

ARMY PUBLIC SCHOOL SHILLONG
ANNUAL EXAMINATION (2022-23)
SUB:-CHEMISTRY THEORY (043)
CLASS XI

Time: 3 hours

MAX MARKS: 70

General Instructions:

Read the following instructions carefully.

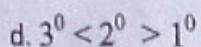
- a) There are **35 questions** in this question paper with internal choice.
- b) **SECTION A** consists of 18 multiple-choice questions carrying **1 mark** each.
- c) **SECTION B** consists of 7 very short answer questions carrying **2 marks** each.
- d) **SECTION C** consists of 5 short answer questions 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.**

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 molality of the solution, which contains 18.5 g of HCl gas in 500g of water is 1
 - a. 0.1m
 - b. 0.01m
 - c. 0.5m
 - d. 1m
2. If a solution contains 36g of water and 46g of glycerine [$C_3H_5(OH)_3$]. The mole fraction of Glycerine will be 1
 - a. 0.2
 - b. 0.3
 - c. 0.6
 - d. 0.4
3. The pair of ions having same electronic configuration is 1
 - a. Cr^{3+} , Fe^{3+}
 - b. Fe^{3+} , Mn^{2+}
 - c. Fe^{3+} , Co^{3+}
 - d. Sc^{3+} , Cr^{3+}
4. Maximum number of electrons in a sub shell with $l=3$ and $n=4$ is 1
 - a. 10
 - b. 12
 - c. 14

- d. 16
5. The correct set of quantum number for the valence electron of Rubidium atomic number 37 is 1
- a. 5, 1, 0, +1/2
 - b. 5, 1, 1, +1/2
 - c. 6, 0, 0, +1/2
 - d. 5, 0, 0, +1/2
6. Element with atomic number 55 belongs to which block in the modern periodic table? 1
- a. s
 - b. p
 - c. d
 - d. f
7. The element with positive electron gain enthalpy is 1
- a. Hydrogen
 - b. Neon
 - c. Oxygen
 - d. Flourine
8. Which of the following has smallest radius? 1
- a. Cl^-
 - b. S^-
 - c. K^+
 - d. Ca^{2+}
9. The bond order of He_2 molecule is 1
- a. 0
 - b. 1/2
 - c. 1
 - d. 2
10. The hybridization in case of PCl_5 is 1
- a. sp^3
 - b. sp^3d
 - c. sp^3d^2
 - d. sp^2
11. For the process to occur under adiabatic conditions, the correct condition is 1
- a. $\Delta T = 0$
 - b. $\Delta P = 0$
 - c. $q = 0$
 - d. $w = 0$
12. The order of stability of carbanion is 1
- a. $3^\circ > 2^\circ > 1^\circ$
 - b. $3^\circ < 2^\circ < 1^\circ$
 - c. $3^\circ = 2^\circ = 1^\circ$



13. Isopropyl bromide on Wurtz reaction gives

1

- a. Hexane
- b. Propane
- c. 2,3-dimethylbutane
- d. Neo hexane

14. Which of the following compounds is formed when ethyne is passed through red hot iron tube at 773K.

1

- a. ~~Toluene~~
- b. ~~Benzene~~
- c. Phenol
- d. Benzaldehyde

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

1

Assertion (A): Alkanes are called paraffins.

Reason (R): Alkanes are highly reactive.

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.

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

1

Assertion (A): Alkanes are soluble in water.

Reason (R): Alkanes are nonpolar in nature..

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.

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

1

Assertion(A): In Friedel Crafts synthesis $AlCl_3$ is used.

Reason(R): $AlCl_3$ helps in generating electrophile.

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.

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

1

Assertion (A): D(+)- Glucose is dextrorotatory in nature,

Reason (R): (+) stands for dextrorotatory nature.

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.

SECTION B

This section contains 7 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

19. Write the IUPAC name of the following compounds: 2
- a. $\text{CH}_3\text{OCH}_2\text{CH}_3$
 - b. $\text{CH}_3\text{CH}=\text{C}(\text{Cl})\text{CH}_3$ 2
20. How will you prepare ? (write chemical reaction):
- a. Alkanes from unsaturated hydrocarbon
- OR
- b. Benzene from phenol
21. Calculate the number of molecules and atoms present in 11.2 liters of oxygen gas at NTP. 2
22. Calculate the wave length of an electron moving with a velocity of 2.05×10^7 m/s. 2
23. a. State Hund's rule. 2
- b. Write the electronic configuration of Cu ($Z=29$). 2
24. Explain why:
- a. The ionization enthalpy of Boron is less than Beryllium.
 - b. The negative electron gain enthalpy of Chlorine is more than Fluorine.
25. Draw the energy level diagram for the molecular orbital of oxygen molecule and also write its Bond order and electronic configuration. 2

SECTION C

This section contains 5 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

26. Derive the relation for work done by isothermal reversible process. 3
27. Draw the resonance structures for the following compounds. Show the electron shift using curved arrows. 3
- a. $\text{C}_6\text{H}_5\text{OH}$
 - b. $\text{C}_6\text{H}_5\text{CHO}$
28. Write the chemical reaction to illustrate the following reactions 3
- a. Wurtz reaction.
 - b. Dehydrohalogenation of Chloro ethane.
 - c. Friedel-Crafts acylation of Benzene.
29. Draw the Lewis dot structure of the following and also find the formal charge of each atom: 3

- a. NO_2^- ✓
- b. H_3O^+
- c. O_3

30. Write short notes on the following with example

3

- a. Isomeric effect
- b. Hyperconjugation
- c. Functional isomerism

OR

Answer the following:

- a. Define pH. Find the pH of a solution whose H_3O^+ concentration is 1.5×10^{-5} .
($\log_{10} 1.5 = 0.176$)
- b. What do you mean by ionic product of water? Prove that the pH of H_2O is 7.

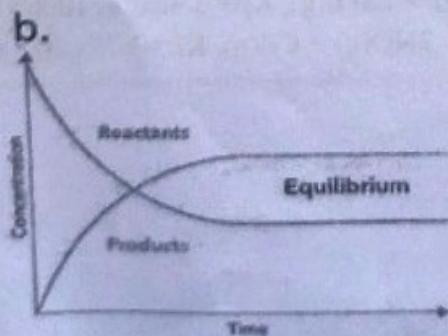
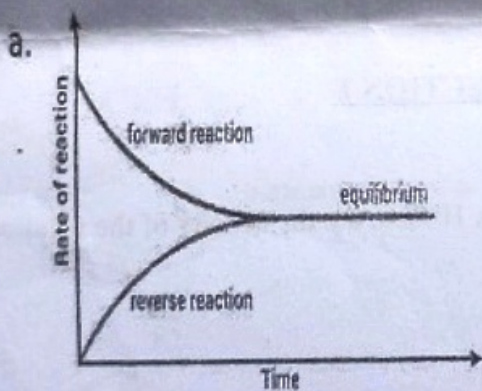
SECTION D

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

31. **CASE 1**

4

On the basis of following graph answer the following:



- a. To reach equilibrium, is it necessary that the concentration of reactant and product has to be equal?
- b. When can a reaction reach Equilibrium?
- c. Can a non reversible reaction reach equilibrium? Why?
- d. Comment on the above two graph.

32. CASE 2

Organic reactions can be classified into four main categories. Substitution, addition reactions, elimination reaction and rearrangement reaction. Substitution reaction can be further classified into free radical, nucleophilic and electrophilic substitution. Similarly elimination reaction reaction can be in the form of dehydration and dehydrohalogenation.

Answer the following questions:

4

- a. Halogenation of alkane is an example of which type of reaction?
- b. Write the chemical equation for the reaction of haloalkanes with alcoholic KOH.
- c. Write the chemical equation for the reaction of alcohol with hot and conc H_2SO_4 ?
- d. What are electrophiles? Give example.

SECTION E

33. a. Define the term molarity and molality.

5

b. A solution of glucose in water is labeled as 10%(w/w). the density of the solution is 1.20g mL^{-1} . Calculate

- i) Molality
- ii) Molarity
- iii) Mole fraction of each component.

34. a. State law of Mass action.

5

b. Determine

- i) K_c for the reaction: $2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{SO}_3(\text{g})$, $K_p = 3.4\text{bar}$ at 1000°C
- ii) K_p for the reaction: $2\text{NOCl}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Cl}_2(\text{g})$, $K_c = 3.75 \times 10^{-6}$ at 1069K

35. Complete the following reactions:

5

