

10th Science Lesson 7 Questions in English**7] Atoms And Molecules**

1. Assertion (A): The Greek philosophers first proposed the idea of atom in fifth century BCE.

Reasoning(R): The Greek theory of atom was more philosophical than scientific.

a) Both A and R is True and R is the correct explanation of A.

b) Both A and R is True but R is not the correct explanation of A.

c) A is True but R is False.

d) Both A and R is False.

Explanation

Matter is made of atoms. Curiously the idea of atom was first proposed by the Greek philosophers in the fifth century BC (BCE). But their theory was more philosophical than scientific.

2. Who proposed the first scientific theory of atom?

a) John Dalton

b) Ernest Rutherford

c) Robert Boyle

d) William Ramsay

Explanation

The first scientific theory of the atom was proposed by John Dalton.

3. Which of this scientist did not agree with Dalton's theory?

a) J.J. Thomson

b) Rutherford

c) Neil's Bohr

d) All the above

Explanation

Few of the postulates of Dalton's theory about an atom were found incorrect by the later on studies made by J.J. Thomson, Rutherford, Neil's Bohr and Schrodinger.

4. Assertion (A): All the Atoms are indivisible.

Reasoning(R): An atom is made up of protons, neutrons and electrons.

a) Both A and R is True and R is the correct explanation of A.

b) Both A and R is True but R is not the correct explanation of A.

c) A is False but R is True.

d) Both A and R is False.

Explanation

'The main postulates of modern atomic theory' are as follows: An atom is no longer indivisible (after the discovery of the electron, proton, and neutron).

5. Define Isobar.

- a) Atoms of same element and same atomic mass.
- b) Atoms of different element and different atomic mass.
- c) Atoms of same element and different atomic mass.
- d) Atoms of different element and same atomic mass.**

Explanation

Atoms of the same element may have different atomic mass. (Discovery of isotopes $^{17}\text{Cl}35$, $^{17}\text{Cl}37$).
Atoms of different elements may have same atomic masses (discovery of Isobars $^{18}\text{Ar}40$, $^{20}\text{Ca}40$).

6. Which of this concept describe the indestructible nature of an atom?

- a) Isotopes
- b) Artificial Transmutation**
- c) Isomer
- d) Isobar

Explanation

Atoms of one element can be transmuted into atoms of other elements. In other words, atom is no longer indestructible (discovery of artificial transmutation).

7. What is the chemical composition of the natural honey?

- a) $\text{C}_6\text{H}_{12}\text{O}_6$**
- b) $\text{C}_4\text{H}_{10}\text{O}_2$
- c) $\text{C}_{12}\text{H}_{20}\text{O}_6$
- d) $\text{C}_1\text{H}_4\text{O}_4$

Explanation

Atoms may not always combine in a simple whole number ratio (E.g. Glucose $\text{C}_6\text{H}_{12}\text{O}_6$ C:H:O = 6:12:6 or 1:2:1 and Sucrose $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ C:H:O = 12:22:11).

8. In which of this smallest particle a chemical reaction occurs?

- a) Atoms**
- b) Molecules
- c) Protons
- d) Molar

Explanation

Atom is the smallest particle that takes part in a chemical reaction. The mass of an atom can be converted into energy ($E = mc^2$).

9. Which of the following is not a subatomic particle?

- a) Proton
- b) Neutron

c) Molecule**d) Electron****Explanation**

Atoms are the building blocks of matter. Since matter has mass, it must be due to its atoms. According to the modern atomic theory, an atom contains subatomic particles such as protons, neutrons and electrons.

10. What is defined as mass number of an atom?

a) Sum of number of protons and neutrons**b) Sum of number of neutrons****c) Sum of number of electrons and protons****d) Sum of number of electrons****Explanation**

Protons and neutrons have considerable mass, but electrons don't have such a considerable mass. Thus, the mass of an atom is mainly contributed by its protons and neutrons and hence the sum of the number of protons and neutrons of an atom is called its mass number.

11. Which of these is used to measure the mass of an atom?

a) Mass number**b) Milligram****c) Atomic mass unit****d) Nanometer****Explanation**

Individual atoms are very small and it is difficult to measure their masses. You can measure the mass of macroscopic materials in gram or kilogram. The mass of an atom is measured in atomic mass unit (amu).

12. Which of the following is not true regarding the atomic mass unit?

a) One-twelfth of mass of a Carbon-12 atom.**b) Carbon-12 is an isobar of carbon.****c) Carbon-12 contains 6 protons and 6 neutrons.****d) Carbon-12 is an isotope of carbon.****Explanation**

Atomic mass unit is one-twelfth of the mass of a carbon-12 atom; an isotope of carbon, which contains 6 protons and 6 neutrons.

13. Which of this symbol is used to denote the unified atomic mass in the modern system?

a) A**b) U****c) M**

d) Au

Explanation

The symbol 'amu' is no longer used in the modern system and instead it uses the symbol 'U' to denote unified atomic mass.

14. What is the approximate mass of a proton or neutron?

a) 10 amu

b) 1 amu

c) 100 amu

d) 0.01 amu

Explanation

The mass of a proton or neutron is approximately 1 amu.

15. Assertion (A): Relative mass was used to measure the atomic mass by elements of equal number of atoms.

Reasoning(R): The absolute mass of an atom cannot be determined directly.

a) Both A and R is True and R is the correct explanation of A.

b) Both A and R is True but R is not the correct explanation of A.

c) A is True but R is False.

d) Both A and R is False.

Explanation

As an atom is very small, its absolute mass cannot be determined directly. The early pioneers of chemistry used to measure the atomic mass of an atom relative to an atom of another element. They measured the masses of equal number of atoms of two or more elements at a time, to determine their relative masses.

16. Which of these is used as a standard for measuring atomic mass?

a) A standard element

b) Planks constant

c) Atmospheric pressure

d) Standard temperature

Explanation

The established one element as a standard, gave it an arbitrary value of atomic mass and using this value they measured the relative mass of other elements. The mass obtained by this way is called relative atomic mass.

17. Which of the atom is not a standard mass for relative atomic mass?

a) Hydrogen

b) Oxygen

c) Carbon

d) Helium**Explanation**

The mass of hydrogen atom was chosen as a standard and masses of other atoms were compared with it because of the existence of isotopic character of hydrogen ($1H_1$, $1H_2$, $1H_3$).

18. Which of these is not an isotope of hydrogen atom?

- a) $1H_2$
- b) $1H_1$
- c) $1H_8$
- d) $1H_3$

Explanation

The mass of hydrogen atom was chosen as a standard and masses of other atoms were compared with it because of the existence of isotopic character of hydrogen ($1H_1$, $1H_2$, $1H_3$).

19. Which of this carbon isotope is used as standard measure for relative atomic mass?

- a) C-17
- b) C-19
- c) C-12
- d) C-15

Explanation

Later hydrogen atom was replaced by oxygen atom as the standard. Now 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.

20. Choose the Incorrect statements regarding relative atomic mass.

- i) $1/10$ th part of mass of a carbon-12 atom.
- ii) Denoted by Ar.
- iii) Also known as Standard Atomic Weight.

a) i only

- b) ii only
- c) iii only
- d) None of the above

Explanation

Relative atomic mass of an element is the ratio between the average mass of its isotopes to $1/12$ th part of the mass of a carbon-12 atom. It is denoted as Ar. It is otherwise called "Standard Atomic Weight".

21. What is defined as relative atomic mass?

- a) Ratio between Average mass of isotopes and mass of carbon atom.
- b) Ratio of Total number of isotopes of element to the mass of carbon.

c) Average mass of carbon atoms

d) Ratio of Average mass of isotopes of the element and 1/12th of mass of carbon-12 atom.

Explanation

Relative Atomic Mass

$$(A_r) = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12^{\text{th}}} \text{ of the mass of one Carbon-12 atom}}$$

22. State the modern method of determining atomic mass?

a) Vernier caliper

b) Mass Spectrometry

c) Physical Balance

d) Standard Elements

Explanation

Modern methods of determination of atomic mass are done by Mass Spectrometry which uses C-12 as standard.

23. Which of the given element has relative atomic mass value as one?

a) Hydrogen

b) Sulphur

c) Sodium

d) Nitrogen

24. Identify the incorrect match.

A. O i) 16

B. Mg ii) 24

C. N iii) 10

D. C iv) 12

a) i only

b) ii only

c) iii only

d) iv only

Explanation

Relative atomic mass of elements (C-12 Scale)

Element	Symbol	A_r
Hydrogen	H	1
Carbon	C	12
Nitrogen	N	14
Oxygen	O	16
Sodium	Na	23
Magnesium	Mg	24
Sulphur	S	32

25. What is the unit of relative atomic mass?

a) **No unit**

b) Grams

c) amu

d) None of the above

Explanation

Relative Atomic Mass is only a ratio so it has no unit. If the atomic mass of an element is expressed in grams it is called as Gram Atomic Mass.

26. What is the gram atomic mass of nitrogen?

a) 1g

b) 16g

c) 12g

d) **14g**

Explanation

Gram Atomic Mass of hydrogen = 1 g

Gram Atomic Mass of carbon = 12 g

Gram Atomic Mass of nitrogen = 14 g

Gram Atomic Mass of oxygen = 16 g

27. Assertion (A): The isotopic mixture of elements is considered to calculate the atomic mass of an element.

Reasoning(R): Naturally occurring element exists as a mixture of isotopes with their own mass.

a) **Both A and R is True and R is the correct explanation of A.**

b) Both A and R is True but R is not the correct explanation of A.

c) A is True but R is False.

d) Both A and R is False.

Explanation

It is somewhat more complicated because most of the naturally occurring elements exist as a mixture of isotopes each of which has its own mass. Thus it is essential to consider this isotopic mixture while calculating the atomic mass of an element.

28. Which of the following is used to measure the average atomic mass of an element?

a) Natural isotopes

- b) Chemical reactions
- c) Available compounds
- d) All the above

Explanation

The average atomic mass of an element is the weighted average of the masses of its naturally occurring isotopes.

29. Calculate the average atomic mass of an element having 2 isotopes of 75% and 25% with masses 10, 20 respectively?

- a) 25
- b) 10.5
- c) 100
- d) 12.5

Explanation

Average atomic mass = (Mass of 1st isotope × % abundance of 1st isotope) + (Mass of 2nd isotope × % abundance of 2nd isotope)

Thus for the given element the average atomic mass = $(10 \times 75 / 100) + (20 \times 25 / 100) = 12.5$

30. Choose the correct statements.

- i) Atomic weight is also used as Average atomic mass.
- ii) Atomic mass of all the elements is whole numbers.

a) i only

- b) ii only
- c) Both i and ii
- d) Neither i nor ii

Explanation

The atomic masses of elements given in the periodic table are average atomic masses. Sometimes the term atomic weight is used to mean average atomic mass. It is observed from the periodic table that atomic masses of most of the elements are not whole numbers.

31. Which of these carbon isotopes are considered for calculating the atomic mass of carbon?

- a) C-12, C-9
- b) C-11, C-7

c) C-12, C-13

d) C-5, C-17

Explanation

To calculate the atomic mass of carbon both of its natural isotopes such as carbon-12 and carbon-13 are considered. The natural abundance of C-12 and C-13 are 98.90 % and 1.10 % respectively. The average of the atomic mass of carbon is calculated as follows:

$$\text{Average atomic mass of carbon} = (12 \times 98.9) / 100 + (13 \times 1.1) / 100$$

32. Match the atomic mass and its elements.

- | | |
|-------------|------------|
| A. Lithium | i) 1.008 |
| B. Hydrogen | ii) 4.003 |
| C. Boron | iii) 6.941 |
| D. Helium | iv) 10.811 |

a) ii, iv, i, iii

b) iii, i, iv, ii

c) ii, iii, i, iv

d) iv, i, iii, ii

Explanation

Atomic mass of some elements

Atomic Number	Name	Symbol	Atomic Mass (amu)
1	Hydrogen	H	1.008
2	Helium	He	4.003
3	Lithium	Li	6.941
4	Beryllium	Be	9.012
5	Boron	B	10.811

33. Which of this Oxygen isotope is abundantly available in nature?

a) ${}^8\text{O}^{16}$ b) ${}^5\text{O}^{11}$ c) ${}^8\text{O}^{17}$ d) ${}^8\text{O}^{15}$ **Explanation**

Isotopes of oxygen

Isotope	Mass (amu)	% abundance
${}_8\text{O}^{16}$	15.9949	99.757
${}_8\text{O}^{17}$	16.9991	0.038
${}_8\text{O}^{18}$	17.9992	0.205

34. Which of this element is not found as single atom by nature?

- a) Helium
- b) Argon
- c) Fluorine**
- d) Xenon

Explanation

Except noble gases atoms of most of the elements are found in the combined form with itself or atoms of other elements. It is called as a molecule.

35. Define a molecule.

- a) Combination of two atoms only.
- b) Physical attraction of atoms.
- c) Combination of two or more atoms.**
- d) None of the above.

Explanation

A molecule is a combination of two or more atoms held together by strong chemical forces of attraction, i.e. chemical bonds.

36. Assertion (A): A molecule may be an element or a compound.

Reasoning(R): Molecules may contain atoms of same element or two or more elements.

- a) Both A and R is True and R is the correct explanation of A.**
- b) Both A and R is True but R is not the correct explanation of A.
- c) A is True but R is False.
- d) Both A and R is False.

Explanation

A molecule may contain atoms of the same element or may contain atoms of two or more elements joined in a fixed ratio, in accordance with the law of definite proportions. Thus, a molecule may be an element or a compound.

37. Which of the following denotes a homoatomic molecule?

- a) Similar kind of atoms**
- b) Single atom element

- c) Simple chemical reaction
- d) Similar atomic value

Explanation

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

38. Assertion (A): Heteroatomic molecule consists of atoms of different elements.

Reasoning(R): A compound is also referred as a heteroatomic molecule.

- a) Both A and R is True and R is the correct explanation of A.
- b) Both A and R is True but R is not the correct explanation of A.
- c) A is True but R is False.
- d) Both A and R is False.

Explanation

The molecule that consists of atoms of different elements is called heteroatomic molecule. A compound is a heteroatomic molecule.

39. What is referred as atomicity?

- a) Total number of molecules
- b) Number of free electrons
- c) Number of atoms in a molecule
- d) Number of chemical forces connecting atoms.

Explanation

The number of atoms present in the molecule is called its 'atomicity'.

40. How many number of atoms are present in polyatomic elements?

- a) =3
- b) <3
- c) > 3
- d) All the above

Explanation

Classification of molecules

Atomicity	No. of atoms present	Name
1	1	Monoatomic
2	2	Diatomic
3	3	Triatomic
>3	>3	Polyatomic

41. Ozone,

- i) Has three oxygen molecules.
- ii) It is a homotriatomic molecule.
- iii) It is also called as polyatomic molecule.

- a) i only
- b) ii only
- c) iii only

d) All the above

Explanation

Ozone (O_3) contains three oxygen atoms and hence it is called homotriatomic molecule. If a molecule contains more than three atoms, then it is called polyatomic molecule.

42. A Heterodiatomic molecule,

- a) Consists of two atoms
- b) Consists of same element atoms
- c) Atomicity value is one.

d) Two atoms of different elements.

Explanation

Consider hydrogen chloride. It consists of two atoms, but of different elements, i.e. hydrogen and chlorine. So, its atomicity is two. It is a heterodiatomic molecule.

43. What is the atomicity value of the water molecule?

- a) 2
- b) 3**
- c) 4
- d) 1

Explanation

The water molecule contains two hydrogen atoms and one oxygen atom. So its atomicity is three. It is a heterotriatomic molecule.

44. Which of this carbon isotope is used to calculate the relative molecular mass of a molecule?

- a) C-12**
- b) C-10
- c) C-9
- d) C-17

Explanation

The Relative Molecular Mass of a molecule is the ratio between the mass of one molecule of the substance to $1/12$ th mass of an atom of Carbon -12.

45. What is the relative molecular mass of water?

- a) 18**

- b) 12
- c) 10
- d) 3

Explanation

Relative molecular mass of water

(H₂O) is calculated as follows: A water molecule is made of 2 atoms of hydrogen and one atom of oxygen. So, the relative molecular mass of water

$$= (2 \times \text{mass of hydrogen}) + (1 \times \text{mass of oxygen})$$

$$= (2 \times 1) + (1 \times 16)$$

= 18 i.e., one molecule of H₂O is 18 times as heavy as 1/12th of the mass of a carbon -12.

46. Assertion (A): Molecular mass of a compound in grams is called Gram molecular mass.

Reasoning(R): Relative Molecular mass is a ratio value expressed in grams.

- a) Both A and R is True and R is the correct explanation of A.
- b) Both A and R is True but R is not the correct explanation of A.
- c) A is True but R is False.**
- d) Both A and R is False.

Explanation

Relative Molecular Mass is only a ratio. So, it has no unit. If the molecular mass of a compound is expressed in grams, it is called Gram Molecular Mass.

47. What is the gram molecular mass value of carbon dioxide?

- a) 17g
- b) 36.5g
- c) 4.4g
- d) 44g**

Explanation

Gram Molecular Mass of water = 18 g

Gram Molecular Mass of carbon dioxide = 44 g

Gram Molecular Mass of ammonia = 17 g

Gram Molecular Mass of HCl = 36.5 g

48. Choose the correct statements regarding atoms.

- i) Atom is the smallest particle of an element.
 - ii) Atoms have a chemical bond.
 - iii) All the atoms are highly reactive.
- a) i only
 - b) ii only
 - c) iii only
 - d) All the above**

Explanation

Atom
An atom is the smallest particle of an element
Atom does not exist in free state except in noble gas
Except some of noble gas, other atoms are highly reactive
Atom does not have a chemical bond

49. Which of these exist in a free state?

- a) Atom
- b) Neutron
- c) Molecule**
- d) Proton

50. Which of this statement is not correct?

- a) Noble gas atoms exist in Free State.
- b) Molecules are highly reactive.**
- c) Molecule is the smallest particle of a compound.
- d) Atoms in a molecule are held by chemical bonds.

Explanation

Atom	Molecule
An atom is the smallest particle of an element	A molecule is the smallest particle of an element or compound.
Atom does not exist in free state except in noble gas	Molecule exists in a free state
Except some of noble gas, other atoms are highly reactive	Molecules are less reactive
Atom does not have a chemical bond	Atoms in a molecule are held by chemical bonds

51. In which of this scale the atomic mass is measured?

- a) U
- b) Milligrams
- c) **Relative scale**
- d) A

Explanation

Atomic mass units provide a relative scale for the masses of the elements. Since the atoms have such small masses, no usable scale can be devised to weigh them in the calibrated units of atomic mass units.

52. Which of these is used to denote the number of particles?

- a) Mass
- b) **Mole**
- c) Numeric
- d) Grams

Explanation

Chemists measure atoms and molecules in 'moles'. So you can now understand that 'mole' denotes a number of particles.

53. Which of these entities are included in SI system calculation for a mol?

- a) Atoms
- b) Molecules
- c) Ions
- d) **All the above**

Explanation

In the SI system, the mole (mol) is the amount of a substance that contains as many elementary entities (atoms, molecules, or other particles) as there are atoms in exactly 12 g (or 0.012 kg) of the carbon-12 isotope.

54. Which of these represents the actual number of atoms in 12g of carbon-12?

a) Avogadro Number

- b) Atomic Mass Number
- c) Atomic Molecule Number
- d) Molecule Number

Explanation

The actual number of atoms in 12 g of carbon-12 is determined experimentally. This is called Avogadro's number (NA)

55. What is the value of Avogadro Number?

- a) 6.674×10^{-11}
- b) 6.626×10^{-34}
- c) 6.023×10^{23}**
- d) 5.6703×10^{-8}

Explanation

NA is named after an Italian scientist Amedeo Avogadro who proposed its significance. Its value is 6.023×10^{23} . So one mole of a substance contains 6.023×10^{23} entities.

56. Which of these values is counted in moles?

- a) Mass
- b) Particles**
- c) Atoms
- d) Molecules

Explanation

Mole Concept: The study of the collection of particles by using mole as the counting unit in order to express the mass and volume of such unit particles in a bulk of matter is known as mole concept.

57. Which of these data's can be counted by the number of moles?

- a) Number of moles of molecules.
- b) Number of moles in a chemical reaction.**
- c) Number of moles of ions.
- d) Number of moles of atoms.

Explanation

The number of moles of a substance can be calculated by various means depending on the data available, as follows: Number of moles of molecules. Number of moles of atoms. Number of moles of a gas (Standard molar volume at STP = 22.4 litre). Number of moles of ions.

58. What is the standard pressure value of a STP?

- a) **1.00 atm**
- b) 10 atm
- c) 0.001 atm
- d) 100 atm

Explanation

STP-Standard Temperature and Pressure (273.15 K, 1.00 atm)

59. Which of these given values are equal to one mole of an element?

- a) **Gram atomic mass**
- b) Relative atomic mass
- c) Average atomic mass
- d) Total number of isotopes

Explanation

One mole of an element contains 6.023×10^{23} atoms and it is equal to its gram atomic mass .i.e., one mole of oxygen atom contains 6.023×10^{23} atoms of oxygen and its gram atomic mass is 16 g.

60. What is the value of one mole of a matter?

- a) 6.023×10^{23}
- b) Avogadro Number
- c) NA

d) All the above

Explanation

One mole of matter contains 6.023×10^{23} molecules and it is equal to its gram molecular mass.

61. How much volume does one mole of gas occupies at STP?

- a) **22.4 liter**
- b) 220 ml
- c) 224000 liter
- d) 2240 ml

Explanation

One mole of any gas occupies 22.4 liter or 22400 ml at S.T.P. This volume is called as molar volume.

62. Which of the following is not correct regarding the number of moles calculation?

- a) **Mass / Average number of isotopes**
- b) Mass / Molecular mass

c) Number of atoms / 6.0238×10^{23}

d) Mass / Atomic mass

Explanation

Calculation of number of moles by Different modes

Number of moles = Mass / Atomic Mass

= Mass / Molecular mass

= Number of Atoms / 6.023×10^{23}

= Number of Molecules / 6.023×10^{23}

63. The percentage composition represents the ____ of each element in ____ of the compound.

a) Number of molecules, 10 g

b) Number of atoms, 100g

c) Mass, 100g

d) Average mass, 10g

Explanation

The percentage composition of a compound represents the mass of each element present in 100 g of the compound.

64. What is the value of the mass percentage of an element?

a) Mass of element in compound / molecular mass of the compound * 100

b) Average mass value of compound / atomic mass of the element * 100

c) Mass of the compound / molecular mass of the compound * 100

d) Atomic mass value of compound / molecular value of isotopes * 100

Explanation

Mass % of an element = mass of that element in the compound / molecular mass of the compound * 100

Now, molecular mass of $H_2O = 2(1) + 16 = 18$ g

Mass % of hydrogen = $2 \times 100 / 18 = 11.11$ %

Mass % of oxygen = $16 \times 100 / 18 = 88.89$ %

This percentage composition is useful to determine the empirical formula and molecular.

65. When did Avogadro frame a hypothesis relating volume of gas and molecules?

a) 1811

b) 1732

c) 1891

d) 1632

Explanation

In 1811 Avogadro framed a hypothesis based on the relationship between the numbers of molecules present in equal volumes of gases in different conditions.

66. Define the Avogadro's law?

- a) Equal volume of all gas varies with unequal number of molecules.
- b) Equal volume of all gas contains equal number of molecules under ideal condition.
- c) Unequal volume of all gas contains equal number of molecules.
- d) Under similar conditions of temperature and pressure equal volume of all gas contains equal number of molecules.**

Explanation

The Avogadro's law states that "equal volumes of all gases under similar conditions of temperature and pressure contain equal number of molecules"

67. Which of the following represents the Avogadro law?

- a) $V = n$
- b) $V \propto n$**
- c) $V < n$
- d) $V > n$

Explanation

It follows that the volume of any given gas must be proportional to the number of molecules in it. If 'V' is the volume and 'n' is the number of molecules of a gas, then Avogadro law is represented, mathematically, as follows: $V \propto n$

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

68. How many oxygen atoms are in Potassium permanganate?

- a) 3
- b) 4**
- c) 1
- d) 5

Explanation

The chemical formula for potassium permanganate is KMnO_4 which has one potassium, one manganese and four oxygen atoms.

69. Which of these is not an application of Avogadro's law?

- a) Determining the atomicity of gas.
- b) Determining the average mass of all gases.
- c) Relation between molecular mass and vapor density.**
- d) Determining gram molar volume of gas.

Explanation

APPLICATIONS OF AVOGADRO'S LAW: It explains Gay-Lussac's law. It helps in the determination of atomicity of gases. Molecular formula of gases can be derived using Avogadro's law. It determines the relation between molecular mass and vapor density. It helps to determine gram molar volume of all gases (i.e, 22.4 liter at S.T.P)

70. Which of these are not related in calculating the relative molecular mass by hydrogen scale?

- a) Relative Molecular Mass of a gas
- b) Mass of one molecule of a gas
- c) Mass of one atom of Hydrogen
- d) Average mass of isotopes**

Explanation

Relative molecular mass: (Hydrogen scale) The Relative Molecular Mass of a gas or vapor is the ratio between the mass of one molecule of the gas or vapor to mass of one atom of Hydrogen.

71. What are the factors considered to measure the vapor density of a gas?

- a) Temperature
- b) Pressure
- c) Viscosity
- d) Both a and b**

Explanation

Vapor density is the ratio of the mass of a certain volume of a gas or vapor to the mass of an equal volume of hydrogen measured under the same conditions of temperature and pressure. Vapor Density (V.D.) = Mass of a given volume of gas or vapor at S.T.P. / Mass of the same volume of hydrogen

72. What is the vapor density value at STP?

- a) Mass of total molecules / mass of hydrogen
- b) Mass of n molecules of gas / Mass of n molecules of hydrogen**
- c) Average molecular value of gas / Mass of hydrogen isotopes
- d) Total number of isotopes / Average number of isotopes of hydrogen

Explanation

V.D. at S.T.P = Mass of 'n' molecules of a gas or vapor at S.T.P. / Mass of 'n' molecules of hydrogen

73. Which of the following is the value of Vapor density?

- a) Relative molecular mass / 2**
- b) Relative molecular mass * 4
- c) Relative molecular mass / 4
- d) Relative molecular mass * 2

Explanation

Relative molecular mass = 2 × Vapor density

74. Calculate percentage of Hydrogen in H₂SO₄.

- a) 20
- b) 2.04**
- c) 32

d) 64

Explanation

$$\begin{aligned}\text{Molecular mass of H}_2\text{SO}_4 &= (1 \times 2) + (32 \times 1) + (16 \times 4) \\ &= 2 + 32 + 64 \\ &= 98 \text{ g}\end{aligned}$$

$$\% \text{ of H in H}_2\text{SO}_4 = \text{Mass of hydrogen} / \text{Molecular mass of H}_2\text{SO}_4 \times 100$$

$$\% \text{ of H in H}_2\text{SO}_4 = 2 / 98 \times 100 = 2.04$$

75. Calculate the number of moles in 10 liter of CO₂ at S.T.P.

a) **0.446**

b) 0.23

c) 2.34

d) 4.4

Explanation

$$\begin{aligned}\text{Number of moles of CO}_2 &= \text{Volume at S.T.P} / \text{Molar volume} \\ &= 10 / 22.4 = 0.446\end{aligned}$$