

11th 12th Chemistry – TnpSC Syllabus Portion**Detection and estimation of elements Notes Questions**

1. Qualitative analysis of elements includes which of the following
- a) **Detection of elements**
 - b) Calculating amount of elements
 - c) Both a and b
 - d) None of the above

Explanation

Qualitative analysis of an organic compound involves the detection of various elements present in it.

2. Which of the following elements are present in organic compounds
- a) Carbon
 - b) Hydrogen
 - c) Oxygen
 - d) **All the above**

Explanation

The elements commonly present in organic compounds are carbon, hydrogen, oxygen, nitrogen, halogens and sulphur and sometimes phosphorous. The carbon and hydrogen are present in almost all the organic compounds.

3. In detection of carbon and hydrogen, a small quantity of pure and dry compound is mixed with about ten times its weight of
- a) Sulphur oxide
 - b) **Copper oxide**
 - c) Carbon dioxide
 - d) None of the above

Explanation

A small quantity of pure and dry compound is mixed with about ten times its weight of copper oxide (CuO).

4. In the detection of carbon and hydrogen, the bulb of delivery tube, a small amount of _____ is taken
- a) Silver sulphate
 - b) **Anhydrous copper sulphate**

- c) Both a and b
- d) None of the above

Explanation

In the bulb of delivery tube, a small amount of anhydrous copper sulphate (white) is placed.

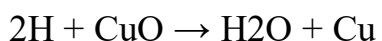
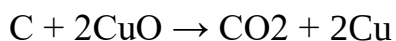
5. Complete the following reaction.



- a) **CO+2Cu**
- b) CO₂+2Cu
- c) Both possible
- d) None of the above

Explanation

The mixture is heated strongly when carbon and hydrogen present are oxidized to carbon dioxide and water respectively.



The above equation is from detection of carbon and hydrogen.

6. In the detection of carbon and hydrogen, carbon dioxide turns the lime water into

- a) Oily
- b) **Milky**
- c) Color less
- d) None of the above

Explanation

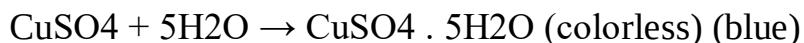
Carbon dioxide turns lime water milky and the water vapour turns colorless copper sulphate, blue.



7. In the detection of carbon and hydrogen, the water vapour turns colourless copper sulphate

- a) Red
- b) **Blue**
- c) Blue green
- d) Brown

Explanation



Turning of lime water milky and of colorless copper sulphate blue shows the presence of carbon and hydrogen respectively.

8. Whether there is any direct method to detect the presence of oxygen in organic compounds
- Yes
 - No**
 - Not possible
 - None of the above

Explanation

There is no direct method for the detection of oxygen in organic compounds. It is detected indirectly.

9. If the sum of the percentages of various elements present in the compound is less than 100, then the compound contains
- Oxygen**
 - Carbon
 - Nitrogen
 - Both a and c

Explanation

If the sum of the percentages of various elements present in the compound is less than 100, then the compound contains oxygen.

10. Find the oxygen containing functional group
- OH
 - CHO
 - COOH
 - All the above

Explanation

If any organic compound is found to contain any oxygen containing functional groups such as - OH, -CHO, -COOH, -NO₂ etc., then the compound contains oxygen.

11. Which of the following is detected by Lassaigne's Test?
- Nitrogen
 - Sulphur
 - Halogens

d) All the above

Explanation

All these can be detected by Lassaigne's Test.

12. The filtrate produced from Lassaigne's Test is known as

- a) Sodium extract
- b) Lassaigne's extract
- c) None of the above
- d) Both a and b**

Explanation

The organic compound is taken in an ignition tube. A pea-size sodium metal is added to it and heated to red hot. The hot tube is crushed to powder under a few ml of water in a mortar. The solution is filtered and the filtrate is known as 'sodium extract' or 'lassaigne's filtrate'.

13. During fusion, the carbon and nitrogen of the organic compound combine with sodium metal forming

- a) Sodium nitrate
- b) Sodium carbide
- c) Sodium cyanide**
- d) Both a and b

Explanation

During fusion, the carbon and nitrogen of the organic compound combine with sodium metal forming sodium cyanide.



14. The unreacted sodium combines with water forming _____, so the solution becomes alkaline in lassaigne's test.

- a) Caustic soda**
- b) Baking powder
- c) Bleaching powder
- d) Both a and b

Explanation

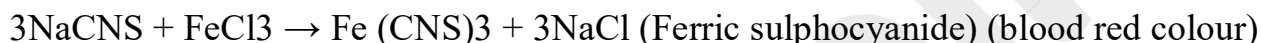
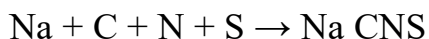
The unreacted sodium combines with water forming caustic soda, so the solution becomes alkaline in lassaigne's test.

15. In lassaigne's test , the presence of nitrogen is detected by the formation of

- a) **Blood red color**
- b) Blue red color
- c) Red color
- d) Blue color

Explanation

If an organic compound contains nitrogen along with sulphur, a blood red colour will be obtained in the above test.

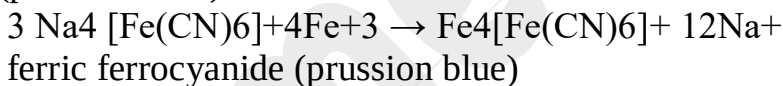


16. Ferric ferrocyanide formed in lassaigne's test appears as

- a) **Prussion blue**
- b) Orange red
- c) Prussion yellow
- d) Both a and c

Explanation

A few drops of ferric chloride are added to it and the solution is acidified with dilute sulphuric acid. The ferric ions react with sodium ferrocyanide giving a bright blue (prussion blue) coloration



17. Organic compounds containing sulphur on combining with sodium forms

- a) Sulphate
- b) Sulphide
- c) Both a and b
- d) None of the above

Explanation

Organic compounds containing sulphur give sulphide on fusion with sodium. $2\text{Na} + \text{S} \rightarrow \text{Na}_2\text{S}$

18. For testing the presence of sulphur , which of the following is added to the lassaigne's mixture

- a) Sodium chloroprusside
- b) Sodium nitroprusside
- c) Sodium oxalate

d) All the above

Explanation

To the Lassaighe's filtrate, sodium nitroprusside is added. Purple colour is developed.



sodium nitroprusside purple.

19. The presence of sulphur in the mixture is known by formation of which colour?

- a) Green
- b) Blue
- c) Blue green
- d) **Purple**

Explanation

To the Lassaighe's filtrate, sodium nitroprusside is added. Purple colour is developed.



sodium nitroprusside purple

20. In the sodium extract or lassaighe's mixture, the halogen appear as

- a) Sodium halide
- b) Sodium nitro halide
- c) Halide
- d) None of the above

Explanation

In sodium extract, the halogen is present as sodium halide. $\text{Na} + \text{X} \rightarrow \text{NaX}$ ($\text{X} = \text{Cl}, \text{Br}, \text{I}$)

21. Which of the following are halogens

- a) Chlorine
- b) Bromine
- c) Iodine
- d) **All the above**

Explanation

The above elements are collectively called as halogens.

22. To test the presence of halogens, which of the following is added to the mixture?

- a) Dil. Nitric acid
- b) Silver nitrate solution

- c) Both a and b
- d) None of the above

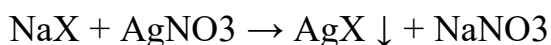
Explanation

The extract is acidified with dilute nitric acid and silver nitrate solution is added. Formation of precipitate indicates the presence of halogen.

23. Complete the following reaction



- a) $\text{AgX} + \text{NaNO}_2$
- b) $\text{AgX} + \text{NaNO}_3$**
- c) Both a and b
- d) None of the above

Explanation

24. If the colour of the precipitate is white, what is the halogen present in it, which is easily soluble in ammonium hydroxide

- a) Bromine
- b) Chlorine**
- c) Iodine
- d) None of the above

Explanation

White- chlorine –easily soluble in ammonium hydroxide.

25. The pale yellow colour of precipitate shows the presence of

- a) Chlorine
- b) Bromine**
- c) Iodine
- d) None of the above

Explanation

Pale yellow- bromine- sparingly soluble in ammonium hydroxide

26. The yellow colour of precipitate shows the presence of

- a) Iodine
- b) Bromine

- c) Chlorine
- d) None of the above

Explanation

Yellow – iodine – insoluble in ammonium hydroxide

27. The method of determining the amount of elements (proportion of elements) present is known as

- a) Qualitative analysis
- b) Quantitative analysis**
- c) Both a and b
- d) None of the above

Explanation

Determination of the relative proportions (generally as percentages) of various elements present in an organic compound is called quantitative analysis of that compound.

28. Estimation of amount of carbon and hydrogen is done by which method?

- a) Liebig's combustion method**
- b) Kjeldahl method
- c) Lassaigne's method
- d) None of the above

Explanation

The estimation of carbon and hydrogen is carried out in one experiment known as Liebig's method.

29. In Liebig's method a known weight of the organic compound is strongly heated with excess of _____ in an atmosphere of dry and pure oxygen or air.

- a) Dry copper oxide**
- b) Wet cupric oxide
- c) Dry cupric oxide
- d) Both b and c

Explanation

A known weight of the organic compound is strongly heated with excess of dry copper oxide in an atmosphere of dry and pure oxygen or air. Carbon of the compound is oxidised to carbon dioxide and hydrogen to water.

30. The CO_2 and H_2O thus formed are absorbed by a strong solution of

- a) Caustic potash
- b) Anhydrous calcium chloride
- c) Both a and b
- d) None of the above

Explanation

The CO₂ and H₂O are absorbed by a strong solution of caustic potash and anhydrous calcium chloride respectively. The percentage of carbon and hydrogen is calculated from the weights of CO₂ and H₂O obtained.

31. 0.30 g of a substance gives 0.88 g of carbon dioxide and 0.54 g water. Calculate the percentage of carbon and hydrogen in it.

- a) **80g and 20g**
- b) 20g and 80g
- c) 10 and 20g
- d) None of the above

Explanation

Solution

Weight of organic compound = 0.30 g

Weight of carbon dioxide = 0.88 g

Weight of water = 0.54 g

Percentage of carbon

44 g of carbon dioxide contains, carbon = 12 g

0.88 g of carbon dioxide contains, carbon = $\frac{12 \times 0.88}{44}$ g

0.30 g substance contains, carbon = $\frac{12 \times 0.88}{44}$ g

100 g substance contains

$$= \frac{12 \times 0.88}{44} \times \frac{100}{0.30} = 80 \text{ g of carbon}$$

Percentage of carbon = 80

Percentage of hydrogen

18 g of water contains, hydrogen = 2 g

0.54 g of water contains, hydrogen = $\frac{2 \times 0.54}{18}$ g

0.30 g of substance contains hydrogen = $\frac{2 \times 0.54}{18 \times 0.30}$ g

100 g of substance contains = $\frac{2 \times 0.54}{18 \times 0.30} \times 100$ g

= 20 g of hydrogen

Percentage of hydrogen = 20

32. Estimation of oxygen is done by method of

- a) Addition
- b) Multiplication
- c) **Difference**
- d) None of the above

Explanation

Oxygen is commonly estimated by the method of difference. The percentage of all other elements are added together and then subtracted from 100. The balance is the percentage of oxygen.

33. **0.2004 g** of glucose gave on combustion 0.2940 g of CO₂ and 0.1202 g of H₂O. Find the percentage composition.

- a) **40.01% and 53.33%**
- b) 42.01% and 33.33%
- c) 30.01% and 23.33%
- d) 20.01% and 33.33%

Explanation

Solution

Weight of organic compound = 0.2004 g

Weight of carbon dioxide = 0.2940 g

Weight of water = 0.1202 g

Percentage of carbon

44 g of CO₂ contains, carbon = 12 g

0.2940 g of CO₂ contains, carbon = $\frac{12 \times 0.2940}{44}$ g

Percentage of carbon = $\frac{12 \times 0.2940}{44} \times \frac{100}{0.2004} = 40.01$

Percentage of hydrogen

18 g of H₂O contains, hydrogen = 2 g

0.1202 g of H₂O contains, hydrogen = $\frac{2 \times 0.1202}{18}$

Percentage of hydrogen = $\frac{2 \times 0.1202}{18} \times \frac{100}{0.2004} = 6.66$

Percentage of oxygen is therefore by difference,
= [100 - (40.01 + 6.66)] = 53.33

34. The estimation of nitrogen is done by

- a) Liebig's combustion method
- b) **Kjeldahl method**
- c) Lassaigne's method
- d) None of the above

Explanation

Nitrogen estimation – Kjeldhal method

35. Nitrogenous compounds when heated with con. Sulphuric acid are quantitatively converted into

- a) Ammonium hydroxide
- b) Ammonium sulphate
- c) Ammonium nitrate
- d) None of the above

Explanation

This method is based on the fact that many nitrogenous organic compounds when heated with con. H_2SO_4 , are quantitatively converted into ammonium sulphate.

36. The ammonium sulphate so obtained is heated with excess NaOH , which of the following is liberated.
- Nitrogen
 - Oxygen
 - Ammonia
 - Hydrogen

Explanation

The ammonium sulphate so obtained is heated with excess NaOH and the ammonia liberated is absorbed in a known volume of standard acid.

37. The ammonia evolved from 0.21 g of an organic compound by Kjeldahl method neutralised 15 ml of $\text{N}/20$ sulphuric acid solution. Calculate the percentage of nitrogen
- 10%
 - 12%
 - 52%
 - 5%

Explanation

$$\begin{aligned}
 &1000 \text{ ml of } 1\text{N ammonia contains} = 14 \text{ g of nitrogen} \\
 &15 \text{ ml of ammonia of normality} \\
 &\frac{\text{N}}{20} \text{ contains nitrogen} = \frac{14 \times 15 \times 1}{1000 \times 20} \\
 &0.21 \text{ g of compound contains nitrogen} \\
 &= \frac{14 \times 15}{1000 \times 20} \\
 &100 \text{ g of compound contains nitrogen} \\
 &= \frac{14 \times 15 \times 100}{1000 \times 20 \times 0.21} = 5\text{g} \\
 &\therefore \text{Percentage of nitrogen} = 5
 \end{aligned}$$

$$\begin{aligned}
 &\text{Weight of organic compound} = 0.21 \text{ g} \\
 &\text{Normality of acid} = \frac{\text{N}}{20} \\
 &\text{Volume of standard acid neutralised by ammonia} = 15 \text{ ml}
 \end{aligned}$$

38. 0.35 g of an organic substance was Kjeldahlised and the ammonia obtained was passed into 100 ml of $\text{N}/5$ H_2SO_4 . The excess acid required 154 ml of $\text{N}/10$ NaOH for neutralisation. Calculate the percentage of nitrogen in the compound.
- 18.4%
 - 20.54%

- c) 18.5%
d) 25.55%

Explanation

Volume of N/5 H₂SO₄ solution taken = 100 mL
The volume of N/5 H₂SO₄ neutralised by N/10 NaOH can be obtained as follows :

$$\begin{aligned} N_{\text{acid}} \times V_{\text{acid}} &= N_{\text{alkali}} \times V_{\text{alkali}} \\ \frac{N}{5} \times V_{\text{acid}} &= \frac{N}{10} \times 154 \text{ mL} \\ V_{\text{acid}} &= \frac{154}{10} \times 5 \text{ mL} \\ &= 77 \text{ mL} \end{aligned}$$

Therefore,

Volume of N/5 H₂SO₄ used for neutralising ammonia = (100 - 77) mL
= 23 mL

Then,

Percentage of nitrogen in the sample
= $\frac{1.4 \times \text{Normality volume of acid used for neutralising NH}_3}{\text{Mass of the compound taken}}$

$$\begin{aligned} \text{Percentage of nitrogen in the sample} &= \frac{1.4 \times 1/5 \times 23}{0.35} = 18.4 \end{aligned}$$

39. Estimation of sulphur is done by

- a) Kjeldahl's method
b) **Carrius method**
c) Lassaigne's method
d) None of the above

Explanation

Estimation of sulphur is done by **Carrius method**

40. Sulphur present in organic compound on oxidizing forms

- a) Sulphur dioxide
b) Sulphur oxide
c) **Sulphuric acid**
d) All the above

Explanation

A known mass of the organic compound is heated in a sealed tube with fuming nitric acid. The sulphur present in the organic compound will be oxidised to sulphuric acid.

41. Which of the following is added in carius method in excess

- a) Barium sulphate
b) Barium oxide
c) **Barium chloride**

d) None of the above

Explanation

In this method excess of barium chloride solution is added. The precipitate of barium sulphate obtained is filtered, washed, dried and weighed accurately.

42. **0.316 g** of an organic compound, after heating with fuming nitric acid and barium nitrate crystals in a sealed tube gave 0.466 g of the precipitate of barium sulphate. Determine the percentage of sulphur in the compound.

(Atomic masses : Ba = 137, S = 32, O = 16, C = 12, H = 1).

a) 25.25%

b) 20.25%

c) 19.77%

d) 30.55%

Explanation

Mass of the substance taken = 0.316 g

Mass of BaSO₄ formed = 0.466 g

Molecular mass of BaSO₄ = 137 + 32 + 64 = 233

Then, mass of S in 0.466 g of BaSO₄

$$= \frac{0.466 \times 32}{233} \text{ g}$$

Percentage of S in compound

$$= \frac{0.466 \times 32 \times 100}{233 \times 0.316}$$
$$= 20.25$$

43. Estimation of which of the following is done by carius method

a) Halogen

b) Sulphur

c) Both of the above

d) None of the above

Explanation

Halogens and sulphur is estimated by carius method

44. Which of the following is precipitated in estimation of halogens

a) Silver halide

b) Silver sodium

c) Both a and b

d) None of the above

Explanation

The halogen in the organic compound becomes the halide ion and this reacts with silver ion of the silver nitrate solution. The silver halide is precipitated. The precipitate is filtered, washed, dried and then weighed accurately.

45. 0.15 g of iodoform gave 0.2682 g of AgI. Calculate the percentage of iodine

- a) 96.6
- b) 79.9
- c) 26.9
- d) 90.3

Explanation

$$\begin{aligned}\text{Weight of compound} &= 0.15 \text{ g} \\ \text{Weight of silver iodide} &= 0.2682 \text{ g} \\ \text{Molecular weight of silver iodide} &= 108 + 127 = 235 \\ \text{235 g of silver iodide contains 127 g of iodine} \\ 0.2682 \text{ g of AgI contains} &= \frac{127 \times 0.2682}{235} \\ &= 0.144 \text{ g iodine} \\ 0.15 \text{ g of compound contains} &0.144 \text{ g of iodine} \\ 100 \text{ g of compound contains} &= \frac{100 \times 0.1449}{0.15} = 96.6 \text{ g} \\ \therefore \text{Percentage of iodine} &= 96.6\end{aligned}$$