Time : 90 Minutes
Maximum Marks : 35

CHEMISTRY

CBSE
Sample Question Papers

Sample Question Paper

Solved

General Instructions:

1. *The Question Paper contains three sections.*
2. ***Section A** has **25** questions. Attempt any **20** questions.*
3. ***Section B** has **24** questions. Attempt any **20** questions.*
4. ***Section C** has **6** questions. Attempt any **5** questions.*
5. *All questions carry equal marks.*
6. *There is no negative marking.*

Section 'A'

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

1. Which of the statements is incorrect for haloalkanes:

(i) Haloalkanes are extremely soluble in water.

(ii) Alkyl halides are colourless when pure.

(iii) Haloalkanes tend to dissolve in organic solvents.

(A) (i) and (ii) **(B)** (i) and (iii)

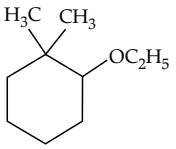
(C) only (i) **(D)** (i), (ii), (iii)

2. How does the branching in haloalkanes affect its boiling point ?

(A) Increases with branching **(B)** decreases with branching

(C) does not affect the branching **(D)** initially increases then decreases

AI **3.** IUPAC name of the following compound is:



(A) 2-ethoxy-1-1-dimethylcyclohexane **(B)** 2,6 -dimethyl phenol

(C) 2 -ethoxy propane **(D)** 1-ethoxy-2-methylcyclohexane

4. Which of the following is not the requirement while preparing ammonia by Haber's process:

(A) A high pressure of 200 atm. **(B)** A temp of nearly 700 K

(C) Catalyst iron oxide **(D)** Reactants in solid state

5. Which is the correct sequence to be followed in Ostwald's process:

(i) Formation of nitrogen dioxide **(ii)** Formation of nitric acid

(iii) Catalytic oxidation of ammonia

(A) (i),(ii),(iii) **(B)** (i),(iii),(ii)

(C) (iii),(ii),(i) **(D)** (iii),(i),(ii)

AI **6.** The general formula for carbohydrate is:

(A) $C_{x-1}(H_2O)_{2y}$ **(B)** $C_x(H_2O)_x$

(C) $C_{2x}(H_2O)_y$ **(D)** $C_{x+1}(H_2O)_y$

7. Conc. nitric acid oxidises non -metals. Based on it, which of the following is wrongly paired ?

(A) Phosphorus –phosphoric acid **(B)** Carbon -carbonic acid

(C) Sulphur - sulphuric acid **(D)** Iodine – iodic acid

8. In preparation of phenol, benzene is sulphonated with oleum. Benzene sulphonic acid so formed is converted to sodium phenoxide on heating with:

(A) molten sodium chloride **(B)** molten sodium hydroxide

(C) solid sodium hydroxide **(D)** sodium nitrate with HCl

9. During preparation of alcohol, the addition of borane to the double bond involves addition of boron to:

(A) sp^2 carbon carrying higher number of hydrogen atoms

(B) sp^3 carbon carrying higher number of hydrogen atoms

(C) sp^2 carbon carrying lower number of hydrogen atoms

(D) sp^3 carbon carrying lower number of hydrogen atoms

10. Which of the following is not the correct statement in relation to vapour pressure:

(A) The lowering of vapour pressure depends only on the concentration of the solute particles.

(B) The lowering of vapour pressure is independent of the identity of solute particles.

(C) In non- volatile solutes, the lowering of the vapour pressure depends on the sum of the mole fraction of different solutes.

(D) vapour pressure of the solvent decreases in the presence of non-volatile solute.

11. Peptide linkage:

(i) is a bond formed between COOH and $–NH_2$ group

(ii) is a bond between two amino acids

(iii) it's a connection between two proteins

What is untrue about peptide linkage:

(A) only (i) **(B)** only (ii)

(C) (i) and (iii) **(D)** (i) and (ii)

12. What happens when glucose reacts with bromine water:

(A) glucose gets reduced to gluconic acid **(B)** it form oxime.

(C) glucose gets oxidised to gluconic acid. **(D)** it forms oxalic acid

13. Which of the following is not the right pair as per the uses of various nitrogen compounds:

(A) Pickling of stainless steel-nitric acid

(B) Refrigerant-liquid nitrogen

(C) In the manufacture of ammonia-dinitrogen

(D) Preparing nitrates used in explosives-dinitrogen

14. Formation of ortho hydroxy benzoic acid from phenol using sodium hydroxide is:

(A) Kolbe's reaction **(B)** Reimer Tiemann reaction

(C) Esterification **(D)** Williamson synthesis

15. Helium is used in filling balloons for meteorological observation because:
(A) it is non – inflammable and light gas.
(B) it is a good oxidising agent
(C) it is a good reducing agent.
(D) all of the above

16. Which of the following colligative property is directly proportional to molarity:
(A) Lowering of vapour pressure **(B)** Elevation of boiling point
(C) Osmotic pressure **(D)** Depression of freezing point

17. The concentration of pollutants in water is expressed in:
(A) μ g / mL **(B)** w/v
(C) v/v **(D)** w/w

18. Deacon's process is used for the manufacture of:
(A) dinitrogen **(B)** dioxygen
(C) sulphuric acid **(D)** chlorine

19. Choose the correct relation:
(A) $p_1 \propto 2x_1$ **(B)** $p_1 \propto 2\frac{1}{x_1}$
(C) $p_1 \propto x_1$ **(D)** $p_1 \propto \frac{1}{2x_1}$

20. Primary alkyl groups form _____ on dehydration while _____ is formed on dehydration of secondary and tertiary alcohol.
(A) ethers, alkenes **(B)** alkenes, ethers
(C) ethers, phenols **(D)** alkenes, phenols

21. Among halogens, which is a radioactive element:
(A) Bromine **(B)** Iodine
(C) Astatine **(D)** fluorine

22. What is the half life of radon?
(A) 10 days **(B)** 4.56 days
(C) 3.82 days **(D)** 5.46 days

AI 23. Which of the following compounds of hydrogen does not from hydrogen bonding ?
(A) NH_3 **(B)** H_2O
(C) HCl **(D)** HF

24. Alkali metal halide do not represent Frenkel defect. It is due to:
(A) Large difference in size of atoms and anions
(B) Almost same size of atoms and anions
(C) low coordination number of atoms and anions
(D) None of these

25. Glycosidic linkage belongs to which functional group ?
(A) Amide **(B)** Ether
(C) Ester **(D)** Alcohol

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. A unit cell is characterised by _____parametres:
(A) two **(B)** four
(C) Six **(D)** One

27. The correct axial angle for tetragonal crystal system is:
(A) $\alpha = \beta = \gamma = 90°$ **(B)** $\alpha = \beta \neq \gamma = 90°$
(C) $\alpha = \beta = \gamma \neq 90°$ **(D)** $\alpha \neq \beta = \gamma \neq 90°$

28. When crystallisation occurs at fast rate:

(A) Single crystals are formed **(B)** Crystals with no defects are formed.

(C) Small crystals with defects are formed. **(D)** Huge size crystals with no defects are formed.

29. Close packed structures have:

(A) Tetrahedral and octahedral voids **(B)** Only tetrahedral voids

(C) Only octahedral voids **(D)** None of octahedral or tetrahedral voids.

30. When there are deviations from ideal arrangement around a point or an atom in a crystalline substance ,it is known as:

(A) point defect **(B)** vacancy defect

(C) line defect **(D)** interstitial defect

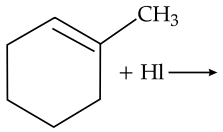
31. Complete the reaction:

$H_3C\text{-}Br + AgF \rightarrow$

(A) $H_3C\text{-}Br + AgF \rightarrow H_3C\text{-}F + AgBr$ **(B)** $H_3C\text{-}Br + AgF \rightarrow Br\text{-}CH_2\text{-}F + AgH$

(C) $H_3C\text{-}Br + AgF \rightarrow [Ag(CH_3)]F + Br$ **(D)** None of the above

AI 32. Name the major monohalo product of the following reaction:



(A) 1-Iodo-1-methyl cyclohexane **(B)** 1-Iodomethyl cyclohexane

(C) 1-Chloro cyclohexane **(D)** None of the above

33. 2-Bromopentane, 2-Bromo-2-methylbutane, 1-Bromopentane

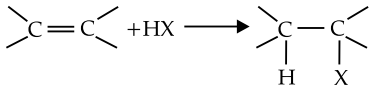
Write the compound which is most reactive towards β-elimination reaction:

(A) 2-Bromopentane **(B)** 1- Bromopentane

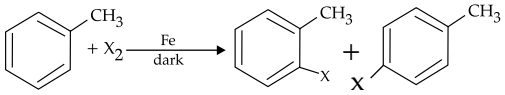
(C) 2-Bromo-2-methylbutane **(D)** None of the above

AI 34. Which of the following is halogen exchange reaction ?

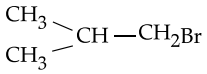
(A) $RX + NaI \longrightarrow RI + NaX$

(B) 

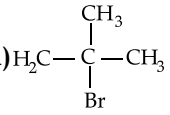
(C) $R\text{-}OH + HX \xrightarrow{ZnCl_2} R\text{–}X + H_2O$

(D) 

35. Arrange the following compounds in increasing order of their boiling points.

(i) 

(ii) $CH_3CH_2CH_2CH_2Br$

(iii) 

(A) (ii) < (iii) < (i) **(B)** (i) < (ii) < (iii)

(C) (iii) < (i) < (ii) **(D)** (iii) < (ii) < (i)

36. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows _____.

(A) S_N1 mechanism

(B) S_N2 mechanism

(C) Any of the above two depending upon the temperature of reaction

(D) Saytzeff rule.

37. What is the correct order of dissociation energy of C-X bond:

(A) C–Cl > C–Br > C–I **(B)** C– Br > C–I > C–Cl

(C) C–Cl > C–I > C–Br **(D)** C–I > C–Br > C–Cl

38. Glucose forms glucose penta acetate when reacts with acetyl chloride. This reaction represents:
(A) Cyclic structure of glucose
(B) Open chain structure of glucose
(C) Presence of five –OH groups in glucose
(D) Presence of –CHO group in glucose

39. In carbohydrates, the Letter 'D' represents:
(A) Configuration
(B) dextrorotating
(C) Conformation
(D) Laevorotating

AI 40. An element having bcc structure has unit cell edge 500 pm. The density of element is:
(atomic mass of element = 100 g/mol)
(A) 2.657 g/cm^3 **(B)** 5.189 g/cm^3
(C) 7.971 g/cm^3 **(D)** 3.985 g/cm^3

AI 41. Which of the following solutions has the highest boiling point at one atmospheric pressure ?
(A) 0.1 M NaCl **(B)** 0.1 M Sucrose
(C) 0.1 M $CaCl_2$ **(D)** 0.1 M Glucose

42. The anhydride of nitrous acid is:
(A) NO **(B)** NO_2
(C) N_2O_3 **(D)** N_2O_4

43. Identify the products X and Y in the following sequence:

$$C_2H_5Br \xrightarrow{KCN} \times \xrightarrow{LiALH_4}$$

(A) X = C_2H_4, Y = C_2H_6 **(B)** X = C_2H_5CN, Y = $C_2H_5NH_2$
(C) X = C_2H_5CN, Y = $C_3H_7NH_2$ **(D)** X = $C_2H_5NH_2$, Y = C_2H_6

44. Which one of the following alcohol does not react with Lucas reagent ?
(A) 2-methyle propom-2-ol **(B)** Propanol
(C) Propan-2-ol **(D)** Sec. butyl alcohol

From Q. 45 to Q. 49, Given below are two statements labelled as Assertion (A) and Reason (R) and at the end of each question give the following line select the most appropriate answers from the options 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 and R is true.

45. **Assertion (A):** Ionization enthalpy in group 15 elements decreases down the group.
Reason (R): Atomic size of group 15 elements gradually increases down the group.

46. **Assertion (A):** The vapour pressure of some solutions is higher and show positive deviation.
Reason (R): The intermolecular attractive forces between the solute-solvent molecules are weaker than those between the solute-solute and solvent-solvent molecules.

47. **Assertion (A):** Osmosis is the process used in desalination of sea water.
Reason (R): The direction of osmosis can be reversed if a pressure smaller than the osmotic pressure is applied to the solution side.

48. **Assertion (A):** Pressure does not have any significant effect on solubility of solids in liquids.
Reason (R): Dinitrogen is a toxic gas.

49. **Assertion (A):** Formation of sulphuric acid is exothermic and reversible process.
Reason (R): Low temperature and high pressure are the favourable conditions for the maximum yield.

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)	$C_2H_5OH \xrightarrow[\Delta]{\text{Conc } H_2SO_4}$	(A)	Dihydric alcohol
(ii)	Glycol	(B)	Esterification
(iii)	$CH_3COOH + C_2H_3OH \xrightarrow{H^+}$	(C)	Mixed ether
(iv)	Methoxymethane	(D)	Elimination reaction
(v)	Methoxyethane		

Which of the following is the best matched options ?

(A) i-B, v-C, iii-A, iv-D **(B)** i-B, ii-A, iii-D, iv-C

(C) i-D, v- C, iii-B, iv-A **(D)** i-A, ii-C, iii-D, iv-B

51. Which of the following analogies is correct:

(A) Group 15: Carfon family:: Group 16: Oxygen family

(B) Rhomfic sulphur: α-sulpher:: Monoclinic sulpher: β-sulpher

(C) Caro's acid: H_2SO_3:: Oleum: H_2S2O_7

(D) Halide ion: Cl^-:: Pseudohalide ion: OH^-

52. Complete the following analogy:

Glucose: A:: Fructose: B

(A) A: $-NH_2$; B: –CHO **(B)** A: $\rangle C = O$; B: –CHO

(C) A: –CHO; B: $\rangle C = O$ **(D)** A: $-CONH_2$;B: –OH

CASE 1: Read the passage given below and answer the following questions 53-55

Aryl halides are extremely less reactive towards nucleophilic substitution reactions due to the following reasons:

(i) In haloarenes, the electron pairs on halogen atom are in conjugation with π-electrons of the ring.

(ii) In haloalkane, the carbon atom attached to halogen is sp^3 hybridised while in case of haloarene, the carbon atom attached to halogen is sp^2 -hybridised.

(iii) In case of haloarenes, the phenyl cation formed as a result of self-ionisation will not be stabilised by resonance.

The following questions are Multiple Choice Questions. Choose the most appropriate answer:

AI **53.** A primary alkyl halide would prefer to undergo _____.

(A) S_N1 reaction **(B)** S_N2 reaction

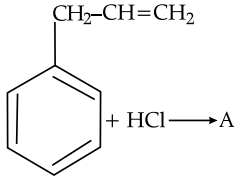
(C) α-Elimination **(D)** Racemisation

AI **54.** Which of the following alkyl halides will undergoes S_N1 reaction most readily ?

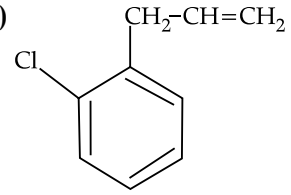
(A) $(CH_3)_3C—F$ **(B)** $(CH_3)_3C—Cl$

(C) $(CH_3)_3C—Br$ **(D)** $(CH_3)_3C—I$

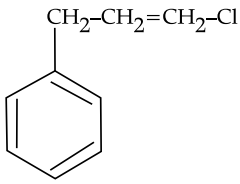
55. What is 'A' in the following reaction ?



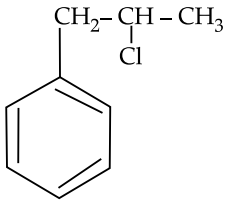
(A)



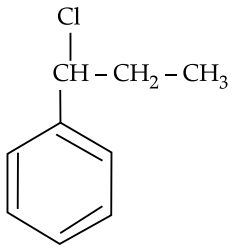
(B)



(C)



(D)



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Solution of Question Paper

Section 'A'

1. **Option (C) is correct.**

   Explanation: Haloalkanes are very slightly soluble in water.

2. **Option (B) is correct.**

   Explanation: This is because branching results in lesser surface area thus the Vander waals force of attraction decreases.

3. **Option (A) is correct.**

4. **Option (D) is correct.**

   Explanation: Only the rest three are required to maximise the yield of ammonia.

5. **Option (D) is correct.**

   Explanation: Ostwald's process is used for the synthesis of nitric acid where catalytic oxidation of ammonia by atmospheric oxygen results in the formation of nitric oxide. The nitric oxide combines with oxygen to form nitrogen dioxide. Nitrogen dioxide is absorbed in water and forms nitric acid.

6. **Option (B) is correct.**

   Explanation: General formula for carbohydrate is $(CH_2O)_n$. Here n is the number of carbon atom in the molecule.

7. **Option (B) is correct.**

   Explanation: Carbon is oxidised to carbon dioxide

8. **Option (B) is correct.**

   Explanation: Molten sodium hydroxide helps in acidification of sodium salts to give phenols.

9. **Option (A) is correct.**

   Explanation: This is due to anti -Markovnikov's rule.

10. **Option (D) is correct.**

    Explanation: Vapour pressure of the solvent increases in the presence of non-volatile solute.

11. **Option (B) is correct.**

    Explanation: Peptide linkage (–CO–NH–) is not a bond between two amino acids.

12. **Option (C) is correct.**

    Explanation: Bromine water is a mild oxidising agent.

13. **Option (D) is correct.**

    Explanation: Nitric acid is the nitrates that is used to prepare explosives.

14. **Option (A) is correct.**

    Explanation: Phenoxide ion generated by treating phenol with sodium hydroxide. Further it undergoes electrophilic substitution with carbon dioxide to form ortho hydroxybenzoic acid as the main reaction product.

15. **Option (A) is correct.**

    Explanation: Helium gas is lighter than air due to its lower density that help to float balloons. Helium gas is completely inert which doesn't react with other compounds in the chemical reaction.

16. **Option (C) is correct.**

    Explanation: Osmotic pressure is directly proportional to the molarity of the solution at a given temperature.

17. **Option (A) is correct.**

    Explanation: The concentration of pollutants in water is expressed in μg/mL.

18. **Option (D) is correct.**

    Explanation: Deacons process involves oxidation of hydrogen chloride gas by atmospheric oxygen in presence of $CuCl_2$ as catalyst at 723 K to produce chlorine.

19. Option (C) is correct.

Explanation: According to Raoult's law, the partial vapour pressure of each volatile component in the solution is directly proportional to its mole fraction.

20. Option (A) is correct.

Explanation: Dehydration of primary alcohols gives ether while dehydration of secondary and tertiary alcohol gives alkenes.

21. Option (C) is correct.

Explanation: Astatine and tennessine are radioactive elements among halogen.

22. Option (D) is correct.

Explanation: Half life of a radioactive substance refers to the amount of time that it takes for half of the radioactive atoms in a sample to decay into a more stable form.

23. Option (C) is correct.

Explanation: HCl does not form hydrogen bonding due to large size of Cl-atom.

24. Option (B) is correct.

Explanation: The crystals showing Frenkel defect do not posses almost same size of atom and anions so alkali metal halides viz. NaCl etc. do not represent Frenkel defect.

25. Option (B) is correct.

Explanation: Glyosidic linkage in a carbohydrate belongs to ether (-C-O-C-) functional group.

Section 'B'

26. Option (C) is correct.

Explanation: Six parameters are:

- Its dimension along the three edges (3),
- angles between the edges (3)

27. Option (A) is correct.

Explanation: Though axial angles are equal and are equal to 90° ,the axial distance a = b ≠ c.

28. Option (C) is correct.

Explanation: Single crystals are formed when the process of crystallisation occurs at extremely slow rate. These crystals are formed with defects. There are basically irregularities in the arrangement of constituent particles.

29. Option (A) is correct.

Explanation: In ccp structure there is one octahedral void at the centre and 12 octahedral voids on the edge. Two tetrahedral voids are located at each body diagonal.

30. Option (A) is correct.

Explanation: The two defects are point defects and line defects.

31. Option (A) is correct.

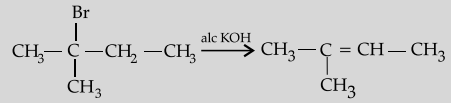
Explanation: H_3C –Br + AgF → H_3C–F + AgBr

32. Option (B) is correct.

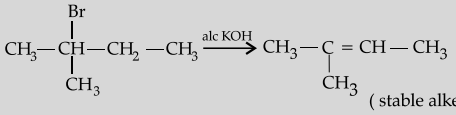
Explanation: According to Markovnikov's rule, iodine will add to the carbon atom having less number of hydrogen atoms.

33. Option (C) is correct.

Explanation:



(stable alkene with α–H atoms)



(stable alkene with α–H atoms)

34. Option (A) is correct.

Explanation: It is halogen exchange reaction as in this reaction both R and Na exchanges halogens.

35. Option (C) is correct.

Explanation: Boiling point of (i) is 364 K, boiling point of (ii) is 375 K. boiling point of (iii) is 346 K As the branching increases in the isomeric alkyl halides, the boiling point decreases.

36. Option (A) is correct.

Explanation: $C_6H_5\text{-}\overset{+\delta}{C}H_2$ – is stable cation so favours the progress of reaction by S_N1 mechanism.

37. Option (A) is correct.

Explanation: Higher the bond dissociation energy of C-X bond, lesser is the reactivity.

38. Option (C) is correct.

Explanation: Formation of glucose penta acetate shows the presence of five –OH groups in glucose.

39. Option (A) is correct.

Explanation: The Letter 'D' represents configuration on the basis of D–L nomenclature.

40. Option (A) is correct.

Explanation: M=100 g/mol

For bcc unit cell m=2

N_a=6.022 × 10^{23}

a = 500 pm

$= 500 \times 10^{-10}$ cm

Density of element (unit cell),

$$d = \frac{n \times M}{a^3 \times N_A}$$

$$= \frac{2 \times 100}{\left(500 \times 10^{-10}\right)^3 \times 6.022 \times 10^{23}}$$

$$= 2.657 \text{ g/cm}^3$$

41. Option (C) is correct.

Explanation: Since,

$$\Delta T_b = imK_b$$

$$\Delta T_b = T_b - T_b^0$$

So, $\Delta T_b \propto i$

For NaCl, $i = 2$; For sucrose, $i = 1$

For $CaCl_2$, $i = 3$; For glucose, $i = 1$

Hence, 0.1 M $CaCl_2$ has highest boiling point at 1 atm.

42. Option (C) is correct.

Explanation: Let Oxidation number of N in $HNO_2 = x$

$$1 + x + 2(-2) = 0$$

$$1 + x - 4 = 0$$

$$x - 3 = 0$$

$$x = +3$$

The anhydride of nitrous acid her also +3 oxidation number of nitrogen.

Oxidation number of N in NO = +2

Oxidation number of N in NO_2 = +4

Oxidation number of N in N_2O_3 = +3

Oxidation number of N in N_2O_4 = +4

The anhydride of nitrons acid (HNO_2) is N_2O_3.

43. Option (C) is correct.

Explanation:

$$C_2H_5Br \xrightarrow{KCN} \underset{(X)}{C_2H_5CN} \xrightarrow{LiAlH_4} \underset{(Y)}{C_2H_7NH_2}$$

44. Option (B) is correct.

Explanation: Propanol ($CH_3CH_2CH_2OH$) is a primary alcohol which does not react with Lucas reagent at room temperature.

45. Option (A) is correct.

Explanation: On moving from top to bottom in group 15 elements, the ionization enthalpy decreases while the atomic size increases.

46. Option (A) is correct.

Explanation: Reason is the correct statement for the given statement.

47. Option (D) is correct.

Explanation: Reverse osmosis is used in desalination of sea water. Reverse osmosis takes place at very high pressure.

48. Option (C) is correct.

Explanation: Due to high bond enthalpy of N ≡ N, dinitrogen is inert at room temperature.

49. Option (A) is correct.

Explanation: As the formation of sulphuric acid is exothermic and reversible process, forward reaction leads to decrease in volume. Thus, low temperature and high pressure are the favourable conditions for the maximum yield.

Section 'C'

50. Option (C) is correct.

Explanation:

$$\underset{\text{Ethanol}}{C_2H_5OH} \xrightarrow[\Delta]{\text{Con. } H_2SO_4} \underset{\text{Ethene}}{CH_2=CH_2} + H_2O$$

Ethanol undergoes elimination reaction when heated with conc. H_2SO_4 and gives ethene. Glycol – It is dihydric alcohol.

$$\begin{array}{l} CH_2OH \\ | \\ CH_2OH \end{array}$$

$$CH_3COOH + C_2H_5OH \xrightarrow{H^+} \underset{\text{Ester}}{CH_3COOC_2H_5} + H_2O$$

Acetic acid reacts with ethanol in acidic medium to form an ester. This reaction is called esterification.

Methoxyethane = $CH_3OCH_2CH_3$

Since it contains two different alkyl groups so it is called mixed ether.

51. Option (B) is correct.

Explanation: There are two allotropics of sulphur viz Rhombic sulphur (α-sulphur) and Monoclinic sulphur (β-sulphur)

52. Option (C) is correct.

Explanation: The functional groups present in glucose and fructose are –CHO and >C=O respectively.

53. Option (B) is correct.

Explanation: A primary alkyl halide would prefer to undergo S_N2 reaction.

54. Option (D) is correct.

Explanation: $(CH_3)_3C–I$ being a tertiary alkyl halide will most readily undergo S_N1 reaction.

55. Option (C) is correct.

Explanation: