrobenzene
(b) 4-methyl-1-fluoro-2-nitrobenzene
(c) 1-fluoro-4-methyl-2-nitrobenzene
(d) 4-fluoro-1-methyl-3-nitrobenzene

17. Halogen that does not exhibit a positive oxidation number in their compounds is .....
(a) F
(b) Cl
(c) Br
(d) None of these

18. Least stable oxide of chlorine is
(a) Cl_2O
(b) ClO_2
(c) Cl_2O_7
(d) ClO_3

19. Choose the incorrect statement regarding RNA ?
(a) It controls the synthesis of protein
(b) It usually does not replicate
(c) It is present in the nucleus of the cell
(d) It has always double stranded α-helix structure

20. Which of the following catalyst used in the preparation of an alkyl chloride by the action of dry HCl on an alcohol?
(a) $FeCl_3$
(b) Cu
(c) Anhydrous $AlCl_3$
(d) Anhyd. $ZnCl_2$

21. Solubility of iodine in water may be increased by adding
(a) potassium iodide
(b) carbon disulphide
(c) chloroform
(d) sodium thiosulphate

22. Number of unit cell in 4 g of X (atomic mass = 40) which crystallises in bcc pattern is (N_A = Avogadro's number)
(a) $2 \times N_A$
(b) $2 \times 0.1\ N_A$
(c) $0.1\ N_A$
(d) $\frac{0.1\ N_A}{2}$

23. Which of the following is the correct fraction of total volume occupied by the atoms present in a simple cube?
(a) $\frac{\pi}{4}$
(b) $\frac{\pi}{3\sqrt{2}}$
(c) $\frac{\pi}{4\sqrt{2}}$
(d) $\frac{\pi}{6}$

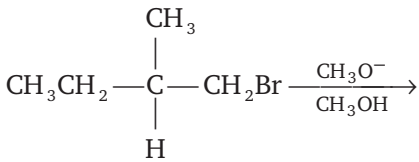
24. Which of the following is the best method used to distinguished 1-propanol and 2-propanol ?
(a) Oxidation with alkaline $KMnO_4$ followed by reaction with Fehling solution
(b) Oxidation with acidic dichromate followed by reaction with Fehling solution
(c) Oxidation by heating with copper followed by reaction with Fehling solution
(d) None of the above

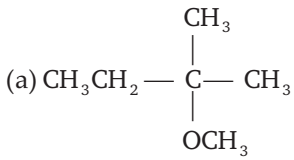
25. When conc. H_2SO_4 comes in contact with sugar, it becomes black due to
(a) dehydration
(b) hydration
(c) hydrolysis
(d) decolourisation

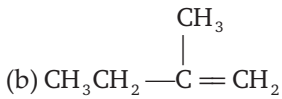
Section B

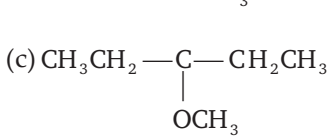
*This section consists of 24 multiple choice questions with overall choice to attempt **any 20** questions. In case more than desirable number of questions are attempted, ONLY first 20 will be considered for evaluation.*

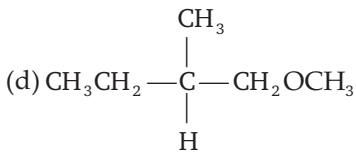
26. The major product formed in the following reaction is



(a) 

(b) 

(c) 

(d) 

27. The metal has a fcc lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g/cm^3. What is the molar mass of the metal ?
(N_A = Avogadro's constant = 6.02×10^{23} mol^{-1})

(a) 27 g/mol (b) 20 g/mol
(c) 40 g/mol (d) 30 g/mol

28. If 22 g of benzene is dissolved in 122 g of carbon tetrachloride then the mass percentage of carbon tetrachloride (CCl_4) and benzene (C_6H_6) are respectively.

(a) 50%, 50% (b) 75.22%, 24.78%
(c) 84.72%, 15.28% (d) 82.72%, 17.27%

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

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

30. Which of the following properties is exhibited by phenol?

(a) It is soluble in *aq.* NaOH and evolves CO_2 with *aq.* $NaHCO_3$
(b) It is soluble in *aq.* NaOH and does not evolve CO_2 with *aq.* $NaHCO_3$
(c) It is not soluble in *aq.* NaOH but evolves CO_2 with *aq.* $NaHCO_3$
(d) It is insoluble in *aq.* NaOH but does not evolve CO_2 with *aq.* $NaHCO_3$

31. Concentrated sulphuric acid is also known as ...(i)... It is manufacture by ...(ii)... process and is a powerful ...(iii)... agent.

	(i)	(ii)	(iii)
(a)	oil of vitriol	contact	dehydrating
(b)	oil of clay	Solvay	hydrating
(c)	oil of green	Solvay	hydrating
(d)	oil of vitriol	oleum	dehydrating

32. Choose the incorrect statements regarding Henry's law.

(a) Different gases have different K_H (Henry's law constant) values at the same temperature

(b) Higher the value of K_H at a given pressure, highest is the solubility of the gas in the liquids

(c) The value of K_H increases with increase of temperature and K_H is function of the nature of the gas

(d) The partial pressure of the gas in vapour phase is proportional to the mole fraction of the gas in the solution

33. Which of the following statement is correct?

(a) BiH_3 is stronger reducing agent than SbH_3

(b) N—N single bond is stronger than P—P bond

(c) NH_3 has lower boiling point than PH_3

(d) Both (a) and (c) are correct

34. NaCl type crystal having coordination number '*A*' can be converted into CsCl type crystal which have coordination number of '*B*' by applying '*C*' pressure/temperature

(a) $A = 6:6;\ B = 8:8;\ C$ = high pressure

(b) $A = 8:8;\ B = 6:6;\ C$ = high temperature

(c) $A = 8:8;\ A = 6:6;\ C$ = low temperature and low pressure

(d) $A = 4:4;\ A = 8:8;\ C$ = high pressure

35. The strongest acid of same oxidation number of halide is

(a) $HClO_4$ (b) $HBrO_4$

(c) HIO_4 (d) Both $HClO_4$ and $HBrO_4$

36. A compound of formula A_2B_3 has the hcp lattice. Which atom forms the hcp lattice and what factors of tetrahedral voids is occupied by the other atoms?

(a) hcp lattice -A, $\frac{2}{3}$ tetrahedral voids -B

(b) hcp lattice -A, $\frac{1}{3}$ tetrahedral voids -B

(c) hcp lattice -B, $\frac{1}{3}$ tetrahedral voids -A

(d) hcp lattice -B, $\frac{2}{3}$ tetrahedral voids -A

37. ClF_3 exists but FCl_3 does not because

(a) Cl has vacant *d*-orbitals but F has no *d*-orbitals

(b) Cl is more electronegative than F

(c) Cl is larger in size than F

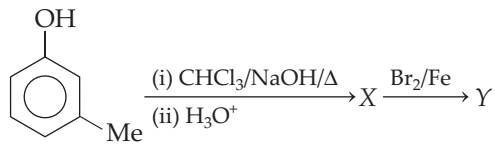
(d) Both (a) and (c)

38. The formula used to determine the molar mass of solute in term of depression in freezing point is

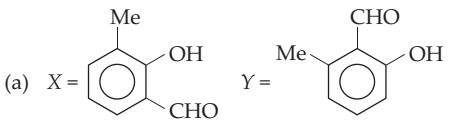
(a) $M_2 = \dfrac{K_f \times w_2 \times 1000}{\Delta T_f \times w_1}$ (b) $M_2 = \dfrac{\Delta T_f \times w_2 \times 1000}{K_f \times w_1}$

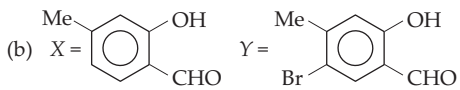
(c) $M_2 = \dfrac{w_1 \times \Delta T_f \times 1000}{K_f \times w_2}$ (d) $M_2 = \dfrac{w_2 \times K_f}{\Delta T_f \times w_1 \times 1000}$

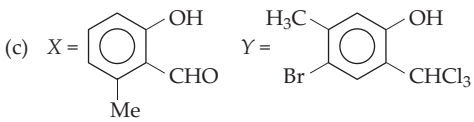
39. Consider the following route map of the reaction.

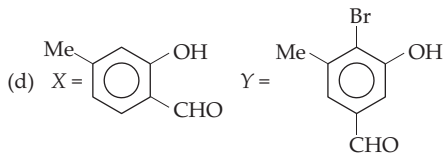


Here, *X* and *Y* respectively are

(a) 

(b) 

(c) 

(d) 

40. Which of the following statements is not correct about XeF_2?
(a) XeF_2 is an oxidising agent
(b) XeF_2 contains two bond pairs and two lone pairs
(c) It can be obtained by direct reaction between F_2 and Xe at high pressure
(d) XeF_2 undergoes alkaline hydrolysis to give O_2 and Xe

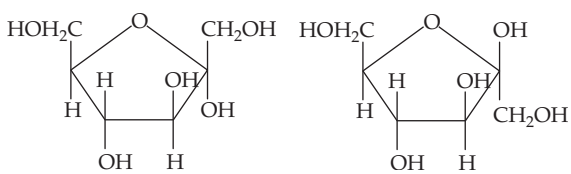
41. Which of the following statements is not correct regarding amino acids?
(a) In these, —NH_2 and — COOH groups are attached to different carbon atoms
(b) Natural proteins are commonly made up of L-isomer of amino acids
(c) Proteins are polyamides formed from amino acids
(d) These are 20 amino acids

42. In the following reaction,

$$\underset{\text{(In excess)}}{\text{Ethyl alcohol}} + \underset{\text{(From } H_2SO_4\text{)}}{H^+} \xrightarrow{413\ K} \text{Product}$$

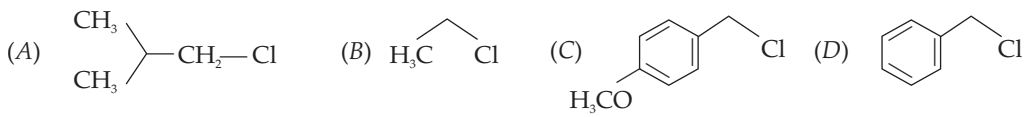
The product is
(a) ethene
(b) ethyl hydrogen sulphate
(c) diethyl ether
(d) acetylene

43. Consider the following structure of glucose :



Which of the following is the incorrect statement ?
(a) Five membered ring structures are named as furanose
(b) The cyclic structures are the two anomers of fructose
(c) These are also called Haworth structures
(d) None of the above

44. Consider the following compounds.



Increasing order of reactivity of the given compounds for S_N1 substitution is

(a) (*A*) < (*B*) < (*D*) < (*C*) (b) (*B*) < (*C*) < (*D*) < (*A*)

(c) (*B*) < (*A*) < (*D*) < (*C*) (d) (*B*) < (*C*) < (*A*) < (*D*)

Direction (Q. Nos. 45-49) *For given questions two statements are given-one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below.*

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

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

(c) A is true, but R is false

(d) A is false, but R is true

45. **Assertion** Glucose does not gives 2, 4-DNP test.

Reason Glucose exists in cyclic hemiacetal form.

46. **Assertion** Mixture of O_2 and He gas is used by the divers inside the sea.

Reason Helium is not soluble in blood even at high pressure.

47. **Assertion** In alkyl hydrolysis of a tertiary halide by aqueous solution of alkali if concentration of alkali is doubled then the reaction is remain constant.

Reason *t*-alkyl halides with aqueous alkali give S_N1 reaction.

48. **Assertion** The density of glycerol is higher than propanol.

Reason Glycerol contain two —OH group due to which it show extensive intermolecular H-bonding.

49. **Assertion** To make a painting over glass, we use fluorine.

Reason Fluorine attacks on glass but very slowly.

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. Which of the following analogies is incorrect ?

(a) Used as refrigerant : Ammonia : : Oxidiser in rocket fuel : Nitric acid

(b) $NH_3 > PH_3 > AsH_3 > SbH_3 \geq BiH_3$: Basic character : : $NH_3 < PH_3 < ASH_3 < SbH_3 < BiH_3$: Reducing character

(c) SF_4 : *See-saw* shape : : BrF_3 : Bent shaped

(d) $H_2S_2O_7$: Oleum : : $H_2S_2O_8$: Pyrosulphuric acid

51. Complete the following analogy:

At specific condition the solutions which shows a large positive deviation from Raoult's law : *A* : : At specific condition, solution which shows a large negative deviation from Raoult's law : *B*

(a) *A* : Does not form azeotrope : : *B* : Minimum boiling azeotropes

(b) *A* : Minimum boiling azeotropes : : *B* : Maximum boiling azeotropes

(c) *A* : Minimum boiling azeotropes : : *B* : Does not form azeotropes

(d) *A* : Maximum boiling azeotropes : : *B* : Minimum boiling azeotropes

52. Match the following Column I with the Column II and mark the correct code that are given below.

	Column I (Radius ratio)		**Column II** (Coordination number)
A.	Less then 0.155	1.	4
B.	0.225-0.414	2.	8
C.	0.414-0.732	3.	2
D.	0.732-1.0	4.	6

Codes

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

	A	B	C	D
(b)	3	1	4	2
(b)	3	2	1	4

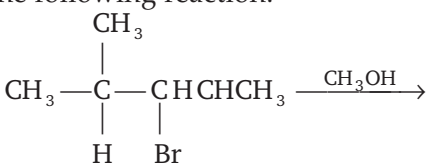
Case *Read the passage given below and answer the following questions (53-55)*

Haloalkane and haloarenes are the derivatives of alkanes. Which can be obtained by replacing hydrogen atom(s) by halogen atom(s). The primary difference between haloalkanes and haloarenes is that haloalkanes are derived from open chain hydrocarbons whereas haloarenes are derived from aromatic hydrocarbons.

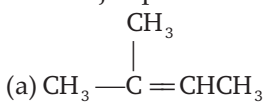
Alkyl halide and aryl halides can be classified on the basis of (i) number of halogen atoms in the molecules (ii) sp^3-hybridised carbon-halogen bond, (iii) sp^2-hybridised carbon hydrogen bond.

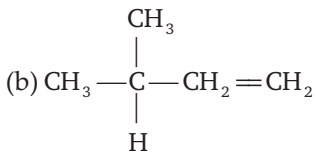
These organic compounds can dissolve non-polar compounds and are therefore used a solvents. Many derivatives of alkyl and aryl halides are used in medicine. Some of them have adverse effect on the environment and are labelled as pollutants.

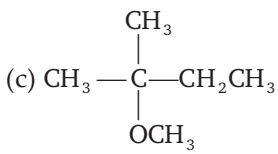
53. Consider the following reaction.

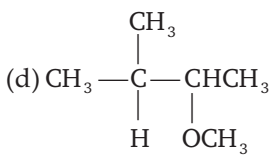


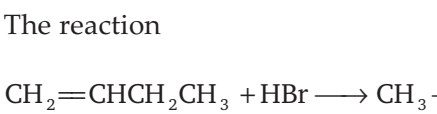
The major product of the following reaction is

(a) 

(b) 

(c) 

(d) 

54. The reaction  is an example of

(a) nucleophilic addition (b) free radical addition

(c) electrophilic addition (d) electrophilic substitution

55. Which of the following compound is most reactive ?

(a) 2-bromopropane (b) 1-bromopropane (c) 2-chloropropane (d) 1-chloropropane

Answers

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

EXPLANATIONS

1. Adenine forms two H-bonds with thymine and cytosine forms a base pair with guanine.

2. In the presence of Cr_2O_3/ZnO catalyst, carbon monoxide and H_2 reacts at 300°C temp. and 300 atm pressure and forms methanol.

$$\underbrace{CO + H_2}_{\text{Synthesis gas}} \xrightarrow[Cr_2O_3/ZnO]{300°C/300\ atm} CH_3OH$$

3. The mixture of one part of conc. HNO_3 and three parts of conc. HCl is known as *aqua-regia*.

$$HNO_3 + 3HCl \longrightarrow 2H_2O + NOCl + 2[Cl]$$

In this reaction of aqua-regia, water (H_2O), nitrosyl chloride (NOCl) and nascent chloride (Cl) are produced.

4. Generally, bromoalkanes are prepared by refluxing the silver salts of acids with bromine in CCl_4. This reaction is known as Borodine-Hunsdiecker reaction. The reaction can be depicted as :

$$\underset{\text{Silver salt of acid}}{CH_3COO^-Ag^+} + Br_2 \xrightarrow{CCl_4} \underset{\text{Methyl bromide}}{CH_3Br} + \underset{\text{Carbon dioxide}}{CO_2\uparrow} + \underset{\text{Silver bromide}}{AgBr}$$

5. When nitric acid (HNO_3) reacts with nitric oxide (NO), NO_2 gas is released which oxidises H_2S into sulphur. The reactions are as follows :

$$2HNO_3 + NO \longrightarrow H_2O + 3NO_2$$

$$NO_2 + H_2S \longrightarrow H_2O + S + NO$$

In this reaction aqua-regia, water (H_2O), nitrosyl chloride (NOCl) and onascent chlorine (Cl) are produced

6. The central dogma of molecular genetics states that the genetic information flows from

$$DNA \xrightarrow{Transcription} RNA \xrightarrow{Translation} Proteins.$$

7. Frenkel defect is present in AgBr. This defect arises when the smaller ion (usually cation) is dislocated from its normal site. It creates a vacancy defect at its original site and an interstitial defect at its new location. e.g. AgBr, AgCl, AgI, ZnS.

8. All the given statements are correct.

9. $NH_4Cl + KNO_2 \xrightarrow{\Delta} [NH_4NO_2] \xrightarrow{\Delta} N_2\uparrow + 2H_2O$

When mixture of ammonium chloride and potassium nitrate is heated, then ammonium nitrite is formed which on further heating, gives dinitrogen gas and water.

10. An unripe mango placed in concentrated salt solution to prepare pickle, shrivels because it loses water due to osmosis.

The concentrated salt solution has greater solute concentration and lowest water content.

Therefore, osmosis occurs because it is the movement of water molecules through semipermeable membrane from higher concentration to lower concentration area.

11. SO_2 is used in the manufacture of sodium bisulphate ($NaHSO_3$) which is used as a preservative for jams, jellies and squashes. But NO_2 is not used as preservatives.

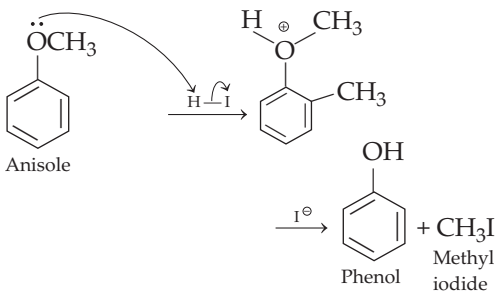
12. Amalgams are the example of liquid in solid solution.
An amalgams is an alloy of mercury (liquid) and one or more other metal (solid).

13. Helium has an usual property of diffusing through commonly used laboratory material such as rubber and glass.

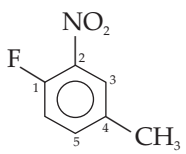
14. The effect of adding a non-volatile solute to a solvent is to

- lower the vapour pressure
- lower the freezing point
- increases the boiling point
- increases the osmotic pressure

15. On heating of phenyl-methyl ethers with HI phenol is produced. Reaction involved is as follows :



16.



1-fluoro-4-methyl-2-nitrobenzene.

17. F is small in size and possess the highest electronegativity atom. Moreover, it doesnot have a vacant *d*-orbital so, it cannot depict a positive oxidation state.

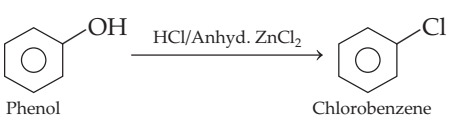
18. The stability of oxides increases with increase in oxidation state of halogen.

Oxide	Oxidation state of halogen
Cl_2O	+1
ClO_2	+4
ClO_3	+6
Cl_2O_2	+7

Hence, Cl_2O is the least stable oxide of chlorine.

19. Statement (d) is incorrect regarding RNA as RNA does not have double stranded α-helix structure. Helices present in RNA are single-stranded. RNA usually does not replicate.

20. Anhydrous $ZnCl_2$ is used as catalyst in the preparation of an alkyl chloride by the action of dry HCl on an alcohol.



21. The solubility of I_2 in water increases by the addition of KI due to formation of polyhalide ion, i.e. I_3^-.

$$KI + I_2 \longrightarrow KI_3$$

22. Number of atoms = Number of moles × N_A

$$= \frac{4}{40} \times N_A$$

$$= 0.1 \times N_A$$

As, 2 atom form 1 unit cell in bcc crystal

$\therefore$ $0.1 \times N_A$ atoms will form = $\frac{0.1 \times N_A}{2}$ unit cells.

23. For a simple cubic cell, radius $(r) = \frac{a}{2}$

Volume of the atom = $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi\left(\frac{a}{2}\right)^3$

$\therefore$ Packing fraction = $\frac{\frac{4}{3}\pi\left(\frac{a}{2}\right)^3}{a^3} = \frac{\pi}{6}$

24. 1-propanol and 2-propanol can be distinguished by the test given in option (c).

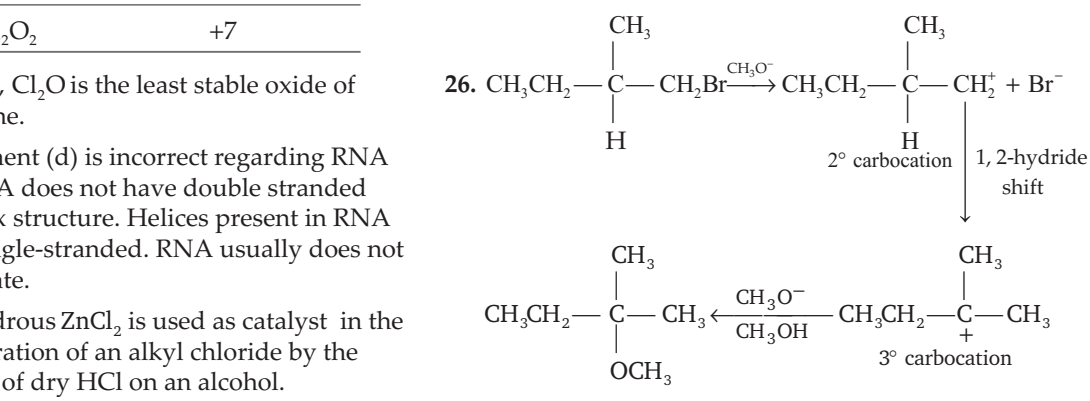
$$\underset{\text{1-propanol}}{CH_3CH_2CH_2{-}OH} \xrightarrow[573\ K]{Cu} \underset{\substack{\text{(Propanal red ppt.}\\ \text{with Fehling solution)}}}{CH_3CH_2CHO}$$

$$\underset{\text{2-propanol}}{CH_3CH(OH)CH_3} \xrightarrow[\Delta]{Cu} \underset{\substack{\text{Propanone}\\ \text{[No reaction takes place}\\ \text{with Fehling solution]}}}{CH_3\overset{\overset{O}{\|}}{C}CH_3}$$

25. When conc. H_2SO_4 comes in contact with sugar, it becomes black due to dehydration and form carbon and water.

$$\underset{\text{Sugar}}{C_{12}H_{22}O_{11}} \xrightarrow{\text{Conc. } H_2SO_4} \underset{\text{Carbon (Black)}}{12C} + \underset{\text{Water}}{11H_2O}$$

26.



27. Given, cell is fcc so, $Z = 4$

Edge length, a = 404 pm

$$= 4.04 \times 10^{-8} \text{ cm}$$

Density of metal, $d = 2.72\ g/cm^3$

$$N_A = 6.02 \times 10^{23}\ mol^{-1}$$

Molar mass of the metal, M = ?

We know that,

$$\text{density } (d) = \frac{Z \cdot M}{a^3 \times N_A} \Rightarrow M = \frac{d \cdot a^3 N_A}{Z}$$

$$= \frac{2.72 \times (4.04 \times 10^{-8})^3 \times 6.02 \times 10^{23}}{4}$$

$$= 26.79 \text{ g/mol} \simeq 27 \text{ g/mol}$$

28. We know that,

$$\text{Mass percent (Mass\%)} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

Given, mass of benzene = 22 g

Mass of carbon tetrachloride = 122 g

On putting the given value in the above formula we get

$$\text{Mass percent of benzene} = \frac{22}{(22 + 122)} \times 100 = 15.28\%$$

Mass percentage of carbon tetrachloride

$$= 100 - 15.28 = 84.72\%$$

29. The given unit cell dimension is of tetragonal unit.

30. Phenol is a weak acid. It reacts with *aq*. NaOH to produce salt.

$$C_6H_5OH + NaOH \longrightarrow \underset{\text{Sodium phenoxide}}{C_6H_5\overset{-}{O}\overset{+}{Na}} + H_2O$$

But it is not sufficient acidic to evolve CO_2 from $NaHCO_3$ solution.

31. (i) → oil of vitriol (ii) → contact process
(iii) → dehydrating agent

32. At constant temperature, solubility of a gas (S) varies inversely with Henry's law constant (K_H).

$$K_H = \frac{\text{Pressure}}{\text{Solubility of a gas in a liquid}} = \frac{p}{S}$$

Thus, higher the value of K_H at a given pressure, the lower is the solubility of the gas in the liquid.

33. Statement (a) is correct and the rest are incorrect statements. Their correct statements are :

(b) N—N bond is weaker than the single P—P bond due to high interelectronic repulsion of the non-bonding electrons in N_2 owing to small bond length. Therefore, the catenation property is weaker in nitrogen as compared to phosphorus.

(c) The electronegativity of N is much higher than that of P. So, NH_3 undergoes extensive H-bonding and hence, it exists as an associated molecule. To break these additional bonds, the large amount of energy is required while PH_3 does not form H-bond and hence exist as discrete molecule.

34. NaCl type crystal (with coordination number 6 : 6) can be converted into CsCl type crystal (with coordination number 8 : 8) by applying high pressure.

35. $HClO_4$ is the strongest acid among the given acid. On compairing the acidic strength in the given oxyacids, (if the oxidation state of halogen is same), depend upon the electronegativity of the central atom. Higher is the electronegativity of central atom, more is the tendency of —XO_4 group to withdraw electrons from OH bond towards itself. Thus, the strongest acid is $HClO_4$.

36. Total effective number of atoms in hcp unit lattice = Number of octahedral voids in hcp = 6

$\therefore$ Number of tetrahedral voids (TV) in hcp
= 2 × Number of atoms in hcp lattice
= 2 × 6 = 12

As, formula of the lattice is A_2B_3.

Suppose	A	B
	$\left(\frac{1}{3} \times \text{TV}\right)$ (hcp)	
$\Rightarrow$	$\frac{1}{3} \times 12$	6
$\Rightarrow$	$\frac{2}{3}$	1
$\Rightarrow$	2	3

So, $A = \frac{1}{3}$ tetrahedral voids, B = hcp lattice.

37. ClF_3 exists but $FeCl_3$ does not because.

(i) Cl has vacant *d*-orbitals and hence, can show an oxidation state of + 3 but F has no *d*-orbitals, therefore, it cannot show positive oxidation states. Further, since F can show only – 1 oxidation state therefore, it forms only ClF_3 not FCl_3.

(ii) Due to larger size, Cl can accomodate three small F atom around it while F being smaller cannot accomodate three bigger sized Cl-atoms around it.

38. The expression used to determine the molar mass of solute in terms of depression in freezing point.

$$M_2 = \frac{K_f \times w_2 \times 1000}{\Delta T_f \times w_1}$$

where, M_2 = Molar mass of solute

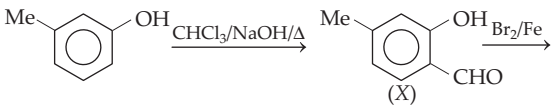
K_f = Freezing point depression constant

w_2 = Mass of solute

w_1 = Mass of solvent

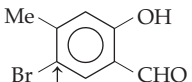
ΔT_f = Depression in freezing point

39.



(*X*)

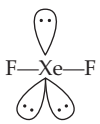
Reimer-Tiemann reaction (—CHO is inserted on *ortho* to more activating —OH group)



(*Y*)

[This position is *ortho* to Me *meta* to —CHO and *para* to —OH so more active]

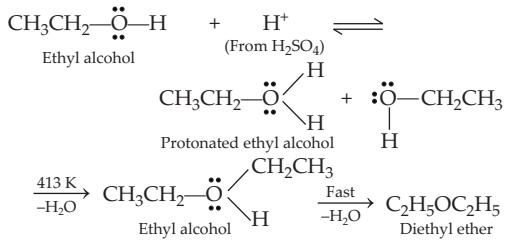
40. XeF_2 contains two bond pairs and three lone pairs. Its structure is as shown below :



41. Statement (a) is incorrect. Rest of the statements are correct. Its correct form is as follows :

In α-amino acids, —NH_2 and —COOH groups are attached to carbon atom.

42.

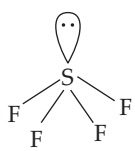


In this reaction, the end product is diethyl ether and if temperature is high (i.e. 463 K), ethene is obtained.

43. Only statement (a) is incorrect. Its correct form is as follows :

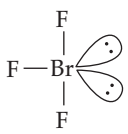
Five membered ring structure are named as furanose.

SF_4 :



Sea saw

BrF_3 :

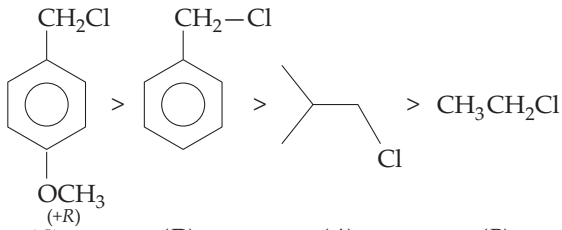


T-shaped

44. Reactivity of substitution nucleophilic unimolecular (S_N1) reaction depends on the formation of carbocation.

Greater the stability of carbocation greater will be its ease of formation of alkyl halide and faster will be the rate of reaction.

So, the correct order of (S_N1) reactivity is



(*C*) (*D*) (*A*) (*B*)

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

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.

As, *t*-alkyl halide with aqueous alkali gives S_N1 reaction and rate of S_N1 reaction is not based upon concentration of nucleophile. (i.e. alkali).

48. Both Assertion is true but Reason is false. Correct Reason is as follows :

The density of glycerol is higher than propanol, it is due to extensive intermolecular H-bonding. Glycerol contains three —OH groups while, propanol contains only one —OH group.

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

50. Option (c) is not correctly matched.

(a) Ammonia (NH_3) is used as refrigerant and nitric acid is used as oxidiser in rocket fuel.

(b) **Basic character** These hydrides are Lewis bases due to the presence of lone pair of electrons on the central atom. Their basic character decreases down the group and thus, the order of basic character is as follows :

$$NH_3 > PH_3 > AsH_3 > SbH_3 \geq BiH_3$$

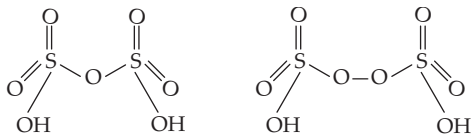
The decrease in basic character down the group is due to increase in the size of central atom thereby leading to decrease in the electron density on the central atom as lone pair of electrons occupy a larger volume. Therefore, the tendency to donate a lone pair of electrons decreases consequently and hence basic strength decreases.

Reducing character The reducing character of hydrides of group 15 elements increases down the group in the order :

$$NH_3 > PH_3 > AsH_3 > SbH_3 < BiH_3$$

This order is due to decrease in the thermal stability of hydrides down the group and thus, their tendency to liberate hydrogen increases and hence, their reducing character increases from NH_3 to BiH_3. Therefore, NH_3 is a mild reducing agent while BiH_3 is the strongest reducing agent amongst all the hydrides.

(d)



Pyrosulphuric acid (oleum) $H_2S_2O_7$

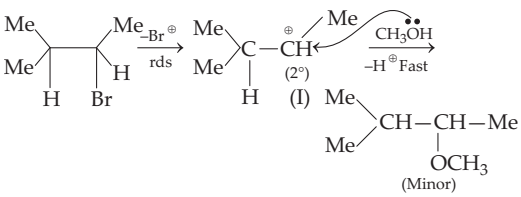
Peroxodisulphuric acid ($H_2S_2O_8$)

51. $A \rightarrow$ Minimum boiling azeotropes
$B \rightarrow$ Maximum boiling azeotropes

52. A $\rightarrow$ 3; B $\rightarrow$ 1; C $\rightarrow$ 4; D $\rightarrow$ 2

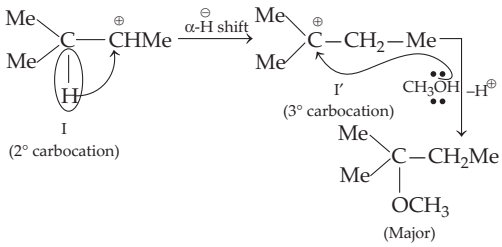
53. In the given question, the substrate is a 2° halide (bromide) and the medium CH_3OH (as well as a poor nucleophile) is protic in nature.

So, the reaction will follow mainly S_N1 pathways *via* the formation of a carbocation intermediate (I).



The intermediate, I can be rearranged into the more stable form I′(3°) by α-hydride shift .

I will give the major product.



54. The following reaction is an electrophilic addition reaction.

$$CH_2{=}CHCH_2CH_3 + HBr \longrightarrow CH_3{-}\underset{\displaystyle Br}{\underset{|}{CH}}{-}CH_2CH_3$$

Reactions which involve combination between two reacting molecules to give a single molecule of the product are called addition reactions. If electrophilic part of the reagents initiates the reaction, then this reaction is called as electrophilic addition reaction.

55. The order of alkyl halides having same halids is tertiary > secondary > primary and order of reactivity according to the nature of the halogen atom is alkyl iodide > alkyl bromide > alkyl chloride.

Thus, among the given compounds (a) is most reactive as it is 2° halide and contains —Br group.