
CBSE Class 11 chemistry
sample papers 04

Time: 3Hrs M.M 70

General Instruction:

- A. All questions are compulsory.
 - B. Q. No. 1 to 5 are Very Short Question carry one mark each.
 - C. Q. No. 6 to 10 are Short Answer Questions and carry 2 marks each.
 - D. Q. No. 11 to 22 are Short Answer Questions and carry 3 marks each.
 - E. Q. No. 23 is Value Based Questions carries 4 marks.
 - F. Q. No. 24 to 26 are Long Answer Questions and carry 5 marks each.
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1. Which of the following has maximum number of significant figure ?
 - i. 0.00453
 - ii. 4.8046
 - iii. 5.643.
 2. How are 0.5 m NaOH and 0.5 M NaOH different from each other?
 3. Explain why Na^+ is smaller in size than Na atom.
 4. Draw resonating structures of CO_3^{2-} ion.
 5. Define critical temperature.
 6. Determine the empirical formula of an oxide of iron which has 69.9% iron and 30.1% di oxygen by mass. Atomic mass: Fe = 55.85, O = 16.00
 7.
 - a. Write the electronic configuration of Cu^{2+} ion.
 - b. Why are Bohr's orbits called stationary states.
 8.
 - a. How many subshells are associated with $1H = 4$?
 - b. How many electrons will be present in the subshells having ms value of $-\frac{1}{2}$ for $n = 4$?
 9.
 - a. What do you understand by isoelectronic species?
 - b. Write a cation and an anion which is isoelectronic with Ar.
 10. Give the shapes of following covalent molecules using VSEPR theory :
-

-
- i. NH_3 ,
 - ii. ClF_5

Or

- a. Use molecular orbital theory to predict why Be_2 molecule does not exist.
 - b. Compare the stability of O_2^+ and O_2^- .
11. The work function for cesium atom is 1.9 eV. Calculate.
- a. The threshold wavelength.
 - b. If the cesium element is irradiated with a wavelength of 500 nm, calculate the kinetic energy of ejected electron. [Given $1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$]
12. Use the periodic table to identify the following:
- a. A group whose elements show valence 2 and 6.
 - b. A metal which can form a predominantly stable covalent halide of the formula MX .
 - c. The group having metalloid, non-metal liquid as well as gas at room temp.
13. Compare the relative stabilities of O_2^- and O_2^+ and comment on their magnetic behaviour.
14. Give reasons for the following:
- i. H_2O has higher boiling point than HF .
 - ii. Ice floats on the surface of water.
 - iii. KHF_2 exists but KCl_2 does not.
15. What is the hybridisation of the central atom in (i) H_3O^+ , (ii) XeF_2 , (iii) XeF_4 ? What are their shapes?
- 16.
- a. In terms of Charles's law, explain why -273°C is the lowest temperature?
 - b. 20 ml of hydrogen measured at 15°C are heated to 35°C , what is the new volume at the same pressure.
17. Define van der Waals' equation. The van der Waals' constants for two gases are as follows:

Gas	a ($\text{atm L}^2 \text{ mol}^{-1}$)	b (L mol^{-1})
X	1.39	0.0391
Y	3.59	0.427

Which of them more easily liquefiable and which has greater molecular size?

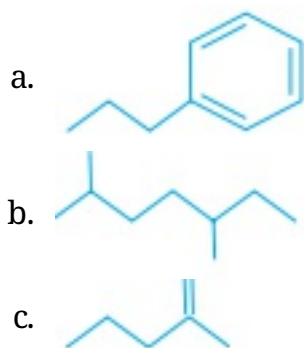
18.

- Name the different salts that cause permanent hardness of water (any two)
- How do we obtain demineralised water from hard water after passing it from synthetic ion exchange resins? Give reaction?

19. What happen when:

- Boric acid is added to water.
- Al is treated with dil. NaOH.
- BF_3 is treated with NH_3

20. Write IUPAC names of the following:

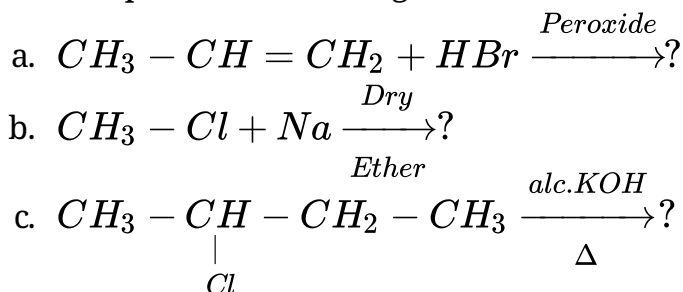


21. Write the naming reactions:

- Wurtz reaction
- Decarboxylation of sodium salt of fatty acid
- Friedal Craft reaction.

Or

Complete the following reaction:



22.

- Mention two similarities in the behaviour of Be and Al to show that they have diagonal relationship.
- What is the biological importance of Na in our body ?

23. A factory was started near a village. Suddenly villagers started feeling the presence of

irritating vapours in the village and cases of headache, chestpain, cough and breathing problem increased. Anil a science student blamed the emission from the chimney of the factory for such problems?

Reading the above paragraph, answer the following questions:

- Explain what could happen?
- Give chemical reactions for the support of your explanation.
- Mention the values shown by student in paragraph.

24.

- What happens when :
 - Propene is treated with HBr,
 - Benzene is treated with methyl chloride in the presence of anhyd. AlCl_3
 - When methyl bromide treated with sodium metal in presence of dry ether.
- Prove that phenolic group is ortho and para directing.

Or

- How is benzene obtained from ethyne 2 What is process called?
- What happens when ethyne is heated with water in the presence of mercuric sulphate and dilute hydrochloric acid
- What is Markownikow's Kov rule?

25.

- Equilibrium constant for a reaction is 10. What will be the equilibrium constant for the reverse reaction?
- Write the conjugate acids for the Bronsted base OH^- and CH_3COO^- .
- Determine the pH of 10^{-8} M HCl solution taking into account the H^+ produced by water also. ($\log 11 = 1.0414$).

26.

- Propanal and pentan-3-one are the ozonolysis product of an alkene. What is the structural formula of the alkene?
 - An Alkyl halide (A) of formula $\text{C}_6\text{H}_{13}\text{Cl}$ on treatment with alcoholic KOH give two isomeric alkenes (B) and (C) (C_6H_{12}). Both alkenes on hydrogenation give 2, 3-dimethylbutane. Predict the structure of A, B and C.
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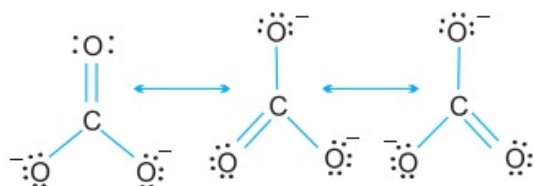
Marking Scheme

1. 4.8046.

2. In 0.5m NaOH, 1 mol NaOH present in 1 kg solvent while in 1.0 M NaOH, 1 mol NaOH present in 1 L of solution.

3. Na^+ has only 2 shells and more effective nuclear charge.

4.



5. Appearance of gas at that temperature is called critical temperature $\text{CO}_2 = -30.98^\circ$.

6.

Element	% by mass	At mass	Relative	Simple	Whole no.
Fe	69.9	55.85	$\frac{69.9}{55.85} = 1.25$	1	2
O	30.1	16.00	$\frac{30.1}{16.00} = 1.88$	1.5	3

Empirical formula : Fe_2O_3

7.

a. Cu^{2+} (27) $[\text{Ar}]3\text{d}^94\text{s}^0$.

b. When an electron is revolving in Bohr's orbit it does not lose energy.

8.

a. $\pi = 4, l = 0, 1, 2, 3$

s, p, d, f subshells are associated with $n = 4$.

b. Total number of electrons in shell $n = 4$ is 32 half of this i.e., 16 elements will have

$$m_s = -\frac{1}{2}$$

9.

a. The species having the same number of electrons are called isoelectric species.

b. $\text{Ca}^{2+}, \text{Cl}^-$

10.

a. M.O. configuration of Be_2 molecule is:

$$\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2$$

$$\text{Bond order} = \frac{1}{2}(4 - 4) = 0$$

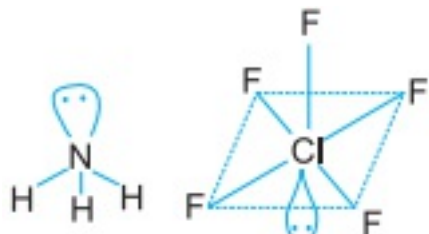
Since bond order is zero Be_2 molecule is not possible.

b. $B.O. (O_2^+) = \frac{1}{2}(10 - 5) = 2.5$

$B.O. (O_2^-) = \frac{1}{2}(10 - 7) = 1.5$

Since B.O of O_2^+ is more than of O_2^- , O_2^+ is more stable.

c.



11.

a. $W_0 = \frac{hc}{\lambda_0}, \lambda_0 = \frac{hc}{W_0}$

$$\lambda_0 = \frac{6.26 \times 10^{-34} \text{ J s} \times 3 \times 10^8 \text{ m s}^{-1}}{1.9 \times 1.6 \times 10^{-19} \text{ J}} = 6.538 \times 10^{-7} \text{ m}$$

b. $E = W_0 + K.E.$

$$\frac{hc}{\lambda} = \frac{hc}{\lambda_0} + K.E.$$

$$K.E. = hc \left[\frac{1}{\lambda} - \frac{1}{\lambda_0} \right]$$

$$= 6.626 \times 10^{-34} \times 3 \times 10^8 \left(\frac{1}{5 \times 10^{-7}} - \frac{1}{6.54 \times 10^{-7}} \right)$$

$$= 19.878 \times 10^{-19} \left(\frac{1}{5} - \frac{1}{6.54} \right)$$

$$= 19.88 \times 10^{-19} (0.2 - 0.15)$$

$$= 0.994 \times 10^{-19} \text{ J}$$

12.

a. Group- 16

b. Lithium

c. Group- 17

13. M.O. electronic configuration of O_2^-

$$\text{Bond order} = \frac{1}{2}(8 - 5) = \frac{3}{2} = 1.5$$

M.O. electronic configuration of N_2^+

$$\text{Bond order} = \frac{1}{2}(7 - 2) = \frac{5}{2} = 2.5$$

As bond order of $N_2^+ >$ bond order of O_2^- . Therefore, N_2^+ is more stable than O_2^- .

14.

i. Due to strong hydrogen bonding or greater intermolecular hydrogen bonding in H_2O than in H-F . H_2O forms four bond with other water molecule whereas HF forms only

two H-bonds.

- ii. Density of ice is less than (water) liquid form.
- iii. Due to H-bonding in HF, $\text{H}-\text{F} \cdots \text{H}-\text{F} \cdots \text{H}-\text{F}$. This can dissociate to give HF ion and hence KHF_2 , exists but no H-binding in $\text{H}-\text{Cl}$. So HCl_2^* , ion not exist.

15.

- i. sp^3 , pyramidal.
- ii. sp^3d , linear.
- iii. sp^2d^2 , square planar.

16.

- a. At -273°C , volume of the gas becomes equal to zero i.e., the gas ceases to exist.

- b. According to Charle's law : $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$$= V_1 = 20 \text{ mL } V_2 = ? \text{ mL}$$

$$T_1 = 15 + 273 = 288$$

$$T_2 = 35 + 272 = 308 \text{ K}$$

$$V_2 = \frac{V_1 T_2}{T_1} = \frac{20}{288} \times 308 = 21.38$$

Volume of hydrogen gas at 35°C = 21.38 ML

17.

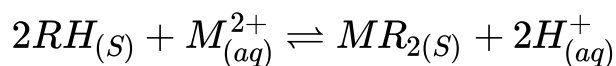
- a. $\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT$

- b. Greater the value of 'a' more easily the gas is liquefiable. Similarly, greater the value 'b' greater is the molecular size. Hence, gas 'y' will be more easily liquefiable and will have greater molecular size.

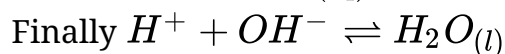
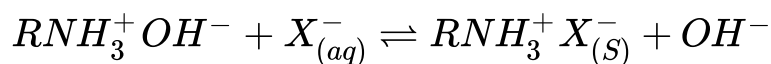
18.

- a. CaCl_2 , MgCl_2 ,

- b. In cation exchange resin



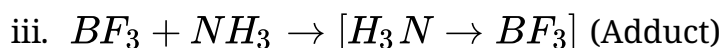
In anion exchange resist



19.

- i. $\text{B}(\text{OH})_3 + 2\text{H}_2\text{O} \rightarrow \text{B}(\text{OH})_4 + \text{H}_3\text{O}^+$

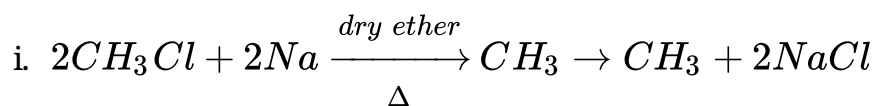
- ii. $2\text{Al} + 2\text{NaOH} + 6\text{H}_2\text{O} \rightarrow 2\text{Na}[\text{Al}(\text{OH})_4] + 3\text{H}_2$
-



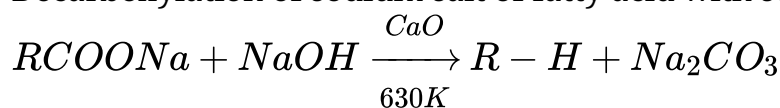
20. IUPAC Name:

- Propylbenzene
- 2, 5 - Dinethyl heptane
- 3-Chloropropanal

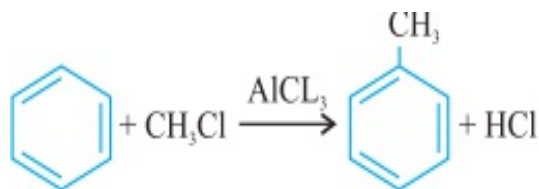
21. Wurtz's reaction:



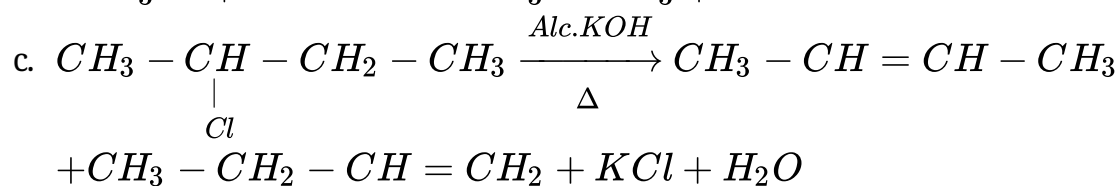
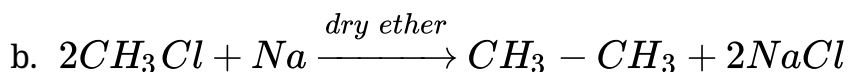
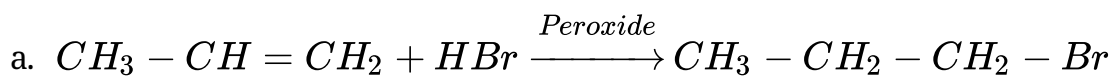
ii. Decarboxylation of sodium salt of fatty acid with soda line.



iii. Friedal Craft reaction :When benzene treated with alkyl halide in presence of $AlCl_3$, Alkyl benzene in formed.



Or



22. a. (i) Like Al, Be is not readily attacked by acids because of the presence of an oxide film on the surface metal.

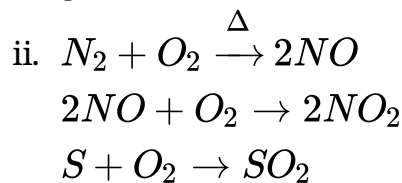
(ii) $Be(OH)_2$ dissolved in excess of NaOH to give $[Be(OH)_4]^{2-}$, just as $Al(OH)_3$ dissolve in NaOH to form $[Al(OH)_4]^{-1}$.

b. Na^+ ions are present in blood plasma and in the interstitial fluid. These ions participate in the transmission of nerve signals and in regulating the flow of water across cell membranes.

23.

i. The symptoms of the villagers show that oxides of nitrogen and sulphur are coming

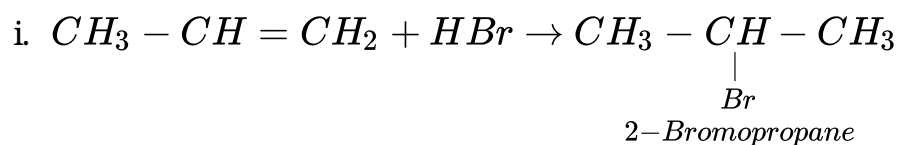
out of the chimney of factory. This is due to combustion of fossil fuel like coal, gasoline etc.



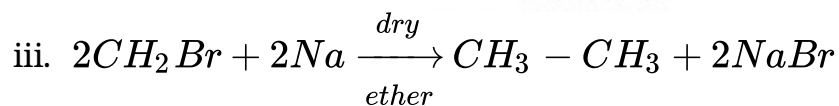
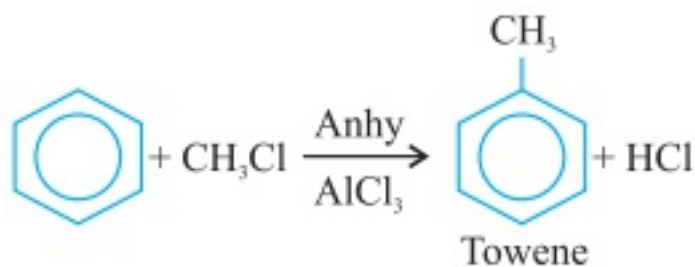
iii. Environment concern, scientific altitude.

24.

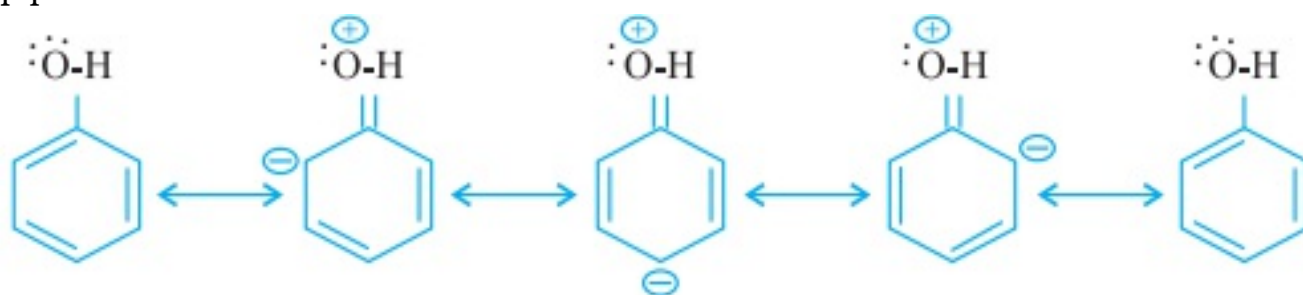
a.



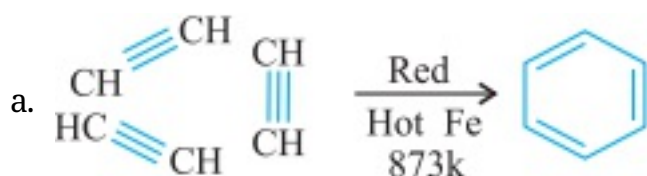
ii.

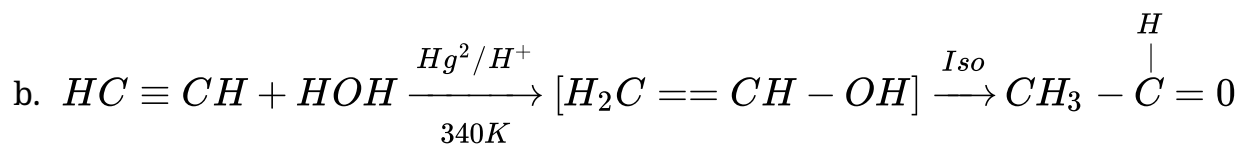


b. This is because of + R (resonance effect) -OH group. The electron density is increased at o- and p-positions as compared to at m-position. Hence the new group will enter at p-position.

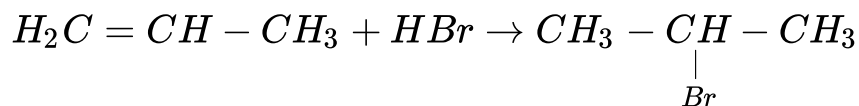


Or



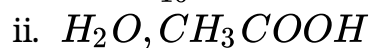


c.



25.

i. $K = \frac{1}{10} = 0.1$



iii. Total $[H_3O^+] = [H_3O^+]_{acid} + [H_3O^+]_{H_2O}$

$$= 10^{-8} + 10^{-7}$$

$$= 11 \times 10^{-8} M$$

$$pH = -\log(H_3O^+)$$

$$pH = -\log(11 \times 10^{-8})$$

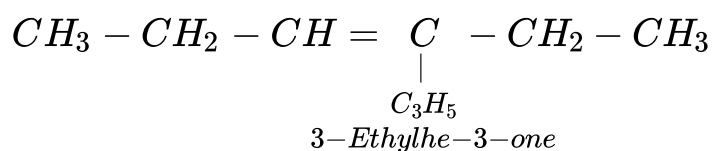
$$pH = -(\log 11 + \log 10^{-8})$$

$$pH = 8 - \log 11$$

$$pH = 8 - 1.0414 = 6.9586$$

26.

a.



b.

