Chemistry
CBSE Class – XI

Time: 3 Hrs. M.M: 70

General Instructions:

(i) Question 1 to 5 one mark.

(ii) Question 6 to 10 each two mark.

(iii) Question 11 to 22 each three mark.

(iv) Question 23 is value based question and carry four marks.

(v) Questions 24 to 26 each five mark.

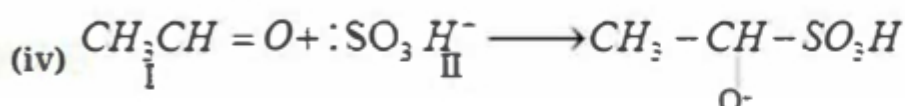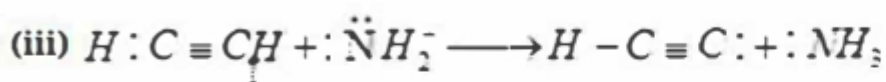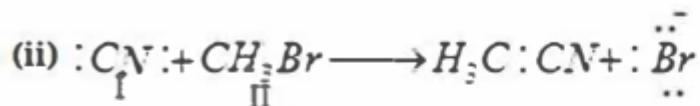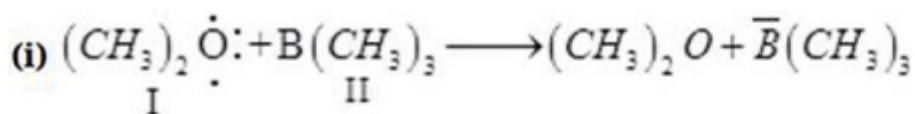## Section A

1. When α-rays hit a thin foil of gold, very few α-particles are deflected back. What does it prove?

2. Calculate the number of atoms of each type in 5.3 g of Na_2CO_3.

3. Critical temperatures of ammonia and carbon dioxide are 405.5 K and 304.10 K respectively. Which of these gases will liquefy first when you start cooling from 500 K to their critical temperature?

4. Why does table salt get wet in rainy season?

5. What orbitals can overlap to form a σ – bond and which orbitals can do so to form a π – bond?

Section B

6. What is hybrid state of central atom in the following? NO_3^-, BF_4^-, PF_5, IF_5 and CO_2.

7. Using van der Waals equation, calculate the constant 'a' when two moles of a gas confined in a four litre flask exerts a pressure of 11.0 atmosphere at a temperature of 300 K. The value of 'b' is 0.05 L mol^{-1}.

8. **(i)** What are conjugate acid-base pairs?

(ii) What are amphoteric substance? Give one example.

9. What are allotropes? List two characteristic differences between diamond and graphite which are allotropes of carbon.

10. Indentify the species I and II as electrophiles (E) or nucleophiles (Nu) in the reactions

(i) $(CH_3)_2 \overset{..}{\underset{I}{\dot{O}}}: + \underset{II}{B(CH_3)_3} \longrightarrow (CH_3)_2 O + \overline{B}(CH_3)_3$

(ii) $: \underset{I}{\overset{}{C}N}: + \underset{II}{CH_2 Br} \longrightarrow H_3 C : CN + : \overset{..}{\underset{..}{Br}}$

(iii) $H : C \equiv \underset{I}{\overset{}{CH}} + : \overset{..}{N}H_2^- \longrightarrow H - C \equiv C : + : NH_3$

(iv) $\underset{I}{\overset{}{CH_3}CH} = O + : SO_3 \underset{II}{\overset{}{H}}^- \longrightarrow CH_3 - \underset{\underset{O^-}{|}}{CH} - SO_3 H$

Section C

11. Arrange the elements of second row in order of increasing second ionisation enthalpies.

12. $0.145 dm^3$ of hydrogen gas is collected over water at $23°C$ and total pressure of $99085 Nm^{-2}$. If the vapour pressure of water at $23°C$ is $2973 Nm^{-2}$, what is the pressure exerted by the dry gas? Also calculate the volume of dry gas? Under NTP conditions?

13. What volume of 0.6 M HCl has enough hydrochloric acid to react exactly with 25 mL of aqueous NaOH having concentration of 0.5 M?

14. When a certain metal was irradiated with a light of frequency $3.2 \times 10^{16} Hz$, the photoelectrons had twice the kinetic energy as emitted when the same metal was irradiated with light of frequency $2.0 \times 10^{16} Hz$. Calculate the threshold frequency (v_0) of the metal.

15. Calculate the kinetic energy of moving electron which has a wavelength of 4.8 pm (mass of electron = $9.11 \times 10^{-31} kg$, h = $6.63 \times 10^{-34} Js$).

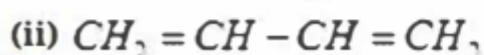**16.** Explain the difference in the reactivity of the group, metals with water.

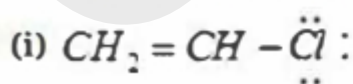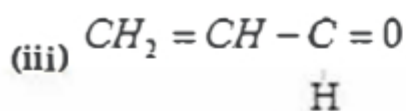**Or**

(i) What is the oxidation state of K in KO_2?
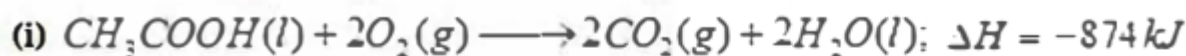
(ii) LiH is more stable than NaH. Explain.

(iii) Why are alkali metal halides soluble in water? '

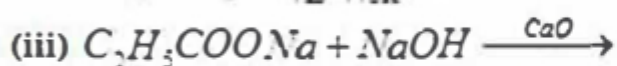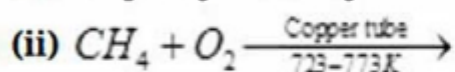**17.** Draw the resonance structure of the following compounds

(i) $CH_2 = CH - \overset{..}{\underset{..}{Cl}}:$

(ii) $CH_2 = CH - CH = CH_2$

(iii) $CH_2 = CH - C = 0$
$\qquad\qquad\qquad\qquad |$
$\qquad\qquad\qquad\qquad H$

18. The enthalpy changes for the following reactions at 298 K and 1 atm are given below:

(i) $CH_3COOH(l) + 2O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(l); \quad \Delta H = -874\,kJ$

(ii) $CH_3CH_2OH(l) + 3O_2(g) \longrightarrow 2CO_2(g) + 3H_2O(l); \quad \Delta H = -1363\,kJ$

(iii) Calculate the internal energy changes for these reactions.

19. Two liquids (A) and (B) can be separated by the method of fractional distillation. The boiling point of liquid (A) is less than boiling point of liquid (B). Which of the liquids do you expect to come out first in the distillate? Explain.

20. Complete the reactions,

(i) $CH_3CH_3 + HNO_3 \xrightarrow{\ Vapour\ phase\ }$

(ii) $CH_4 + O_2 \xrightarrow[723-773K]{\ Copper\ tube\ }$

(iii) $C_2H_5COONa + NaOH \xrightarrow{\ CaO\ }$

21. Identify the kind of energy change usually associated with each of the following.

(i) Automobile engine

(ii) Fluorescent lamp

(iii) Radio

(iv) Friction

(v) Photoelectric cell

22. How should the management of domestic waste be done?

Section D

23. WHO has suggested that people should take less common salt as it leads to high blood pressure and heart ailments. Sodium ions are found primarily on outside of the cells, being located in blood plasma and in the interstitial fluid which surrounds the cells. These ions participate in the transmission of nerve signals, in regulating the flow of water across cell membranes and in the transport of sugar and amino acids into cells.
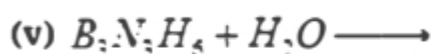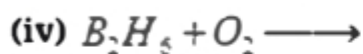
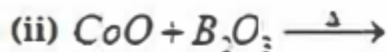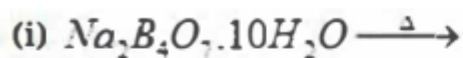(i) How much sodium is present in blood plasma?

(ii) What is the major source of sodium?

(iii) What is the harmful effect if we take excess of salt?

(iv) What values are possessed by WHO?

24. Complete the following reactions:

(i) $Na_2B_4O_7.10H_2O \xrightarrow{\Delta}$

(ii) $CoO + B_2O_3 \xrightarrow{\Delta}$

(iii) $BF_3 + LiAlH_4 \xrightarrow{\text{Diethyl ether}}$

(iv) $B_2H_6 + O_2 \longrightarrow$

(v) $B_3N_3H_6 + H_2O \longrightarrow$

Or

Give the preparation of borax from the mineral colemanite. Briefly describe its properties and uses.

25. Give the condensed structural formula for each of the following compounds.

(i) 3-ethylcyclohexene

(ii) 2 – methyl – 4 – isopropylheptane

(iii) 2-methyl – 4 – propyl – 3 – heptene

(iv) 2, 2 – imethylhexanoic acid

(v) 2 – chloro – 2 – methylbutanol

(vi) 1, 3 – diaminopropane

(vii) 1 – bromo – 3 – chlorocyclohexene

(viii) 2, 3 – dimethyl – 1, 3 – butadiene

(ix) 4 – oxobutanoic acid

(x) 2 – nitro, 3 – ethyldecane

Or

Correct each of the following and write corresponding structure

(i) 2, 4, 6 – trinitrobenzene

(ii) 4 – chloro-mefa-xylene

(iii) 2 – aminonitrobenzene

(iv) 1 – ethyl – 4 – butylbenzene

(v) l-chloro-2-chloropropyl benzene

26. An unsaturated hydrocarbon 'A' adds two molecules of H_2 and on reductive ozonolysis gives butane-l, 4-dial, ethanal and propanone. Give the structure of 'A', write its IUPAC name and explain the reactions involved.