CBSE
Class XII Chemistry
Board Paper (Term 1 – 2021)

Time: 90 minutes **Total Marks: 35**

General Instructions:

- *This question paper contains, **55** questions out of which **45** questions are to be attempted*
- *All question carry **equal marks.***
- *This question paper consists of three Sections - **Section A, B,** and **C.***
- *Section **A** contains **25** questions Attempt any **20** question from Q. No. **1** to **25**.*
- *Section **B** contains **24** questions Attempt any **20** questions from Q. No. **26** to **49**.*
- *Section **C** contains **6** questions Attempt any **5** questions from Q. No. **50** to **55**.*
- *The first **20** questions attempted in **Section A** and **Section** B and first **5** questions attempted in **Section C** by a candidate will be evaluated.*
- *There is only one correct option for emery multiple choice question (MCQ). Marks will not be awarded for answering more than one option.*
- *There is no negative marking.*

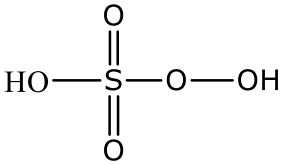
SECTION A

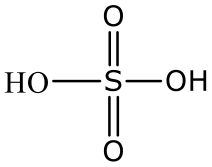
This section consists of **25** multiple choice questions with overall choice to attempt any **20** questions. In caw more than desirable number of questions are attempted. ONLY first 20 will be considered for evaluation.

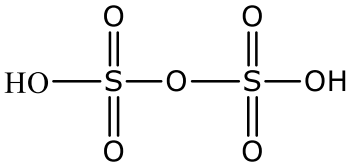
1. Which one of the following pairs will form an ideal solutions?
(A) Chloroform and acetone
(B) Ethanol and acetone
(C) n-hexane and n-heptane
(D) Phenol and aniline

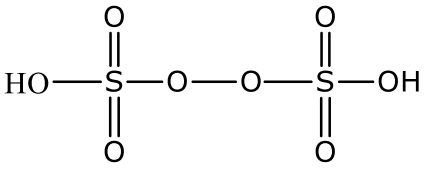
2. Which of the following is known as amorphous solid?
(A) Glass
(B) Plastic
(C) Rubber
(D) All of the above

3. The structure of pyrosulphuric acid is

(A) 

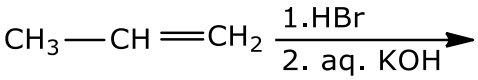
(B) 

(C) 

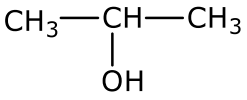
(D) 

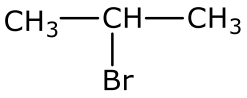
4. The C-O-H bond angle in alcohol is
(A) Slightly greater than 109°28'.
(B) Slightly less than 109°28'.
(C) Slightly greater than 120°
(D) Slightly less than 120°

5. Consider the following reaction:



The major end product is

(A) 

(B) 

(C) CH_3-CH_2-CH_2-OH
(D) CH_3-CH_2-CH_2-Br

6. Nucleosides are composed of
(A) a pentose sugar and phosphoric acid
(B) a nitrogenous base and phosphoric acid
(C) a nitrogenous base and a pentose sugar
(D) a nitrogenous base, a pentose sugar and phosphoric acid

7. The oxidation state of -2 is most stable in:
(A) O
(B) S
(C) Se
(D) Te

8. Which of the following is not a characteristic of a crystalline solid?
(A) A true solid
(B) A regular arrangement of constituent particles
(C) Sharp melting point
(D) Isotropic in nature

9. Which of the following formula represents Raoult's law for a solution containing non-volatile solute?
(A) $P_{solute} = P^{o}_{solute} - X_{solute}$
(B) $P = K_{H.X}$
(C) $P_{Total} = P_{solvent}$
(D) $P_{solute} = P^{o}_{solvent} - X_{Solvent}$

10. An azeotropic solution of two liquids has a boiling point lower than either of the two when it
(A) Shows a positive deviation from Raoult's law.
(B) Shows a negative deviation from Raoult's law.
(C) Shows no deviation from Raoult's law.
(D) is saturated.

11. Which of the following crystal will show metal excess defect due to extra cation?
(A) AgCl
(B) NaCl
(C) FeO
(D) ZnO

12. Which of the following acids reacts with acetic anhydride to from a compound Aspirin?
(A) Benzoic acid
(B) Salicylic acid
(C) Phthalic acid
(D) Acetic acid

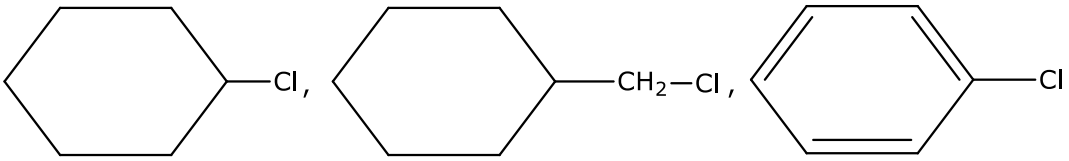
13. Which of the following statement is wrong?
(A) Oxygen shows $p\pi - p\pi$ bonding.
(B) Sulphur shows little tendency of catenation.
(C) Oxygen is diatomic whereas Sulphur is polyatomic.
(D) O-O bond is stronger than S-S bond.

14. Amino acids which cannot be synthesized in the body and must be obtained through diet are known as
(A) Acidic amino acids
(B) Essential amino acids
(C) Basic amino acids

15. Which one of the following halides contains $C_{sp^2} - X$ bond?
(A) Allyl halide
(B) Alkyl halide
(C) Benzyl halide
(D) Vinyl halide

16. On mixing 20 mL of acetone with 30 mL of chloroform, the total volume of the solution is
(A) < 50 mL
(B) = 50 mL
(C) > 50 mL
(D) = 10 mL

17. Consider the following compounds:



I II III

The correct order of reactivity towards S_{N2} reaction
(A) I > III > II
(B) II > III > I
(C) II > I > III
(D) III > I > II

18. Which of the following forms strong $p\pi - p\pi$ bonding?
(A) S_8
(B) Se_8
(C) Te_8
(D) O_2

19. F_2 acts as a strong oxidising agent due to
(A) Low Δ_{bond} H° and low Δ_{hyd} H°
(B) Low Δ_{bond} H° and low Δ_{hyd} H°
(C) High Δ_{bond} H° and high Δ_{eg} H°
(D) Low Δ_{hyd} H° and low Δ_{eg} H°

20. Which of the following sugar is known as dextrose?
(A) Glucose
(B) Fructose
(C) Ribose
(D) Sucrose

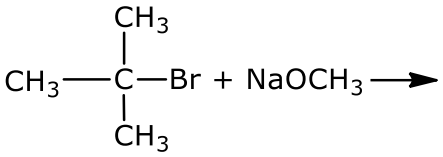
21. Cu reacts with dilute HNO_3 to evolve which gas?

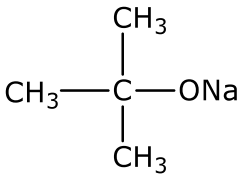
(A) N_2O
(B) NO_2
(C) NO
(D) N_2

22. Which of the following is a network solid?

(A) SO_2
(B) SiO_2
(C) CO_2
(D) H_2O

23. Major product formed in the following reaction



(A)


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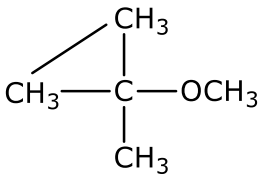

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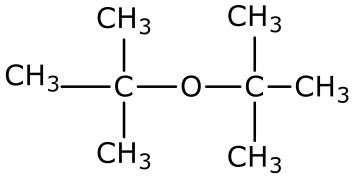
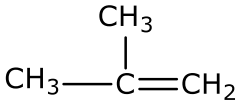


(D)


24. Chlorine reacts with cold and dilute NaOH to give

(A) NaCl and $NaClO_3$
(B) NaCl and NaClO
(C) NaCl and $NaClO_4$
(D) NaClO and $NaClO_3$

25. Elevation of boiling point is inversely proportional to

(A) Molal elevation constant (K_b)
(B) Molality (m)
(C) Molar mass of solute (M)

SECTION B

*This section consist of **24** multiple choice question 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. An unknown gas 'X' is dissolved in water at 2.5 bar pressure and has mole fraction 0.04 is solution. The mole fraction of 'X' gas when the pressure of gas is doubled at the same temperature is
(A) 0.08
(B) 0.04
(C) 0.02
(D) 0.92

27. The base which is present in DNA but not in RNA, is
(A) Cytosine
(B) Guanine
(C) Adenine
(D) Thymine

28. In the following reaction $CH_3 - CH = CH - CH_2 - OH \xrightarrow{PCC}$
The product formed is
(A) CH_3-CHO and CH_3CH_2OH
(B) CH_3-CH= CH- COOH
(C) CH_3 – CH= CH-CHO
(D) CH_3-CH_2-CH_2-CHO

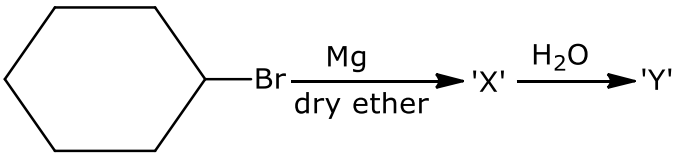
29. Enantiomers differ only in
(A) boiling point
(B) rotation of polarised light
(C) melting point
(D) solubility

30. The number of lone pairs of electrons in XeF_4 is
(A) Zero
(B) One
(C) Two
(D) Three

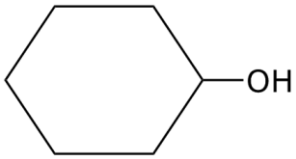
31. Sulphuric acid is used to prepare more volatile acids from their corresponding salts due to its
(A) strong acidic nature
(B) low volatility
(C) strong affinity for water

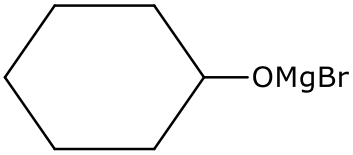
32. An element with density 6 g cm^{-3} forms a fee lattice with edge length of 4×10^{-8} cm. The molar mass of the element is ($N_A = 6 \times 10^{23}$ mol^{-1})

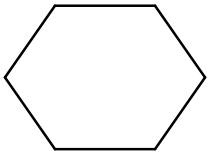
(A) 57.6 g mol^{-1}
(B) 28.8 g mol^{-1}
(C) 82.6 g mol^{-1}
(D) 62 g mol^{-1}

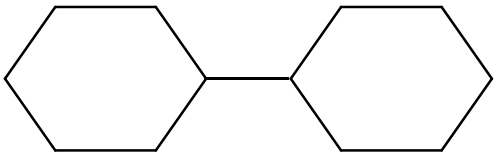
33. In the reaction 

Compound 'Y' is

(A) 

(B) 

(C) 

(D) 

34. Which of the following is the weakest reducing agent in group 15?

(A) NH_3
(B) PH_3
(C) AsH_3
(D) BiH_3

35. The boiling point of a 0.2 m solution of a non-electrolyte in water is (Ks for water = 0.52 K kg mol^{-1})

(A) 100 °C
(B) 100.52 °C
(C) 100.104 °C
(D) 100.26 °C

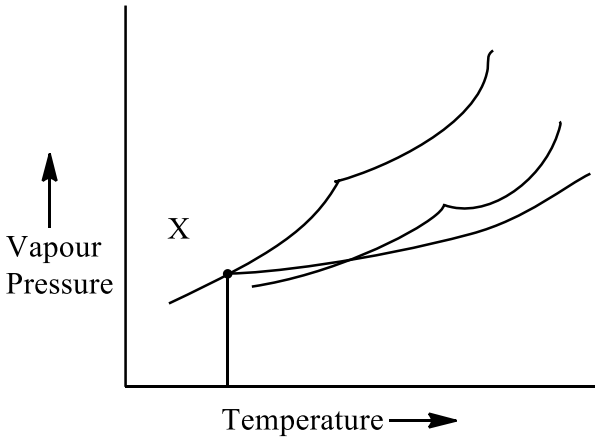
36. Nucleic acids are polymer of

(A) Amino acids
(B) Nucleosides
(C) Nucleotides

37. Which of the following gas dimerises to become stable?

(A) CO_2 (g)
(B) NO_2 (g)
(C) SO_2 (g)
(D) N_2O (g)

38. In the following diagram point, 'X' represents



(A) Boiling point of solution
(B) Freezing point of solvent
(C) Boiling point of solvent
(D) Freezing point of solution

39. XeF_6 on reaction with NaF gives

(A) $Na^+[XeF_7]^-$
(B) $[NaF_2]^-[XeF_5]^+$
(C) $Na^+[XeF_6]^-$
(D) $[NaF_2]^+[XeF_5]^-$

40. Glucose on reaction with Br_2 water gives:

(A) Saccharic acid
(B) Hexanoic acid
(C) Gluconic acid
(D) Salicylic acid

41. Which of the following is optically inactive?

(A) (+)- Butan-2-ol
(B) (-) - Butan-2-ol
(C) (±) - Butan-2-ol
(D) (+) -2 - Bromobutane

42. Which of the following is not a correct statement?

(A) Halogens are strong oxidising agents.

(B) Halogens are more reactive than interhalogens.

(C) All halogens are coloured.

(D) Halogens have maximum negative electron gain enthalpy.

43. Which of the following has highest boiling point?

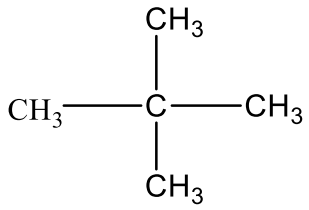
(A) C_2H_5-F

(B) C_2H_5-Cl

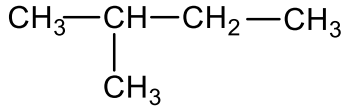
(C) C_2H_5-Br

(D) C_2H_5-I

44. Which of the following isomer of pentane (C_5H_{12}) will give three isomeric monochlorides on photochemical chlorination?

(A) 

(B) $CH_3\ CH_2\ CH_2\ CH_2\ CH_3$

(C) 

(D) All of the above

*Given below are the questions (45-49) labelled as **Assertion (A)** and **Reason (R)**. Select the most appropriate answer from the options given below:*

45. **Assertion (A)**: A raw mango placed in a saline solution loses water and shrivel into pickle.

Reason (R): Through the process of reverse osmosis, raw mango shrivel into pickle.

(A) Both A and R arc true and R is the correct explanation of A.

(B) Both A and R arc true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

46. **Assertion (A):** H_2S is less acidic than H_2Te.

Reason (R): H-S bond has more Δ_{bond} H^o than H-Te bond

(A) Both A and R arc true and R is the correct explanation of A.

(B) Both A and R arc true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

47. **Assertion (A):** Chlorobenzene is less reactive towards nucleophilic substitution reaction.
Reason (R): Nitro group in chlorobenzene increases its reactivity towards nucleophilic substitution reaction.
(A) Both A and R are true and R. is the correct explanation of A.
(B) Both A and R arc true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

48. **Assertion (A):** Due to Schottky defect, there is no effect on the density of a solid.
Reason (R): Equal number of cations and anions arc missing from their normal sites in Schottky defect.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

49. **Assertion (A):** Fluorine forms only one oxoacid HOF.
Reason (R): Fluorine atom is highly electronegative.
(A) Both A and R arc true and R is the correct explanation of A.
(B) Both A and R are true but K is not the correct explanation of A.
(C) A n true but K is false.
(D) A is false but R is true.

SECTION C

*This section consists of **6** multiple choice questions with an overall choice to attempt any **5**. In case more than desirable number of questions are attempted, ONLY first **5** will be considered for evaluation.*

50. Match the following:

I	II
(i) Stoichiometric defects	(A) Crystalline solids
(ii) long range order	(b) F-centres
(iii) ….ABC ABC ABC…….	(c) Schottky and Frenkel defects
(iv) Number of atoms per unit cell=2	(d) fee structure
(v) Metal excess defect due to anionic vacancies	

Which of the following is the best matched options?
(A) (i) - (d), (ii) - (a), (iii) - (b), (iv) - (c)
(B) (i) - (c), (ii) - (a), (iii) - (d), (v) - (b)
(C) (i) - (c), (ii) - (a), (iii) - (d), (iv) - (b)
(D) (i) - (a), (ii) - (b), (iii) - (a), (iv) - (d)

51. Which of the following analogies is correct?

(A) XeF_2 : linear :: XeF_6 square planar

(B) moist SO_2 : Reducing agent :: Cl_2 : bleaching agent

(C) N_2 : Highly reactive gas :: F_2 : inert at room temperature

(D) NH_3 : strong base :: HI : weak acid

52. Complete the following analogy :

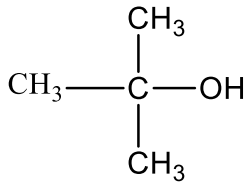
Curdling of milk : A :: u-helix : B

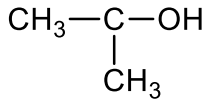
(A)	A : Primary structure	B : Secondary structure
(B)	A : Denatured protein	B : Primary structure
(C)	A : Secondary structure	B : Denatured protein
(D)	A : Denatured protein	B : Secondary structure

Case: Read the passage given helms and answer the following questions (53-55).

Alcohols and Phenols are acidic in nature. Electron withdrawing groups in phenol increase its acidic strength and electron donating groups decrease it. Alcohols undergo nucleophilic substitution with hydrogen halides to give alkyl halides. On oxidation primary alcohols yield aldehydes with mild oxidising agents and carboxylic acids with strong oxidising agents while secondary alcohols yield ketones. The presence of —OH groups in phenols activates the ring towards electrophilic substitution. Various important products are obtained from phenol like salicylaldehyde, salicylic acid, picric acid etc.

53. Which of the following alcohols is resistant to oxidation?

(A) 

(B) 

(C) $CH_3—CH_3—OH$

(D) $CH_3—OH$

54. Which of the following group increases the acidic character of phenol?

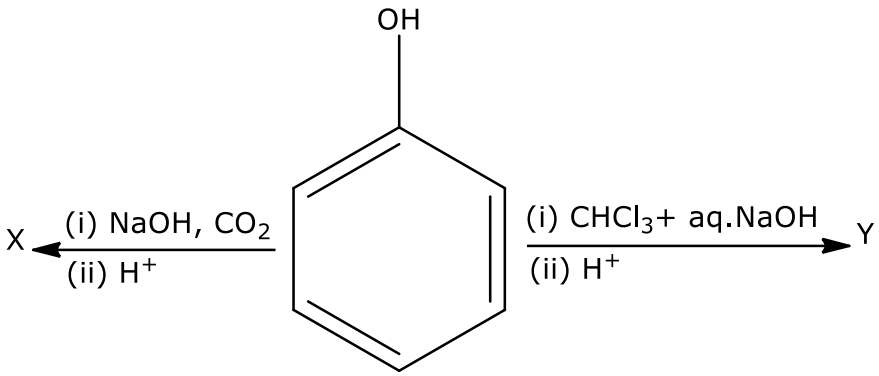
(A) CH_3O-

(B) CH_3-

(C) NO_2-

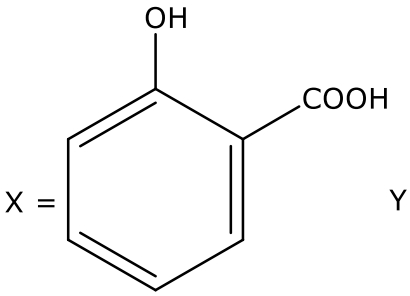
(D) All of these

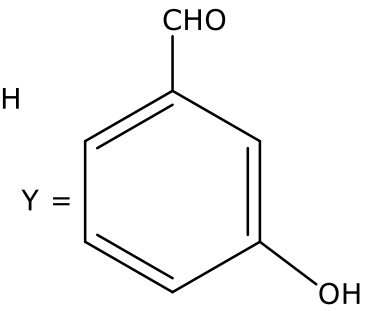
55. Consider the following reaction:



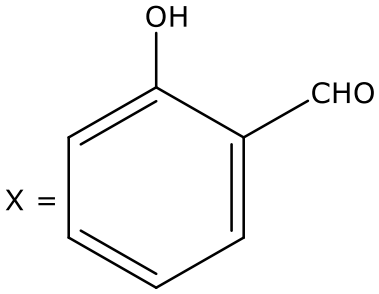
The products X and Y are

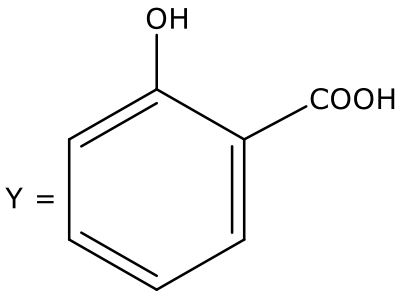
(A)



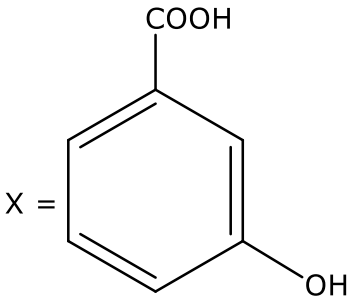


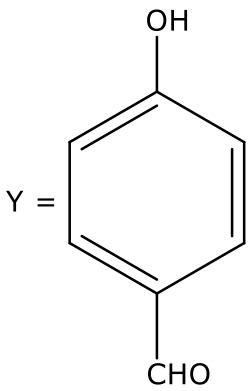
(B)



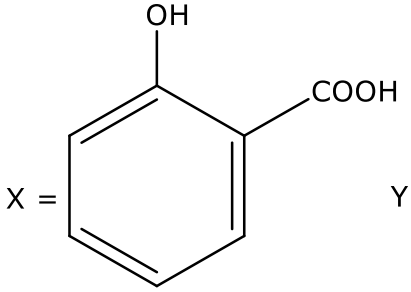


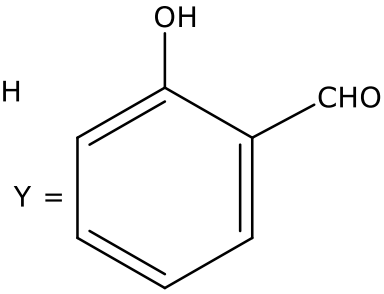
(C)





(D)





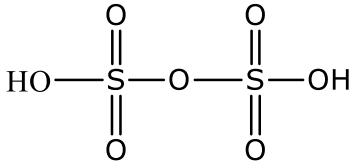
Solution

SECTION A

1. (C) Substances which have similar structures and polarities form ideal solution.

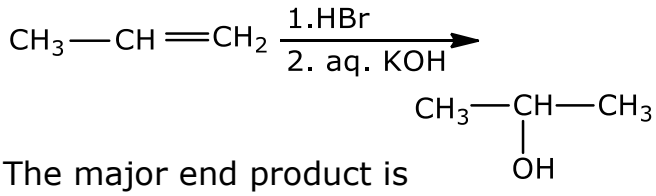
2. (D) Any noncrystalline solid in which the atoms and molecules are not organized in a definite lattice pattern. Glass, Plastic, Rubber are such solids.

3. (C) The structure of pyrosulphuric acid is-



4. (B) In alcohols and ethers, the oxygen atom is sp^3 hybridized. So, according to hybridization, the geometry around oxygen atoms should be tetrahedral and angle should be equal to 109°28′. But in reality it is not seen. The reason is the two lone pairs on the oxygen atom. They cause repulsion to each other and resultive bond angle is slightly less in those compounds.Hence, the C-O-H bond angle in alcohols is slightly less than the tetrahedral angle which is equal to 109° 28′.

5. (A)



The major end product is

6. (C) Nucleosides are composed of a nitrogenous base and a pentose sugar.

7. (A) The oxidation state of -2 is most stable in O atom.

8. (D) Crystalline solids are anisotropic in nature.

9. (D) Raoult's law for solution containing non-volatile solute.

$$P_{solute} = P^{o}_{solvent} \cdot X_{Solvent}$$

10. (A) An azeotropic solution of two liquids has a boiling point lower than either of the two when it shows a positive deviation from Raoult's law.

11. (D) ZnO crystals will show metal excess defect due to extra cation.

12. (B) Salicylic acids reacts with acetic anhydride to from a compound Aspirin.

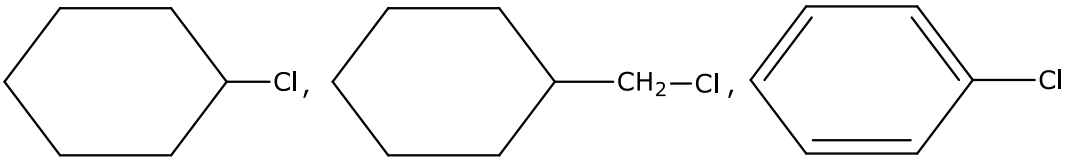
13. (D) S-S bond is stronger than O-O bond.

14. (B) Essential amino acids cannot be synthesized in the body and must be obtained through diet.

15. (D) Vinyl halides contains SP^2 carbon which is also attached to halogen.

16. (A) On mixing 20 mL of acetone with 30 mL of chloroform, H-bonding is formed between acetone and chloroform so there will be negative deviation of Raoult's law and total volume < 50 mL.

17. (C)



I II III

Benzylic halides are least reactive in S_{N2} reactions. The correct order of reactivity towards S_{N2} reaction II > I > III

18. (D) O_2 forms strong $p\pi - p\pi$ bonding.

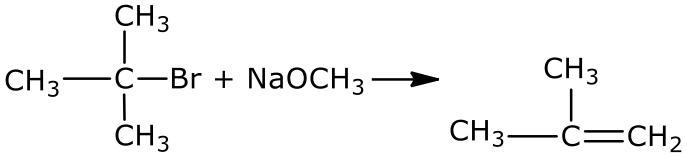
19. (B) Due to its small size, F_2 is having high High Δ_{hyd} H° and easy breaking of F_2 in atomic form is required for high oxidation so, it also have low Δ_{bond} H°.

20. (A) Glucose is known as dextrose.

21. (B) Cu reacts with dilute HNO_3 to evolve NO_2 gas.

22. (B) SiO_2 is network solid that is covalently bonded.

23. (D) Major product formed in the following reaction



24. (B) Chlorine reacts with cold and dilute NaOH to give NaCl and NaClO.

25. (C) Elevation of boiling point is inversely proportional to molar mass of solute

$$\Delta T_b = m \times K_b$$

$$\Delta T_b = m \times \frac{w_{solute}}{M_{solute} \times w_{solvent}(kg)}$$

SECTION B

26. (A) When pressure of gas is doubled mole fraction is also doubled.

$$P = K_H X_{gas}$$

$$P \alpha X_{gas}$$

27. (D) Thymine is present in DNA but not in RNA.

28. (C) $CH_3 - CH = CH - CH_2 - OH \xrightarrow{PCC} CH_3 - CH = CH\text{-}CHO$

29. (B) Physical properties of enantiomers are same, they only differ in rotation of polarised light.

30. (C) Number of lone pair of electrons in XeF_4 is two.

31. (B) Sulphuric acid is used to prepare more volatile acids from their corresponding salts due to its low volatility.

32. (A)

$$d = \frac{z.M}{N_A \times V}$$

$$6\frac{g}{cm^3} = \frac{4 \times M}{6.02 \times 10^{23} \times (4 \times 10^{-8}\,cm)^3}$$

$$M = 57.6\,\frac{g}{mol}$$

33. (C) In the reaction Compound 'Y' is- $R-X+Mg \rightarrow RMgX+H_2O \rightarrow RH$

34. (A) Ammonia is the weakest reducing agent as well as the weakest base among Group 15.

35. (C)

$$\Delta T_b = m \times K_s$$

$$T_s - T = 0.52 \times 0.2$$

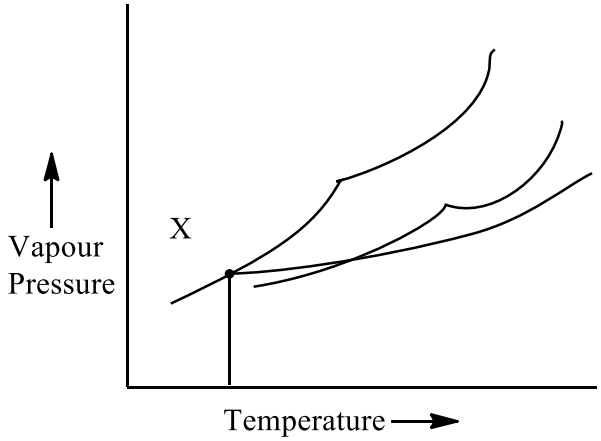
$$T_s = 0.104 + 100^{\circ}C$$

$$T_s = 100.104\,^{\circ}C$$

36. (C) Nucleic acids are polymer of nucleotide.

37. (B) NO_2 gas dimerises to N_2O_4 to become stable.

38. (D) In the following diagram point, 'X' represents freezing point of solution.



39. (A) XeF_6 on reaction with NaF gives $Na^+[XeF_7]^-$

41. (C) (±) - Butan-2-ol is racemic mixture and racemic mixture is optically inactive.

42. (B) Only Fluorine is more reactive than interhalogens.

43. (D) Compounds which has highest molecular weight has highest boiling point.

44. (B) CH_{3}- CH_2-CH_2-CH_2-CH_3 will give 3 different types of products because of three different hydrogen.

Given below are the questions (45-49) labelled as ***Assertion (A)*** *and* ***Reason (R)****. Select the most appropriate answer from the options given below:*

45. (C) A raw mango placed in a saline solution loses water and shrivel into pickle through the process of osmosis so R is false.

46. (A) H_2S is less acidic than H_2Te because H-S bond has more Δ_{bond} H^o than H-Te bond

47. (B) Chlorobenzene is less reactive towards nucleophilic substitution reaction and Nitro group in chlorobenzene increases its reactivity towards nucleophilic substitution reaction.

48. (D) Due to Schottky defect, the density of a solid decreases so A is false.

49. (B) Fluorine forms only one oxoacid HOF and Fluorine atom is highly electronegative.

SECTION C

50. (C)

I	Correct Answer
(i) Stoichiometric defects	Schottky and Frenkel defects
(ii) long range order	Crystalline solids
(iii) ….ABC ABC ABC…….	fcc structure
(iv) Number of atoms per unit cell=2	
(v) Metal excess defect due to anionic vacancies	F-centres

51. (B) Moist SO_2 is reducing agent and Cl_2 is bleaching agent.

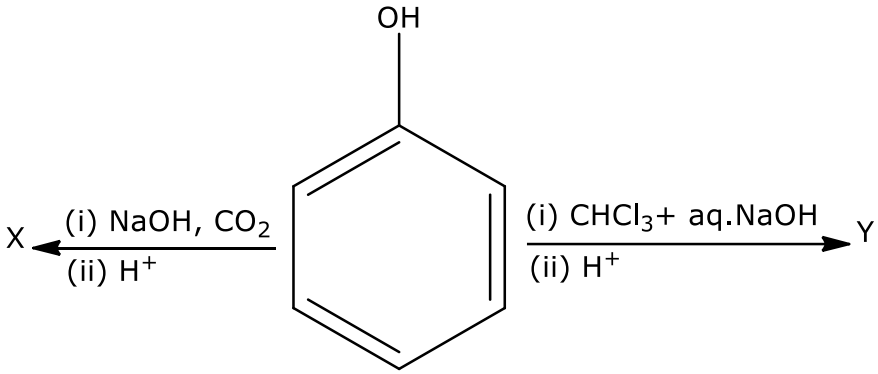
52. (D) Curdling of milk leads to denaturation of protein.
Alpha-helix is secondary structure.

Case: Read the passage given helms and answer the following questions (53-55).

53. (A) Alcohols which does not have any hydrogen attached with the C which contains -OH group are resistant to oxidation.

54. (C) NO_2 group increases the acidic character of phenol because of -I effect.

55. (D) X is an acid Y is an aldehyde.



The products X and Y are-