Mock Test – 4

Time: 3 Hrs **Max. Marks: 70**

General Instructions

1. All questions are compulsory.
2. Question numbers 1 to 8 are very short answer questions and carry 1 mark each.
3. Question numbers 9 to 18 are short answer questions and carry 2 marks each.
4. Question numbers 19 to 27 are also short answer questions and carry 3 marks each.
5. Question numbers 28 to 30 are long answer questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

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1. Calculate the molecular mass of glucose ($C_6H_{12}O_6$) molecule. Given at. mass: H = 1.008 u. (1)

2. Why are Bohr's orbits called stationary states? (1)

3. Give the general electronic configuration of (a) *p*-block and (b) actinoids. (1)

4. Why does touching ice give someone cold sensation? (1)

5. State the law of mass action. (1)

6. Name the gases which cause greenhouse effect. (1)

7. Convert methane into ethane. (1)

8. Give one example of orthosilicate. (1)

9. Calculate the enthalpy of combustion of ethylene (gas) to form CO_2 (gas) and H_2O (gas) at 298 K and 1 atm pressure. The enthalpies of formation of CO_2, H_2O and C_2H_4 are –393.7, –241.8 and +52.3 kJ mol^{-1}, respectively. (2)

10. PbI_4 does not exist. Explain. (2)

11. State the number of (a) orbitals in a 4*s* subshell, (b) subshells with $n = 2$, (c) orbitals in a 5*p* subshell and (d) orbitals in a 6*d* subshell. (2)

12. Define lattice enthalpy and how is it related to the stability of the ionic compound. (2)

13. Calculate $\Delta_f H°$ for the reaction:

$$2\ H_2S(g) + 3O_2\ (g) \rightarrow 2\ H_2O\ (l) + 2\ SO_2\ (g)$$

Given $\Delta_f H°$ values: $H_2S(g)$ = –20.60 kJ mol^{-1}; H_2O (l) = –285.83 kJ mol^{-1}; $SO_2(g)$ = –296.83 kJ mol^{-1} (2)

14. Explain the different types of chemical equilibrium. (2)

15. What do you understand by electrochemical series? What are its characteristics? (2)

16. What happens when (give only chemical reactions)
(a) sodium hydride is dissolved in water.
(b) gypsum is heated very slowly. (2)

17. Why is it not possible to have pure staggered ethane or pure eclipsed ethane? (2)

18. How does resonance hybrid of benzene differ from hypothetical cyclohexatriene? (2)

19. What do you understand by quantum numbers? (3)

20. Consider the elements N, P, O and S and arrange them in the order of
(a) increasing first ionization enthalpy.
(b) decreasing negative electron gain enthalpy.
(c) increasing non-metallic character. (3)

21. Two moles of an ideal gas at 2 atm and 27 °C are compressed isothermally to half the volume by an external pressure of 4 atm. Calculate *W*, *q* and ΔU. (3)

22. How do atomic sizes vary in a group and in a period? Give reasons for the variation. (3)

23. What do you understand by coordinate bond? Give one example. (3)

24. Explain what are spontaneous and non-spontaneous processes. Give two examples of each. (3)

25. Calculate the pH at the equivalence point when the solution of 0.1 M acetic acid is titrated with a solution of 0.1 M NaOH. K_a for $CH_3COOH = 1.9 \times 10^{-5}$ (3)

26. Write a short note on electrochemical cell taking an example of Daniell cell. (3)

27. On combustion of 0.45 g of an organic compound, we get 0.792 g CO_2 and 0.324 g H_2O. On using Kjeldahl method, 0.2 g of the same substance evolved ammonia which is absorbed in 50.0 mL of M/8 H_2SO_4. The excess acid required 77.0 mL of decimolar NaOH for complete neutralization. Calculate the percentage composition of the organic compound. (3)

28. An unsaturated hydrocarbon A adds two molecules of H_2 and on reductive ozonolysis gives butan-1,4-dial, ethanol and propanone. Give the structure of A, write its IUPAC name and explain the reactions involved.

OR

The hydrocarbon A adds 1 mol of hydrogen in the presence of a platinum catalyst to form *n*-hexane. When A is oxidized vigorously with $KMnO_4$, a single carboxylic acid containing three carbon atoms is isolated. Give and explain the structure of A. (5)

29. Boron fluoride exists as BF_3 but boron hydride does not exist as BH_3. Give reasons. In which form does it exist? Explain its structure.

OR

(a) What are silicones? State some of its uses.

(b) What are boranes? Give chemical equation for the preparation of diborane. (5)

30. Distinguish between resonance effect and inductive effect.

OR

Distinguish between hyperconjugation effect and mesomeric effect. (5)