**Sample Paper-04**
**Chemistry (Theory)**
**Class – XI**

**Time allowed: 3 hours** **Maximum Marks: 70**

**General Instructions:**

a) All the questions are compulsory.
b) There are **26** questions in total.
c) Questions **1** to **5** are very short answer type questions and carry **one** mark each.
d) Questions **6** to **10** carry **two** marks each.
e) Questions **11** to **22** carry **three** marks each.
f) Questions **23**is value based question carrying **four** marks.
g) Questions **24**to **26** carry **five** marks each.
h) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions in five marks each. You have to attempt only one of the choices in such questions.
i) Use of calculators is **not** permitted. However, you may use log tables if necessary.

1. What does the property of molecules of real gases is indicated by van der Waals constant 'a'?
2. Using periodic table, identify

   (a) An element that would tend to gain two electrons.

   (b) An element that would tend to lose two electrons.
3. Give IUPAC name of allyl alcohol.
4. Explain why $BeH_2$ molecule has zero dipole moment although the Be - H bonds are polar?
5. In the given equation, determine $\Delta H^{\theta}$ for the reaction.

   $2Al\,(s) + \frac{3}{2}O_2(g) \rightarrow Al_2O_3(s),\ \Delta_f H^{\theta} = -1,670 kJ/mol \text{ for } Al_2O_3(s)$
6. Convert:
   (a) Carbon to benzene.
   (b) Calcium carbide to oxalic acid.
7. How would you calculate the pH of 0.001M NaOH?

   **Or**

   Ramesh forgot to add the reaction mixture to the round bottomed flask at $27^oC$ but instead he placed the flask on the flame. But after sometime, he realized his mistake and used pyrometer and found the temperature of the flask which was $477^oC$. What fraction of air would have been expelled out?
8. State the difference between classical smog and photochemical smog.
9. Given the electrode reduction potentials of four metallic elements A, B, C and D = + 0.79, - 0.74, 1.08 and – 0.31 V. Arrange these in order of decreasing electropositive character and support you answer.
10. Give any three factors favourable for the formation of ionic bond.
11. (a) Which undergo nitration easily m-dinitrobenzene or toluene? Give reason.
    (b) What is the number of σ and π bonds in $N \equiv C - CH = CH - C \equiv N$?

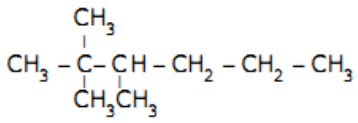
(c) Indicate the number of σ and π bonds in $HCONHCH_3$.

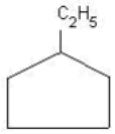
12. If successive ionization energies of a certain element are $I_1$ = 589.5 kJ/mol, $I_2$ = 1145 kJ/mol, $I_3$ = 4900 kJ/mol, $I_4$ = 6500 kJ/mol, $I_5$ = 8100 kJ/mol, then identify the unknown element as K, Si, Ca or As from the pattern of ionization energies
13. Professor of Delhi University found that some scraps emit high energy radiations which harmed large number of people. There are certain elements like Co-60 which emit radiations at their own and this phenomenon is called radioactivity. There are three kinds of rays.
    (a) Name the ray which is used to treat cancer.
    (b) Give the source of γ-rays used for treating cancer.
    (c) Discuss the values not possessed by people disposing off radioactive waste materials.
14. These people are not concerned with the health of other people.The first element in every group of representative elements shows properties different from the characteristic properties of the group.
    (a) Name three such elements.
    (b) Give two abnormal properties of each one of them.
15. (a) Lifetimes of the molecules in the excited states are often measured by using pulsed radiation source of duration nearly in the nano second range. If the radiation source has the duration of 2 ns and the number of photons emitted during the pulse source is $2.5 \times 10^{15}$, then calculate the energy of the source.
    (b) Calculate the wave number for the longest wavelength transition in the Balmer series of atomic hydrogen.
16. Give reasons:
    (a) LiCl is more covalent than KCl.
    (b) In aqueous solution Li+ has lowest mobility.
17. BARC at Trombay in Mumbai has five nuclear reactors which produce electricity. Boron rods are used as control rods to absorb neutrons in nuclear reactors, used for the production of electricity. Boron steel containers are used to dispose nuclear waste materials safely. Metal borides are used as protective shield.
    (a) Give reason for the absorption of neutrons by boron.
    (b) Give methods to dispose-off nuclear wastes safely.
    (c) Give harmful effects of nuclear radiations.
18. Give reasons:
    (a) Ethyne molecule is linear.
    (b) Covalent bonds are directional while ionic bonds are non-directional.
    (c) Water molecule has bent structure.
19. When we eat sweets, they form acid in our mouth which reacts with calcium phosphate of the enamel and tooth starts to decay. In order to avoid tooth decay, we should brush our teeth after every meal.
    (a) Comment: "Calcium phosphate is a basic salt".
    (b) Give reason: "Toothpaste is basic in nature".
    (c) Give the expression for $K_{sp}$ of calcium phosphate.

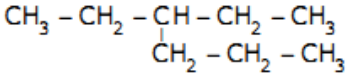
**Or**

How would you classify the state of chemical equilibrium in a chemical reaction based on the extent to which the reactions proceed?

20. Explain the physical significance of van der Waals parameters.
21. (i) Draw the structural isomers of pentane.
    (ii) Give the IUPAC names of the following compounds.

(a) 

(b) 

(c) 

22. What are the factors made Thomson to argue about the amount of deviation of the particles from their path in the presence of electrical or magnetic field depends upon?
23. During an educational trip, class XI students saw a beautiful lake in a village. They noticed that some villagers were washing clothes around the lake and at some places waste material from houses was destroying its beauty. After few years back, one of the student went to the same lake again and saw the lake was covered with algae, stinking smell and the water becomes unusable. Explain the reason for this condition.
24. (i) Give the chemical reactions when borax solution is acidified.
    (ii) Explain why $BF_3$ exists whereas $BH_3$ does not?
    (iii) $SiO_2$ is solid but $CO_2$ is a gas at room temperature.

**Or**

(a) Explain the rule for the formation of 1-bromopropane by adding HBr to propene in presence of benzoyl peroxide.
(b) What is the cause of extra ordinary stability of benzene inspite of presence of three double bonds in it?
(c) Alkenes prefer to undergo electrophilic addition reaction while arenes prefer electrophilic substitution reactions. Why?
(d) Why moist ethene be dried by passing it through concentrated sulphuric acid?

25. Write the balanced ionic equation for the reaction of permanganate ion with bromide ion in basic medium to give manganese dioxide and bromate ion.

**Or**

Explain the rules for calculating oxidation number.

26. What are the uses of dihydrogen?

**Or**

(a) Out of n-hexane and ethyne which will be more acidic. Also give reason for this behaviour.
(b) Explain with an example: i) Wurtz reaction ii) Acidic Dehydration
(c) Convert propyne to propanone.