

# Mock Test – 3

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. How many moles of NaOH are contained in 27 mL of 0.15 M NaOH? (1)
2. Why does methane not react with chlorine in the dark? (1)
3. What is photoelectric effect? (1)
4. Under what conditions is the heat of reaction equal to enthalpy change? (1)
5. Why is the density of potassium less than sodium? (1)
6. What is PAN? (1)
7. What happens to a reversible reaction if a catalyst is added to it? (1)
8. What is the active mass of water? (1)
9. When 0.532 g of benzene ( $C_6H_6$ ), boiling point 353 K, is burnt with excess of oxygen in a constant volume system, 22.3 kJ of heat is given out. Calculate  $\Delta H$  of the combustion process ( $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$ ). (2)
10. Calculate the work done when 1.0 mol of water at 373 K vaporizes against an atmospheric pressure of 1.0 atm. Assume ideal gas behavior. (2)
11. Express the following numbers up to four significant figures:  
(a) 5.607892  
(b) 32.392800 (2)
12. State the postulates of kinetic molecular theory of gases. (2)
13. Lassaigne's test is not shown by diazonium salts. Why? (2)
14. What are strong and weak electrolytes? Derive an expression for the calculation of the degree of ionization of a weak electrolyte.  
**OR**  
Derive Henderson–Hasselbalch equation. (2)
15. Explain:  
(a)  $H_2O_2$  has a higher boiling point than water.  
(b)  $H_2O_2$  cannot be stored for prolonged periods. (2)
16. What is meant by hybridization? Compound  $CH_2=C=CH_2$  contains  $sp$  or  $sp^2$  hybridized carbon atoms. Will it be a planar molecule? (2)
17. LiH, LiF and  $Li_3N$  show exceptional thermal stabilities. Explain. (2)
18. Differentiate between ionization enthalpy and electron gain enthalpy.  
**OR**  
Why is ionization enthalpy of B is less than that of Be and O is less than that of N? (2)
19. What are the pollutants attacking Taj Mahal? How are they being produced in the atmosphere? (3)
20. What is screening effect? How does it affect ionization of an atom? (3)
21. Calculate the formal charges on the atoms in (a) nitrite ion and (b) carbonate ion. (3)
22. (a) Calculate the number of moles and number of grams of  $Na_2SO_4$  which contain  $1 \times 10^{23}$   $SO_4^{2-}$  ions.  
(b) Calculate the number of formula units of  $Na_2SO_4$  which contains 0.2 mol of oxygen atoms. (3)
23. Draw the orbital representation of the following molecules:  
(a) Water  
(b) Nitrogen molecule  
(c) Ammonia (3)
24. During a process, a system absorbs 710 J of heat and does work. The change in internal energy for the process is 460 J. What is the work done by the system? (3)
25. Explain the term molar gas constant, prove that the universal gas constant is the work done per mole per Kelvin. Give the numerical value of molar gas constant in SI units. Why is it universally valid for all gases irrespective of their nature? (3)
26. Describe in brief the extraction of sodium from molten sodium chloride using the Down's cell. Also draw a neat and labeled diagram of Down's cell. (3)
27. Account for the following:  
(a) Alkali metals show only +1 oxidation state.  
(b) The hydroxides of alkali metals are strong bases.  
(c) Na and K impart color to the flame but Mg does not. (3)

**OR**

Account for the following:

- There is a striking similarity between Li and Mg.
- Alkali metals are difficult to reduce.
- Li is the best reducing agent in aqueous solution. (3)

28. Write balanced equations for the following:

- NaCl is heated with sulphuric acid in the presence of  $\text{MnO}_2$ .
- Chlorine gas is passed into a solution of NaI in water.
- $\text{SiO}_2$  is treated with HF.
- $\text{NaClO}_3$  is treated with  $\text{SO}_2$ .
- Iodine is treated with conc.  $\text{HNO}_3$ .

OR

Complete the following reactions

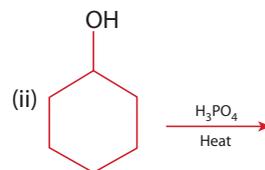
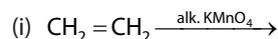
- $\text{CH}_3(\text{CH}_2)_5\text{CH}_3 \xrightarrow[773 \text{ K}/10-20 \text{ atm}]{\text{Cr}_2\text{O}_3}$
- $\text{CH}_4 + \text{H}_2\text{O}(\text{steam}) \xrightarrow{\text{Ni}}$
- $\text{NaNO}_2 + \text{HCl} \rightarrow$
- $\text{K}_2\text{Cr}_2\text{O}_7 + \text{HCl} \rightarrow$

- 
 $\xrightarrow[\text{KMnO}_4]{\text{Hot alkaline}}$  (5)

- How will propene react with HBr
    - in the presence of peroxide and
    - in the absence of any peroxide?
  - Draw the structures of three cycloalkane isomers with molecular formula  $\text{C}_5\text{H}_{10}$ , each with different ring size.

OR

(a) Complete the following reactions:



- Write the structural formulas of all the possible isomers of  $\text{C}_2\text{H}_2\text{Cl}_2$  and indicate which of these is non-polar? (5)
- What is the difference between distillation, distillation under reduced pressure and steam distillation?
    - State the principle of chromatography

OR

- Give detailed differences between crystallization and chromatography.
- Discuss the chemistry of Lassaigne's test. (5)

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