

Periodic Test 1 : 2025-26
Subject: Chemistry
Date: 16 / 06 / 25
Time: 3 Hours
Max Marks: 70

Name: _____
Class: 12 Division: _____
Roll No: _____
Invigilator's Sign _____



General Instructions:

Read the following instructions carefully.

- (a) There are 33 questions in this question paper with internal choice.
- (b) SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
- (c) SECTION B consists of 5 short answer questions carrying 2 marks each.
- (d) SECTION C consists of 7 short answer questions carrying 3 marks each.
- (e) SECTION D consists of 2 case-based questions carrying 4 marks each.
- (f) SECTION E consists of 3 long answer questions carrying 5 marks each.
- (g) All questions are compulsory.
- (h) Use of log tables and calculators is not allowed.
- (i) The total number of pages is 7.

SECTION A

16

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

- Q.1 Assume a living cell with 0.9 % (w/w) of glucose solution (aqueous). This cell is immersed in another solution having an equal mole fraction of glucose and water. (Consider the data up to the first decimal place only)

1

- a. shrink since the solution is 0.5 % (w/W) 0.5 % (w/W)
- b. shrink since the solution is 0.45 % (w/w) 0.45 % (w/w) as a result of the association of glucose molecules (due to hydrogen bonding)
- c. swell up since solution is 1 % (w/W) 1 % (w/W)
- d. Show no change in volume since the solution is 0.9 % (w/W)

- Q.2 Arrange the following in increasing order of Van't Hoff factor:
0.1M MgCl_2 , 0.1M KCl , 0.1M $\text{Al}_2(\text{SO}_4)_3$, 0.1M $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

1

- (a) $0.1\text{M Al}_2(\text{SO}_4)_3 < 0.1\text{M KCl} < 0.1\text{M MgCl}_2 < 0.1\text{M C}_{12}\text{H}_{22}\text{O}_{11}$
- (b) $0.1\text{M C}_{12}\text{H}_{22}\text{O}_{11} < 0.1\text{M KCl} < 0.1\text{M MgCl}_2 < 0.1\text{M Al}_2(\text{SO}_4)_3$
- (c) $0.1\text{M MgCl}_2 < 0.1\text{M KCl} < 0.1\text{M C}_{12}\text{H}_{22}\text{O}_{11} < 0.1\text{M Al}_2(\text{SO}_4)_3$
- (d) $0.1\text{M KCl} < 0.1\text{M C}_{12}\text{H}_{22}\text{O}_{11} < 0.1\text{M MgCl}_2 < 0.1\text{M Al}_2(\text{SO}_4)_3$

Handwritten notes:
 MgCl_2
 KCl
 $\text{Al}_2(\text{SO}_4)_3$
 $\text{C}_{12}\text{H}_{22}\text{O}_{11}$

- Q.3 What is an example of camphor in N_2 gas?

1

- a. Solid in gas solution
- b. Gas in gas solution
- c. Solid in liquid solution
- d. Liquid in gas solution

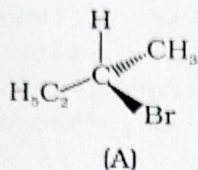
Q4. Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is

- a. Electrophilic elimination reaction b. Electrophilic substitution reaction
c. Free radical addition reaction d. Nucleophilic substitution reaction

Q5. Which of the following is an example of vic-dihalide?

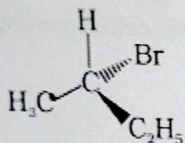
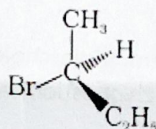
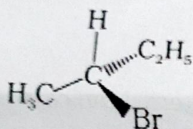
- a. Dichloromethane b. 1,2-dichloroethane
c. Ethylidene chloride d. Allyl chloride

Q6. Which of the following structures is enantiomeric with the molecule (A) given below :

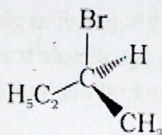


a.

b.

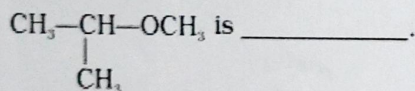


c.



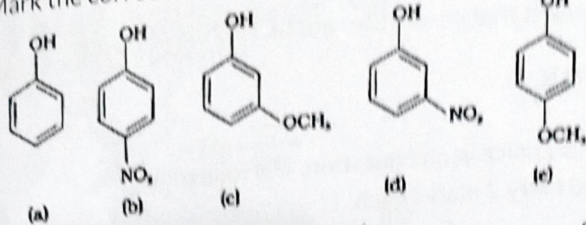
d.

Q7. The IUPAC name of the compound given below is



- a. 1-methoxy-1-methyl ethane b. 2-methoxy-2-methyl ethane
c. 2-methoxypropane d. isopropyl methyl ether

Q8 Mark the correct order of decreasing acid strength of the following compounds.



a. $b > d > c > a > e$

b. $d > b > c > a > e$

c. $b > c > d > a > e$

d. $e > b > d > a > e$

Q9 The correct order of boiling points for Primary (1°), Secondary (2°) and Tertiary (3°) alcohols is

a. $1^\circ > 2^\circ > 3^\circ$

b. $3^\circ > 2^\circ > 1^\circ$

c. $2^\circ > 1^\circ > 3^\circ$

d. $2^\circ > 3^\circ > 1^\circ$

Q10 The reaction of toluene with Cl_2 in the presence of AlCl_3 gives 'X', and the reaction with Cl_2 in the presence of light gives 'Y'. Thus 'X' and 'Y' are:

a. 'X' = benzyl chloride and 'Y' = m-chlorotoluene

b. 'X' = benzyl chloride and 'Y' = o-chlorotoluene

c. 'X' = m-chlorotoluene and 'Y' = p-chlorotoluene

d. 'X' = p-chlorotoluene and 'Y' = benzyl chloride.

Q11 Fructose and Glucose can be distinguished by _____

a. Selwinoff's reagent

b. Benedict's reagent

c. Fehling's reagent

d. Barfoed's reagent

Q12 Sucrose is a _____ chemical, and the hydrolysis product combination is _____ in nature.

a. dextrorotatory; dextrorotatory

b. laevorotatory; laevorotatory

c. laevorotatory; dextrorotatory

d. dextrorotatory; laevorotatory

Select the most appropriate answer 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 but R is true.

Q13 Assertion (A): If red blood cells were removed from the body and placed in pure water, pressure inside the cells would increase.

Reason (R): The concentration of salt content in the cell increases.

Q14 Assertion(A): Phosphorus chlorides (tri and penta) are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohols.

Reason(R) : Phosphorus chlorides give pure alkyl halides.

Q15 Assertion (A): Phenols give o- and p-nitrophenol on nitration with conc. HNO_3 and H_2SO_4 mixture.

Reason(R): -OH group in phenol is o-, p- directing.

- Q16 Assertion (A): The glycosidic linkage involved in linking the glucose units in the amylose part of the starch is C1-C4 α -linkage. 1
Reason(R): Amylose is a water-soluble component that constitutes about 15-20% of starch. 10

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are of a very short answer type and carry 2 marks each.

- Q17 a. Which of the compounds will react faster in S_N1 reaction with the $-OH$ ion? 2
 CH_3-CH_2-Cl or $C_6H_5-CH_2-Cl$
b. Why does iodoform have appreciable antiseptic properties?
- Q18 a. Identify the products A and B formed in the following reaction : 2
 $CH_3-CH_2-CH=CH-CH_3 + HCl \rightarrow A + B$
c. Halo Arenes are less reactive than halo alkanes and haloalkanes. Explain.
- Q19 a. Arrange the following compounds in increasing order of acidity and give a suitable explanation. Phenol, o-nitrophenol, o-cresol 2
b. Why is the reactivity of all three classes of alcohols with conc. HCl and $ZnCl_2$ (Lucas reagent) are different?
- Q20 On mixing liquid X and liquid Y, the volume of the resulting solution decreases. What type of deviation from Raoult's law is shown by the resulting solution? What change in temperature would you observe after mixing liquids X and Y. 2
- Q21 a. How do you explain the absence of an aldehyde group in the pentaacetate of D-glucose? 2
b. What are the hydrolysis products of lactose?
OR
a. Define anomers.
What is the difference between the α -form of glucose and the β -form of glucose? Explain.

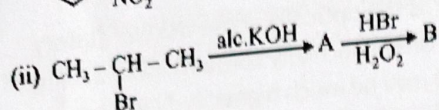
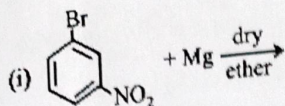
SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer types and carry 3 marks each.

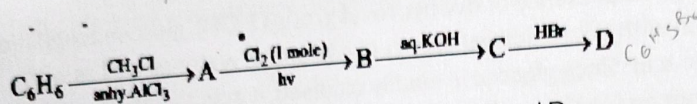
- Q22 What is the freezing point depression constant of a solvent, 50 g of which contains 1 g non-volatile solute (molar mass 256 g mol^{-1} and the decrease in freezing point is 0.40 K ? 3
- Q23 a. What is another term for solutions that exhibit identical osmotic pressure? 3
b. Name the deviation the methanol-acetone liquid pair shows. And why?
c. Two solutions are separated by a semipermeable membrane. If the solvent flows from A to B then which solution is less concentrated? Name the material used for a semipermeable membrane.

$$\begin{array}{r} 22 \\ 256 \\ \times 0.40 \\ \hline 10240 \end{array}$$

- Q24 a. tert-butyl bromide reacts with aq. NaOH by S_N1 mechanism while n-butyl bromide reacts with S_N2 mechanism. Why?
b. Identify the products:



Q25 a.



Complete the above equation and identify A, B, C and D.

- b. Why is sulphuric acid not used during the reaction of alcohols with KI?

- Q26 a. Write the mechanism of the reaction of HI with methoxybenzene.
b. Name the factors responsible for the solubility of alcohols in water.
- Q27 a. Out of o-nitrophenol and p-nitrophenol, which is more volatile? Explain.
b. Convert Phenol to aspirin.

OR

- a. The C-O bond is much shorter in phenol than in ethanol. Give 2 reasons.
b. What happens when phenol is oxidized by $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}_2\text{SO}_4$?

- Q28 a. Write the structure of the product obtained when glucose is oxidised with nitric acid.
b. Write a reaction which shows that all the carbon atoms in glucose are linked in a straight chain.
c. Define glycosidic linkage.

SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (1+1+2) marks each. Read the passage carefully and answer the questions that follow.

- Q29 When haloalkanes with β -hydrogen atoms are boiled with alcoholic solution of KOH, they undergo elimination of hydrogen halide resulting in the formation of alkenes. These reactions are called β -elimination reactions or dehydrohalogenation reactions. These reactions follow Saytzeff's rule. Substitution and elimination reactions often compete with each other. Most bases behave as nucleophiles and therefore can engage in substitution or elimination reactions depending upon the alkyl halide and the reaction conditions.

- a. Specify the reagent used in the Elimination reaction (β -elimination) in case of alkyl halides.

- b. When phenol is treated with bromine water, a white precipitate is obtained. Give the structure and the name of the compound formed.
- c. Differentiate between SN^1 and SN^2 substitution reactions.

OR

- c. Predict the product of the reaction between (R)-2-chloro-2-methylpropane and water. Write the mechanism for it.

4

Q30

Glucose is known as dextrose because it occurs in nature as the optically active dextrorotatory isomer. It is an essential constituent of human blood. The blood normally contains 65 to 110 mg of glucose per 100 mL (hence named Blood sugar). The level may be much higher in diabetic persons. The urine of diabetic persons also contains a considerable amount of glucose. In combined form, it occurs in cane sugar and polysaccharides such as starch and cellulose. Glucose has an aldehyde group (-CHO), one primary alcoholic group (-CH₂OH) and four secondary alcoholic groups (-CHOH) in their structure. Due to the presence of five hydroxyl groups (-OH), glucose acetylation. Glucose also undergoes oxidation with mild oxidising agents like bromine water as well as with strong oxidising agents like nitric acid. Since glucose is readily oxidised, it acts as a strong reducing agent and reduces Tollen's reagent and Fehling solution. Glucose exists in two crystalline forms: α -D-glucose and β -D-glucose. β -D-glucose undergoes mutarotation. If either of the two forms is dissolved in water and allowed to stand, the specific rotation of the solution changes gradually, until a constant value is obtained. This change is called mutarotation.

- Draw pyranose structure of glucose.
- What is meant by 'reducing sugars'?
- Write down the structures and names of the products formed when D-glucose is treated with
 - Hydroxylamine
 - Acetic anhydride.

OR

- (i) Which one of the following is a polysaccharide: Starch, Maltose, Fructose, Glucose?
- (ii) Write the structural difference between starch and cellulose.

15

SECTION E

The following questions are long answer types and carry 5 marks each. All questions have an internal choice.

Q31

- Henry's law constant for CO₂ in water is 1.67×10^8 Pa at 298 K. Calculate the quantity of CO₂ in 500 mL of soda water when packed under 2.5 atm CO₂ pressure at 298 K.
- Vapour pressure of pure water at 298 K is 23.8 mm Hg. 50 g of urea (NH₂CONH₂) is dissolved in 850 g of water. Calculate the vapour pressure of water for this solution and its relative lowering.

OR

- A solution of glucose in water is labelled as 10% w/w, what would be the molality and mole fraction of each component in the solution? If the density of solution is 1.2 g mL⁻¹, then what shall be the molarity of the solution?
- State Henry's law and mention some important applications?

3

2

3+2

Q32

5

- a. How will the following conversion be carried out:
 i. Propene to propan-1-ol
 ii. Benzene to 4-bromonitrobenzene
- b. Primary alkyl halide C_4H_9Br (A) reacts with alcoholic KOH to give compound (B). Compound (B) is reacted with HBr to give (C), which is an isomer of (A). When (A) is reacted with sodium metal, it gives compound (D), C_8H_{18} , which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (A) and write the equations for all the reactions.

OR

- a. Illustrate the following name reactions;



- i. Reimer-Tiemann reaction ii. Williamson synthesis

- b. How will you prepare Secondary, Tertiary, primary alcohols from Grignard reagent?

5

Q33

Attempt any 5:

- a. Explain why low molecular mass alcohols are soluble in water.
 b. Explain why $O=C=O$ nonpolar while $R-O-R$ is polar.
 c. Write the structures of the isomers of alcohols with molecular formula $C_4H_{10}O$.
 Which of these exhibits optical activity?
 d. Name the reagents which cause denaturation of alcohol.
 e. Suggest a reagent for conversion of ethanol to ethanoic acid.
 f. How would you obtain acetophenone from phenol?
 g. Write IUPAC name of the following.

