SAMPLE PAPER 6

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. Schottky defect in a crystal is observed, when
(a) it arises when some constituent particle occupy an interstitial site
(b) it arises when equal number of cations and anions are missing from their lattice site
(c) it arises when an ion leaves its normal site and occupies an interstitial site
(d) density of crystal is increased

2. Which of the following liquid pair shows a positive deviation from Raoult's law ?
(a) Benzene—methanol
(b) Water—nitric acid
(c) Water—hydrochloric acid
(d) Acetone—chloroform

3. The oxoacid of sulphur that does not contain bond between sulphur atoms is .....
(a) $H_2S_2O_4$
(b) $H_2S_2O_3$
(c) $H_2S_2O_7$
(d) None of these

4. Which is the most suitable reagent for the following transformation ?

$$CH_3—CH=CH—CH_2—\underset{\displaystyle OH}{\underset{|}{CH}}—CH_3 \longrightarrow CH_3—CH=CH—CH_2COOH$$

(a) Tollen's reagent
(b) I_2/NaOH
(c) Alkaline $KMnO_4$
(d) CrO_2Cl_2/CS_2

5. Reagent that used for the conversion of glucose to gluconic acid is ..... .
(a) Na—Hg / H_2O (b) Br_2/H_2O
(c) HNO_3 (d) $NaBH_4$

6. Which one of the following has the minimum boiling point?
(a) *n*-butane (b) 1-butyne
(c) 1-butene (d) Isobutene

7. In a compound, atoms of element Y forms ccp lattice and those of element X occupy $\frac{2}{3}$ rd of tetrahedral voids, then what will be the formula of the compound ?
(a) X_4Y_3 (b) X_2X_3 (c) X_2Y (d) X_3X_4

8. Which of the following is the correct oxidation states range for nitrogen ?
(a) – 3 to + 5 (b) 3 to – 5
(c) 0 to 5 (d) – 5 to + 3

9. Which of the following is the colligative property ?
(a) Boiling point (b) Vapour pressure
(c) Osmotic pressure (d) Freezing point

10. Oxide which is amphoteric in nature is ..... .
(a) P_4O_6 (b) N_2O_3
(c) Sb_4O_6 (d) Bi_2O_3

11. During osmosis, flow of water through a semipermeable membrane is
(a) from solution having higher concentration only
(b) from both sides of semipermeable membrane
(c) from both sides of semipermeable membrane with unequal flow rates
(d) from solution having lower concentration only

12. The heating of phenyl-methyl ethers with HI produces
(a) ethyl chlorides (b) iodobenzene
(c) phenol (d) benzene

13. Which of the following is the correct IUPAC name for the given ether ?

$$CH_2 = CH — CH_2OCH_3$$

(a) Alkyl methyl ether (b) 1-methoxy-2-propene
(c) 3-methoxy-l-propene (d) Vinyl dimethyl ether

14. What is the coordination number of a unit cell whose packing efficiency is 68% ?
(a) 6 (b) 8 (c) 4 (d) 2

15. Which of the following is a nitric acid anhydride?
(a) NO (b) NO_2 (c) N_2O_5 (d) N_2O_3

16. If molality of the dilute solution is doubled, the value of molal depression constant (K_f) will be
(a) unchanged (b) halved (c) doubled (d) triplet

17. The factor would favour the formation of ammonia in Haber's process is
(a) high pressure (b) low temperature
(c) high volume (d) low pressure

18. Which of the following alcohol does not give a stable compound on dehydration ?
(a) Ethyl alcohol (b) Methyl alcohol
(c) *n*-propyl alcohol (d) *n*-butyl alcohol

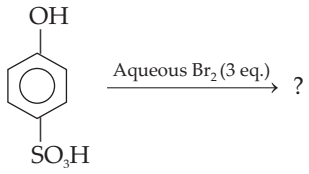
19. On the reaction of bleaching powder with a few drops of conc. HCl …… is produced.
(a) hypochlorous acid (b) oxygen
(c) chlorine (d) calcium oxide

20. Bleaching action of chlorine is due to
(a) reduction (b) hydrogenation
(c) chlorination (d) oxidation

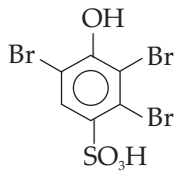
21. Solubility of a substance dissolved in solvent under specific condition depends on
(a) nature of solute (b) nature of solvent
(c) temperature (d) All of the above

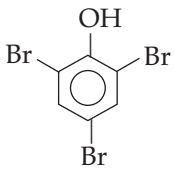
22. In alkaline medium, alanine exists prodominantly as
(a) anion (b) Zwitter ion
(c) cation (d) covalent form

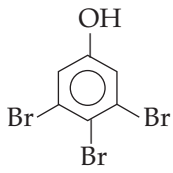
23. Consider the following reaction,

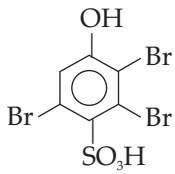


The major product formed in the above reaction is

(a) 

(b) 

(c) 

(d) 

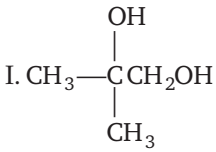
24. Tertiary butyl alcohols gives tertiary butyl chloride on treatment with
(a) conc. HCl / anhydrous $ZnCl_2$ (b) KCN
(c) NaOCl (d) Cl_2

25. Which of the following linkage is present between the monomers of polysaccharides ?
(a) Glycosidic linkage (b) Peptide linkage
(c) Nucleosidic linkage (d) None of the above

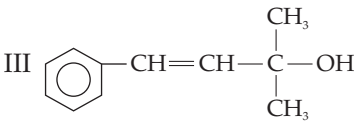
Section B

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. Consider the following

I. 

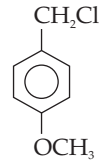
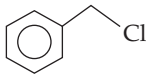
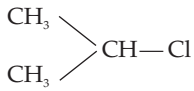
II. $CH_2=CH-CH_2OH$

III 

Among the given compounds, the allylic alcohol are

(a) II and III
(b) I and III
(c) I only
(d) I, II and III

27. Consider the following compounds,

I. 
II. 
III. 

The increasing order of the S_N1 reactivity of the given compound is

(a) I < II < III
(b) II < I < III
(c) III < II < I
(d) I < III < II

28. Which of the following option is correct about DNA ?

(a) Uracil and adenine : cytosine and guanine
(b) Adenine and thymine : guanine and cytosine
(c) Adenine and thymine : guanine and uracil
(d) Adenine and guanine : thymine and cytosine

29. Which of the following is the example of Wurtz-Fittig reaction?

(a) $CH_3I + 2Na + ICH_3 \longrightarrow CH_3CH_3 + 2NaI$
(b) $C_6H_5I + Cu + IC_6H_5 \longrightarrow C_6H_5—C_6H_5 + CuI_2$
(c) $C_6H_5I + 2Na + ICH_3 \longrightarrow C_6H_5—CH_3 + 2NaI$
(d) None of the above

30. In the following table, dimensions and angles of various crystals are given. Complete the table by filling the blanks.

S.No.	Type of crystal	Axial distance	Axial angles
1.	Tetragonal	…(*i*)…	$\alpha = \beta = \gamma = 90°$
2.	Monoclinic	$a \neq b \neq c$	…(ii)…
3.	Hexagonal	$a = b \neq c$	…(iii)…

Choose the correct option.

	(i)	(ii)	(iii)
(a)	$a = b \neq c$	$\alpha = \gamma = 90°, \beta \neq 90°$	$\alpha = \beta = 90°, \gamma = 120°$
(b)	$a \neq b \neq c$	$\alpha = \beta = \gamma = 90°$	$\alpha = \gamma = 90°, \gamma \neq 120°$
(c)	$a \neq b = c$	$\alpha = \beta = 90°, \gamma = 120°$	$\alpha = \beta = \gamma = 90°$
(d)	$a \neq b \neq c$	$\alpha \neq \beta \neq \gamma, \gamma \neq 90°$	$\alpha = \beta = \gamma = 90°$

31. The solubility of $Ba(OH)_2 \cdot 8H_2O$ in water is 5.6 g per 100 g water at 288 K. The molality of hydroxide ion in saturated solution of $Ba(OH) \cdot 8H_2O$ at that temperature is

(a) 0.356 m
(b) 3.56 m
(c) 5.36 m
(d) 6.5 m

32. An element with density 2.8 g cm^{-3} forms an fcc unit cell with edge length 4×10^{-8} cm. The molar mass of the element .... g/mol $(N_A = 6.022 \times 10^{23}\ mol^{-1})$

(a) 27 (b) 30
(c) 28 (d) 25

33. Which of the following is not the characteristics of interhalogen compounds ?

(a) They are ionic in nature
(b) They are highly stable
(c) They are more reactive than halogens
(d) None of the above

34. The partial pressure of ethane over a saturated solution containing 6.56×10^{-3} g of ethane is 1 bar. If the solution were to contains 5.0×10^{-2} g of ethane, then what will be the partial pressure of the gas ?

(a) 6.72 bar (b) 7.62 bar
(c) 2.76 bar (d) 8.62 bar

35. The species, having bond angles of 120° is …… .

(a) PH_3 (b) ClF_3
(c) NCl_3 (d) BCl_3

36. Which of the following statements is incorrect ?

(a) Sulphur shows maximum covalency of four
(b) Ozone can be easily detected by mercury
(c) Both sulphurous and sulphuric acid are dibasic in nature
(d) Both (a) and (c) are incorrect

37. The incorrect statement regarding hexagonal close packing is

(a) atom occupy 74% the available space.
(b) it is *ABAB* type packing in which third layer is aligned with first layer.
(c) Be, Mg, Mo etc., are found to have hcp structure.
(d) coordination number is 6.

38. Noble gases do not react with other elements because

(a) they are monoatonic
(b) they are found in abundance
(c) the size of their atoms is very small
(d) they are completely paired up and have stable electron shell

39. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution the oxidation number of chlorine changes from

(a) 0 to +1 and 0 to –5 (b) 0 to –1 and 0 to +5
(c) 0 to –1 and 0 to +3 (d) 0 to +1 and 0 to –3

40. Consider the following reaction, Chlorobenzene + Mg $\xrightarrow{\text{Dry ether}}$ (*A*) $\xrightarrow{\text{Ethanol}}$ (*B*).

Identify the compound (*A*) and (*B*).

(a) *A* = Benzene and *B* = Ethyl benzene
(b) *A* = Phenyl magnesium chloride and *B* = Benzene
(c) *A* = Benzene and *B* = Phenol
(d) *A* = Phenyl magnesium chloride and *B* = Phenyl ether

41. Indicate which set of the reagents amongst the following is ideal to be used to convert propene into 1-propanol by oxidation.

(a) $KMnO_4$ (alkaline) (b) Osmium tetraoxide

(c) B_2H_6 and H_2O_2 (d) O_3/Zn

42. In the following reaction, identify *A* and *B*

$$C_6H_{12}O_6 \xrightarrow{HI,\ \Delta} (A)$$
$$\downarrow Br_2 \text{ / water}$$
$$(B)$$

(a) $A = CH_3(CH_2)_4CH_3$, $B = COOH(CHOH)_4CH_2OH$

(b) $A = COOH—(CH_2)_4—COOH$, $B = OHC—(CHOCOCH_3)_4—CH_2OCOCH_3$

(c) $A = OHC—(CHOCOCH_3)_3—CH_2OCOCH_3$, $B = COOH(CH_2)_4CHO$

(d) $A = OHC—(CHOCOCH_3)_4—CH_2OCOCH_3$, $B = COOH(CH_2)_4COOH$

43. Reaction of phenol with chloroform in the presence of dilute sodium hydroxide finally introduces which one of the following functional group.

(a) $—CH_2Cl$ (b) —COOH

(c) $—CHCl_2$ (d) —CHO

44. Which of the following statements is not true for halogens ?

(a) Except fluorine, all halogens show negative oxidation states

(b) All are oxidising agents

(c) All form monobasic oxyacids

(d) Chlorine has the highest electron gain enthalpy

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** Quartz glass is crystalline solid and quartz is an amorphous solid.

Reason Quartz glass, have long range order.

46. **Assertion** The preservation of meat by salting protects them from bacterial action.

Reason The bacteria on salted fruit loss water through osmosis.

47. **Assertion** Acidic character of group 16 hydrides decreases from H_2O to H_2Te.

Reason Thermal stability of hydrides decreases down the group.

48. **Assertion** Picric acid is a strong acid than phenol inspite of absence of carboxylic group.

Reason Three $—NO_2$ group in picric acid activate the phenolate ion.

49. **Assertion** F-atom has less negative electron affinity than Cl-atom.

Reason Additional electrons are repelled more effectively by 2*p*-electrons in F than by 3*p* -electrons in Cl-atom.

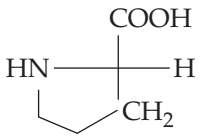
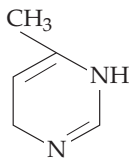
Section C

*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. Complete the following analogy :
Point defects that do not disturb the ratio between the cations and anions in a molecular formula of solid : *A* : : Point defect that leads to change in the composition of solids : *B*
(a) *A* : Intrinsic :: *B* : Thermodynamic defects
(b) *A* : Intrinsic defects :: *B* : Non-stoichiometric defects
(c) *A* : Thermodynamic defects :: *B* : Intrinsic defects
(d) *A* ; Non-stoichiometric defects :: *B* : Intrinsic defects

51. Which of the following analogies is correct ?
(a) He : Used in diving apparatus :: Rn : Radioactive element
(b) XeF_4 : Square planar :: XeF_6 : Square planar
(c) Ne : $[He]2s^2 2p^6$ :: O : $[Ne]3s^2 3p^4$
(d) None of the above

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

	Column I (Name of amino acid)		**Column II** (Structure of amino acid)
I.	Histidine	A.	
II.	Proline	B.	
III.	Cysteine	C.	$HS—CH_2—R$

Codes

	I	II	III
(a)	B	A	C
(c)	C	A	B

	I	II	III
(b)	A	C	B
(d)	A	B	C

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

Halogens, being among the most electronegative elements, have great tendency to form various derivatives of organic compounds. These derivatives are of great importance in terms of day-to-day applications, in synthesis of other useful compounds, in chemical research, etc. They can be synthesised in laboratories and are also found in nature.

These compounds persist in the environment due to their resistance to breakdown by soil bacteria. They have great importance in medicines as well as in healthcare, e.g. chloroquine is used in the treatment of malaria and haloethane ($CF_3CHClBr$) is used as an anaesthetic in surgery.

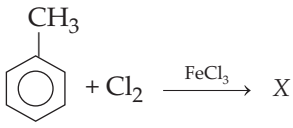
The replacement of hydrogen atom(s) from a hydrocarbon, aliphatic or aromatic by halogen atom(s) (i.e. F, Cl, Br, I) results in the formation of alkyl halide (haloalkane) and aryl halide (haloarene), respectively.

Haloarenes contain halogen atom(s) attached to sp^2-hybridised carbon atom(s) of an aryl group. Haloarenes can be prepared by electrophilic substitution of aromatic hydrocarbons, from diazonium salts etc. Haloarenes show nucleophilic substitution reactions but under very drastic conditions. This is due to resonance effect, difference in hybridisation of carbon atom in C—*X* bond, unstability of phenyl cation and repulsion between the electron rich attacking nucleophiles and electron rich arenes.

53. Among the following, which one has the weakest carbon-halogen bond ?

(a) Benzyl bromide
(b) Bromobenzene
(c) Vinyl bromide
(d) Benzyl chloride

54. In the reaction,



X in the above reaction is

(a) benzyl chloride
(b) can be *o*- or *p*-chlorotoluene
(c) benzoyl chloride
(d) *m*-chlorotoluene

55. Chlorobenzene can be prepared by reacting aniline with

(a) cuprous chloride
(b) chloride in presence of anhydrous aluminium chloride
(c) hydrochloric acid
(d) nitrous acid followed by heating with cuprous chloride.

Answers

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

EXPLANATIONS

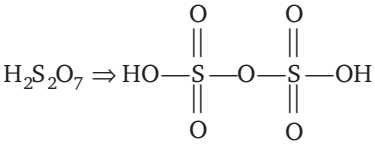
1. Schottky defect is a type of vacancy defect, which arises when equal number of cations and anions are missing from their lattice site in a crystal.

2. Benzene and methanol shows a positive deviation from Raoult's law.

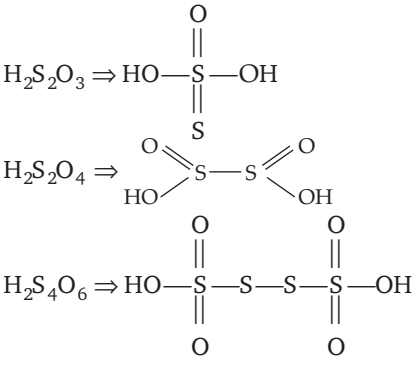
In case of positive deviation from Raoult's law, intermolecular interactions, i.e. $A-B$ interaction are weaker than those between $A-A$ or $B-B$, i.e. the intermolecular attractive forces between the solute and solvent molecules are weaker than those between solute-solute and solvent-solvent molecules.

In case of benzene-methanol solution, benzene-benzene interaction and methanol-methanol interactions are stronger than benzene-methanol interaction. Hence, their solution shows positive deviation from Raoult's law.

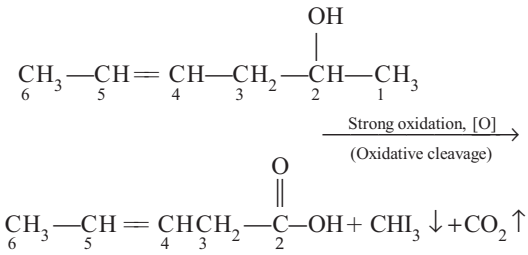
3. Among the given oxyacids of sulphur, S—S bond is not present in $H_2S_2O_7$ (pyrosulphuric acid or oleum). Its structure is as follows



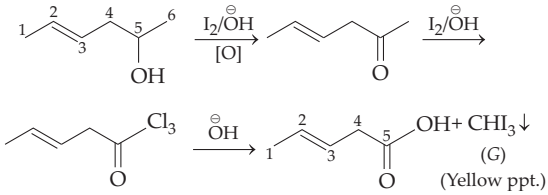
While in other given oxoacids, S—S bonds are present. Their structures are as follows :



4. The most suitable reagent to carry out given transformation is I_2/NaOH

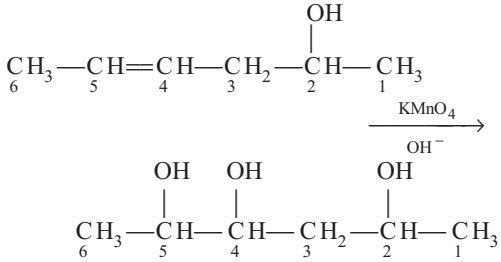


Here, the haloform reaction will give following reaction:



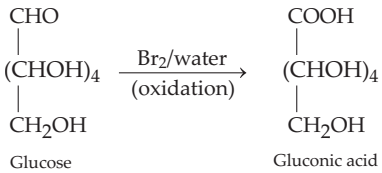
(i) Tollen's reagent ($AgNO_3 + NH_4OH$) is a mild oxidising agent. It does not react with —CH—CH_3 group (2°-alcohol).

(ii) Alkaline $KMnO_4$ cannot perform the oxidative cleavage, rather it will hydroxylate the C═C.



(iv) CrO_2Cl_2 / CS_2 will not react here.

5. Br_2 / H_2O reagent is used for the conversion of glucose to gluconic acid. The reaction involved is as follows



6. Isobutene $\begin{matrix} H_3C \\ H_3C \end{matrix}\!\!>\!C{=}CH_2$ has minimum force of attraction due to steric hindrance and has branched chain structure. Thus, minimum boiling point.

7. Y occupies ccp lattice, $Z = 4$

X occupies of tetrahedral voids generated in any unit cell $= 2Z$

$$= 2 \times 4 = 8$$

Since X occupies $\frac{2}{3}$ of tetrahedral voids, so

effective number of $X = \frac{2}{3} \times 8 = \frac{16}{3}$

Thus, $X = \frac{16}{3}$ and $Y = 4$

$\Rightarrow$ Simplest formula is X_4Y_3.

8. Nitrogen shows different oxidation states in the range of -3 to $+5$.

Nitrogen has 5 valence electrons ($2s^2 2p^3$) and to achieve the nearest noble gas configuration, either it can 3 electrons, so charge on it will be -3 or it can lose 5 electrons, so charge on N will be $+5$.

9. Osmotic pressure is an example of colligative property because its value depends only on the number of moles of solue, not on their chemical nature.

10. On moving down the group, the acidic character of the oxides decreases and basic character increase because the electronegativity decreases down the group. As electronegativity decreases, the metallic character increases and therefore basic character increases (because metallic oxides are basic in nature).

So, the order of acidity of oxides is :

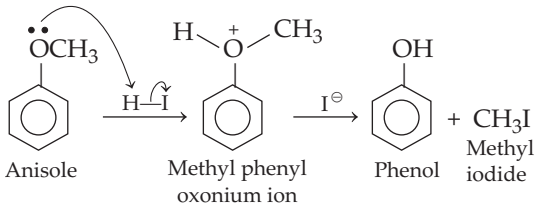
$$\underbrace{N_2O_3 > P_4O_6}_{\text{Acidic}} > \underbrace{As_4O_{10} > Sb_4O_{10}}_{\text{Amphoteric}} > \underbrace{Bi_2O_3}_{\text{Basic}}$$

Hence, Sb_4O_6 is an amphoteric in nature.

11. During osmosis, flow of water through a semipermeable membrane is from solution having lower concentration only.

12. In phenyl methyl ether (anisole), methyl phenyl oxonium ion is formed by protonation of ether. The bond between O—CH_3 is weaker than the bond between O—C_6H_5 because the carbon of phenyl group is sp^2 - hybridised and there is a partial double bond character.

Thus, the final product of the reaction is phenol and alkyl halide.



13. $\overset{1}{CH_2}{=}\overset{1}{CH}{-}\overset{3}{CH_2}OCH_3$

3-methoxy-1-propene.

14. The packing efficiency of 68% is found in case of bcc structure, where its coordination number is 8 and number of atoms per unit cell is 2.

15. N_2O_5 (dinitrogen pentaoxide) is prepared by dehydrating the concentrated nitric acid with phosphorous pentoxide.

$4HNO_3 + P_4O_{10} \longrightarrow 2N_2O_5 + HPO_3$

Thus, N_2O_5 is regarded as anhydride of HNO_3.

16. For a dilute solution, the depression in freezing poin (ΔT_f) is directly proportional to molality (m) of the solution.

$$\Delta T_f \propto m \text{ and } \Delta T_f = K_f m$$

where, K_f is called molal depression constant or freezing point depression constant. The value of K_f depends only on nature of the solvent and independent of composition of solute particles, i.e. does not depend on the concentration of solution.

17. According to Le-Chatelier's principle, high pressure would favour the formation of NH_3 because by increasing pressure, the equilibrium will shift to the side with fewer moles of gas (towards ammonia).

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

18. Dehydration of CH_3OH will give methylene (a carbene) which is unstable. The reaction involved is as follows

$$\underset{\text{Methyl alcohol}}{CH_3OH} \xrightarrow{H_2SO_4} \underset{\text{(Unstable)}}{:CH_2} + H_2O$$

19. When bleaching powder is treated with small amount of conc. HCl, then calcium chloride, chlorine and water are produced. The reaction involved is as follows

$$\underset{\text{Bleaching powder}}{CaOCl_2} + \underset{\text{Hydrochloric acid}}{2HCl} \longrightarrow \underset{\text{Calcium chloride}}{CaCl_2} + \underset{\text{Chlorine}}{Cl_2} + \underset{\text{Water}}{H_2O}$$

20. When chlorine reacts with water, it gives nascent oxygen which bleaches the coloured substances.

$$H_2O + Cl_2 \longrightarrow 2HCl + [O]$$

Coloured substance + [O] ⟶ Colourless substance

21. Solubility of a substance depends on all the given options.

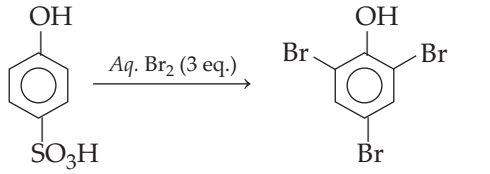
- **Nature of gas and liquid** The solubility of different gases in same solvent varies. e.g. gases like hydrogen, oxygen, nitrogen and helium, etc. dissolve in water to small extent whereas the gases like NH_3, HCl, SO_2 etc. are highly soluble in water.
- **Effect of temperature** The solubility of a gas decreases with increase in pressure.
- **Effect of pressure** The solubility of gas decreases with increase in temperature.

22. In alkaline medium, alanine exists as anion

$$CH_3-\underset{\underset{COOH}{|}}{CH}-NH_2 \xrightarrow[pH>7]{\text{Basic medium}} CH_3\underset{\underset{COO^-}{|}}{CH}-NH_2$$

(Alanine) (Anion)

23. Benzene sulphonic acid on reaction with *aq.* Br_2(3 eq.) gives 2, 4, 6-tribromophenol.



Benzene sulphonic acid 2, 4, 6- tribromophenol

24. *t*-butyl alcohols give tertiary butyl chloride on treatment with conc. HCl / anhyd. $ZnCl_2$.

$$\underset{\underset{CH_3}{|}}{H_3C-\overset{\overset{CH_3}{|}}{C}-OH} \xrightarrow[\text{Anhyd. } ZnCl_2]{\text{Conc. HCl,}} \underset{\underset{CH_3}{|}}{H_3C-\overset{\overset{CH_3}{|}}{C}-Cl}$$

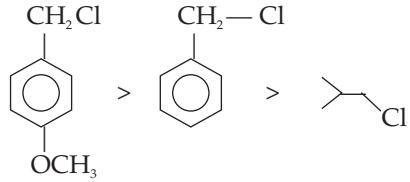
t-butyl alcohol *t*-butyl chloride

25. Glycosidic linkage The two monosaccharide units are joined together through an oxide linkage which is formed by the loss of a water molecule. Such a linkage between two monosaccharide units through an oxygen atom is called glycosidic linkage.

26. Allylic alcohol is an organic compound in which —OH group is attached to sp^2 hybridised carbon next to C=C, i.e. to an allylic carbon. So, among the given compounds, (II) and (III) are allylic alcohols.

27. 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 halides and faster will be the rate of reaction. So, the correct order of S_N1 reactivity is



(I) (II) (III)

28. Correct base pair in DNA is : Adenine and thymine : guanine and cytosine.

29. Wurtz-fittig reaction is the chemical reaction of aryl halides with alkyl halides and sodium metal in the presence of dry ether to give substituted aromatic compounds. From the given options option (c) is an example of Wurtz-fittig reaction.

$$C_6H_5I + 2Na + ICH_3 \longrightarrow C_6H_5-CH_3 + 2NaI$$

30.

Type of crystal	Axial distance	Axial angle
Tetragonal	$a = b \neq c$	$\alpha = \beta = \gamma = 90°$
Monoclinic	$a \neq b \neq c$	$\alpha = \gamma = 90°, \beta \neq 90°$
Hexagonal	$a = b \neq c$	$\alpha = \beta = 90°, \gamma = 120°$

31. Molar mass of $Ba(OH)_2 \cdot 8H_2O$

$$= 137 + 2 \times 17 + 8 \times 18 = 315 \text{ g mol}^{-1}$$

$\therefore$ 100 g water has 5.6 g of $Ba(OH)_2 \cdot 8H_2O$

$\therefore$ 1000 g water will have $Ba(OH)_2 \cdot 8H_2O$ = 56 g

Number of moles of $Ba(OH) \cdot 8H_2O$ is 1 kg of water $= \frac{56}{315} = 0.178$ mol

As, molality is moles of solute per kg of solvent. Thus, molality of $Ba(OH)_2$= 0.178 m

$$Ba(OH)_2 \cdot 8H_2O \longrightarrow Ba^{2+} + 2OH^- + H_2O$$

That means, 1 mole of $Ba(OH)_2 \cdot 8H_2O$ produces 2 moles of $\bar{O}H$ ions.

Molality of OH^- ions = 2 × molality of $Ba(OH)_2$

$$= 2 \times 0.178$$

$$= 0.356 \text{ m}$$

32. Given that, density $d = 2.8 \text{ g cm}^{-3}$

Edge length, $a = 4 \times 10^{-8}$ cm and for fcc, $Z = 4$

Applying the formula,

$$\Rightarrow \quad d = \frac{ZM}{a^3 \times N_A}$$

$$M = \frac{da^3 N_A}{Z}$$

$$M = \frac{2.8 \times (4 \times 10^{-8})^3 \times 6.022 \times 10^{23}}{4}$$

$$= 26.98 \simeq 27 \text{ g mol}^{-1}$$

33. Among the given characteristics, option (c) is not true about interhalogen compounds.

The interhalogen compounds are highly reactive as compared to halogens.

34. According to Henry's law ,

$$m \propto p \Rightarrow m = Kp$$

$$6.56 \times 10^{-3}\ \text{g} = K \times 1\ \text{bar}$$

$$K = 6.56 \times 10^{-3}\ \text{g bar}^{-1}$$

When $m' = 5 \times 10^{-2}$ g, $p' = ?$

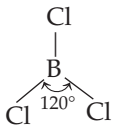
$$m' = K \times p'$$

$$5 \times 10^{-2}\ \text{g} = 6.56 \times 10^{-3}\ \text{g bar}^{-1} \times p'$$

$$p' = \frac{5 \times 10^{-2}}{6.56 \times 10^{-3}}$$

$$= 7.62\ \text{bar}$$

35. BCl_3 has bond angle of 120°.



36. Option (a) is incorrect while other are correct statements. Its correct form is as follows :

Since, the total number of unpaired electrons are 6, therefore, the maximum number of covalent bonds that sulphur can be formed are 6. Hence, sulphur shows maximum covalency of six.

37. Option (d) is incorrect while other are correct statement. Its correct is are as follows :

Coordination number of hcp is 12 as there are 12 atoms in coordination with each atom in hcp structure.

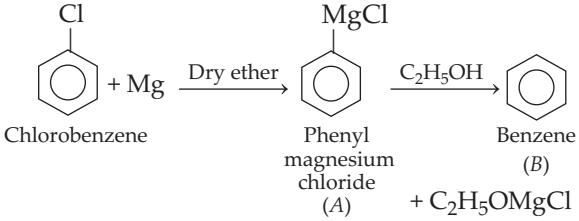
38. They have completely filled ns^2np^6 electronic configuration of their valence shells. Thus, they are not much reactive.

Also, they have very high I. E and almost zero electron affinity.

39. When Cl_2 gas reacts with hot and concentrated sodium hydroxide solution the oxidation number of chlorine changes from 0 to −1 and 0 to +5.

$$3\overset{0}{Cl_2} + 6NaOH \longrightarrow \overset{+5}{NaClO_3} + 5\overset{-1}{NaCl} + 3H_2O$$

40.



41. $3CH_3CH{=}CH_2 \xrightarrow{B_2H_6} (CH_3 - CH_2 - CH_2)_3B$

Propene — Tripropyl borane

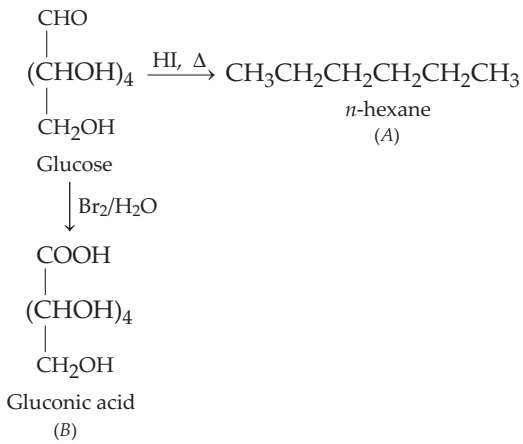
$$\xrightarrow{H_2O_2/OH^-} CH_3 - CH_2 - CH_2 - OH$$

1-propanol

Here, half mol of (B_2H_6) diborane reacts with propene by Markownikoff's addition and it gives tripropyl borane called hydroboration. In presence of H_2O_2 in basic medium, tripropyl borane gives alcohol.

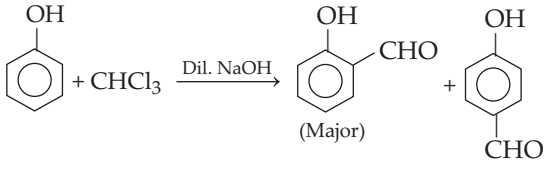
Remember that product is anti-Markownikoff's rule that is 1-propanol. Reaction is called hydroboration-oxidation.

42.



Here, A = *n*-hexane and B = Gluconic acid.

43. Reaction of phenol with chloroform in the presence of dilute NaOH finally introduce —CHO group. The reaction involve is as follows



44. (a) Fluorine is the most electronegative element and cannot exhibit any positive oxidation state. Other halogens have *d*-orbitals and therefore, can expand their octets and show +1, +3, +5 and +7 oxidation states. Thus, option (a) is incorrect.

Note Fluorine can form an oxoacid, HOF in which oxidation state of F is +1. But HOF is highly unstable compound.

(b) All halogens are strong oxidising agents as they have strong tendency to accept an electron. Thus, option (b) is correct.

(c) All halogens form monobasic oxyacids. Thus, option (c) is also correct.

(d) Electron gain enthalpy of halogens become less negative down the group. However, the negative electron gain enthalpy of fluorine is less than chlorine due to small size of fluorine atom. Thus, option (d) is also correct.

45. A is false but R is true.

The structure of quartz is crystalline and that of quartz glass is amorphous and quartz glass have long range order.

46. Both A and R are true and R is the correct statement explanation for A.

Due to osmosis bacteria lose water on salted meat, shrink and die.

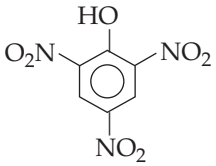
47. A is false but R is a correct statement. Acidic character increases from H_2O to H_2Te.

The increase in acidic character can be explained in terms of decrease in bond enthalpy for the dissociation of H - *E* bond down the group.

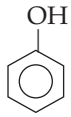
As the atomic size increases down the group, the bond length increases and hence, the bond strength decreases, thereby leading to the decrease in bond enthalpy down the group.

Consequently, the cleavage of *E* - H bond become easier. As a result, the tendency to release hydrogen as proton increases. i.e acidic strength increases down the group.

48. Both A and R are true and R is the correct explanation for A.



Picric acid



Phenol

Due to the presence of three electron withdrawing $-NO_2$ group in picric acid, H^+ can easily be removed.

49. Both A and R statements are true and R is the correct explanation for A.

Generally, electron gain enthalpy become less negative on moving from chlorine to iodine. However, negative electron gain enthalpy of fluorine is less than that of chlorine due to small size of fluorine atom. It has very high inter-electronic repulsions in the relatively small 2*p*-orbitals.

Hence, incoming electron experiences less attraction from the nucleus.

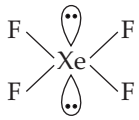
50. **Stoichiometric defects** (intrinsic or thermodynamic defects). A type of point defects that do not disturb the stoichiometric of the solid.

Non-stoichiometric defects A type of defects/ imperfections in the crystals which lead to change in the composition of solid.

51. (a) Only option (a) is correct.
Correct analogies of other options are as follows :

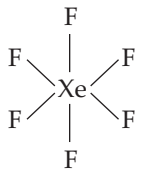
(b) XeF_4 is squar planar in shape and XeF_6 is distorted octahedral in shape.

Structure of XeF_4



Square planar

Structure of XeF_6



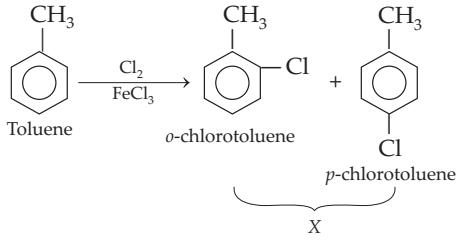
Distorted octahedral

(c) $Ne = [He]\,2s^2 2p^6 :: O : [He]\,2s^2 2p^4$

52. I - B : II - A ; III - C.

53. C—*X* bond in benzyl bromide is much weaker than in vinyl bromide and bromobenzene since the benzyl cation left after the removal of the bromide ion is stabilised by resonance. Further C—Br bond is weaker than C—Cl bond due to larger size of Br. Therefore, $C_6H_5CH_2Br$ has the weakest C—*X* bond.

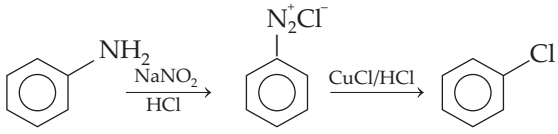
54. In the given reaction, *o* - and *p*-chlorotoluene is formed.



Toluene — *o*-chlorotoluene — *p*-chlorotoluene

X

55. Chlorobenzene can be prepared by reacting aniline with nitrous acid followed by heating with cuprous chloride.



Aniline — Benzene diazonium salt — Chlorobenzene