

**SAMPLE PAPER (2023 -24)**

**CLASS XI**

**CHEMISTRY**

**THEORY (043)**

**M M:70**

**Time: 3 hours**

**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.*
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**SECTION A**

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

1. The peroxide effect proceeds via formation of ----

- (a) carbocation
- (b) carbene
- (c) carbanion
- (d) free radical

2. In which of the following options does the order of arrangement not agree with the variation of property indicated against it?

- (a)  $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$  (increasing ionic size)
- (b)  $\text{B} < \text{C} < \text{N} < \text{O}$  (increasing first ionization enthalpy)
- (c)  $\text{I} < \text{Br} < \text{F} < \text{Cl}$  (increasing electron gain enthalpy)
- (d)  $\text{Li} < \text{Na} < \text{K} < \text{Rb}$  (increasing metallic radius)

3. When heat capacity (C) is large for a substance then:

- (a) A given amount of heat results in greater rise in temperature of a substance.

(b) A given amount of heat results only in small rise in temperature of a substance.

(c) Initially there is greater rise and decreases subsequently.

(d) Temperature rise is not related to heat capacity.

4. In sulphur estimation, 0.24g of an organic compound gave 0.48g of barium sulphate. Calculate the percentage of sulphur in the compound.

(a) 2.746

(b) 2.074

(c) 27.46

(d) 28.46

5. Select the non-polar molecule :

(a) H<sub>2</sub>O.

(b) BF<sub>3</sub>

(c) NH<sub>3</sub>

(d) O<sub>3</sub>

6. Which of the following cannot act as reducing agent?

(a) ClO<sup>-</sup>

(b) ClO<sub>2</sub><sup>-</sup>

(c) ClO<sub>3</sub><sup>-</sup>

(d) ClO<sub>4</sub><sup>-</sup>

7. Choose the compound that cannot be prepared by Kolbe's electrolytic method:

(a) Ethane

(b) Butane

(c) Methane

(d) Hexane

8. Which of the following reactions is not an example of redox reaction:

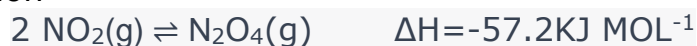
(a) 2H<sub>2</sub>O(l) → 2H<sub>2</sub>(g) + O<sub>2</sub>(g)

(b) 2NaH(s) → 2Na(s) + H<sub>2</sub>(g)

(c) 2KClO<sub>3</sub>(s) → 2KCl(s) + 3O<sub>2</sub>(g)

(d) CaCO<sub>3</sub>(s) → CaO(s) + CO<sub>2</sub>(g)

9. Brown colour gas NO<sub>2</sub> dimerises into a colourless gas N<sub>2</sub>O<sub>4</sub> given by following reaction



The intensity of brown colour in the reaction mixture can be increased by

- (a) increasing temperature
- (b) Decreasing pressure
- (c) Decreasing temperature
- (d) Both (a) and (b)

10. Select the compound that will show Cis -Trans isomerism:

- (a)  $(\text{CH}_3)_2\text{C} = \text{CH} - \text{C}_2\text{H}_5$
- (b)  $\text{C}_6\text{H}_5\text{CH} = \text{CH} - \text{CH}_3$
- (c)  $\text{CH}_3\text{CH} = \text{C}(\text{Cl})_2$
- (d)  $\text{Br}_2\text{C} = \text{C}(\text{Cl})\text{CH}_3$

11 Identify the organic compound synthesized from an inorganic compound ,ammonium cyanate, by F.Wohler

- (a) Acetic acid
- (b) Methane
- (c) Urea
- (d) Methanol

12. Enthalpy of which of the following reactions represents the heat of formation of Carbon Dioxide.

- (a)  $\text{CH}_4(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
- (b)  $\text{C}(\text{s}) + 1/2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$
- (c)  $2\text{C}(\text{s}) + 2\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g})$
- (d)  $\text{C}(\text{s}) + 2\text{O}(\text{g}) \rightarrow \text{CO}_2(\text{g})$

**Question number 13 to 16 are assertion reason types.**

**Given below are two statements labelled as Assertion (A) and Reason (R)**

**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.**

13. **Assertion (A):** LiF has more covalent character than KF.

**Reason (R):** According to Fajan's rule, the smaller cation has less polarising power.

14. **Assertion (A):** Increasing order of acidity of hydrogen halides is  
 $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$

**Reason (R):** While comparing acids formed by the elements belonging to the same group of the periodic table, H–A bond strength is a more important factor in determining the acidity of acid than the polar nature of the bond.

15. **Assertion (A):** Carbocation always has planar geometry.

**Reason (R):** Carbon bearing positive charge is  $sp^3$  Hybridised.

16. **Assertion:** The empirical mass of acetic acid is half of its molecular mass.

**Reason:** The empirical formula represents the simplest whole number ratio of various atoms present in a compound.

## SECTION B

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

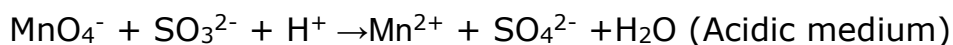
17. The effect of uncertainty principle is significant only for motion of microscopic particles and is negligible for the macroscopic particles. Justify the statement.

18 a) Aluminium forms  $[AlF_6]^{3-}$  while Boron does not form  $[BF_6]^{3-}$ .

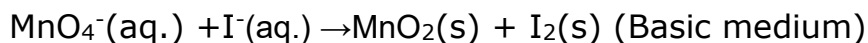
b) Assign the position of the element having atomic number 117.

19. Is Decrease in enthalpy, a criterion for spontaneity? Illustrate with an example.

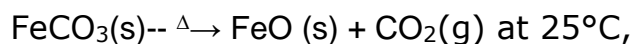
20. Balance the following reactions:



OR



21.  $FeCO_3(s)$  decomposes at constant pressure as  $FeO(s) + CO_2(g)$



The heat absorbed during the reaction is 80 kJ. Calculate  $\Delta H$  &  $\Delta U$  for the reaction.

## SECTION C

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

22. Commercially available concentrated HCl contains 36.5% HCl by mass.

a) What is the molarity of this solution? The density is 1.10 g/mL?

b) What volume of concentrated HCl is required to make 1 L of 0.10 M HCl?

23. Account for the following:

a) MgO is a basic oxide and SO<sub>2</sub> is an acidic oxide.

b) Second Ionization enthalpy of sodium is more than that of second ionization enthalpy of Magnesium.

c) Lithium unlike other alkali metals form compounds with pronounced covalent character.

24.(a) During the hearing of a court case, the judge suspected that some changes in the documents had been carried out. He asked the forensic department to check the ink used at two different places. According to you, Which identification technique can give the best results?

(b) A solution of potassium hydroxide is used to absorb carbon dioxide evolved during the estimation of carbon present in an organic compound. Give reason.

**OR**

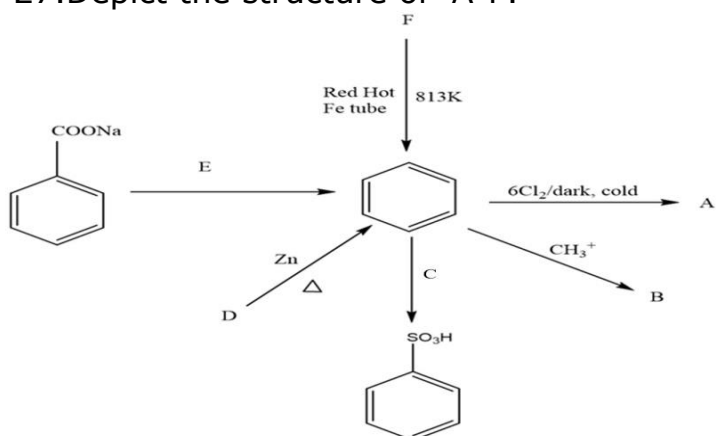
(c) Isomeric pentanes do not boil at same temperature. Justify

Attempt **any two** questions.

25. According to de Broglie, matter should exhibit dual behaviour, that is both particle and wave like properties. However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a bowler at a speed of 100 km/h. Calculate the wavelength of the ball and explain why it does not show wave nature.

26. 500 cm<sup>3</sup> of 0.200 M NaCl solution is added to 100 cm<sup>3</sup> of 0.500 M AgNO<sub>3</sub> solution resulting in the formation of white precipitate of insoluble AgCl. How many moles and how many grams of AgCl are formed? Which is the limiting reagent?

27. Depict the structure of A-F.



28. a) Explain how reversible work done is more than irreversible work done.  
b) Mass and volume both are extensive properties but density is an intensive property. Explain.

### **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.***

29. The photoelectric effect was discovered in 1887 by the German physicist Heinrich Rudolf Hertz. In connection with work on radio waves, Hertz observed that, when ultraviolet light shines on two metal electrodes with a voltage applied across them, the light changes the voltage at which sparking takes place. This relation between light and electricity (hence *photoelectric*) was clarified in 1902 by another German physicist, Philipp Lenard. He demonstrated that electrically charged particles are liberated from a metal surface when it is illuminated and that these particles are identical to electrons, which had been discovered by the British physicist Joseph John Thomson in 1897. Further research by other physicist such as Einstein showed that the photoelectric effect represents an interaction between light and matter that cannot be explained by classical physics, which describes light as an electromagnetic wave

**Answer the following questions.**

(a) Can light of any frequency cause a photoelectric effect? Give reason for your answer.

(b) What is the meaning of intensity of light? What is the relationship between the intensity of light and photoelectric current?

(c) Define Threshold frequency. What happens to the extra energy if a frequency higher than the threshold frequency is used?

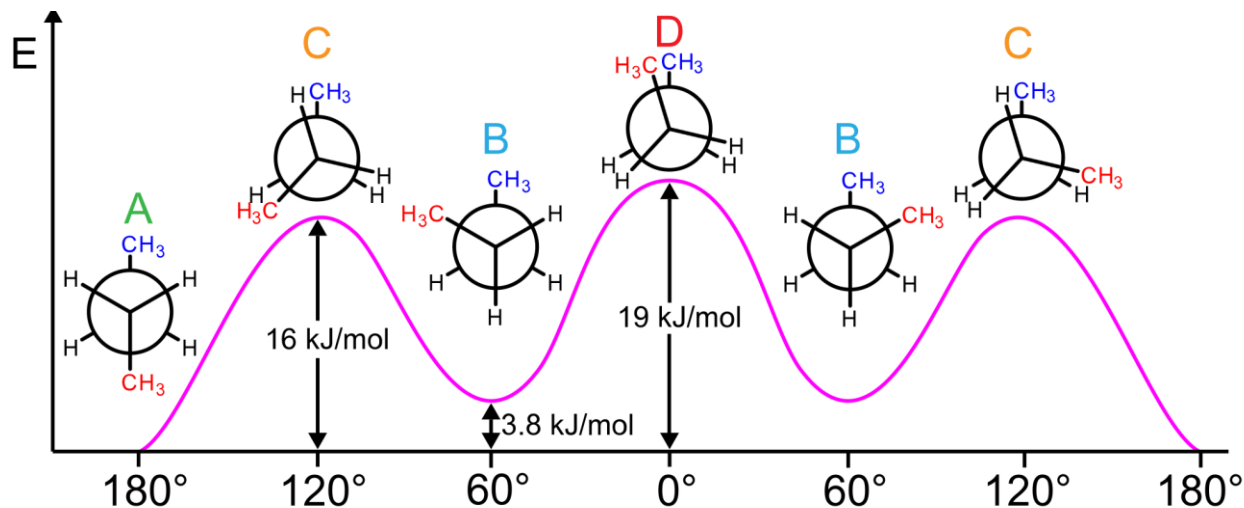
**OR**

**Observe the table given below carefully.**

Metal	Li	Na	K	Cs	Mg	Cu	Ag
$W_0$ /eV	2.42	2.3	2.25	1.9	3.7	4.8	4.3

Which metal will be most suitable for a photoelectric cell. Give reason to support your answer.

30. Conformational isomerism is a form of stereoisomerism in which the isomers can be interconverted just by rotations about formally single bonds. The energies of different conformers changing with dihedral angles can be depicted by the following graph:



Based on your analysis of the graph, answer the following questions:

- Select the isomer with maximum magnitude of torsional strain.
- Identify the type of Rotamers shown as C and D .
- Draw and label the two extreme forms of Newman projection of Ethane.

OR

Draw and label the two extreme forms of Sawhorse projections of Ethane

### SECTION E

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

31. Attempt any five of the following:

- Explain Inductive effect .
- Which electron displacement effect is responsible for o/p directive nature of toluene?
- Write Structural formula of 4-Oxopentanal.
- Give specific term for the ratio of distance travelled by one component of a mixture to distance travelled by solvent in separation techniques.

(e)  $(\text{CH}_3)_3\text{C}^+$  is more stable than  $\text{CH}_3\text{CH}_2^+$  and  $\text{CH}_3^+$  is the least stable cation. Give appropriate reason.

(f) In Which of the following compounds, presence of Nitrogen cannot be detected by Lassaigne's test

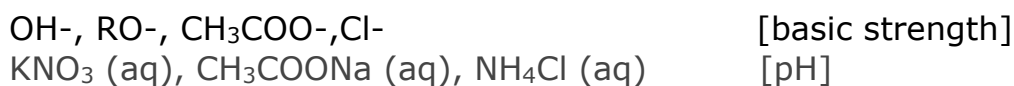


32.(a) What is common ion effect? What will be the effect of extent of ionization of  $\text{H}_2\text{S}$  in the  $\text{HCl}$  solution?

(b) The solubility of  $\text{BaSO}_4$  in water is  $8 \times 10^{-5} \text{ mol dm}^{-3}$ , calculate its solubility in  $0.01 \text{ mol dm}^{-3}$  of  $\text{H}_2\text{SO}_4$ .

OR

(a) Arrange the following in decreasing order of the property indicated:



(b) Calculate the pH of 0.08M solution of Hypochlorous acid  $\text{HOCl}$ . The ionization constant of the acid is  $2.0 \times 10^{-5}$ . Determine the percentage dissociation of  $\text{HOCl}$ .

[ $\log 1.26 = 0.10037$ ]

33.(a) Consider the given molecules and recognise the molecules with  $\text{SP}^3$  hybridisation :



(b) Draw Molecular orbital diagram to explain the paramagnetic nature of Oxygen. Calculate the bond order.

OR

(a) Differentiate between the shape and geometry of  $\text{BrF}_3$  molecule using structure, on the basis of VSEPR theory.

(b) Show Lewis representation of Ozone molecule and calculate formal charge on each oxygen.



