

Mock Test – 1

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.

1. Define law of multiple proportions. (1)
2. Calculate to proper significant figures:
(a) 12.6×11.2
(b) $\frac{172.8}{15}$ (1)
3. Why are alkali metals highly reactive? (1)
4. How would you describe the state of a thermodynamic system? (1)
5. State the difference between a proton and a photon. (1)
6. Identify "A"
 (1)
7. What are primary pollutants? (1)
8. Name the four measurable properties of gases. (1)
9. KBr (potassium bromide) contains 32.9% of potassium by weight. If 6.40 g of bromine reacts with 3.60 g of potassium, calculate the number of moles of potassium which combine with bromine to form KBr. (2)
10. Why is it that the s-block elements never occur free in nature? What are their usual modes of occurrence?
OR
Explain what happens when
(a) Sodium hydrogen carbonate is heated.
(b) Sodium amalgam reacts with water.
(c) Fused sodium metal reacts with ammonia. (2)
11. At constant volume, 500 J of heat was supplied to a system. It resulted in the increase of temperature of the system from 20 °C to 25 °C. What is the change in internal energy of the system? (2)
12. What is the molality of solution of methanol in water in which the mole fraction of methanol is 0.25? (2)
13. Draw the sawhorse and Newman's projection of staggered and eclipsed forms of ethane molecule. (2)
14. Why does greenhouse effect lead to global warming? What could be the consequences of global warming? (2)
15. Methane, CH₄ reacts with chloride in the presence of light to give four products: Methyl chloride (CH₃Cl), dichloromethane (CH₂Cl₂), trichloromethane (CHCl₃) and tetrachloromethane (CCl₄). Which compound has the lowest vapor pressure at room temperature? Explain. (2)
16. Define the terms: Oxidation, reduction, oxidizing agent and reducing agent according to electronic concept. (2)
17. On the basis of hybridization, predict the shapes of the following molecules:
(a) CH₃F
(b) HC≡N
(c) H₂C=O (2)
18. In DNA and RNA, nitrogen atom is present in the ring system. Can Kjeldahl's method be used for the estimation of nitrogen present in these? Give reasons. (2)
19. Hydrogen peroxide (H₂O₂) decomposes according to the equation:
$$\text{H}_2\text{O}_2(\text{l}) \longrightarrow \text{H}_2\text{O}(\text{l}) + \frac{1}{2}\text{O}_2(\text{g})$$

$$\Delta H^\circ = -98.2 \text{ kJ and } \Delta S^\circ = +70.1 \text{ J K}^{-1}$$

(a) Is this reaction spontaneous at 25 °C?
(b) From the given data, calculate the value of K_p for this reaction at 25 °C. (3)
20. Account for the following:
(a) Melting point of a hydrocarbon increases with branching.
(b) Ethene is more reactive than ethyne towards addition reactions.
(c) Benzene does not give addition reactions under normal conditions. (3)
21. An organic compound (A) C₆H₁₀ on reduction first gives (B) C₆H₁₂ and finally (C) C₃H₁₄. Compound (A) on ozonolysis followed by hydrolysis gives two aldehydes (D) C₂H₄O and (E) C₂H₂O₂. Oxidation of (B) with acidified KMnO₄ gives the acid (F) C₄H₈O₂. Determine the structure of the compounds (A) to (F) with proper reasoning. (3)

22. Describe vapor pressure in molecular terms. What do we mean by saying that it involves a dynamic equilibrium? (3)
23. Give a brief account of the various types of electronic effects in a covalent molecule. (3)
24. NaCl of 95% purity is used to prepare salt cake (Na_2SO_4) by the reaction,



If the product (Na_2SO_4) is only 85% pure, what weight of NaCl is used up in producing 1 kg of the impure salt cake? (3)

25. On the basis of Heisenberg's uncertainty principle, show that electron cannot exist within the atomic nucleus of radius 10^{-15} m.

OR

Calculate the retarding potential to be applied to an electron to increase its de Broglie wavelength from 1.75 \AA to 2.25 \AA ? (3)

26. What are fullerenes? How are they prepared? (3)
27. Explain what happens when boric acid is heated? (3)
28. Discuss the position of lithium in the periodic table. How does it differ from other members of the family? To which other elements in the periodic table does it resemble? Justify your answer with suitable examples.

OR

Give general characteristics of alkali metals. Discuss the anomalous behavior of lithium. Mention similarities shown by lithium towards magnesium. (5)

29. (a) Arrange the three isomeric pentanes in order of increasing stability at room temperature.
 (b) Give a method of preparation of propane from (i) an alkene and (ii) an alkyl halide.
 (c) Write the structure of all the alkenes that can be hydrogenated to form 2-methylbutane.
 (d) Why is light or heat necessary to initiate the chlorination reaction?

OR

Discuss the variation in the boiling points, melting points and solubility of the alkanes with their molecular structure. (5)

30. What are allotropes? Sketch the structure of two allotropes of carbon. What is the impact of structure on physical properties of diamond and graphite?

OR

What are electron-deficient compounds? Are BCl_3 and SiCl_4 electron-deficient species? Explain. (5)

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