CHEMISTRY

BOOKS - FULL MARKS CHEMISTRY (TAMIL ENGLISH)

ATOMS AND MOLECULES

Solved Examples Calculation Of Average Atomic Mass

1. Oxygen is the most abundant element in both the Earth's crust and the human body. It exists as a mixture of three stable isotopes in nature as shown in Table.

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2. Boron naturally occurs as a mixture of boron - 10 $(5 \text{ protons} + 5 \text{ neutrons})$ and boron 11 $(5 \text{ protons} + 6 \text{ neutrons})$

isotopes. The percentage abundance of $B-10$ is 20 and that of $B-11$ is 80. Then, the atomic mass of boron in calculated as follows :

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Solved Examples Calculation Of Relative Molecular Mass

1. Relative molecular mass of sulphuric acid (H_2SO_4) is calculated as follows:

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2. Relative molecular mass of water (H_2O) is calculated as follows:

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Solved Examples Calculation Of Percentage Composition

1. Find the mass percentage composition of methane (CH_4).

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Solved Problems Calculation Of Molar Mass

1. Calculate the gram molar mass of the following.

(i) H_2O (ii) CO_2 (iii) $Ca_3(PO_4)_2$

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Solved Problems Ii Calculation Based On Number Of Moles From Mass And Volume

1. Calculate the number of moles in 46 g of sodium.

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2. 5.6 litre of oxygen at S.T.P

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3. Calculate the number of moles of a sample that contains 12.046×10^{23} atoms of iron?

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Solved Problems Iii Calculation Of Mass From Mole

1. Calculate the mass of the following:

0.3 mole of aluminium (Atomic mass of Al = 27)

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2. Calculate the mass of the following:

2.23 litre of SO_2 gas at S.T.P

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3. Calculate the mass of the following:

$1/51 \times 10^{23}$ molecules of water

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4. Calculate the mass of the following:

5×10^{23} molecules of glucose

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Solved Problems Iv Calculation Based On Number Of Atoms Molecules

1. Calculate the number of molecules in 11.2 litre of CO_2 at S.T.P

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2. Calculate the number of atoms present in 1 gram of gold $(\text{Atomic mass of Au} = 198)$

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3. Calculate the number of molecules in 54 gm of H_2O

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4. Calculate the number of atoms of oxygen and carbon in 5 moles of CO_2.

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Solved Problems V Calculate Based On Molar Volume

1. Calculate the volume occupied by :

$1.5\ \text{mole of}\ \ CO_2\ \ \text{at S.T.P}$

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2. Calculate the volume occupied by :

3.011×10^{23} of ammonia gas molecules

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3. Calculate the volume occupied by :

14 g nitrogen gas

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Solved Problems Calculation Based On Composition

1. Calculate $\%$ of S in H_2SO_4

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Textual Evaluation Solved I Choose The Correct Answer

1. Which of the following has the smallest mass?

A. 6.023×10^{23} atoms of He

B. 1 atom of He

C. 2 g of He

D. 1 mole atoms of He

Answer: B

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2. Which of the following is a triatomic molecule?

A. Glucose

B. Helium

C. Carbon dioxide

D. Hydrogen

Answer: C

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3. The volume occupied by 4.4 g of CO_2 at S.T.P.....

A. 22.4 litre

B. 2.24 litre

C. 0.24 litre

D. 0.1 litre

Answer: B

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4. Mass of 1 mole of Nitrogen atom is ..... .

A. 28 amu

B. 14 amu

C. 28 g

D. 14 g

Answer: B

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5. Which of the following represents 1 amu?

A. Mass of a $C-12$ atom

B. Mass of a hydrogen atom

C. $1/12^{\text{th}}$ of the mass of $C-12$ atom

D. Mass of $O-16$ atom

Answer: C

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6. Which of the following statement is incorrect?

A. One gram of $C-12$ contains Avogadro's number of atoms.

B. One mole of oxygen gas contains Avogadro's number of molecules.

C. One mole of hydrogen gas contains Avogadro's number of atoms.

D. One mole of electrons stands for 6.023×10^{23} electrons.

Answer: A

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7. The volume occupied by 1 mole of a diatomic gas at S.T.P is ..... .

A. 11.2 litre

B. 5.6 litre

C. 22.4 litre

D. 44.8 litre

Answer: C

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8. In the nucleus of $_{20}Ca^{40}$, there are ..... .

A. 10 protons and 40 neutrons

B. 20 protons and 20 neutrons

C. 20 protons and 40 electrons

D. 40 protons and 20 electrons

Answer: B

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9. The gram molecular mass of oxygen molecules is ..... .

A. 16g

B. 18g

C. 32g

D. 17g

Answer: C

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10. 1 mole of any substance contains .....molecules.

A. 6.023×10^{23}

B. 6.023×10^{-23}

C. 3.0115×10^{23}

D. 12.046×10^{23}

Answer: A

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Textual Evaluation Solved Ii Fill In The Blanks

1. Atoms of different elements having .....mass number, but .....atomic numbers are called isobars.

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2. Atoms of different elements having same numbr of .....are called isotones.

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3. Atoms of one element can be transmuted into atoms of other element by ..... .

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4. The sum of the numbers of protons and neutrons of an atom is called its ..... .

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5. Relative atomic mass is otherwise known as ..... .

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6. The average atomic mass of hydrogen is .....amu.

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7. The number of atoms present in a molecule is called its ..... .

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Textual Evaluation Solved Iii Match The Following

1. Match the following.

a. 8 g of O_2	i. 4 moles
b. 4 g of H_2	ii. 0.25 moles
c. 52 g of He	iii. 2 moles
d. 112 g of N_2	iv. 0.5 moles
e. 35.5 g of Cl_2	v. 13 moles.

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Textual Evaluation Solved Iv True Or False If False Give The Correct Statement

1. Noble gases are Diatomic

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2. The gram atomic mass of an element has no unit

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3. Molar mass of CO_2 is 42 g.

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Textual Evaluation Solved V Assertion And Reason

1. Assertion : Atomic mass of aluminium is 27

Reason : An atom of aluminium is 27 times heavier than $1/12^{\text{th}}$ of the mass of the $C-12$ atom.

A. A and R correct, R explains the A.

B. A is correct, R is wrong.

C. A is wrong, R is correct.

D. A and R are correct, R doesn't explains A.

Answer: (i)

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2. Assertion : The Relative Molecular Mass of Chlorine is 35.5 a.m.u.

Reason : The natural abundance of Chlorine isotopes are not equal.

A. A and R correct, R explains the A.

B. A is correct, R is wrong.

C. A is wrong, R is correct.

D. A and R are correct, R doesn't explains A.

Answer: (i)

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Textual Evaluation Solved Vi Short Answer Questions

1. Define Relative atomic mass.

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2. Write the different types of isotopes of oxygen and its percentage abundance. `

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3. Define Atomicity.

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4. Give any two examples for heterodiatomic molecules.

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5. What is Molar volume of a gas?

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6. Find the percentage of nitrogen in ammonia.

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Textual Evaluation Solved Vii Long Answer Questions

1. Calculate the number of water molecule present in one drop of water which weighs 0.18 g.

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2. $N_2 + 3H_2 \rightarrow 2NH_3$

(The atomic mass of nitrogen is 14, and that of hydrogen is 1)

$1 \text{ mole of nitrogen } (\ldots\ldots\ldots\ldots g) +$

$3 \text{ moles of hydrogen } (\ldots\ldots\ldots g) \rightarrow$

$2 \text{ moles of ammonia } (\ldots\ldots\ldots g)$

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3. Calculate the number of moles in

(i) 27 g Al

(ii) 1.51×10^{23} molecules of NH_4Cl

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4. Give the salient features of "Modern atomic theory".

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5. Derive the relationship between Relative molecular mass and Vapour density.

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Textual Evaluation Solved Viii Hot Question

1. Calcium carbonate is decomposed on heating in the following reaction

$CaCO_3 \rightarrow CaO + CO_2$

i. How many moles of Calcium carbonate are involved in this reaction?

ii. Calculate the gram molecular mass of calcium carbonate involved in this reaction.

iii. How many moles of CO_2 are there in this reaction?

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Textual Evaluation Solved Ix Solve The Following Problems

1. How many grams are there in the following?

i. 2 moles of hydrogen molecule, H_2

ii. 3 moles of chlorine molecules, Cl_2

iii. 5 moles of sulphur molecule, S_8

iv. 4 moles of phosphorous molecules, P_4

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2. Calculate the $\%$ of each element in calcium carbonate. (Atomic mass : $C-12, O-16, Ca-40$)

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3. Calculate the $\%$ of oxygen in $Al_2(SO_4)_3$. (Atomic mass: $Al-12, O-16, S-32$)

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4. Calculate the $\%$ relative abundance of $B-10$ and $B-11$, if its average atomic mass is 10.804 amu.

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Activities

1. Complete the following table by filling the appropriate values/terms

Element	No. of Protons	No. of Neutrons	Mass Number	Stable Isotopes (abundance)	Atomic Mass (amu)
	7			N-14 (99.6 %)	
		8		N-15 (0.4 %)	
Silicon	14		28	Si-28 (92.2 %)	
	14			Si-29 (4.7 %)	
		16		Si-30 (3.1 %)	
	17			Cl-35 (75 %)	
	17			Cl-37 (25 %)	

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2. Classify the following molecules based on their atomicity and fill in the table: Fluorine (F_2), Carbon dioxide (CO_2), Phosphorous (P_4), Sulphur (S_8) Ammonia (NH_3), Hydrogen iodide (HI), Sulphuric Acid (H_2SO_4),

Methane (CH_4), Glucose $(C_6H_{12}O_6)$, Carbon nonoxide (CO)

Molecule	Diatomic	Triatomic	Polyatomic
Homo			
Hetero			

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3. Under same conditions of temperature and pressure if you collect 3 litre of O_2, 5 litre of Cl_2 and 6 litre of H_2,

i. Which has the highest number of molecules?

ii. Which has the lowest number of number of molecules?

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Additional Questions Solved I Choose The Correct Answer

1. Which of the following pair indicates isotopes?

A. ${}_{17}C_{35}$, ${}_{17}Cl^{37}$

B. ${}_{18}Ar^{40}$, ${}_{20}Ca^{40}$

C. ${}_6C^{13}, {}_7N^{14}$

D. ${}_{35}As^{27}, {}_{34}Se^{78}$

Answer: A

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2. Identify the pair that indicates isobars among the following.

A. ${}_1H^2, {}_1H^3$

B. ${}_{17}Cl^{35}, {}_{17}Cl^{37}$

C. ${}_{18}Ar^{40}, {}_{18}Ca^{40}$

D. ${}_6C^{13}, {}_7N^{14}$

Answer: C

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3. The sum of the number of protons and neutrons of an atom is called its .....

A. nucleus

B. atomic number

C. mass number

D. relative atomic mass

Answer: C

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4. The isotope of Carbon - 12 contains ..... .

A. 6 protons and 7 electrons

B. 6 protons and 6 neutrons

C. 12 protons and no neutrons

D. 12 neutrons and no protons

Answer: B

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5. An isotope of hydrogen without neutrons is ..... .

A. Deuterium ${}_1H^2$

B. Protinum ${}_1H^1$

C. Tritium ${}_1T^3$

D. Heavy hydrogen ${}_1D^2$

Answer: B

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6. The mass of proton or neutron is approximately ..... .

A. 1 amu

B. $1.609 \times 10^{-19} g$

C. 1 g

D. $16.023 \times 10^{-23} g$

Answer: A

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7. Which one of the following element is used as the standard for measuring the relative atomic mass of an element in now a days?

A. ${}_1H^2$

B. ${}_6O^{12}$

C. $C - 12$

D. $C - 14$

Answer: C

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8. The relative atomic mass of magneiusm based on $C-12$ scale is ..... .

A. 24 g

B. 24

C. 24 amu

D. 24 kg

Answer: B

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9. The average atomic mass of carbon is ..... .

A. 12 amu

B. 12.84 amu

C. 24.011 amu

D. 12.011 amu

Answer: D

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10. Which one of the following is the most abudant element in both the Earth's crust and in human body?

A. Carbon

B. Silicon

C. Oxygen

D. Hydrogen

Answer: C

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11. Find the odd one out.

A. ${}_8O^{16}$

B. ${}_8O^{17}$

C. ${}_6O^{12}$

D. ${}_8O^{18}$

Answer: C

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12. Boron - 10 and Boron - 11 are called ..... .

A. isotopes

B. isobars

C. isotones

D. isomers

Answer: A

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13. Which of the following are found in elementary state in nature?

A. Hydrogen chloride

B. Carbon dioxide

C. Noble gases

D. Oxygen

Answer: C

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14. Which one of the following is a home diatomic molecule?

A. H_2

B. CO

C. NO

D. O_3

Answer: A

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15. Which one of the following is a hetero diatomic molecules?

A. P_2

B. N_2

C. HI

D. CH_4

Answer: C

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16. Which one of the following is a hetero triatomic molecule?

A. H_2O

B. BCl_3

C. CH_4

D. PCl_5

Answer: A

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17. Which of the following is an example of homo triatomic molecule?

A. Phosphorous

B. Sulphur

C. Bromine

D. Ozone

Answer: D

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18. Find out the hetero diatomic molecule?

A. Hydrogen

B. Hydrogen chloride

C. Methane

D. Ammonia

Answer: B

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19. Which one of the following is an example of polyatomic molecule?

A. Sulphur

B. Gold

C. Sodium

D. Helium

Answer: A

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20. Find the odd one out.

A. Silver

B. Potassium

C. Iron

D. Phosphorous

Answer: D

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21. Which one of the following is an example of poly atomic molecule?

A. Fluorine

B. Glucose

C. Oxygen

D. Sodium

Answer: B

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22. The gram molecular mass of water is ..... .

A. 18 amu

B. 18 g

C. 18 u

D. 18

Answer: B

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23. The value of Avogadro's number is ..... .

A. 6.023×10^{-23}

B. 6.023×10^{23}

C. 22.4

D. 22400

Answer: B

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24. The value of molar volume is ..... .

A. 22.4 ml

B. 22.4 litres

C. 22400 litres

D. 2.24 litres

Answer: B

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25. Which one of the following represent Avogadro's law ? α

A. $V \propto \frac{1}{n}$

B. $V \propto n$

C. $V \propto \frac{1}{n^2}$

D. $V^2 \propto \frac{1}{n}$

Answer: B

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26. Which of the following has the highest number number of molecules?

A. 1 litre of N_2

B. 2 litres of oxygen

C. 5 litres of Cl_2

D. 6 litres of Hydrogen

Answer: D

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27. Which one of the following has the lowest number of molecules?

A. 1 litre of N_2

B. 2 litres of H_2

C. 3 litres of O_2

D. 4 litres of Cl_2

Answer: A

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28. $2 \times \text{Vapour}$ density is equal to ..... .

A. atomic mass

B. valency

C. relative molecular mass

D. atomic number

Answer: C

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29. The value of gram molar mass of CO_2 is ..... .

A. 44 amu

B. 44 g

C. 44

D. 44 kg

Answer: B

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30. The number of moles of a sample that contain 36 g of water is ..... .

A. 1 mole

B. 0.5 mole

C. 4 moles

D. 2 moles

Answer: D

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31. Which of the following has the largest number of particles?

A. 8 g of CH_4

B. 4.4 g of CO_2

C. 34.2 g of $C_{12}H_{22}O_{11}$

D. 2 g of $C_{12}H_{22}O_{11}$

Answer: D

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32. The number of molecules in 16.0 g of oxygen is ..... .

A. 6.023×10^{23}

B. 6.023×10^{-23}

C. 3.01×10^{-23}

D. 3.011×10^{23}

Answer: D

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33. The percentage of hydrogen in H_2O is ..... .

A. 8.88

B. 11.2

C. 20.6

D. 80.0

Answer: B

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34. Which of the following contains the largest number of molecules?

A. 0.2 moles of H_2

B. 8.0 g of H_2

C. 17 g of H_2O

D. 6.0 g of CO_2

Answer: B

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35. One gram of which of the following contains the largest number of oxygen atoms?

A. O

B. O_2

C. O_3

D. All contains same

Answer: C

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36. The percentage by weight of O_2 in $CaSO_4(O = 16, Ca = 40, S = 32)$ is ..... .

A. $64\ \%$

B. $28.2\ \%$

C. $47.05\ \%$

D. $16.2\ \%$

Answer: C

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37. One mole of a gas occupies a volume of 22.4 L. This is derived from ..... .

A. Berzilliu's hypothesis

B. Gay - Lussac's law

C. Avogadro's law

D. Dalton's law

Answer: C

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38. Volume of gas at STP is $1.12 \times 10^{-7} cc$. Calculate the number of molecules in it.

A. 3.011×10^{20}

B. 3.011×10^{12}

C. 3.011×10^{23}

D. 3.011×10^{24}

Answer: B

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39. The number of molecules of CO_2persent in 44 g of CO_2 is ..... .

A. 6.023×10^{23}

B. 3.011×10^{23}

C. 12×10^{23}

D. 3×10^{10}

Answer: A

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40. The valume occupied by 4.4 g of CO_2 at S.T.P is ..... .

A. 22.4 L

B. 2.24 L

C. 0.224 L

D. 0.1 L

Answer: B

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41. How many molecules at present in one gram of hydrogen?

A. 6.023×10^{23}

B. 3.011×10^{23}

C. 2.5×10^{23}

D. 1.5×10^{23}

Answer: B

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42. Atoms which have same number of protons but different number of neutrons are called as ..... .

A. isotopes

B. isomers

C. allotropes

D. isotones

Answer: A

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43. Number of atoms which a molecule to sulphur contains is ..... .

A. 3

B. 8

C. 4

D. 2

Answer: B

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44. An example of triatomic molecule is ..... .

A. Ozone

B. Nitrogen

C. Hydrogen

D. Ammonia

Answer: A

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45. The atomic mass of sodium is 23. The number of moles in 46 g of sodium is ..... .

A. 0.5

B. 2

C. 1

D. 0.25

Answer: B

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46. The number of atoms in a molecule of the elementary substance is called ..... .

A. atomic number

B. Avogadro number

C. atomic mass

D. atomicity

Answer: D

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47. Avogadro number represents the number of atoms in ..... .

A. 12 g of C - 12

B. 4.4 g of CO_2

C. 320 g of Sulphur

D. 1 g of C - 12

Answer: A

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48. The number of moles in 5 grams of Calcium is ..... .

A. 0.5 mole

B. 0.125 mole

C. 1.25 mole

D. 12.5 mole

Answer: B

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49. One mole of H_2O corresponds to .....

A. 22.4 litre at 1 atm and $250^\circ C$

B. 6.023×10^{23} atoms of hydrogen and 6.023×10^{23} atoms of oxgygen

C. 18 g

D. 1g

Answer: D

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50. Which one of the following has maximum number of atoms?

A. 18 g of H_2O

B. 18 g of O_2

C. 18 g of CO_2

D. 18 g of CH_4

Answer: D

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51. The atomicity of $K_2Cr_2O_7$ is ..... .

A. 9

B. 11

C. 10

D. 12

Answer: B

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52. All noble gases are ..... Molecules.

A. diatomic

B. triatomic

C. mono atomic

D. poly atomic

Answer: C

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53. The total number of atoms represented by the compound $CuSO_4.5H_2O$ is ..... .

A. 27

B. 21

C. 5

D. 8

Answer: B

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54. Which one of the following represent the mass of 0.5 moles of water molecules?

A. 18 g

B. 1.8 g

C. 9 g

D. 4.5 g

Answer: C

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55. The atomic mass of Calcium is 40. Calculate the number of moles in 16 g of Calcium.

A. 0.4 mole

B. 4 moles

C. 640 moles

D. 1/4 mole

Answer: A

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56. If the atomic mass of sodium is 23 amu, then the mass of 3.011×10^{23} sodium atoms is ..... .

A. 11.5 kg

B. 23 g

C. 0.5 mole

D. 11.5 g

Answer: D

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57. Which of the following will have maximum mass?

A. 0.1 mole of NH_3

B. 1022 atoms of carbon

C. 1022 molecules of CO_2

D. 1 g of Fe

Answer: A

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58. Which of the following correctly represents 360 g of water?

(i) 2 moles of water

(ii) 20 moles of water

(iii) 6.023×10^{23} molecules of water

(iv) 1.2044×10^{23} molecules of water

A. (i) only

B. (i) and (iv)

C. (ii) and (iii)

D. (ii) and (iv)

Answer: D

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59. Which of the following contains maximum number of molecules?

A. 1 g of CO_2

B. 1 g of N_2

C. 1 g of H_2

D. 1 go of CH_4

Answer: C

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60. Which of the following pair is in example of isotopes?

A. ${}_{21}Sc^{45}$ and ${}_{23}V^{50}$

B. ${}_{22}Ti^{48}$ and ${}_{22}Ti^{50}$

C. ${}_{22}Ti^{50}$ and ${}_{23}V^{50}$

D. ${}_{21}Sc^{45}$ and ${}_{22}Ti^{50}$

Answer: B

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Additional Questions Solved Ii Fill In The Blanks

1. Amedeo Avogadro put forward a hypothesis based on the relation between the number of ..... And the ..... Of gases.

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2. The molar volume of a gas at STP is ..... And the value of Avogadro Number is .....

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3. Nitrogen and oxygen are ..... Molecules wheres Helium and Neon are ..... molecules.

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4. (i) ..... Are the building blocks of matter.

(ii) .....is a triatomic molecule.

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5. NH_3, H_2O are .....molecules wheres N_2, O_2 are .....molecules.

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6. .....and .....are polyatomic molecules.

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7. (i) Atoms of same element with same atomic number but different mass number are called ..... .

(ii) Atoms of different elements with same number of neutrons are called ..... .

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8. Atoms of the same element with same atomic number but having different mass number of called.....

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9. Atoms of different elements having the same number of neutrons but different atomic number and different mass number are callled ..... .

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10. .....is one twelfth of the mass of C - 12 atom, an isotope of carbon which contains .....protons and .....neutrons.

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11. The stable isotope of .....is used as the standard for measuring the relative atomic mass of an element.

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12. Modern methods of determination of atomic mass by .....uses C - 12 as standard.

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13. The average atomic mass of carbon is .....

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14. The average atomic mass of an element becomes fractional due to the presence of ..... .

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15. Except .....atoms of most of the elements are found in the combined form with itself or atoms of other elements.

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16. A molecule is a combination of two or more atoms held together by ..... .

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17. If the molecule is made of similar kind of atoms, it is called ..... .

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18. The molecule that consists of atoms of different element is called..... .

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19. Water is a .....molecule.

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20. One mole of an element contains .....atoms and it is equal to its gram atomic mass.

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21. One mole of any gas occupies .....or.....at S.T.P.

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22. The .....is useful to determine the empirical formula and molecular formula.

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23. The percentage composition of elements is useful to determine .....and ..... .

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24. Avogadro's law is in agreement with ..... .

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25. .....determines the relation between molecular mass and vapour density.

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26. Relative molecular mass is equal to ..... .

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27. The metals Cu, Ag, Au are .....elements.

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28. Atomicity of an element is equal to ..... .

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Additional Questions Solved Iii Match The Following

1.

i. Monoatomic molecule	(a) Ozone
ii. Diatomic molecule	(b) Phosphorous
iii. Triatomic molecule	(c) Helium
iv. Polyatomic molecule	(d) Oxygen

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2.

i. 22.4 litres	(a) Avogadro Number
ii. 6.023×10^{23}	(b) Molar volume
iii. $2 \times$ vapour density	(c) 1 mole
iv. Mass/Atomic mass	(d) Molecular mass

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3.

i. ${}_{17}Cl^{35}, {}_{17}Cl^{37}$	(a) Isotones
ii. ${}_{6}Cl^{13}, {}_{7}N\&(14)$	(b) Isobars
iii. ${}_{18}Ar^{40}, {}_{20}Ca^{40}$	(c) $E = mc^2$
iv. Einstein's equation	(d) Isotopes

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4.

i. H_2O	(a) 180 g
ii. NH_3	(b) 44g
iii. CO_2	(c) 17g
iv. $C_6H_{12}O_6$	(d) 18g

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5.

i. NH_3, CH_4	(a) Polyatomic molecule
ii. O_2, N_2	(b) Monoatomic molecule
iii. He, Ne	(c) Heteroatomic molecule
iv. Sulphur	(d) Diatomic molecule

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6.

i. F_2	(a) Polyatomic molecule
ii. O_3	(b) Monoatomic molecule
iii. P_4	(c) Diatomic molecule
iv. He	(d) Triatomic molecule

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7.

i. H_2	(a) Hetero diatomic molecule
ii. HCl	(b) Monoatomic molecule
iii. H_2O	(c) Homo diatomic molecule
iv. Ne	(d) Hetero triatomic molecule

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8.

i. Isotopes	(a)	S_8, P_4
ii. Isobars	(b)	${}_6C^{13}, {}_7N^{14}$
iii. Isotones	(c)	${}_1H^1, {}_1H^2, {}_1H^3$
iv. Polyatomic molecule	(d)	${}_{18}Ar^{40}, {}_{20}Ca^{40}$

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9.

$i.\ H_2O$	$(a) 16$
$ii.\ CO_2$	$(b) 18$
$iii.\ C_6H_{12}O_6$	$(c) 44$
$iv.\ CH_4$	$(d) 180$

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10.

$i.$ 22 g of CO_2	(a) 2 moles
ii. 18 g of H_2O	(b) 4 moles
iii. 360 g of Glucose	(c) 0.5 mole
iv. 64 g of CH_4	(d) 1 mole

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Additional Questions Solved Iv State Whether True Or False Give The Correct Statement

1. Isotopes are the atoms of the same element may not be similar in all respects.

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2. Isotones are the atoms of different elements with same number of neutrons.

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3. Isobars are the atoms of the different element with same atomic number and different mass numbers.

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4. The number of molecules present in one mole of an element is called atomicity of an element.

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5. Avogadro's hypothesis is used in the deduction of atomicity of elementary gases.

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6. The volume of a gas at a given temperature and pressure is proportional to the number of particles.

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7. The value of Gram molar volume at STP is 11.2 litres.

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8. The atomicity of nitrogen, oxygen and hydrogen is two.

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9. Atoms and molecules are the building blocks of matter.

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10. The atoms of certain elements such as hydrogen, oxygen and nitrogen have independent existence.

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11. A molecule is the simplest structural unit of an element or compound which contains one or more atoms.

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12. Phosphorous and sulphur are monoatomic molecules.

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13. H_2O, NH_3, CH_4 are the examples of homoatomic molecules.

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14. Atom of one element can be transmuted into atom of other element is known as artificial transmutation.

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15. Molecule is the smallest particle that takes part in a chemical reaction.

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16. The sum of the number of protons and neutrons of an atom is called Atomic number.

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View Text Solution

17. The stable isotope of carbon (C-12) with atomic mass 12 is used as the standard for measuring the relative atomic mass of an element.

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18. Gram atomic mass of oxygen is 16 g.

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19. Silicon is the most abundant element in the Earth's crust.

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20. Except noble gases, atoms, of most of the elements are found in the combined form.

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21. The number of atoms present in the molecule is called Avogadro number.

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22. O_2, N_2, Cl_2, Br_2, F_2, I_2 are hetero diatomic molecules.

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23. Water is an example of Hetero triatomic molecule.

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24. One molecule of an element contains 6.023×10^{23} atoms and it is equal to its gram atomic mass.

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25. Equal volume of all gases under similar conditions of temperature and pressure contain different number of molecules.

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26. The mathematical representation of False Avogadro's law is

$V/n = \text{constant}(\text{ or })V \propto (\text{ or })$

$V = \text{constant} \times n$

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27. Molecular formula of gases can be derived using Avogadro's law.

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28. The number of moles of a sample that contains 12.046×10^{23} atoms of iron is 2.

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29. The volume occupied by 14 g of Nitrogen gas is 22.4 litres.

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30. Avogadro's law determines the relation between molecular mass and absolute density.

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Additional Questions Solved V Assertion And Reason

1. Assertion (A) : $C_{12}H_{22}O_{11}$ is not a simple ratio.

Reason (R) : The ratio of atoms in a molecule may be fixed and integral but may not be simple.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: a

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2. Assertion (A) : ${}_6C^{13}$ and ${}_7N^4$ are called Isotones.

Reason (R) : Isotones are the atoms of the different element with different atomic number but same mass number.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: c

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3. Assertion (A) : Nitrogen, oxygen and hydrogen are diatomic molecules.

Reason (R) : N_2, O_2, H_2 contain two atoms in one molecule and so they are diatomic molecule.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: a

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4. Assertion (A) : Atoms and molecules are the building blocks of matter.

Reason (R) : Atom is the ultimate particle of an element which may or may or may not have independent existence.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: c

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5. Assertion (A) : Hydrogen, Oxygen and Ozone are called homoatomic molecules.

Reason (R) : Homoatomic molecules are made up of atoms of the same element.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: d

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6. Assertion (A) : Water, Ammonia (H_2O, NH_3) are hetero atomic molecules.

Reason (R) : Most of the elementary gases and compounds consist of atoms of the same element.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: c

View Text Solution

7. Assertion (A) : 18 g water contains Avogadro number $\left(6.023 \times 10^{23}\right)$ of particles.

Reason (R) : 18 g of water is the molecular mass (or) 1 mole of water. One mole is defined as the amount of the substance which contains 6.023×10^{23} number of particles.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: a

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8. Assertion (A) : Atoms of same element may not similar in all respects.

Reason (R) : Atoms of same element have same atomic number but different number of neutrouns.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: b

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9. Assertion (A) : The atomicity of ozone is three.

Reason (R) : 1 moleculles of ozone contains 3 atoms of oxygen.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: a

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10. Assertion (A) : ${}_1H^1$, ${}_1H^2$, ${}_1H^3$ are the isotopes of hydrogen.

Reason (R) : The atoms of same element with same mass number but different at numbers are called isotopes.

A. Both (A) and (R) are correct

B. Both (A) and (R) are wrong

C. (A) is correct but (R) is wrong

D. (A) is wrong but (R) is correct

Answer: c

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11. Assertion (A) : An atom is no longer indivisible.

Reason (R) : The sub atomic particles protons, electrons and neuutrons were discovered.

A. (A) are (R) are correct. (R) explain (A)

B. (A) is correct (R) is wrong

C. (A) is wrong (R) is correct

D. (A) and (R) are correct. (R) does not explain (A)

Answer: (i)

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12. Assertion (A) : ${}_{18}Ar^{40}$ and ${}_{20}Ca^{40}$, are isobars.

Reason (R) : They have same atomic mass but different atomic number.

A. (A) are (R) are correct. (R) explain (A)

B. (A) is correct (R) is wrong

C. (A) is wrong (R) is correct

D. (A) and (R) are correct. (R) does not explain (A)

Answer: (i)

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13. Assertion (A) : ${}_{17}Cl^{35}$ and ${}_{17}Cl^{37}$ are isotones.

Reason (R) : Atoms of same element have same atomic number but different mass number.

A. (A) are (R) are correct. (R) explain (A)

B. (A) is correct (R) is wrong

C. (A) is wrong (R) is correct

D. (A) and (R) are correct. (R) does not explain (A)

Answer: (iii)

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14. Assertion (A) : NH_3, H_2O, HCl are heteroatomic molecules.

Reason (R) : The molecule that consists atoms of different elements is called heteroatomic molecules.

A. (A) are (R) are correct. (R) explain (A)

B. (A) is correct (R) is wrong

C. (A) is wrong (R) is correct

D. (A) and (R) are correct. (R) does not explain (A)

Answer: (i)

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15. Assertion (A) : ${}_6C^{13}$ and ${}_7C^{13}$ are called isotones.

Reason (R) : Atoms of different elements having the same number of neutrons, but different atomic number and different mass number are called isotones.

A. (A) are (R) are correct. (R) explain (A)

B. (A) is correct (R) is wrong

C. (A) is wrong (R) is correct

D. (A) and (R) are correct. (R) does not explain (A)

Answer: (i)

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Additional Questions Solved Vi Short Answer Questions

1. What are isotopes ? Give example.

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2. What are isobars ? Give example.

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3. What are isotones ? Give example.

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4. What is artificial transmutation ?

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5. Define (i) Atomic number (ii) Mass number

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6. Define atomic mass unit.

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7. Define molecule.

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8. What is homo atomic molecule ? Give two examples.

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9. What is hetero atomic molecule ? Give two example.

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10. Consider the following and classify them on the basis of their atomicity.

H_2, CCl_4, O_3, BF_3, $C_{12}H_{22}O_{11}$, NO, Cl_2, He, Au, P_4,

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11. Define Relative molecular mass.

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12. Define Mole.

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13. Define Avogadro number.

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14. What is meant by percentage composition ? What is its use ?

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15. State Avogadro hypothesis (or) Avogadro's Law.

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16. What are the applications of Avogadro's Law.

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17. How is Average atomic mass calculated ?

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18. Define Vapour density.

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19. Write the relationship between (i) Atomicity and Molecular mass (ii) Molecular mass and Vapour density.

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20. Distinguish between isotopes and isobars.

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21. What are the types of molecules? Give example for each type?

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Additional Questions Solved Vii Hot Questions

1. Why do we take atomic mass of Carbon -12 as standard?

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2. A flask P contains 0.5 mole of oxygen gas. Another flask Q contains 0.4 mole of ozone gas. Which of the two flask contains greater number of oxygen atoms?

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3. What will be the mass of one ^{12}C atom in g?

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4. In three moles of ethane (C_2H_6), calculate the following :

(i) Number of moles of carbon atoms (ii) Number of moles of hydrogen

atoms

(iii) Number of molecules of ethane

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5. If ten volumes of dihydrogen gas reacts with five volumes of dioxygen gas, how many volumes of water vapour could be produced?

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Additional Questions Solved Viii Long Answer Questions

1. What are the difference between atoms and molecules?

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2. Explain how Avogadro hypothesis used to derive the value of atomicity.

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3. State and explain the applications of Avogadro's law.

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4. Give any two applications of Avogadro's law.

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5. Write any three applications of Avogadro's law.

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6. Explain the classification of molecules based on atomicity.

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7. A compound made up of two elements A and B has $A = 70\,\%$, $B = 30\,\%$. Their relative number of moles in the compound are 1.25 and 1.88. Calculate

(a) Atomic masses of the elements A and B

(b) Molecular formula of the compound, if its molecular mass if found to be 160

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Additional Questions Solved Ix Solve The Following Problems

1. Calculate the average atomic mass of carbon, if the natural abundance of $C-12$ and $C-13$ are $98.90\,\%$ and $1.10\,\%$ respectively.

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2. Calculate the percentage composition of oxygen and hydrogen by taking the example of H_2O.

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3. Calculate the number of moles in

(i) 12.046×10^{23} atoms of copper

(ii) 27.95 g of iron

(iii) 1.51×10^{23} molecules of CO_2

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4. Find the gram molecular mass of the following from the data given :

(i) H_2O (ii) CO_2 (iii) $NaOH$ (iv) NO_2 (v) H_2SO_4

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5. Calculate the table given below.

Element	Atomic Mass	Molecular Mass	Atomicity
Chlorine	35.5	71	-
Ozone	-	48	3
Sulphur	32	-	8

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6. Fill in the blanks using the given data :

The formula of Calcium oxide is CaO. The atomic mass of Ca is 40, Oxygen is 16 and Carbon is 12.

(i) 1 mole of Ca (.....g) and 1 mole of Oxygen atom (.....g) combine to form ..... Mole of CaO (.....g).

(ii) 1 mole of Ca (.....g) and 1 mole of C (.....g) and 3 moles of Oxygen atom (.....g) combine to form 1 mole of $CaCO_3$ (.....g)

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7. How many grams are there in :

(i) 5 moles of water (ii) 2 moles of Ammonia (iii) 2 moles of Glucose

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8. Analyse the table and fill in the blanks.

Gas	Atomic mass	Molecular mass	Atomicity
Ozone	16	48	-
Nitrogen	14	-	2

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9. Analyse the table and fill in the blanks.

	Substance	Mass	No. of moles
(*a*)	Al	81g	-
(*b*)	Fe	-	0.5

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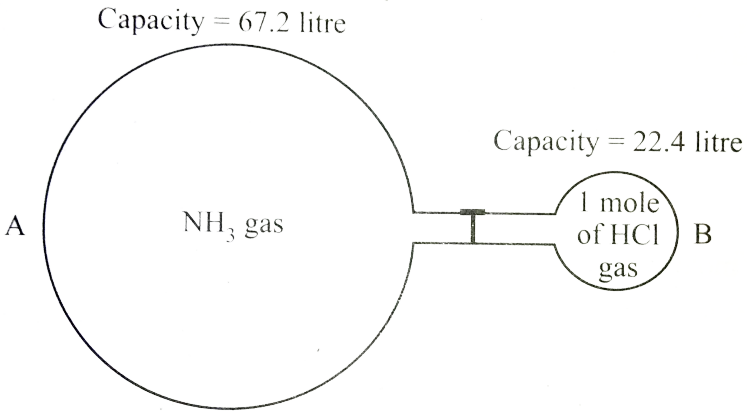
10. When ammonia reacts with hydrogen chloride gas, it produces white fumes of ammonium chloride. The volume occupied by NH_3 in glass bulb A is three times more than the volume occupied by HCl in glass bulb B at STP.



(i) How many moles of of ammonia are present in glass bulb A?

(ii) How many grams of NH_4Cl will be formed when the stopper is opened?

$(\text{Atomic mass of N} = 14, \text{H} = 1, \text{Cl} = 35.5)$

(iii) Which gas will remain after completion of the reaction?

(iv) Write the chemical reaction involved in this process.

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11. Nitro glycerine is used as a explosive. The equation for the explosive reaction is

$$\underset{(l)}{4C_3H_5((NO_3))_3} \rightarrow \underset{(g)}{12CO_2} + \underset{(l)}{10H_2O} + \underset{(g)}{6N_2} + \underset{(g)}{O_2}$$

$(\text{Atomic mass of C} = 12, \text{H} = 1, \text{N} = 14, \text{O} = 16)$

(i) How many moles does the equation show for (a) Nitroglycerine (b) gas molecules produced?

(ii) How many moles of gas molecules are obtained from 1 mole of nitroglycerine?

(iii) What is the mass of 1 mole of nitroglycerine?

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12. Sodium bi carbonate breaks down on heating:

$2NaHCO_3 \rightarrow Na_2CO_3 + H_2O + CO_2$

$(\text{Atomic mass of Na} = 23, C = 12, H = 1, O = 16)$

(i) How many moles of sodium bi carbonate are there in this equation?

(ii) What is the mass of sodium bicarbonate used in this equation?

(iii) How many moles of carbon dioxide are there in this equation?

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13. 40g of calcium was extracted from 56 g of calcium oxide

(Atomic mass of Ca = 40, O = 16)

(i) What mass oxygen is there is there in 56 g of calcium oxide?

(ii) How many moles of oxygen atoms are there in this?

(iii) How many moles of calcium atoms are there in 40 g of calcium ?

(iv) What mass of calcium will be obtained from 1000 g of calcium oxide?

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14. How many grams are there in the following ?

(i) 1 mole of chlorine molecule, Cl_2

(ii) 2 moles of sulphur molecules, S_8

(iii) 4 moles of ozone molecules, O_3

(iv) 2 moles of nitrogen molecules, N_2

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15. Find the how many moles of atoms are there in :

(i) 2 g of nitrogen

(ii) 23 g of sodium

(iii) 40 g of calcium

(iv) 1.4 g of lithium

(v) 32 g of sulphur

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16. Find the atomicity of chlorine, if its atomic mass is 35.5 and its molecular mass is 71.

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17. Find the atomicity of ozone if its atomic mass is 16 and its molecular mass is 48.

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18. How many atoms are present in 5 moles of oxygen?

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19. Calculate the number of moles in (i) 81 of Aluminium (ii) 4.6 g of sodium (iii) 5.1 g of ammonia (iv) 90 g of water (v) 2g of $NaOH$.

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20. Calculate the mass of 0.5 mole of iron.

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21. Find the mass of 2.5 mole of oxygen atoms.

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22. Calculate the number of molecules of 11 g of CO_2.

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23. Calculate the number of molecules in 360g of flucose.

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24. Calculate the mass of 18.069×10^{23} molecules of SO_2

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25. Calculate the mass of glucose in 2×10^{24} molecules.

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26. Calculate the mass of 12.046×10^{23} molecules of CaO.

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27. Calculate the number of moles for a substance containing 3.0115×10^{23} molecules in it.

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28. Calculate the number of moles in 12.046×10^{22} atoms of copper.

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29. Calculate the number of moles in 24.092×10^{22} molecules of water.

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30. Which one of the following will have largest number of atoms?

(i) $1gAu(s)$

(ii) $1gNa(s)$

(iii) $1gLi(s)$

(iv) $1g$ of $Cl_2(g)$

(Atomic masses : Au = 197, Na = 23, Li = 7, Cl = 35.5 amu)

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31. Calculate the number of atoms in each of the following:

(i) 52 moles of He (ii) 52 u of He (iii) 52 g of He

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32. Calculate the number of moles in each of the following.

(i) 392 g of sulphuric acid

(ii) 44.8 litres of sulphur dioxide at N.T.P.

(iii) 6.022×10^{22} moles of oxygen

(iv) 8g of calcium

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33. The density of water at room temperature is 1.0 g/mL. How many molecules are there in a drop of water if its volume is 0.05 mL?

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34. Calculate the total number of electrons present in 1.6 g of methane.

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35. The Vapour Density of a gaseous element is 5 times that of oxygen under similar conditions. It the molecules is triatomic, what will be its atomic mass?

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