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Class: XI
Subject: Chemistry
Topic: Some Basic Concepts of Chemistry
No. of Questions: 27

Q1. What is the mass of 2.6 g molecule of sulphur dioxide?

A. 123.5 g
B. 166.4 g
C. 75.5 g
D. 50.9 g

Right Answer Explanation: B
Mass of 2.6 g molecule of sulphur dioxide = 2.6 x 64 = 166.4 g

Q2. The approximate number of molecules in one litre of water is

A. $6.023 \times 10^{23} \times 23.4$
B. $6.023 \times 10^{23} \times 22.4$
C. $6.023 \times 10^{23} \times 36.4$
D. $6.023 \times 10^{23} \times 55.5$

Right Answer Explanation: D
1 litre of water has mass about 1000 grams/litre
Molecular mass of water = 18g/mol
So, number of moles in 1litre = 1000/18 = 55.55 moles.
This multiplied by Avogadro's number: 6.02×10^{23}, will give number of water molecules in 1 litre as
$55.55 \times 6.02 \times 10^{23} = 3.35 \times 10^{25}$

Q3. Which of the following contains more number of molecules?

A. 1 g of hydrogen
B. 1 g of oxygen
C. 1 g of carbon dioxide
D. 1 g of water

Right Answer Explanation: A
Since atomic mass of hydrogen is least, so 1 g of hydrogen will contain maximum number of molecules.

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Q4. Balance the following equation:
$C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$

A. $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$
B. $C_2H_5OH + 3O_2 \rightarrow 5CO_2 + 3H_2O$
C. $C_2H_5OH + 3O_3 \rightarrow 5CO_2 + 5H_2O$
D. None of these

Right Answer Explanation: A
$C_2H_5OH + 3O_2 \rightarrow 2\ CO_2 + 3H_2O$ is the balanced equation.
7 O atoms are on reactant and product sides, 6 H atoms are on both reactant and product sides, similarly 2 C atoms are on both reactant and product sides.

Q5. Air is a mixture of gases. It can be regarded as a

A. substance
B. chemical element
C. compound
D. molecule

Right Answer Explanation: A
A chemical substance is a type of matter with a definite composition and properties. A mixture of compound elements is not a chemical substance. Most of the substances, we go through in our daily life, are kind of mixtures. Examples are air, alloys, biomass, etc.

Q6. The volume of oxygen necessary for complete combustion of 20 litres of propane is _____ litres.

A. 40
B. 60
C. 80
D. 100

Right Answer Explanation: D
Write the balanced equation for combustion of propane and then use unitary combustion of 20 litres of propane.
$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
$\because$ Oxygen required by 1 litre propane = 5 litres
$\therefore$ 5 x 20 litres = 100 litres

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Q7. The weight of a residue obtained by heating 2.76 g of silver carbonate is

A. 2.76 g
B. 2.96 g
C. 2.16 g
D. 2.44 g

Right Answer Explanation: C
Ag_2CO_3 on strong heating gives Ag.
$Ag_2CO_3 \rightarrow 2\ Ag + CO_2 + 1/2\ O_2$
276 g 2 x 108 g
276 g of Ag_2CO_3 on strong heating gives 216 g of Ag
2.76 g of Ag_2CO_3 on strong heating gives 2.16 g of Ag

Q8. Volume of CO_2 obtained from complete decomposition of 126 g $CaCO_3$ at STP is

A. 2.24 litres
B. 28.22 litres
C. 20 litres
D. 22.4 litres

Right Answer Explanation: B
Calcium carbonate ($CaCO_3$) has a molecular mass of 100 g/mol.
So, 126 g is 1.26 moles.
$CaCO_3 \rightarrow CaO + CO_2$

At STP, 1 mole = 22.4 litres
So, you have 28.224 litres.

Q9. Which of the following statements about oxidation number is wrong?

A. Oxidation number of an element in its compound can be zero.
B. Fluorine can show positive oxidation state in its compound.
C. Oxygen can show an oxidation state of + 2 in its compound.
D. Oxidation number of an element is always a positive or negative integer.

Right Answer Explanation: D

This statement is false. For example, oxidation state of O in KO_2 is $\frac{1}{-2}$

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Q10. A 24 g Mg wire burns in 5 g oxygen. Find the atomic weight of magnesium oxide formed.

A. 40 g
B. 20 g
C. 14 g
D. 56 g

Right Answer Explanation: B

$Mg + \frac{1}{2}O_2 \rightarrow MgO$

O_2 used = 8 g = $\frac{8}{32} = \frac{1}{4}$ mole

Mg = 24 g

$\Rightarrow \frac{1}{2}$ mole $O_2 \equiv \frac{1}{2}$ mole MgO

$\therefore$ MgO formed = $\frac{(24+16)}{2}$ = 20 g

Q11. If 10^{21} molecules are removed from 200 mg of CO_2, then the number of moles of CO_2 left will be

A. 2.88×10^{-3}
B. 1.66×10^{-3}
C. 4.54×10^{-3}
D. 3.341×10^{23}

Right Answer Explanation: A

200 mg CO_2 = 0.2 g = $\frac{0.2}{44}$ mol

= 0.00454 mol = 4.54 x 10^{-3} mol

10^{21} molecules of CO_2 = $\frac{10^{21}}{6.02 \times 10^{23}}$

= 1.66 x 10^{-3} mole

$\therefore$ No. of moles left

= (4.54 - 1.66) x 10^{-3}

= 2.88 x 10^{-3}

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Q12. What is the unit of formula unit mass?

A. Atomic mass unit (amu)
B. Unified mass (u)
C. Gram (g)
D. Microgram (Mg)

Right Answer Explanation: B
The formula unit mass of a substance is the sum of the atomic masses of all the atoms present in one formula unit mass of the ionic compound.
For example, formula of unit mass of NaCl = Atomic mass of Na + Atomic mass of Cl = 23 + 35.5 = 58.5u The unit of formula unit mass is unified mass (u). One atomic mass unit is a mass unit equal to exactly one-twelfth ($1/12^{th}$) the mass of one atom of carbon – 12. Earlier atomic mass unit was abbreviated as 'amu' but according to the latest IUPAC recommendation, it is now written as 'u' – unified mass. An atom is very small and mass is also very less, so it is expressed as unified mass. Gram and microgram ($^{\mu}$g) are comparatively bigger units used to measure heavier mass.

Q13. Atomic mass of carbon is 12 u. One atom of magnesium is twice as heavy as one carbon atom. What is the atomic mass of magnesium?

A. 6 u
B. 6 g
C. 24 u
D. 24 g

Right Answer Explanation: C
Carbon -12 isotope is used as the standard reference for measuring atomic mass unit (amu). 1

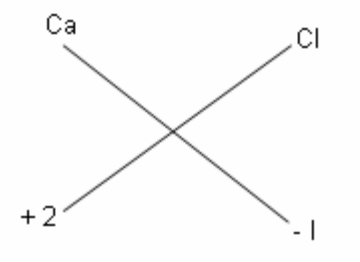
amu may be defined as $\frac{1}{12}$ th of mass of an atom of C – 12 isotope on the atomic scale.
This implies that on atomic scale, the mass of C – 12 isotope is taken as 12 amu or 12u.

Atom of magnesium is two times heavier than an atom of C – 12, i.e. 24 times heavier than $\frac{1}{12}$ th of the mass = 24u
The unit of atomic mass is 'u' (unified mass), not gram 'g'.

Q14. Atomic masses of calcium and chlorine are 40 u and 35.50 u respectively. What is the formula for unit mass of calcium chloride?

A. 75.5 u
B. 111 u
C. 75.5 g
D. 111 g

Right Answer Explanation: B
The formula unit mass of a substance is the sum of the atomic masses of all the atoms in a formula unit of a compound. The unit of formula mass unit is 'u' (unified mass). The chemical formula of calcium chloride is



Formula $CaCl_2$
Formula unit mass of $CaCl_2$ = No. of atoms of Ca × at. mass of Ca + no. of atoms of Cl × at. mass of Cl
= 1 × 40 + 2 x 35.5 [Atomic mass of Ca = 40u and atomic mass of Cl = 35.5u]
= 40 + 71
= 111u
The formula unit mass of calcium chloride is $CaCl_2$, not CaCl because valency of calcium is +2, not +1. Moreover, unit of formula unit mass is 'u' (unified mass) not 'g' (grams). Therefore, 111 g is also incorrect and 75.5 g is also incorrect. Gram and microgram units are used to measure heavier masses.

Q15. The ratio of the number of atoms of hydrogen to the number of atoms of oxygen in water is

A. 2 : 1
B. 1 : 2
C. 1 : 8
D. 8 : 1

Right Answer Explanation: A
Molecular formula for water is (H_2O)
Ratio of atoms is 2:1.

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Q16. The number of particles present in one mole of any substance has a fixed value of 6.022×10^{23}. What is the name given to this number?

A. Dalton's number
B. Proust's number
C. Avogadro's number
D. Lavoisier's number

Right Answer Explanation: C
A mole of particles is defined as that amount of substance, which contains 6.022×10^{23} number of particles (atom, molecules or ions). This value is experimentally determined and this number is called Avogadro's constant or Avogadro's number (represented by N_o) named in honour of the Italian scientist Amedeo Avogadro. Dalton gave the atomic theory. Antoine Lavoisier gave the law of conservation of mass, which stated that mass can neither be created nor destroyed during a chemical reaction. Proust gave the law of definite proportions according to which a chemical compound is always made up of the same elements combined together in the same fixed proportion by mass.

Q17. Which of the following relations is correct?

A. 1 mole of carbon atom = 1 g of hydrogen atom
B. 6.022×10^{23} atoms of carbon = 12 g of carbon
C. 6.022×10^{23} atoms of hydrogen = 12 u of carbon
D. 1 mole of hydrogen atom = 6.022×10^{23} atoms of carbon

Right Answer Explanation: B
1 mole of atom = Gram atomic mass = 6.022×10^{23} atom.
For carbon
1 mole of carbon = Gram atomic mass of C = 6.022×10^{23} atoms of C
Atomic mass of C = 12 u
Gram atomic mass of C = 12 g
Therefore, 1 mole of carbon = 12 g of C = 6.022×10^{23} atoms of carbon.
For hydrogen,
1 mole of hydrogen = Gram atomic mass of H = 6.022×10^{23} atoms of hydrogen
Atomic mass of H = 1 u
Gram atomic mass of H = 1 g
Therefore, 1 mole of hydrogen = 1 g = 6.022×10^{23} atoms of hydrogen.
Thus, option (2) i.e. 6.022×10^{23} atoms of carbon = 12 g of carbon is correct.

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Q18. Which of the following postulates of Dalton's atomic theory could explain the second law of chemical combination?

A. All matter is made up of very tiny particles called atoms.
B. The number and kind of atoms are constant in a particular compound.
C. In a chemical reaction, atoms can neither be created nor destroyed.
D. Atoms of different elements have different mass and chemical properties.

Right Answer Explanation: B
This law can be explained on the basis of the following postulate of Dalton's atomic theory: The number and kind of atoms are constant in a particular compound. Moreover, the postulate "in a chemical reaction can neither be created nor destroyed" can explain the law of conservation of mass (first law of chemical reaction), i.e. mass can neither be created nor destroyed in a chemical reaction.

Q19. If the mass of one sulphur atom is 2x g and mass of one oxygen atom is x g. What is the ratio of the masses of sulphur and oxygen in sulphur dioxide?

A. x : 2
B. 1 : 1
C. 2 : x
D. 1 : 2

Right Answer Explanation: 2
Sulphur dioxide (SO_2) contains one atom of sulphur and two atoms of oxygen.
Mass of one sulphur atom = 2x g
Mass of one oxygen atom = x g

Ratio of atomic masses of sulphur and oxygen in SO_2 = $\frac{\text{Atomic mass of one sulphur atom}}{2x\ \text{Atomic mass of one oxygen atom}}$

$= \frac{2x}{2\times x} = 1 : 1$

Thus the ratio of the masses of sulphur and oxygen in sulphur dioxide is 1 : 1.

Q20. The ratio between the volumes of the reactant gases and the products can be expressed in simple whole numbers. This law is known as

A. law of constant composition
B. law of multiple proportions
C. law of combining volumes
D. law of reciprocal proportions

Right Answer Explanation: C

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The ratio between the volumes of the reactant gases and the products can be expressed in simple whole numbers. This law is known as law of combining volumes.

Q21. Calculate the mass of sodium acetate (CH_3COONa) required to make 500 mL of 0.375 molar aqueous solution. (Molar mass of sodium acetate is 82.0245 g mol^{-1}).

Ans : No of moles of sodium acetate (CH_3COONa) required (0.375/1000) X500=0.1875, ie 0.1875X82.245 g = 15.38g

Q22. What is the concentration of sugar ($C_{12}H_{22}O_{11}$) in mol L^{-1} if its 20 g are dissolved in enough water to make a final volume up to 2L?

Ans: 20g in 2lit⟶ 10g in 1 lit; 10/342 = 0.02924 moles/lit

Q23. A sample of drinking water was found to be severely contaminated with chloroform, $CHCl_3$, supposed to be carcinogenic in nature. The level of contamination was 15 ppm (by mass).

(i) Express this in percent by mass.

(ii) Determine the molality of chloroform in the water sample.

Ans: (i) $(15/10^6)X100=15X10^{-4}$ % by mass

(ii) Mass of solute in 1 kg of solvent is $15X10^{-3}$ g ⇒ $15X10^{-3}/119.5=1.26X10^{-4}$ molal.

Q24. Calculate the number of atoms in each of the following

(i) 52 moles of Ar;

(ii) 52 u of He;

(iii) 52 g of He;

Ans: (i) 52 X $6.022X10^{23}$ = $313.144X\ 10^{23}=3.13\ X\ 10^{25}$ atoms

(ii) 52/4 = 13 atoms

(iii) (52/4) X $6.022X10^{23}$ = $78.286\ X\ 10^{23}$ atoms of He.

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Q25. Calculate the atomic mass (average) of chlorine using the following data:

Isotope	% Natural Abundance	Molar Mass
^{35}Cl	75.77	34.9689
^{37}Cl	24.23	36.9659

Ans : (34.9689 X 75.77) + (36.9659 X 24.23)/100 = 35.48

Q26. 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.

Ans : (i) 3X2 = 6

(ii) 3X6 = 6

(iii) 3X $6.023X10^{23}$ = $18.069X10^{23}$

Q27. If ten volumes of dihydrogen gas reacts with five volumes of dioxygen gas, how many volumes of water vapour would be produced?

Ans : $2H_{2(g)} + O_{2(g)} \longrightarrow 2H_2O_{(g)}$. ^{10} volumes of water vapour