

2019

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 Nos. **27** is a value based answer questions carrying 4 marks.
- (vii) Question Nos. **28 to 30** are very long answer questions carrying 5 marks each.
- (viii) Use simple calculator and log table if necessary.

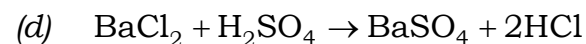
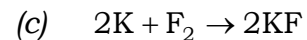
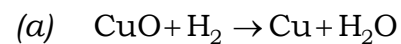
Choose the correct answer:

 $1 \times 5 = 5$

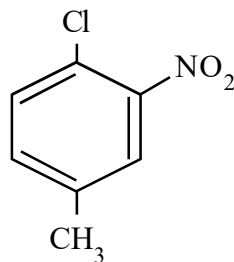
- 1. Metals, non-metals and semi-metals can only be found in:
 - (a) s – block
 - (b) p – block
 - (c) d – block
 - (d) f – block
- 2. Considering the elements B, C, N and F the correct order of their non-metallic character is:
 - (a) $B > C > N > F$
 - (b) $C > B > N > F$
 - (c) $F > N > C > B$
 - (d) $F > N > B > C$
- 3. Which one of the following molecule does not have zero dipole moment:
 - (a) CO_2
 - (b) BF_3
 - (c) H_2O
 - (d) CCl_4

(3)

4. Which one of the following is not an example of redox reaction?



5. The IUPAC name for:



(a) 1-chloro-2-nitro-4-methylbenzene

(b) 1-chloro-4-methyl-2-nitrobenzene

(c) 2-chloro-1-nitro-5-methylbenzene

(d) m-nitro-p-chlorotoluene.

(4)

PART — II

6. State the law of definite proportion. 1

7. Write the electronic configuration of Cr (atomic number =24) or Ni^{2+} (atomic number = 28) 1

8. Define Dalton's law of partial pressure. 1

9. What is hard water? 1

10. Write the structure of B_2H_6 . 1

PART — III

11. Calculate the molality of 15% H_2SO_4 solution by mass. 2

12. What will be the wavelength of a ball of mass 0.1kg moving with a velocity of 10ms^{-1} ? ($h = 6.626 \times 10^{-34}\text{J}$) 2

13. Derive de-Broglie's equation. 2

(5)

14. What is diagonal relationship? Discuss any two points to show diagonal relationship between Li and Mg. 2

Either

15. What is Bond enthalpy? Arrange H_2 , N_2 and O_2 in increasing order of Bond enthalpy. 1 + 1 = 2

Or

Draw the structure of SF_6 and SF_4 on the basis of VSEPR theory. 1 + 1 = 2

16. It water vapour is assumed to be a perfect gas, molar enthalpy change for vapourisation of 1 mol of water at 1 bar and $100^\circ C$ is 41 kJ mol^{-1} . Calculate the internal energy change, when 1 mol of water is vapourised at 1 bar pressure and $100^\circ C$. 2

Either

17. What are Homolytic and Heterolytic cleavage? 2

Or

Define Anti-Markovnikov's rule with suitable example. 2

(6)

PART — IV

Either

18. Draw the molecular orbital diagram of N_2 molecule and interpret its magnetic behaviour. 2 + 1 = 3

Or

Draw the molecular orbital structure for C_2H_4 and C_2H_2 and mention their bond angles. $1\frac{1}{2} + 1\frac{1}{2} = 3$

19. (a) Calculate the volume occupied by 8.8 g of CO_2 at $31.1^\circ C$ and 1 bar pressure.
 $R=0.083 \text{ bar L K}^{-1} \text{ mol}^{-1}$. 2

(b) Write the formula of van der Waal's equation of state. 1

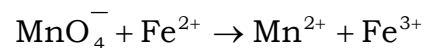
20. (a) What is buffer solution? 1

(b) The concentration of hydrogen ion in a sample of soft drink is $3.8 \times 10^{-3} \text{ M}$. What is its pH? 2

21. (a) Which element shows always a negative oxidation state? 1

(7)

- (b) Balance the following equation in acidic medium by half - reaction method: 2



Either

22. (a) What are the Isotopes of Hydrogen? 1

- (b) Explain the position of Hydrogen in the periodic table. 2

Or

- (c) What are metallic hydrides? Give one example each. 1 + 1 = 2

- (d) What is heavy water? 1

23. (a) Why are alkali metals not found in nature? 1

- (b) Write the equation involved in the manufacture of Na_2CO_3 in Solvay's process. 2

24. (a) What is Catenation? 1

- (b) Why does graphite conduct electricity? 1

- (c) Write one use of Zeolite. 1

(8)

25. (a) What is a functional group? 1

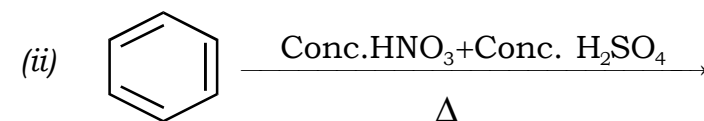
- (b) What is Inductive effect? 1

- (c) Write the resonance structures of Aniline. 1

Either,

26. (a) Write the two geometrical isomers of But-2-ene. 1

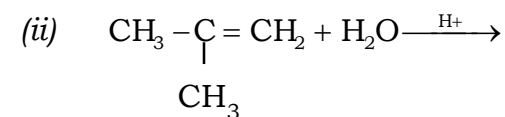
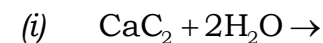
- (b) Complete the following equation: 1 + 1 = 2



Or

- (c) What is Wurtz reaction? 1

- (d) Write the products of the following reaction: 1 + 1 = 2



PART — V

- 27.** A factory was started near a village. Suddenly villagers started feeling the presence of irritating vapour in the village and causes of headache, chest pain, cough, dryness of throat and breathing problems increased. Villagers could not understand the causes of these health problems. Explain how will you educate the people of such environmental hazards and will take up the matter with factory owner to solve these problems. 4

Either

- 28.** (a) Define closed system and isolated system. 1 + 1 = 2
 (b) State 3rd law of thermodynamics. 1
 (c) Derive the relation, 2

$$\Delta H = \Delta U - P\Delta V$$

Or

- (d) State Hess's law of constant heat summation with example. 2
 (e) Under which conditions a process can be spontaneous? Explain with the help of $\Delta G = \Delta H - T\Delta S$ 3

- 29.** (a) Why ice floats on water? 1
 (b) Why hydrogen peroxide is stored in black plastic bottle? 1
 (c) Complete the following reactions. 1 + 1 + 1 = 3
 (i) $\text{MnO}_4^- + \text{H}_2\text{O}_2 \xrightarrow{\text{H}^+}$
 (ii) $\text{NaNO}_3 \xrightarrow{\Delta}$
 (iii) $\text{Ca(OH)}_2 + \text{CO}_2 \longrightarrow$
30. (i) What is Homologous Series? 1
 (ii) Write the Positional Isomers of $\text{C}_3\text{H}_6\text{O}$ 1
 (iii) What happens when (Give equation) 1 + 1 + 1 = 3
 (a) Propyne is treated with hydrogen in presence of Ni as catalyst.
 (b) Ethanol is heated with Conc. H_2SO_4 at 440K.
 (c) Propene undergoes ozonolysis.

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