Meghalaya Board of School Education

SAMPLE PAPERS

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CHEMISTRY

(Theory)

Full Marks : 70

Time : 3 hours

General Instructions :

(i) All questions are compulsory.

(ii) Question No. **1** to **5** are multiple choice questions carrying 1 mark each.

(iii) Question No. **6** to **10** are very short answer questions carrying 1 mark each.

(iv) Question No. **11** to **17** are short answer questions carrying 2 marks each.

(v) Question No. **18** to **26** are long answer questions carrying 3 marks each.

(vi) Question No. **27** is a value based answer question carrying 4 marks.

(vii) Question No. **28 to 30** are very long answer questions carrying 5 marks each.

(viii) If necessary simple calculator and log table can be used.

PART — I

Choose the correct answer: $1 \times 5 = 5$

1. Considering the elements *B*, *Al*, *Mg* and *K* the correct order of their metallic character is : 1

(a) $B > Al > Mg > K$

(b) $Al > Mg > B > K$

(c) $Mg > Al > K > B$

(d) $K > Mg > Al > B$

2. The % by mass of carbon in methane is: 1

(a) 25%

(b) 50%

(c) 75%

(d) 100%

3. Which of the following has the highest dipole moment? 1

(a) NH_3

(b) NF_3

(c) BF_3

(d) $BeCl_2$

4. An electrophillic reagent is: 1

(a) Electron deficient species

(b) Electron rich species

(c) Negatively charged species

(d) A Lewis base

5. The empirical formula and molecular mass of a compound are CH_2O and 180g respectively. What will be the molecular formula of the compound? 1

(a) $C_9H_{18}O_9$

(b) CH_2O

(c) $C_6H_{12}O_6$

(d) $C_2H_4O_2$

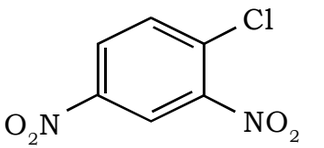
PART — II

6. How do you express the bond length in terms of bond order? 1

7. Define molarity of a solution. 1

8. Write down the electronic configuration of Cr (Atomic no.24). 1

9. What type of a chemical reaction attain a state of equilibrium when carried out in a closed vessel? 1

10. Give the IUPAC name of  1

PART — III

11. Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% oxygen by mass. 2

12. Derive de-Broglie equation. 2

13. Define (i) Entropy and (ii) Gibb's free energy 2

14. *Either*

(a) Define and explain the law of multiple proportion with suitable example. 2

Or

(b) How many moles of nitrogen will be needed to produce 8.2 moles of ammonia by reaction with hydrogen. 2

15. *(a)* Why does BF_3 behave as Lewis acid? 1

(b) Define Octet rule. 1

16. Derive the relation : $\Delta H = \Delta U - p\Delta V$ 2

17. *Either*

(a) Explain the shapes of the following on the basis of VSEPR theory. 2

(i) $BeCl_2$ *(ii)* PCl_5

Or

(b) Define Intermolecular and Intramolecular hydrogen bonding with examples. 2

PART — IV

18. *(a)* Give the relationship between standard free energy change and equilibrium constant. 1

(b) State First Law of Thermodynamics and derive its mathematical expression. 2

19. *(a)* An atomic orbital has n=3. What are the possible values of l and m_l? 1

(b) How many protons, electrons and neutrons are there in $^{25}_{12}Mg$? 2

20. *(a)* Find out the oxidation number of the underlined elements in each of the following species. 1

(i) $K\underline{Cl}O_3$ *(ii)* $[\underline{Fe}(CN)_6]^{4-}$

(b) Write the expression for the equilibrium constant, K_c of the following reaction. 1

$$2NOCl(g) \rightleftharpoons 2NO(g) + Cl_2(g)$$

(c) What is common ion effect? 1

21. *Either*

(a) Ionization enthalpy of Nitrogen is more than that of oxygen. Give reason. 2

(b) Why electrons are first filled up in the 4*s* orbital and then the 3*d* orbital in writing electronic configuration of atoms? 1

Or

(c) Among the elements B, Al, C and Si which has the most negative electron gain enthalpy? 1

(d) How do atomic radius vary in a period and in a group? How do you explain the variation? 2

22. *Either*

(a) Permanganate ion reacts with iodide ion in acidic medium to give Manganese ion and iodine. Write a balanced chemical equation for the reaction by oxidation number method/ion electron method. 3

Or

(b) Define Oxidation and Reduction in terms of electronic concept with suitable example. 3

23. *(a)* What will be the wavelength of a ball of mass 0.1kg moving with a velocity of $10ms^{-1}$. 1

(b) What are Isotopes and Isobars? 2

24. *(a)* The equilibrium constant expression for a gas reaction is 1

$$K_c = \frac{[NH_3]^4[O_2]^5}{[NO]^4[H_2O]^6}$$

Write the balanced chemical equation corresponding to this expression.

(b) Calculate K_c for the reaction: 2

$$2SO_3(g) \rightleftharpoons 2SO_2(g) + O_2(g)$$

for which $K_p = 3.5 \times 10^{-23}$ atm at 27°C

Given R = 0.082 L atm mol^{-1} K^{-1}.

25. *Either*

(a) Write Lewis dot symbols for the following atom and ion. 1

(i) S^{2-} *(ii)* *Al*

(b) What is a Buffer solution? Give examples. 2

Or

(c) What is the total number of σ and π bonds in the following molecules? 1

(i) $H-C\equiv C-H$ *(ii)* CH_3COOH

(d) What is the effect of increasing pressure on the equilibrium? 2

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$

26. *(a)* Explain Isoelectronic species with examples. 2

(b) State Hess's Law of Constant Heat Summation. 1

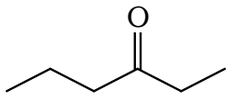
PART – V

27. $-NO_2$ group attached to benzene ring is meta directing whereas –OH group is ortho and para directing. Why? 4

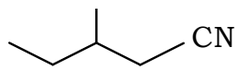
28. *Either*

(a) Give a complete structural formula of the following compounds. 3

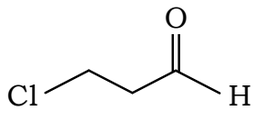
(i)



(ii)

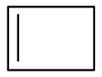


(iii)



(b) Which of the following compounds are aromatic according to Huckel rule? 1

(i)



(ii)



(c) Give the hybridisation state of the underlined Carbon atom in the following molecules. 1

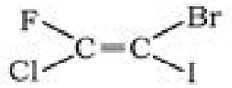
(i) $CH_3\underline{C}N$ *(ii)* $CH_3\underline{C}H = \underline{C}HCH_3$

Or

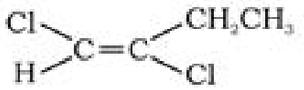
(d) Explain Inductive effect and Electromeric effect with suitable examples. 3

(e) Assign E–Z system to the following compounds 1

(i)



(ii)



(f) Give the correct order of stability of the following alkyl free radicals. 1

$\dot{C}H(CH_3)_2, \dot{C}H_2CH_3, \dot{C}(CH_3)_3, \dot{C}H_3$

29. *Either*

(a) Define Rearrangement reaction and Isomerisation reaction with examples. 3

(b) What is α – elimination reaction? 1

(c) What are carbenes? 1

Or

(d) What are Carbocations and Carbanions? 3

(e) Write down the Resonance structure of Aniline. 1

(f) Write bond line formula of Isopropyl alcohol. 1

30. *(a)* What happens when benzene is treated with chlorine in the presence of anhydrous $AlCl_3$? (Give equation only) 1

(b) Complete the reaction: 1

(i) $CaC_2 + 2H_2O \rightarrow$

(ii) $CH_3 - CH = CH_2 + HBr \xrightarrow{\text{Peroxide}}$ 1

(c) Explain Geometrical Isomerism with suitable examples. 2

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