**Roll No. _____** **Code : 112015-043-A**

Please check that this question paper contains **26** questions and **7** printed pages.

# CLASS-XI
# CHEMISTRY (THEORY)

**Time Allowed : 3 Hrs.** **Maximum Marks : 70**

***General Instructions :***

*(i) All questions are compulsory.*

*(ii) There are 26 questions in all. Questions 1 to 5 carry one mark each, Questions 6 to 10 carry two marks each, questions 11 to 22 carry three marks each, question 23 carries four marks and questions 24 to 26 carry five marks each.*

*(iii) 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 the three questions of five marks each. You have to attempt only one of the choices in such questions.*

*(iv) Fifteen minutes time has been allotted to read this question paper. During this time, the students will read the question paper only and will not write any answer on the answer script.*

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1. Write the IUPAC name and symbol for the element with atomic number 114. (1)

2. Why is nitric acid added to sodium extract before adding silver nitrate solution for testing halogens ? (1)

3. Why gas fizzes out when soda water bottle is opened ? (1)

4. Why are the atomic masses the average values ? (1)

5. The empirical formula and molecular mass of a compound are $CH_2O$ and 180 g per mole respectively. What will be the molecular formula of the compound ? (1)

6. Explain :

   (a) The boiling point of a liquid rises on increasing pressure. (2)

   (b) Drops of liquid assume spherical shape.

7. Write balanced equations for : (2)

(a) $Ca(OH)_2 + CO_2 \longrightarrow$

(b) $LiNO_3 \xrightarrow{\Delta}$

8. A sample of nitrogen gas occupies a volume of 1 $l$ at a pressure of 0.2 bar at 60°C. Calculate the pressure if the gas is compressed to 0.225 $l$ at – 3°C ? (2)

9. (a) $[SiF_6]^{2-}$ exists where as $[SiCl_6]^{2-}$ does not exist. Why ?

(b) Why the atomic radius of Gallium is smaller as compared to Aluminium ?

***OR***

Write equations for the chemical reactions when : (2)

(i) Silicon is heated with methyl chloride at high temperature in the presence of copper.

(ii) Boric acid is added to water.

10. Convert : (2)

(a) Acetylene to Toluene

(b) Sodium acetate to methane

11. The molarity of sulphuric acid ($H_2SO_4$) is 0.8 M and its density is 1.06 g $cm^{-3}$. What will be the concentration of solution in terms of molality and mole fraction ? (3)

12. An element having atomic number 29. Write (3)

(i) electronic configuration of this element

(ii) all the quantum numbers for an unpaired electron of this element.

13. For the reaction (3)

$$2A\ (g) + B\ (g) \longrightarrow 2D\ (g)$$

$\Delta\mu^0 = -\ 10.5$ kj and $\Delta S^0 = -\ 44.10\ J\ K^{-1}$

Calculate $\Delta G^0$ for the reaction and predict whether the reaction may occur spontaneously.

14. State as to why : (3)

(a) Among alkali metal ions in aqueous solution, $Li^+$ has the lowest mobility.

(b) Caesium rather than lithium is used in photoelectric cells.

(c) Gypsum is added in the final stages of manufacture of cement.

15. Describe the following with the help of chemical equations : (3)

(a) Wurtz Reaction

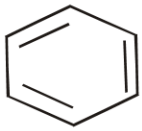
(b) Markovnikov Rule

(c) Dehydrohalogenation

***OR***

Complete the following reactions :

(a) $$CH_3CH_2 - \underset{\underset{CH_2\text{-}CH_3}{|}}{C} = CH_2 + O_3 \xrightarrow{Zn/\,H_2O}$$

(b)  $+ 3Cl_2 \xrightarrow[500\ K]{uv}$

(c) $$CH_3 - C \equiv CH + H_2O \xrightarrow[333\,K]{Hg^{2+}/H^+} A \xrightarrow{Isomerisation} B$$

16. (a) Why hard water is softened before using in boilers ? (3)

(b) Write chemical reactions to show the amphoteric nature of water.

(c) Write two uses of interstitial hydrides ?

17. Balance the following redox reaction in acidic medium ?

$$MnO_4^- + SO_2 \longrightarrow Mn^{+2} + HSO_4^-$$ (3)

Also name the substance which is oxidised and reduced in the above reaction.

18. (a) Given :

$$2Al_2O_3\ (S) \longrightarrow 4Al\ (S) + 3O_2\ (g); \quad \Delta_r H^{\ominus} = 3352\ kj$$

What is the standard enthalpy of formation for $Al_2O_3$ (S) ?

(b) Why entropy of ice is less than that of water ?

(c) What is the difference between extensive property and intensive property ? (3)

19. (a) In how many elements does the last electron have the quantum numbers n = 4 and $l$ = 1 ?

(b) Calculate the energy associated with the first orbit of $He^+$. What is the radius of this orbit ? (3)

20. What happens when (write chemical equations only) :

(a) Aluminium is treated with dilute NaOH.

(b) Sodium borohydride is reacted with iodine.

(c) Silicon dioxide is treated with hydrogen fluoride. (3)

21. Arrange the following in order of property indicated against each :

(a) $Na^+$, $F^-$ , $Mg^{+2}$ , $Al^{+3}$ (increasing ionic size)

(b) B, C, N, O (increasing first ionization enthalpy)

(c) I, Br, F, C$l$ (increasing negative electron gain enthalpy) (3)

22. Give reasons : (3)

(a) Alkynes are acidic in nature.

(b)  is not aromatic.

(c) n-pentane has greater boiling point than isopentane.

23. Rahul visited his grandmother's house in vacations. He observed that families from nearby localities bring loads of laundry to wash in the river. Also they make their animals bathe in the river and dump garbage around it. Rahul advised them to keep the environment clean, maintain healthy and hygenic surroundings and prevent water pollution. (4)

(a) What is the effect of water pollution ?

(b) What do you mean by Biochemical Oxygen Demand (BOD) ?

(c) What is the threat to aquatic animals due to water pollution ?

(d) What values are possessed by Rahul ?

24. (a) Account for the following : (5)

(i) Although ammonia and water both have distorted tetrahedral geometries, bond angle in water is less than that of ammonia.

(ii) All carbon to oxygen bonds in $CO_3^{2-}$ are equivalent.

(iii) $BF_3$ has a zero dipole moment although B–F bonds are polar.

(b) Write the molecular orbital configuration of $O_2^+$. Also calculate its bond order and magnetic nature.

***OR***

(a) On the basis of VSEPR theory, predict the shape of $BrF_5$.

(b) Name the molecular orbital formed by the combination of following atomic orbitals (assume Z-axis as the internuclear axis)

(i) $2P_X + 2P_X$

(ii) $2P_Z - 2P_Z$

(c) In the molecule of ethene ($C_2H_4$)

(i) How many sigma and pi bonds are present ?

(ii) Draw the orbital overlap diagram showing the double bond formation in ethene.

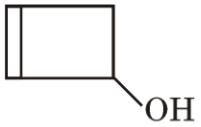
25. (a) Why $(CH_3)_3\ C^{\oplus}$ is more stable than $(CH_3)_2\ C^{\oplus}H$ ? (5)

(b) What type of liquids can be purified by the technique of distillation under reduced pressure ?

(c) Draw the resonance structures for $C_6H_5$ — CHO ?

(d) Write IUPAC names of :

(i) $CH_3 - \underset{\underset{Br}{|}}{CH} - \underset{\underset{O}{\|}}{C} - CH_2 - CH_3$

(ii) 


***OR***

(a) Giving justification categorise $BF_3$ as electrophile or nucleophile.

(b) What type of structural isomerism is exhibited by $CH_3O\ CH_2\ CH_2\ CH_3$ and $CH_3\ CH_2\ OCH_2\ CH_3$ ?

(c) Give examples of two substances which can be used as adsorbents in Thin Layer Chromatography ?

(d) Write the structural formula of :

(i) $4-O\times O$ pentanal

(ii) 1-Phenyl but-1-ene

26. (a) Calculate the value of $K_C$ for the following equilibrium :

$CaCO_3$ (S) $\rightleftharpoons$ CaO (S) + $CO_2$ (g), $k_P$ = 167 at 1000 K

(b) The solubility product of $Al(OH)_3$ is $2.7 \times 10^{-11}$. Calculate its solubility and also find the pH of this solution. (5)

***OR***

(a) Explain the following :

(i) Common Ion Effect

(ii) Bronsted Lowry Concept of acid and base.

(b) Calculate the pH of a solution obtained by mixing 10 m*l* of 0.2 M $Ca(OH)_2$ with 25 m*l* of 0.1 M HC*l*.

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