CHEMISTRY

BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

CHARACTERISATION OF ORGANIC COMPOUNDS

Solved Problems

1. 0.92 gm of an organic compound containing carbon, hydrogen, and oxygen was analysed by combustion method. The increase in the mass of the U-tube and the potash bulbs at the end of the operation was found to the 1.08 gm and 1.76 gm respectivley. Determine the percentage composition of the compound.

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2. An organic compound was analysed by dumas method. 0.45 gm of the compound on combustion gave 48.6 ml nitrogen at $27^{\circ}C$ and 756 mm pressure. Calculate the percentage composition of the compound.

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3. 0.2 gm of an organic compound was analysed by kjeldahl's method the ammonia evolved was absorbed in 60 ml $\frac{N}{5}H_2SO_4$. Unused acid required 40 ml of $\frac{N}{10}NaOH$ for complete neutralisation. Find the percentage of nitrogen in the compound.

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4. 1.216 gm of an organic compound was reacted under Kjeldahl's method and the ammonia evolved was absorbed in 100 ml NH_2SO_4. The remaining acid solution was made up to 500 ml by the addition of water. Twenty millilitres of the dilute solution required 32 ml $\frac{N}{10}$ caustic soda

solution for complete neutralisation. Calculate the percentage of nitrogen in the compound.

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5. 0.5264 gm silver bromide is obtained from 0.5124 gm of an organic compound. Calculate the percentage of bromine in the compound.

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6. 0.156 gm of an organic compound on heating with fuming HNO_3 and $AgNO_3$ gives 0.235 gm of Agl. Calculate the percentage of iodine in the compound.

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7. 0.1170 gm of an organic compound on heating with conc. HNO_3 and silver nitrate in Carius furnace gave 0.42 gm of $AgCl$. Find the

percentage of chlorine in the compound.

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8. On heating $0.32g$ of an organic compound with concentrated nitric acid and barium chloride, $0.932g$ barium sulphate was obtained. Calculate the percentage of sulphur in the given compound.

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9. In a Victor Meyer's determination, the following observations have been made:

Mass of compound $= 0.17g$

Volume of air collected $= 34.2mL$

Temperature $= 15^{\circ}C$

Atmospheric pressure $= 750mm$

Vapour pressure of water at $15^{\circ}C = 13mm$

Calculate the vapour density and molecular mass of the compound.

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10. A duma bulb full of air weighs 22.567 gm at $20^\circ C$ and 755 mm pressure. Full of vapours of a substance at $120^\circ C$ and the same pressure. It weighs 22.8617 gm. The capacity of the bulb is 200 ml. Find out the molecular mass of the substance. [density of air $= 0.00129 \frac{gm}{ml}$]

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11. 0.38 gm of a silver salt of a dibasic acid on igition gave 0.27 gm of silver. Calculate the molecular mass of the acid.

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12. 0.49 gm of chloroplatinate of a diacidic base gave on ingintion 0.195 gm of platinum. Calculate the molecular mass of the base.

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13. 1.575 gm of an organic acid was dissolved in 250 ml of water Further, 20 ml of this solution required 16 ml of $\frac{N}{8}$ alkali solution for complete neutralisation. If the basicity of the acid is 2, find its molecular mass.

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14. $2.65gm$ of a diacidic base was dissolved in 500 ml of water. Twenty millilitres of this solution required 12 ml of $\frac{N}{6}$ HCl solution. Calculate the equivalent mass and molucular mass of the base.

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15. An organic compound contains $C = 40\,\%$, $H = 13.33\,\%$, and $N = 46.67\,\%$. Its empirical formula will be

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16. A dibasic organic acid gave the following results: $C = 34.62\,\%$, $H = 3.84\,\%$, $0.1075g$ of this acid consumes $20mL$ of $0.1NNaOH$ for complete neutralisation. Find out the molecular formula of the acid.

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17. An organic ompound contains $C = 48, H = 8\,\%$. $0.48g$ of the compound was Kjeldahlised and the liberated ammonia required $19.2mLN/2H_2SO_4$. Find the empirical formula of the compound.

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18. Haemoglobin is a chromoprotein having four atoms of Fe in each molecule. Analysis showed $0.35\,\%\,Fe$. What is the molecular weight of haemoglobin?

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19. 5mL of a gas containing only carbon and hydrogen were mixed with an excess of oxygen (30mL) and the mixture exploded by means of an electric spark. After the explosion, the volume of the mixed gases remaining was 25mL. On adding a concentrated solution of potassium hydroxide, the volume further diminished to 15mL, the residual gas being pure oxygen. All volumes have been reduced to NTP. Calculate the molecular formula of the hydrocarbon gas.

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20. Ten millilitre of a gaseous hydrocarbon is was exploded with oxygen. After the explosion, there was a contraction of 20 ml in volume. On shaking the residual gaseous mixture with KOH, there was a further concentration of 20 ml in volume. Calculate the molecular formula. All the volumes were recorded at same temperature and pressure.

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Illustrations Of Objective Questions

1. Lassaigne's test for the detection of nitrogen will fail in case of :

A. NH_2CONH_2

B. $NH_4CONHNH_2.HCI$

C. $NH_2NH_2.HCI$

D. $C_6H_5NHNH_2.2HCI$

Answer: C

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2. The function of boiling the sodium extract with conc. HNO_3 before testing for halogen as:

A. to make the solution acidic

B. to make the solution clear

C. to convert Fe^{2+} to Fe^{3+}

D. to destroy CN^- and S^{2-} ions

Answer: D

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3. Sodium nitroprusside when added to an alkaline solution of sulphide ions produces

A. red

B. blue

C. brown

D. purple

Answer: D

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4. In Kjeldahl's method, nitrogen present is estimated as :

A. N_2

B. NH_3

C. NO_2

D. none of these

Answer: B

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5. In Kjeldahl's method, nitrogen present is estimated as :

A. N_2

B. $(NH_4)_2SO_4$

C. NO_2

D. none of these

Answer: B

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6. In Kjeldahl's method of estimation of nitrogen K_2SO_4 acts as:

A. an oxidising agent

B. catalytic agent

C. hydrolysing agent

D. boiling point elevator

Answer: D

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7. Positive Beilstein test shows that

A. halogens are surely present

B. halogens are absent

C. halogens may be present

D. none of these

Answer: C

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8. In an organic compound, the phosphorus is estimated as:

A. $Mg_2P_2O_7$

B. $Mg_3(PO_4)_2$

C. H_3PO_4

D. P_2O_5

Answer: A

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9. Molecular mass of a volatile substance is determined by :

A. silver chloride method

B. platinichloride method

C. Victor Meyer's method

D. Kjeldahl's method

Answer: C

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10. Molecular mass of a non-volatile organic solid can be determined by:

A. Victor Meyer's method

B. elevation in boiling point

C. silver salt method

D. depression in freezing point

Answer: A::B::D

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11. Equivalent mass of an organic acid can be determined by :

A. silver salt method

B. cryoscopic method

C. ebullioscopic method

D. platinichloride method

Answer: A

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12. Equivalent mass of an organic base can be determined by:

A. silver salt method

B. depression in freezing point

C. elevation in boiling point

D. platinichloride method

Answer: D

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13. An organic compound has C and H percentage in the ratio 6:1 and C and O percentage in the 3:4. The compound is

A. $HCHO$

B. CH_3OH

C. CH_3CH_2OH

D. $(COOH)_2$

Answer: A

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14. A hydrocarbon (X) was found to have a molecular weight of 80-85. A 10.02 mg sample took up $8.40mL$ of H_2 gas measured at $0^\circ C$ and 760 mm pressure. Ozonolysis of (X) yields only $HCHO$ and $OHC-CHO$. What was hydrocarbon?

A. C_6H_8

B. C_6H_{10}

C. C_6H_{12}

D. C_6H_{14}

Answer: A::B::C

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Problems For Practice

1. Given reasons:

(i) During the test of nitrogen in Lassaigne's filtrate, sometimes red colouration is obtained when ferric chloride is added.

(ii) Why is sodium extract made acidic with acetic acid before the addition of lead acetate in the test of sulphur?

(iii) In the test of nitrogen, freshly prepared solution of ferrous sulphate is always used.

(iv) During the test for halogens, why is sodium extract first boiled with a few drops of conc. HNO_3?

(v) Why the organic compound is fused with sodium metal during detection of nitrogen, sulphur, halogens, etc.?

(vi) What is the role of copper sulphate and potassium sulphate in Kjeldahl's process for the estimation of nitrogen in an organic compound?

(vii) Is Beilstein test a satisfactory test for detection of halogens?

(viii) Why CCI_4 will not give white precipitate of $AgCI$ on heating with $AgNO_3$?

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2. Math the following:

(a)Molecular mass of a volatile organic solid	1. Silver sa
(b)Molecular mass of a nonvolatile organic solid	2. Liebig n
(c)Estimation of chlorine in carbon tetrachloride	3. Platinic
(d)Estimation of nitrogen in aniline	4. Victor M
(e)Equivalent mass of an organic acid	5. Depress
(f)Equivalent mass of an organic base	6. Carius r
(g)Estimation of carbon and hydrogen in an organic compound	7. Kjeldah

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Numerical Problems

1. 0.45 gm of an organic compound gave on combution 0.792 gm of CO_2 and $0.324gm$ of water. 0.24 gm of the same substance was Kjeldahlised and the ammonia liberated was absorbed in 50.0 ml of $\frac{M}{8H_2SO_4}$. The excess acid required 77.0 ml of $\frac{N}{10}NaOH$ for complete neutralisation. Calculate the empirical formula of the compound.

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2. A compound contains $40\,\%$, C, $6.66\,\%$ H and $53.33\,\%$ O. An examination reveals that 9.0g of the compound dissolved in 500g of water raises the boiling point of water by $0.051^{\circ}C$. What is the molecular formula of the compound $\left(K_f = 0.51 K mol^{-1} kg\right)$

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3. Tyrosine is one of the amino acids present in protein. Its content in the protein is $0.22\,\%$ and its molecular weight is $181 g mol^{-1}$. What is the lowest molecular weight of the protein?

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4. A molecule was known by its made of synthesis of contain 10 atoms of carbon per molecule, along with unknown number of chlorine, hydrogen and oxygen. Analysis indicates that it contains $60.5\,\%$ carbon 5.55% hydrogen, 16.1% oxygen and 17.9% chlorine. Derive molecular formula.

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5. A welding fuel gas contains carbon and hydrogen only. Burning a small sample of it in oxygen gives 3.38 g carbon dioxide, 0.690 g of water and no other products. A volume of 10.0 litre (Measured at STP) of this welding gas is found weigh $11.6g$. Calculate

(i) empirical formula,

(ii) molar mass of the gas, and

(iii) molecular formula.

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6. 0.33 mol cholesterol gives 9 mole CO_2 on combustion. It was observed that cholesterol contains $83.85\,\%\,C$, $12\,\%\,H$ and $4.15\,\%\,O$. Find its molecular formula and molecular mass.

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7. An automobile antifreeze consist of 38.7% carbon, 9.7% hydrogen and remaining oxygen by weight. When 0.93g of it are vaporised at $200^{\circ} C$ and 1 atm pressure, 582 mL of vapour are formed. Find molecular formula of antifreeze.

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8. The compound $\left[Pd\left(C_{x} H_{y} N_{z}\right]\left(CIO_{4}\right)_{2}\right.$ contains 30.15% carbon and 5.06% hydrogen. The compound $\left[Pb\left(C_{x} H_{y} N_{z}\right](SCN)_{2}\right.$ contains 40.46% carbon and 5.94% hydrogen. Calculate x, y,z.

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9. Methyl orange, an acid base indicator, is the sodium salt of an acid that contains C,H,N,S and oxygen. Quantitative analysis gave $C=51.4 \%, H=4.3 \%, N=12.8 \%, S=9.8 \%$ and $Na=7.0 \%$. What is the empirical formula of methyl orange?

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10. The sulphur content of cystine is 26.7%. Given that cystine contains two sulphur atoms, what is the molecular weight of cystine?

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11. 0.5g of an organic compound gave 62.2ml of N_2 by Duma's method. Calculate the percentage of N in this compound.

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12. In a compound C, H, N atoms are present in $9:1:3.5$ by weight. Molecular weight of compound is 108. Its molecular formula is:

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13. $0.30g$ of an organic compound containing C, H, and O an combustion yields $0.44g$ of CO_2 and $0.18g$ of H_2O. If its molecular mass is 60μ the molecular mass is formula will be

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Objective Questions Level A

1. Carbon and hydrogen are estimated by

A. Kjeldahl's method

B. Duma's method

C. Liebig's method

D. Carius method

Answer: C

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2. Lassaigne's test is used for th detection of:

A. carbon only

B. hydrogen only

C. oxygen only

D. nitrogen, sulphur and halogens

Answer: D

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3. In Lassaigne's test, the organic compound is fused with sodium metal so as to

A. hydrolyse the compound

B. form a sodium derivative

C. convert nitrogen, sulphur or halogens if present into soluble ionic sodium compound

D. burn the compound

Answer: C

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4. Nitrogen containing organic compound when fused with sodium metal forms:

A. $NaNO_2$

B. $NaCN$

C. $NaNH_2$

D. $NaNC$

Answer: B

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5. The sodium extract on acidification with acetric acid and then adding lead acetate solution gives a black precipitate. The organic compound contains.

A. both nitrogen and sulphur

B. nitrogen only

C. sulphur only

D. halogen

Answer: A

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6. The prussian blue colour obtained during the test of nitrogen by lassaigne's test is due to the formation of:

A. $Fe_4\left[Fe(CN)_6\right]_3$

B. $Na_3\left[Fe(CN)_6\right]$

C. $Fe(CN)_3$

D. $Na_4[Fe(CN)_5NOS]$

Answer: A

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7. Which of the following sodium compound is/are formed when as organic compound containing both nitrogen and sulphur is fused with sodium?

A. Cyanide and sulphide

B. Thiocyanate

C. Sulphite and cyanide

D. Nitrate and sulphide

Answer: B

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8. When N and S both are present in an organic compound, the sodium extract with $FeCl_3$ gives

A. green colour

B. blue colour

C. yellow colour

D. red colour

Answer: D

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9. The sodium extract on acidification with acetric acid and then adding lead acetate solution gives a black precipitate. The organic compound contains.

A. nitrogen

B. halogen

C. sulphur

D. phosphorus

Answer: C

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10. The sodium extract on acidification with acetric acid and then adding lead acetate solution gives a black precipitate. The organic compound contains.

A. nitrogen

B. phosphrous

C. sulphur

D. chlorine

Answer: B

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11. Which of the following compounds gives blood red colouration when its Lassaigne's extract is treated with alkali and ferric chloride .

A. Thiourea

B. Benzamide

C. Phenyl hydrazine

D. Diphenyl sulphide

Answer: A

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12. Copper wire test is called

A. Liebig's test

B. Lassaigne's test

C. Fusion test

D. Beilstein's test

Answer: D

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13. Duma's method involves the determination of content of nitrogen in the organic compound in the form os

A. NH_3

B. N_2

C. $NaCN$

D. $(NH_4)_2SO_4$

Answer: B

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14. In Lassaigne's solution, pink/violet colouration is produced when sodium nitroprusside solution is added. It indicates the presence of:

A. sulphur

B. nitrogen

C. chlorine

D. none of these

Answer: A

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15. An organic compound on heating with CuO produces CO_2 but no water. It may be:

A. CH_4

B. C_2H_5I

C. $CHCI_3$

D. CCI_4

Answer: D

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16. Lassaigne's test (with silver nitrate) is commonly used to detect halogens such as chlorine, bromine and iodine but not useful to detect fluorine because the product AgF formed as:

A. volatile

B. reactive

C. soluble in water

D. explosive

Answer: C

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17. In Lassaigne's test for the detection of halogen , the sodium fusion extract is first boiled with concentrated nitric acid . This is

A. to remove silver halides

B. to decompose Na_2S and $NaCN$, if present

C. to dissolve Ag_2S

D. to dissolve $AgCN$, if formed

Answer: B

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18. In Kjeldahl's method of estimation of N, $CuSO_4$ acts as

A. an oxidising agent

B. a reducing agent

C. a catalytic agent

D. a hydrolysing agent

Answer: C

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19. In dumas method for the estimation of nitrogen in an organic compound,nitrogen is determined in the form of:

A. gaseous nitrogen

B. gaseous ammonia

C. ammonium sulphate

D. sodium cyanide

Answer: A

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20. An organic compound which produces a bluish green colored flame on heating in the presence of copper is

A. benzaldehyde

B. benzoic acid

C. aniline

D. Chlorobenzene

Answer: D

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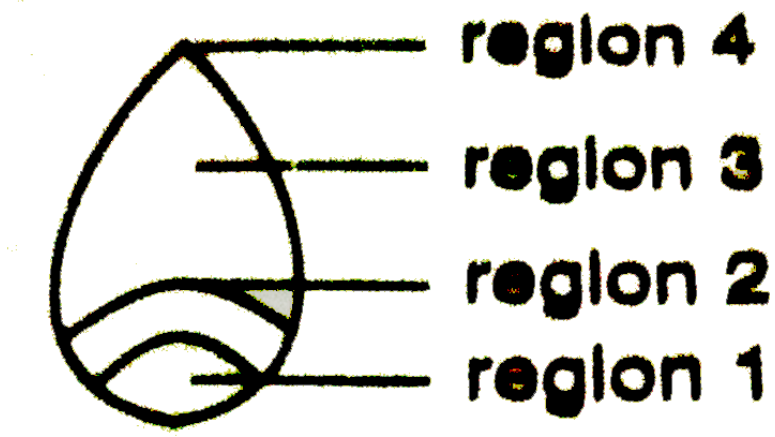
21. The hottest region of Bunsen flame shown in the figure below is:



A. 2

B. 1

C. 4

D. 3

Answer: A

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22. In the estimation of sulphur organic compound on treating with conc. HNO_3 is converted to

A. SO_2

B. H_2S

C. H_2SO_3

D. H_2SO_4

Answer: D

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23. Schiff's and Piria method is used for the estimation of:

A. nitrogen

B. sulphur

C. halogens

D. oxygen

Answer: C

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24. Prussian blue colour is obtained by mixing together aqueous solution of Fe^{3+} salt with:

A. ferricyanide

B. ferrocyanide

C. hydrogen cyanide

D. sodium cyanide

Answer: B

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25. The blood red colour in the combination test of nitrogen and sulphur in organic compound is due to the formation of:

A. ferric sulpho cyanide

B. ferric acetate

C. ferrous sulpho cyanide

D. ferric cyanide

Answer: A

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26. The violet colour in the Lassaigne's test of sulphur is due to

A. $Na_2\left[Fe(CN)_5S\right]$

B. $Na_2\left[Fe(CN)_5NO\right]$

C. $Na_2\left[Fe(CN)_6\right]$

D. $Na_4\left[Fe(CN)_5NOS\right]$

Answer: D

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27. At $300K$ and $1atm$, $15mL$ of a gaseous hydrocarbon requires $375mL$ air containing $20\,\%\,O_2$ by volume for complete combustion. After combustion, the gases occupy $330mL$. Assuming that the water formed is in liquid form and the volumes were measured at the same temperature and pressure, the formula of the hydrocarbon is

A. C_4H_{10}

B. C_4H_8

C. C_3H_8

D. C_3H_6

Answer: C

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28. Mark the incorrect statement in nitrogen Kjeldhal's method of estimation:

A. nitrogen gas is collected over caustic potash solution

B. potassium sulphate is used as boiling point elevator of H_2SO_4

C. copper sulphate or mercury acts as a catalyst

D. nitrogen is quantitatively decomposed to give ammonium sulphate

Answer: A

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29. In the estimation of carbon and hydrogen, if the substance also contains nitrogen, then near the exit, it is placed:

A. a roll of silver

B. a bright copper gauge spiral

C. ammonium sulphate

D. a layer of lead chromate

Answer: B

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30. In the estimation of carbon and hydrogen, if the substance also contains halogens, then near the exit, it is placed:

A. a roll of silver

B. a layer of lead chromate

C. a layer of lead chromate

D. both, a roll of silver and a layer of lead chromate

Answer: C

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31. In Duma's method for estimation of nitrogen. $0.25g$of an organic compound gave $40mL$ of nitrogen collected at $300K$ temperature of $725mm$ pressure. If the aqueous tension at $300K$ is $25mm$, the percentage of nitrogen in the compound is

A. 15.76

B. 16.76

C. 17.36

D. 18.20

Answer: B

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32. $0.30g$ of an organic compound containing $C, H,$ and O an combustion yields $0.44g$ of CO_2 and $0.18g$ of H_2O. If its molecular mass is 60μ the molecular mass is formula will be

A. C_3H_8O

B. CH_2O

C. C_4H_6O

D. $C_2H_4O_2$

Answer: D

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33. In Carius method of estimation of halogens $250mg$ of an organic compound gave $141mg$ of $AgBr$. The percentage of bromine in the compound is (atomic mass $Ag = 108, Br = 80$)

A. 48

B. 60

C. 24

D. 36

Answer: C

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34. In Dumas' method of estimation of nitrogen $0.35g$ of an organic compound gave $55mL$ of nitrogen collected at $300K$ temperature and $715mm$ pressure. The percentage composition of nitrogen in the compound would be : (Aqueous tension at $300K = 15mm$)

A. 15.45

B. 16.45

C. 17.45

D. 14.45

Answer: B

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35. An organic compound 'A', containing C,H,N and O, on analysis gives 49.32% carbon 9.59%, hydrogen and 19.18% nitrogen. 'A' on boiling with $NaOH$ gives off NH_3 and a salt which on acidification gives a monobasic nitrogen free acid, 'B'. The silver salt of 'B' contains 59.67% silver. Structure of 'A' and 'B' are respectively:

A. $CH_3CH_2COOH, CH_3CH_2CONH_2$

B. $CH_3CONHCH_3, CH_3COOH$

C. $CH_3CH_2CONH_2, CH_3CH_2COOH$

D. $CH_3CH_2CH_2NH_2, CH_3CH_2COOCH_3$

Answer: C

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36. An alkaloid contains $17.28\,\%$ of nitrogen and its molecular mass is 162. The number of nitrogen atoms present in one molecule of alkaloid is:

A. 3

B. 2

C. 5

D. 4

Answer: B

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37. 1.2g of organic compound on kjeldahlization librates ammonia which consumes $30cm^3$ of $1NHCI$. The percentage of nitrogen in the organic compound is:

A. 30

B. 35

C. 46.67

D. 20.28

Answer: B

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38. Which of the following reagents is used for the separation of acetaldehyde from acetophenone?

A. NH_2OH

B. $NaOHI_2$

C. $NaHSO_3$

D. $C_6H_5NHNH_2$

Answer: C

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39. In the estimation of sulphur by carius method, 0.468 gm of an organic sulphur compound afforded 0.668 gm of barium sulphate. Find out the percentage of sulphur in the given compound.

A. $20\ \%$

B. $15\ \%$

C. $35\ \%$

D. $30\ \%$

Answer: A

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40. The ammonia evolved from the treatment of $0.30g$ of an organic compound for the estimation of nitrogen was passed in $100mL$ of $0.1M$ sulphuric acid. The excess of acid required $20mL$ of $0.5M$ sodium hydroxide solution for complete neutralization. The organic compound is

A. urea

B. thiourea

C. acetamide

D. benzamide

Answer: A

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41. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia avolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4. The percentage of nitrogen in the soil is

A. 37.33

B. 45.33`

C. 35.33

D. 43.33

Answer: A

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42. An organic compound having molecular mass 60 is found to contain $C = 20\,\%$, $H = 6.67\,\%$, and $N = 46.67\,\%$, while rest is oxygen. On heating, it gives NH_3 along with a solid residue. The solid residue gives violet color with alkaline copper sulphate solution. The compounds is

A. CH_3NCO

B. CH_3CONH_2

C. $(NH_4)_2CO$

D. $CH_3CH_2CONH_2$

Answer: C

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43. A compound containing only carbon, hydrogen and oxygen has molecular mass of 44.0. On complete oxidation, it is converted into a

compound of molecular mass 60.0. The compound is :

A. an aldehyde

B. an acid

C. an alcohol

D. an ether

Answer: A

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44. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20mL of 0.1M HCL solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is:

A. 29.5

B. 59.0

C. 23.7

D. 47.4

Answer: C

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45. An aromatic hydrocarbon with empirical formula C_5H_4 on sulphonation gave a monosulphonic acid. $0.104g$ of this acid $0.104g$ of this acid required $10mL$ of $NaOH$ for complete neutralization. The molecular formula of the acid is

A. C_5H_4

B. $C_{10}H_8$

C. $C_{15}H_{12}$

D. $C_{20}H_{16}$

Answer: C

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46. When 20 g of naphthoic acid $(C_{11}H_8O_2)$ is dissolved in 50 g of benzene $(K_f = 1.72 K \text{kg} mol^{-1})$, a freezing point depression of 2K is observed . The van't Hoff factor (i) is :

A. 0.5

B. 1

C. 2

D. 3

Answer: A

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47. Sodium fusion extract, obtained from aniline, a treatment with iron (II) sulphate and H_2SO_4 in presence of air gives a prussion blue precipitate. The blue colour is due to the formation of:

A. $Fe_4\left[Fe(CN)_6\right]_3$

B. $Fe_3\left[Fe(CN)_6\right]_2$

C. $Fe_4\left[Fe(CN)_6\right]_2$

D. $Fe_3\left[Fe(CN)_6\right]_3$

Answer: A

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48. Match the following:

(A)Duma's method	$(i)AgNO_3$
(B)Kjeldahl's method	(ii)silica gel
(C)Carius method	(iii)Nitrogen
(D)Chromatography	(iv)Ammonium sulphate

A. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (ii) & (iv). \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (i) & (ii) & (iii) & (iv). \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (iii) & (iv) & (i) & (ii). \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (i) & (iv) & (iii) & (ii). \end{matrix}$

Answer: C

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49. Match the following:

Property to be determined	Method used for determ
(A)Estimation of carbon and hydrogen in an organic compound	(i)Lassaigne's test
(B)Estimation of nitrogen in aniline	(ii)Carius method
(C)Estimation of chlorine in carbon tetrachloride	(iii)Liegid's method
(D)Detection of nitrogen sulphur and halogens	(iv)Kjeldahl's method

A. $\begin{matrix} A & B & C & D \\ (i) & (ii) & (iii) & (iv). \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (iv) & (iii) & (i) & (ii). \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (ii) & (i) & (iv) & (iii). \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (iii) & (iv) & (ii) & (i). \end{matrix}$

Answer: D

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50. Match the following:

(A)Equivalent mass of an organic acid	(i)Depression in freezir
(B)Equivalent mass of an organic base	(ii)Victor Meyer's met
(C)Molecular mass of a volatile organic solid	(iii)Platinichloride me
(D)Molecular mass of a non-volatile organic solid	(iv)Silver salt method

A. $\begin{matrix} A & B & C & D \\ (iv) & (iii) & (ii) & (i). \end{matrix}$

B. $\begin{matrix} A & B & C & D \\ (i) & (ii) & (iii) & (iv). \end{matrix}$

C. $\begin{matrix} A & B & C & D \\ (iii) & (i) & (iv) & (ii). \end{matrix}$

D. $\begin{matrix} A & B & C & D \\ (ii) & (iv) & (i) & (iii). \end{matrix}$

Answer: A

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51. Kjeldahl's method for estimation of nitrogen is not applicable to:

A. pyridine

B. hexamethylenediamine

C. propan-1-amine

D. 2-phenylethanamine

Answer: A

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52. Correct pair of compounds which gives blue colouration/precipitate and white precipitate, re- spectively, when their Lassaigne's test separately

A. NH_2NH_2HCI and $CICH_2COOH$

B. NH_2CSNH_2 and $PhCH_2CI$

C. NH_2CH_2COOH and NH_2CONH_2

D. 

Answer: D

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53. The reaction of nitroprusside anion with sul- phide ion gives purple colouration due to the formation of

A. the tetranionic complex of iron (II) coordinating to one NOS^- ion

B. the dianionic complex of iron (II) coordinating to one NCS^- ion

C. the trianionic complex of iron (III) coordinating to one NOS^- ion

D. the tetranionic complex of iron (III) coordinating to one NCS^- ion

Answer: A

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54. Empirical formula of a compound is CH_2O and its molecular mass is 90. The molecular formula of the compound is

A. $C_3H_6O_3$

B. $C_2H_4O_2$

C. $C_6H_{12}O_6$

D. CH_2

Answer: A

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55. A gaseous hydrocarbon gives upon combustion $0.72g$ of water and $3.08g$ of CO_2. The empirical formula of the hydrocarbon is

A. C_7H_8

B. C_2H_4

C. C_3H_4

D. C_6H_5

Answer: A

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56. On complete combustion, 0.246g of an organic compound gave $0.198g$ of CO_2 and 0.1014g of H_2O. The ratio of carbon and hydrogen atoms in the compound is:

A. $1:3$

B. $1:2$

C. $2:5$

D. $2:7$

Answer: C

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57. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl's method and the evolved ammonia was absorbed in 60 mL of $M/10$ sulphuric acid. The unreacted acid required 20 mL of $M/10$ sodium hydroxide for complete neutralisation. The percentage of nitrogen in the compound is

A. 0.05

B. 0.06

C. 0.1

D. 0.03

Answer: C

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Objective Questions Level B

1. Which among the following is not correctly matched with their colour?

A.

Compound	Colour
$Na_4[Fe(CN)_5NOS]$	purple

B.

Compound	Colour
$Fe_4[Fe(CN)_6]_3$	blue

C.

Compound	colour
$Fe(CNS)_3$	blood red

D.

Compound	colour
$AgCI$	light yellow

Answer: D

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2. In case, nitrogen sulphur both are present in an organic compound, sodium thiocynate is formed. If sodium fusion is carried out with excess of sodium, sodium thocyanate decomposes. Which of the following compounds is/are present in the extract after decomposition?

A. $NaCN$

B. Na_2S

C. Both

D. None of these

Answer: C

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3. 0.0833mol of carbohydrate of empirical formula CH_2O contain $1g$ of hydrogen. The molecular formula of the carbohydrate is

A. $C_5H_{10}O_5$

B. $C_3H_4O_3$

C. $C_{12}H_{22}O_{11}$

D. $C_6H_{12}O_6$

Answer: D

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4. Kjeldahl's method cannot be used for the estimation of nitrogen in

A. pyridine

B. azobenzene

C. nitrobenzene

D. all of these

Answer: D

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5. 9.9g of amide with molecular formula $C_4H_5N_xO_y$ on heating with alkali liberated 1.7g of ammonia. If the percentage of oxygen is 33.33% then the ratio of 'N' and 'O' atoms in the compound is:

A. $1:1$

B. $1:2$

C. $2:3$

D. $3:2$

Answer: B

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6. Lassigne's test in not shown by diazonium salts and hydrazines (NH_2NH_2). Why?

A. form NH_3 gas on heating much before the reaction with sodium

B. form N_2 gas on heating much before the reaction with sodium

C. are highly volatile and evaporate before the reaction with sodium

D. all of the above

Answer: B

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7. 0.256 g of some nitrogenous compound was kjeldahlised and produced 0.155 g of ammonia. The % of nitrogen in the organic compound is approximately

A. 5

B. 30

C. 50

D. 80

Answer: C

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8. Kjeldahl's method cannot be used for estimation of nitrogen in:

(I) $C_6H_5CONH_2$

(II) Pyridine

(III) $C_6H_5 - N = N - C_6H_5$ (IV) $C_6H_5NHCOCH_3$

A. I,II

B. II,III

C. III,IV

D. I,II

Answer: B

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9. Violet coloured complex obtained in the detection of sulphur is:

A. $Na_2\left[Fe(NO)(CN)_5\right]$

B. $Na_3\left[Fe(ONSNa)(CN)_5\right]$

C. $Na_4\left[Fe(CN)_5NOS\right]$

D. both (b) and (c)

Answer: D

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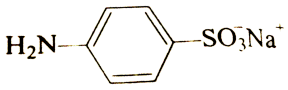
10. Select the organic compounds, which will give red colour in Lassaigne's test?

A. $NaCNS$

B. $NH_2 - \overset{O}{\overset{||}{C}} - NH_2$

C. $NH_2 - \overset{\overset{S}{\|}}{C} - NH_2$

D. 

Answer: C::D

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11. The desiccants used for absorbing water during Liebig's method for estimation of carbon and hydrogen are:

A. $CaCI_2$

B. Na_2SO_4

C. $MgSO_4.7H_2O$

D. $Mg(CIO_4)_2$

Answer: A::D

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12. Which of the following compounds may give blood red colouration while performing Lassaigne's test for nitrogen?

A. $(NH_2)_2CO$

B. $(NH_2)_2C = S$

C. $p - NH_2C_6H_4SO_3H$

D. $C_6H_5SO_3H$

Answer: B::C

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13. The desiccants used for absorbing water during Liebig's method for estimation of carbon and hydrogen are:

A. Anhydrous $CaCI_2$

B. Anhydrous Na_2SO_4

C. $MgSO_4.7H_2O$

D. $Mg(CIO_4)_2$

Answer: A::D

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14. The empirical formula of a compound is CH_2 . To which of the following series can it belong ?

A. Alkanes

B. Alkenes

C. Alkynes

D. Cycloalkanes

Answer: B::D

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15. An organic compound contains about 25% carbon. It could be:

A. ethanol

B. dimethyl ether

C. acetic acid

D. phenol

Answer: A::B

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16. Pressure of halogen in a compound is tested by:

A. Iodoform test

B. Millon's test

C. Silver nitrate test

D. Beilstein's test

Answer: C::D

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17. The weight of carbon ,hydrogen and oxygen in an organic compound are in the ratio 6 : 1 : 8 respectively .The molecular formula of compound may be

A. CH_2O

B. $C_2H_4O_2$

C. CH_2O_2

D. $C_3H_6O_3$

Answer: A::B::D

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18. Which of the organic compounds will give white precipitate with $AgNO_3$?

A. $C_6H_5NH_3^+CI^-$

B. $NaCI$

C. C_6H_5CI

D. 2,6,6-Trinitrochlorobenzene

Answer: A::D

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Assertion Reason Type

1. (A) Lassaigne's test can be used to detect nitrogen in hydrazine.

(R) During fusion with sodium metal, nitrogen and carbon of the organic compound combine to form sodium cyanide.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: D

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2. (A) If sulphur and nitrogen are also present in orgaic compound along with halogen then $AgNO_3$ solution is added in acidified sodium fusion extract.

(R) On acidification, $NaCN$ and Na_2S decompose.

$NaCN + HNO_3 \rightarrow NaNO_3 + HCN \uparrow$

$Na_2S + 2HNO_3 \rightarrow 2NaNO_3 + H_2S \uparrow$

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: A

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3. (A) Litmus is not used in Lassaigne's test.

(R) It generally forms covalent compounds.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: A

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4. (A) in Victor Meyer's method, vapour density is considered to be one-half of molecular weight.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: C

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5. (A) Nitrogen cannot be estimated in nitrobenzene by Kjeldahl's method.

(R) Nitrobenzene evolves ammonia gas on acid treatment.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: C

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6. (A) All compounds containing an odd number of nitrogen atoms have odd masses and those which contain even number of nitrogen atoms have even masses.

(R) Nitrogen rule can be applied to both aliphatic and aromatic compounds.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: B

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7. (A) $p - NH_2C_6H_5SO_3H$ gives blood red colouration while performing Lassaigne's test for nitrogen.

(R) Sodium fusion extract containing $NaCNS$ gives blood red colour on treatment with $FeCI_3$.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: A

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8. (A) Lassaigne's test is not shown by diazonium compounds.

(R) Diazonium compounds lose N_2 on heating

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: A

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9. (A) If two compounds have the same empirical formula but different molecular formula, they have same vapour density.

(R) g/mL is the unit of vapour density.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: D

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10. (A) Duma's method is more applicable to nitrogen containing organic compounds than Kjeldahl's method.

(R) Kjeldahl's method does not give satisfactory results for compounds in which nitrogen is linked to oxygen.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: B

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11. (A) Hydrazine contains nitrogen but does nto give Lassaigne's test for nitrogen.

(R) Hydrazine reacts with fused sodium to give H_2 gas.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: A

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12. (A) Sodium fusion extract of a compound gives black precipitate with lead acetate.

(R) Sulphur containing compounds form Na_2S in sodium fusion extract.

A. If both assertion and reason are correct and reason is the correct explanation of the assertion

B. If both assertion and reason are correct but reason is not the correct explanation of the assertion

C. If assertion is correct but reason is incorrect

D. If assertion is incorrect but reason is correct

Answer: B

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Matrix Match Type

1. Match the following:

$ColumnI$ (Tests)	$ColumnII$ (Element to be detected).
(a)Lassaigne' test	(p)Nitrogen
(b)Beilstein test	(q)Chlorine
(c)Sodium nitroprusside test	(r)Sulphur
(d)Layer test	(s)Bromine

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2. Match the following:

$ColumnI$ (Methods of estimation)	$ColumnII$ (Elements to be estimated).
(a)Kjeldahl's method	(p)Halogen
(b)Duma's method	(q)Sulphur
(c)Carius method	(r)Carbon
(d)Liebig's method	(s)Estimation of nitrogen

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3. Match the following:

$Column I$ (Compound)	$Column II$ (Reagent for separation).
(a) Diethyl ketone	$(p) C_6H_5SO_2CI$
(b) Benzoic acid	$(q) NaOH$
$(c) 1^\circ$ and 2° amines	$(r) NaHSCO_3$
$(d) \beta -$ Naphthol	$(s) NaHCO_3$

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4. Match the following:

$Column I$ (Compound)	$Column II$ (Test with the reagent).
(a) Ethanol	$(p) 2.4 -$ Dinitriphenyl hydrazine solution
(b) Phenol	(q) Cerric ammonium nitrate solution
(c) Acetone	(r) Sodium nitrite and hydrochloric acid in cold followed by
(d) Aniline	(s) Aqueous or alcoholic solution of ferric chloride

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Passage 1

1. Combustion of 0.42g of a compound gave $0.924gCO_2$ and $0.243gH_2O$. Due to distillation of $0.208g$ of compound with NaOH, ammonia evolved required 30mL of $\frac{N}{20}H_2SO_4$ for complete neutralization. Vapour density of the compound is 69.5.

The compound has empirical formula:

A. $C_7H_9O_2N$

B. $C_6H_5NO_2$

C. $C_3H_7 - CONH_2$

D. $NH_2 - \overset{O}{\overset{||}{C}} - NH_2$

Answer: A

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2. Combustion of 0.42g of a compound gave $0.924gCO_2$ and $0.243gH_2O$. Due to distillation of $0.208g$ of compound with NaOH, ammonia evolved required 30mL of $\frac{N}{20}H_2SO_4$ for complete neutralization. Vapour density

of the compound is 69.5.

Percentage composition of carbon in the compound is...

A. 6.43

B. 22.48

C. 60

D. 10.09

Answer: C

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3. Combustion of 0.42g of a compound gave $0.924gCO_2$ and $0.243gH_2O$. Due to distillation of $0.208g$ of compound with NaOH, ammonia evolved required 30mL of $\frac{N}{20}H_2SO_4$ for complete neutralization. Vapour density of the compound is 69.5.

What is the percentage composition of nitrogen in the compound?

A. 23.48

B. 10.09

C. 6.43

D. 60

Answer: B

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4. Combustion of 0.42g of a compound gave $0.924gCO_2$ and $0.243gH_2O$. Due to distillation of $0.208g$ of compound with NaOH, ammonia evolved required 30mL of $\frac{N}{20}H_2SO_4$ for complete neutralization. Vapour density of the compound is 69.5.

What is the percentage composition of hydrogen in the compound?

A. 6.43

B. 10.09

C. 60

D. 23.48

Answer: A

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5. Combustion of 0.42g of a compound gave $0.924gCO_2$ and $0.243gH_2O$. Due to distillation of $0.208g$ of compound with NaOH, ammonia evolved required 30mL of $\frac{N}{20}H_2SO_4$ for complete neutralization. Vapour density of the compound is 69.5.

What is the value of 'n' for the given compound? where $n = \frac{\text{Molecular mass}}{\text{Empirical formula mass}}$

A. 2

B. 3

C. 1

D. 4

Answer: C

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Passage 2

1. 0.9g of an organic compound gave on combustion:

(i) $1.584gCO_2$ (ii) $0.648gH_2O$ When $0.24g$ of the substance was Kjeldahlised and the ammonia formed was absorbed in $50cm^3$ of $\frac{N}{2}H_2SO_4$. The excess acid required $77cm^3$ of $N/10NaOh$ for complete neutralization. Molecular mass of the compound is estimated to be 100.

The compound has maximum percentage composition of which of the following elements?

A. C

B. H

C. N

D. O

Answer: A

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2. 0.9g of an organic compound gave on combustion:

(i) $1.584gCO_2$ (ii) $0.648gH_2O$ When $0.24g$ of the substance was Kjeldahlised and the ammonia formed was absorbed in $50cm^3$ of $\frac{N}{2}H_2SO_4$. The excess acid required $77cm^3$ of $N/10NaOh$ for complete neutralization. Molecular mass of the compound is estimated to be 100.

What is the percentage composition of carbon in the compound?

A. 0.16

B. 0.08

C. 0.28

D. 0.48

Answer: D

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3. 0.9g of an organic compound gave on combustion:

(i) $1.584gCO_2$ (ii) $0.648gH_2O$ When $0.24g$ of the substance was Kjeldahlised and the ammonia formed was absorbed in $50cm^3$ of $\frac{N}{2}H_2SO_4$. The excess acid required $77cm^3$ of $N/10NaOh$ for complete neutralization. Molecular mass of the compound is estimated to be 100.

Percentage composition of nitrogen in the compound will be:

A. 16

B. 61

C. 6

D. 28

Answer: D

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4. 0.9g of an organic compound gave on combustion:

(i) $1.584gCO_2$ (ii) $0.648gH_2O$ When $0.24g$ of the substance was

Kjeldahlised and the ammonia formed was absorbed in $50cm^3$ of $\frac{N}{2}H_2SO_4$. The excess acid required $77cm^3$ of $N/10NaOh$ for complete neutralization. Molecular mass of the compound is estimated to be 100.

Which among the following is the empirical formula of the compound?

A. $C_8H_4NO_2$

B. $C_4H_8N_2O$

C. C_4H_8NO

D. C_8H_4NO

Answer: B

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5. 0.9g of an organic compound gave on combustion:

(i) $1.584gCO_2$ (ii) $0.648gH_2O$ When $0.24g$ of the substance was Kjeldahlised and the ammonia formed was absorbed in $50cm^3$ of $\frac{N}{2}H_2SO_4$. The excess acid required $77cm^3$ of $N/10NaOh$ for complete

neutralization. Molecular mass of the compound is estimated to be 100.

Molecular formula of the compound will be:

A. $C_8H_4NO_2$

B. $C_4H_8N_2O$

C. C_4H_8NO

D. C_8H_4NO

Answer: B

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