

Quiz (Basic Chemical Calculation 1)

Section A: Multiple-choice

- The haemoglobin in mammals contains 0.33% by mass of iron. Given that the molar mass of a haemoglobin molecule is 68 000, how many iron atoms are there in a haemoglobin molecule?
(Relative atomic mass: Fe = 55.8)

A. 2	B. 3
C. 4	D. 5
- Which of the following gases has the least number of atoms?
(Relative atomic masses: C = 12.0, O = 16.0, Ne = 20.2, S = 32.1, Cl = 35.5)

A. 2.0 g of chlorine	B. 4.0 g of carbon dioxide
C. 6.0 g of sulphur dioxide	D. 8.0 g of neon
- Iron(III) oxide is reduced by carbon to give iron. Let w be the relative atomic mass of iron. In an experiment x g of iron(III) oxide is reduced to y g of iron. Which of the following is the correct expression of w ?
(Relative atomic mass: O = 16.0)

A. $\frac{24.0 \times y}{x - y}$	B. $\frac{x - y}{16.0 \times y}$
C. $\frac{x - y}{24.0 \times y}$	D. $\frac{16.0 \times (x - y)}{y}$
- A mixture of sodium sulphate and copper(II) sulphate contains three moles of sulphate ions and one mole of copper(II) ions. How many moles of sodium ions are there in the mixture?

A. 1	B. 2
C. 3	D. 4
- The relative atomic mass of metal X is 27.0. One mole of metal X burns completely in pure oxygen to form 51.0 g of the oxide. The empirical formula of the oxide is
(Relative atomic mass: O = 16.0)

A. X_2O .	B. X_2O_2 .
C. X_2O_3 .	D. X_3O_2 .
- Which of the following nitrides has the greatest percentage by mass of nitrogen?
(Relative atomic masses: Li = 6.9, N = 14.0, Na = 23.0, Mg = 24.3, Al = 27.0)

A. Li_3N	B. Na_3N
C. Mg_3N_2	D. AlN
- 5.60 g of hydrocarbon Y is burnt completely to give 17.0 g of carbon dioxide. What is the empirical formula of Y ?
(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0)

A. CH_3	B. C_2H_5
C. C_2H_6	D. C_4H_{10}

Suggested Answer

Section A

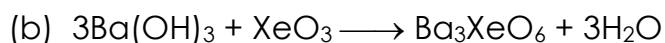
1.	C	6.	A	11.	B
2.	A	7.	B	12.	A
3.	A	8.	D	13.	C
4.	D	9.	B	14.	D
5.	C	10.	C	15.	D

Section B

1. (a) Assume there is 100 g of the white substance.

	Ba	Xe	O
Mass (g)	64.4	20.5	15.1
Number of moles of atoms (mol)	$64.4 / 137.3$ = 0.469	$20.5 / 131.3$ = 0.156	$15.1 / 16.0$ = 0.944
Mole ratio of atoms	$0.469 / 0.156$ = 3	$0.156 / 0.156$ = 1	$0.9444 / 0.156$ = 6

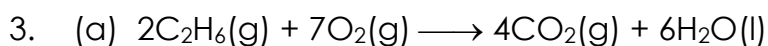
∴ the empirical formula of the white substance is Ba₃XeO₆.



- 2.

	Al₂O₃	H₂O
Mass (g)	20.2	$31.2 - 20.2 = 11.0$
Number of moles of atoms (mol)	$20.2 / (27.0 \times 2 + 16.0 \times 3)$ = 0.198	$11.0 / (1.0 \times 2 + 16.0)$ = 0.611
Mole ratio of atoms	$0.198 / 0.198$ = 1	$0.611 / 0.198$ = 3

∴ $x = 3$



- (b) Number of moles of O₂(g) required
= $1 / 2 \times 7$
= 3.5

Volume of O₂(g) required
= 3.5×24.0
= 84.0 dm³

(c) Number of moles of $\text{CO}_2(\text{g})$ formed
 $= 1 / 2 \times 4$
 $= 2$

Volume of $\text{CO}_2(\text{g})$ required
 $= 2 \times 24.0$
 $= 48.0 \text{ dm}^3$