

Supplementary Exercise – Topic 3 (Part 3 Note)

1. Consider the following table:

Element	Atomic number	Relative atomic mass
X	9	19.0
Y	13	27.0

The formula mass of the compound formed between X and Y is

- A. 40.0
- B. 84.0
- C. 100.0
- D. 111.0



2. Consider the following table:

Element	Atomic number	Relative atomic mass
X	6	12.0
Y	16	32.1

The relative molecular mass of the compound formed between X and Y is

- A. 38.1
- B. 44.1
- C. 56.1
- D. 76.2



3. The Avogadro number is the same as the number of

- A. molecules in 1 g of hydrogen.
- B. atoms in 16 g of sulphur.
- C. atoms in 24 g of carbon.
- D. molecules in 32 g of oxygen.

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, S = 32.1)

4. How many atoms are there in 4.50 moles of magnesium atoms?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

- A. 2.71×10^{23}
- B. 5.42×10^{23}
- C. 2.71×10^{24}
- D. 5.42×10^{24}

5. What is the number of moles of ions in 9.03×10^{23} sodium ions?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

- A. 1.00 moles
- B. 1.50 moles
- C. 2.00 moles
- D. 2.50 moles

1.5

6. Which of the following statements concerning
(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
- (1) It can form 1 mole of Al^{3+} ions.
 - (2) It can form $3 \times 6.02 \times 10^{23} \text{ Al}^{3+}$ ions.
 - (3) It contains the same number of atoms as 3 moles of sodium.

Al

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

7. The relative atomic mass of hydrogen and oxygen are 1.0 and 16.0 respectively. Which of the following statements concerning 36.0 g of water is / are correct?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)



- (1) It contains $3 \times 6.02 \times 10^{23}$ molecules.
- (2) It contains $6 \times 6.02 \times 10^{23}$ atoms. ✓
- (3) It contains 2 moles of hydrogen atoms.

2 mol

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

8. How many atoms are present in 6.00 moles of carbon dioxide molecules?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

Na_2S

Na 3

- A. 1.08×10^{23}
- B. 3.61×10^{23}
- C. 3.61×10^{24}
- D. 1.08×10^{25}

9. How many ions are present in 0.350 mole of sodium sulphide?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

$\text{Ca}(\text{PO}_4)_2$

5

- A. 2.11×10^{23}
- B. 6.32×10^{23}
- C. 2.11×10^{24}
- D. 6.32×10^{24}

10. What is the number of moles of ions in 1 mole of calcium phosphate?

- A. 2 moles
- B. 3 moles
- C. 4 moles
- D. 5 moles

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11. One mole of magnesium chloride contains
- two moles of magnesium ions and one mole of chloride ions.
 - 6.02×10^{23} magnesium ions and $2 \times 6.02 \times 10^{23}$ chloride ions.
 - equal number of magnesium ions and chloride ions.
 - 1 magnesium ion and 2 chloride ions
12. Which of the following contains the largest number of moles of ions?
- 2 moles of aluminium sulphate
 - 2 moles of calcium chloride
 - 3 moles of zinc oxide
 - 4 moles of potassium nitrate
13. Which of the following has the greatest number of ions?
- 5 moles of aluminium fluoride
 - 6 moles of iron(II) chloride
 - 7 moles of copper(II) nitrate
 - 8 moles of potassium permanganate
14. How many moles of silane (SiH_4) contain y hydrogen atoms?
(L represents the Avogadro constant.)
- $\frac{y}{L}$
 - $\frac{L}{y}$
 - $\frac{y}{4L}$
 - $\frac{4y}{L}$
15. Element X forms two oxides XO and X_2O_3 . If 1 mole of XO contains n atoms, 1 mole of X_2O_3 would contain
- $\frac{2}{5}n$ atoms.
 - $\frac{5}{2}n$ atoms.
 - $2n$ atoms.
 - $5n$ atoms.

16. Which of the following has the highest mass?
(Relative atomic masses: H = 1.0, C = 12.0, N = 14.0)
A. 0.500 mole of CO_2
B. 1.00 mole of Na_2CO_3
C. 1.50 moles of CH_3COOH
D. 2.00 moles of NH_3
17. How many moles of atoms are there in 4.80 g of sulphur?
(Relative atomic mass: S = 32.1)
A. 0.150 mole
B. 0.500 mole
C. 0.800 mole
D. 1.00 mole
18. How many moles of formula units ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) are there in 60.2 g of calcium sulphate-2-water?
(Relative atomic masses: H = 1.0, O = 16.0, S = 32.1, Ca = 40.1)
A. 0.350 mole
B. 0.500 mole
C. 0.650 mole
D. 0.800 mole
19. How many molecules are there in 51.0 g of ammonia?
(Relative atomic masses: H = 1.0, N = 14.0; Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
A. 3
B. 12
C. $3 \times 6.02 \times 10^{23}$
D. $12 \times 6.02 \times 10^{23}$
20. How many ions are there in 202 g of magnesium nitride?
(Relative atomic masses: N = 14.0, Mg = 24.3; Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
A. 2.00
B. 10.0
C. $2.00 \times 6.02 \times 10^{23}$
D. $10.0 \times 6.02 \times 10^{23}$
21. If 6.75 g of aluminium contain x atoms, how many atoms are present in 24.0 g of carbon?
(Relative atomic masses: C = 12.0, Al = 27.0)
A. $3x$
B. $4x$
C. $6x$
D. $8x$

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22. If 1 mole of oxygen (O_2) contains x atoms, 2 moles of ozone (O_3) will contain
- A. $\frac{3}{2}x$ atoms.
 - B. $2x$ atoms.
 - C. $3x$ atoms.
 - D. $6x$ atoms.
23. What mass of carbon dioxide has the same number of molecules as 21.9 g of hydrogen chloride?
(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Cl = 35.5)
- A. 26.4 g
 - B. 28.2 g
 - C. 30.0 g
 - D. 31.8 g
24. Which of the following contains the same number of atoms as there are in 8.00 g of oxygen?
(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Ne = 20.2, Si = 28.1)
- A. 1.00 g of hydrogen
 - B. 18.0 g of carbon
 - C. 10.1 g of neon
 - D. 28.1 g of silicon
25. Which of the following samples of gases contains the SMALLEST number of molecules?
(Relative atomic masses: H = 1.0, C = 12.0, N = 14.0, O = 16.0, S = 32.1)
- A. 10 g of NO
 - B. 10 g of SO_2
 - C. 10 g of CO
 - D. 10 g of CH_4
26. Which of the following has the greatest number of ions?
(Relative atomic masses: O = 16.0, Na = 23.0, Mg = 24.3, Cl = 35.5, Ca = 40.1, Fe = 55.8, Br = 79.9)
- A. 12 g of calcium chloride
 - B. 14 g of magnesium oxide
 - C. 16 g of iron(II) chloride
 - D. 18 g of sodium bromide
27. The molecular formula of a gaseous element X is X_2 . 70.0 g of the gas contain 2.50 moles of molecules. What is the relative atomic mass of X?
- A. 14.0
 - B. 28.0
 - C. 35.0
 - D. 49.0

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28. Which of the following statements concerning 32.0 g of oxygen gas is correct?
(Relative atomic masses: H = 1.0, C = 12.0, N = 14.0, O = 16.0;
Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
- It contains the same number of molecules as 28.0 g of nitrogen gas.
 - It contains the same number of molecules as 34.0 g of ammonia gas.
 - It contains 6.02×10^{23} oxygen atoms.
 - It contains the same number of atoms as 12.0 g of carbon.
29. Which of the following statements concerning 2 moles of ammonia is INCORRECT?
(Relative atomic masses: H = 1.0, C = 12.0, N = 14.0, O = 16.0, Cl = 35.5;
Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
- It contains 2 moles of nitrogen atoms.
 - It contains $6 \times 6.02 \times 10^{23}$ hydrogen atoms.
 - It contains the same number of atoms as 4 moles of hydrogen chloride.
 - It contains the same number of atoms as 44.0 g of carbon dioxide.
30. What is the percentage by mass of potassium in potassium carbonate?
(Relative atomic masses: C = 12.0, O = 16.0, K = 39.1)
- 28.1 %
 - 42.2 %
 - 56.6 %
 - 84.4 %
31. What is the percentage by mass of water in $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?
(Relative atomic masses: H = 1.0, O = 16.0, S = 32.1, Cu = 63.5)
- 36.1 %
 - 41.8 %
 - 52.3 %
 - 66.4 %
32. The compound X_2CrO_4 contains 65.1 % of X by mass. What is the relative atomic mass of X?
(Relative atomic masses: O = 16.0, Cr = 52.0)
- 102
 - 108
 - 162
 - 216

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33. Hydrated sodium carbonate $\text{Na}_2\text{CO}_3 \cdot n\text{H}_2\text{O}$ contains 60.4 % by mass of water. What is the value of n?

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Na = 23.0)

- A. 7
- B. 8
- C. 9
- D. 10

34. Metal X forms an oxide. 54.8 g of this oxide contain 49.7 g of X. What is the mole ratio of X to oxygen in the oxide?

(Relative atomic masses: O = 16.0, X = 207.2)

- A. 1 : 2
- B. 1 : 3
- C. 2 : 3
- D. 3 : 4

35. In a compound formed between copper and oxygen, it is found that 25.4 g of copper combine with 3.20 g of oxygen. What is the empirical formula of the compound?

(Relative atomic masses: O = 16.0, Cu = 63.5)

- A. Cu_2O
- B. CuO
- C. CuO_2
- D. Cu_2O_3

36. An alcohol contains 60.0 % carbon, 13.3 % hydrogen and 26.7 % oxygen. What is its empirical formula?

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0)

- A. $\text{C}_2\text{H}_6\text{O}$
- B. $\text{C}_3\text{H}_8\text{O}$
- C. $\text{C}_4\text{H}_{10}\text{O}$
- D. $\text{C}_5\text{H}_{12}\text{O}$

37. The formula of hydrated zinc sulphate is $\text{ZnSO}_4 \cdot x\text{H}_2\text{O}$. 5.75 g of the hydrated sulphate are heated to drive away the water. 3.23 g of residue are left. What is the value of x?

(Relative atomic masses: H = 1.0, O = 16.0, S = 32.1, Zn = 65.4)

- A. 5
- B. 6
- C. 7
- D. 8

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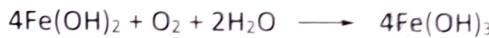
38. A compound X contains 82.8 % carbon and 17.2 % hydrogen. Its relative molecular mass is 58.0.
What is its molecular formula?
(Relative atomic masses: H = 1.0, C = 12.0)

- A. C_2H_5
- B. C_4H_{10}
- C. C_6H_{15}
- D. C_8H_{20}

39. 4.68 g of metal X combine with 2.16 g of oxygen to form an oxide in which the charge of the ion of X is +3. What is the relative atomic mass of X?

(Relative atomic mass: O = 16.0)

- A. 11.6
- B. 34.7
- C. 52.0
- D. 104



40. 1 mole of O_2 reacts with Fe(OH)_2 according to the reaction represented by the above equation.
How many moles of Fe(OH)_3 can be obtained?

- A. 2
- B. 3
- C. 4
- D. 5

41. Magnesium and titanium(IV) chloride react according to the following chemical equation:



What is the mass of magnesium required to react completely with 114 g of titanium(IV) chloride?
(Relative atomic masses: Mg = 24.3, Cl = 35.5, Ti = 47.9)

- A. 14.6 g
- B. 29.2 g
- C. 43.8 g
- D. 58.4 g

42. 7.51 g of calcium carbonate decompose completely on heating. What is the mass of calcium oxide obtained?

(Relative atomic masses: C = 12.0, O = 16.0, Ca = 40.1)

- A. 3.01 g
- B. 3.61 g
- C. 4.21 g
- D. 4.81 g

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43. Consider the following chemical equation:

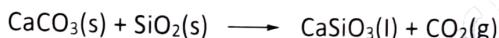


83.7 g of iron are formed. What is the mass of iron(III) oxide consumed?

(Relative atomic masses: O = 16.0, Fe = 55.8)

- A. 80 g
- B. 120 g
- C. 160 g
- D. 200 g

44. The removal of silicon dioxide with limestone in a blast furnace can be represented by the following equation:



What is the mass of calcium carbonate needed to remove 1.00 tonne of silicon dioxide?

(Relative atomic masses: C = 12.0, O = 16.0, Si = 28.1, Ca = 40.1; 1 tonne = 10^6 g)

- A. 0.46 tonne
- B. 0.60 tonne
- C. 1.67 tonnes
- D. 2.18 tonnes

45. Consider the following chemical reaction of an oxide of lead with hydrogen:



178 g of the oxide of lead are consumed in the reaction. What is the mass of lead obtained?

(Relative atomic masses: O = 16.0, Pb = 207.2)

- A. 106 g
- B. 117 g
- C. 131 g
- D. 161 g

46. Thermal decomposition of $\text{KClO}_3(\text{s})$ gives $\text{KCl}(\text{s})$ and $\text{O}_2(\text{g})$ as the only products. What is the mass of oxygen produced when 24.5 g of $\text{KClO}_3(\text{s})$ undergo complete decomposition?

(Relative atomic masses: O = 16.0, Cl = 35.5, K = 39.1)

- A. 3.20 g
- B. 6.40 g
- C. 9.60 g
- D. 19.2 g

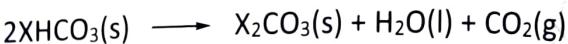
47. A, B, X and Y represent four different compounds. A and B react according to the following equation:



a grams of A react with b grams of B to give x grams of X and y grams of Y. What is the value of y?

- A. $a + b - x$
- B. $a + 2b - x$
- C. $a + b - 2x$
- D. $\frac{a + 2b - 2x}{2}$

48. Upon heating, a hydrogencarbonate $XHCO_3$ decomposes according to the following equation:



A sample of 1.50 g of $XHCO_3$ is heated. 0.330 g of carbon dioxide is produced. What is the formula mass of $XHCO_3$?

(Relative atomic masses: C = 12.0, O = 16.0)

- A. 100
- B. 150
- C. 200
- D. 250

49. The oxide of metal M, M_2O , can be reduced by passing hydrogen gas over the heated oxide. Complete reduction of 23.2 g of the oxide produces metal M and 1.80 g of water. What is the relative atomic mass of M?

(Relative atomic masses: H = 1.0, O = 16.0)

- A. 54.0
- B. 72.0
- C. 108
- D. 162

50. 5 g of copper were added to excess silver nitrate solution. After some time, the silver obtained is filtered off from the resulting solution. The final mass of the silver obtained would be

- A. less than 5 g.
- B. 5 g.
- C. 10 g.
- D. more than 10 g.

(Relative atomic masses: Cu = 63.5, Ag = 107.9)

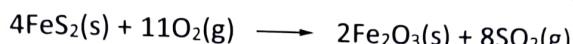
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51. When a 1.00 g sample of limestone was dissolved in dilute hydrochloric acid completely, 0.380 g of carbon dioxide was generated. What was the percentage by mass of calcium carbonate in the limestone?

(Relative atomic masses: C = 12.0, O = 16.0, Ca = 40.1)

- A. 16.7 %
- B. 51.5 %
- C. 64.7 %
- D. 86.5 %

52. When the iron ore pyrite, FeS_2 , is roasted, iron(III) oxide is produced.



Roasting 60.0 tonnes of the ore produces 36.7 tonnes of iron(III) oxide. What is the percentage by mass of FeS_2 in the ore?

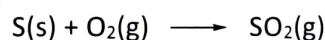
(Relative atomic masses: O = 16.0, S = 32.1, Fe = 55.8; 1 tonne = 10^6 g)

- A. 27.6 %
- B. 46.0 %
- C. 55.2 %
- D. 92.0 %

53. When equal masses of magnesium and iron react separately with excess hydrochloric acid, magnesium gives more hydrogen than iron does. Which of the following deductions is correct?

- A. The metallic bond in magnesium is weaker than that in iron.
- B. The reactivity of magnesium is higher than that of iron.
- C. The atomic number of magnesium is greater than that of iron.
- D. The relative atomic mass of magnesium is smaller than that of iron.

54. Sulphur dioxide is produced when sulphur burns in oxygen.

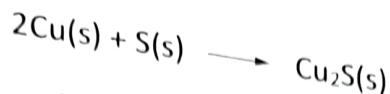


48.2 g of sulphur burn in 64.0 g of oxygen. What is the mass of sulphur dioxide produced?

(Relative atomic masses: O = 16.0, S = 32.1)

- A. 96.2 g
- B. 112 g
- C. 128 g
- D. 144 g

following equation:



- In a particular experiment, 2.40 g of copper were heated with excess sulphur to obtain 2.85 g of copper(I) sulphide. What is the percentage yield of copper(I) sulphide?
(Relative atomic masses: S = 32.1, Cu = 63.5)
- A. 80.7 %
 - B. 84.7 %
 - C. 90.7 %
 - D. 94.8 %

60. The molecular formula of ozone is O₃. Which of the following statements concerning 1 mole of ozone is / are correct?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)

- (1) It contains $3 \times 6.02 \times 10^{23}$ atoms.
- (2) It contains 3 moles of molecules.
- (3) It contains the same number of atoms as 1 mole of O₂(g).

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

61. Which of the following statements concerning 1 mole of magnesium is / are correct?

(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$; Relative atomic mass: Mg = 24.3)

- (1) It can form 1 mole of Mg²⁺ ions.
- (2) It can form $2 \times 6.02 \times 10^{23}$ Mg²⁺ ions.
- (3) The mass of 1 mole of Mg²⁺ ions is 48.6 g.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

62. A mixture of sodium chloride and sodium sulphate is known to contain 4 moles of chloride ions and 3 moles of sulphate ions. How many moles of sodium ions are present in the mixture?

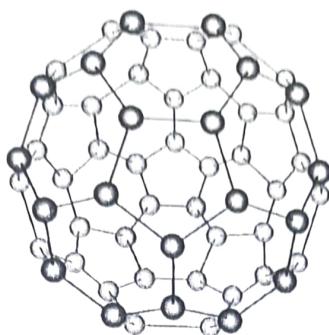
- A. 7
- B. 8
- C. 9
- D. 10

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63. Which of the following contains the same number of atoms as 5.10 g of ammonia?
- 17.6 g of carbon dioxide
 - 18.0 g of nitrogen monoxide
 - 42.6 g of chlorine
- (Relative atomic masses: H = 1.0, C = 12.0, N = 14.0, O = 16.0, Cl = 35.5)
- (1) and (2) only
 - (1) and (3) only
 - (2) and (3) only
 - (1), (2) and (3)
64. The relative atomic masses of carbon and oxygen are 12.0 and 16.0 respectively. Which of the following statements concerning 88.0 g of carbon dioxide is / are correct?
(Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
- It contains 4 moles of oxygen atoms.
 - It contains $2 \times 6.02 \times 10^{23}$ atoms.
 - It contains $6 \times 6.02 \times 10^{23}$ molecules.
- (1) only
 - (2) only
 - (1) and (3) only
 - (2) and (3) only
65. 2 g of sulphur and 1 g of oxygen contain the same number of atoms. Which of the following statements is / are correct?
- The number of atoms in one mole of sulphur atoms is twice that in one mole of oxygen atoms.
 - The mass of one mole of sulphur atoms is twice that of one mole of oxygen atoms.
 - The number of occupied electron shells in a sulphur atom is twice that in an oxygen atom.
- (1) only
 - (2) only
 - (1) and (3) only
 - (2) and (3) only
66. Which of the following has the greatest number of ions?
- 4 moles of iron(III) sulphate
 - 5 moles of calcium phosphate
 - 6 moles of barium hydrogencarbonate
 - 7 moles of magnesium hydroxide

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67. A certain form of carbon is composed of C₆₀ molecules. Each C₆₀ molecule is formed by 60 carbon atoms bonded together like a football as shown in the diagram below:



Approximate how many such molecules are present in 12 g of this form of carbon?

(Relative atomic mass: C = 12.0; Avogadro constant = 6.02 × 10²³ mol⁻¹)

- A. 1.0 × 10²²
B. 2.0 × 10²²
C. 3.6 × 10²³
D. 6.0 × 10²³
68. How many moles of glucose (C₆H₁₂O₆) contain x oxygen atoms?
(L represents the Avogadro constant.)

- A. $\frac{x}{L}$
B. $\frac{L}{x}$
C. $\frac{x}{6L}$
D. $\frac{6x}{L}$

69. The relative atomic masses of hydrogen and oxygen are 1.0 and 16.0 respectively. Which of the following statements concerning 54.0 g of water is correct?
(Avogadro constant = 6.02 × 10²³ mol⁻¹)
- A. It contains 9 moles of molecules.
B. It contains 3 × 6.02 × 10²³ atoms.
C. It contains 6 moles of hydrogen atoms.
D. It contains 6 × 6.02 × 10²³ oxygen atoms.

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70. The chemical formulae of two chlorine oxides are Cl_2O and Cl_2O_7 . If 1 mole of Cl_2O contains n atoms, 2 moles of Cl_2O_7 would contain
- A. $\frac{7}{2}n$ atoms.
 - B. $2n$ atoms.
 - C. $4n$ atoms.
 - D. $6n$ atoms.
71. A two carat diamond used in a ring contains 2×10^{22} carbon atoms. What is the approximate mass of the diamond?
(Relative atomic mass: C = 12.0; Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$)
- A. 0.10 g
 - B. 0.20 g
 - C. 0.40 g
 - D. 0.80 g
72. The molecular formula of an element X is X_2 . If the Avogadro constant is $L \text{ mol}^{-1}$, how many molecules are there in 76.0 g of the element?
(Relative atomic mass of X = 19.0)
- A. $\frac{1}{2}L$
 - B. L
 - C. $2L$
 - D. $3L$
73. The relative atomic mass of metal X is 69.7. 4.53 g of X are allowed to react with excess oxygen until completely oxidized. 6.10 g of oxide are obtained. What is the empirical formula of the oxide?
(Relative atomic mass: O = 16.0)
- A. XO
 - B. X_2O_3
 - C. X_3O_2
 - D. X_3O_4
74. Which of the following gases contains the SMALLEST number of molecules?
(Relative atomic masses: H = 1.0, N = 14.0, O = 16.0, F = 19.0)
- A. 100 g of fluorine
 - B. 100 g of nitrogen
 - C. 100 g of oxygen
 - D. 100 g of hydrogen

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75. The formula of hydrated iron(II) sulphate is $\text{FeSO}_4 \cdot x\text{H}_2\text{O}$. On strong heating, 18.1 g of the hydrated sulphate produces 8.20 g of water. What is the value of x?
(Relative atomic masses: H = 1.0, O = 16.0, S = 32.1, Fe = 55.8)
- A. 5
B. 6
C. 7
D. 8
76. The relative atomic mass of element X is 35.5. It forms an oxide containing 18.4 % of oxygen by mass. What is the mole ratio of X to oxygen in the oxide?
(Relative atomic mass: O = 16.0)
- A. 1 : 2
B. 1 : 3
C. 2 : 1
D. 2 : 3
77. Metal M forms an oxide. Complete reduction of 11.9 g of this oxide by carbon produces metal M and 3.29 g of carbon dioxide. What is the empirical formula of the oxide?
(Relative atomic masses: C = 12.0, O = 16.0, M = 63.5)
- A. M_2O
B. MO
C. MO_2
D. M_2O_3
78. Rhodonite is a decorative stone that consists mainly of pink MnSiO_3 . Less valuable variants of the stones have black streaks of MnO_2 in them. Analysis of a particular sample of rhodonite indicates that it contains a total of 49.2 % of Mn by mass. What is the percentage by mass of MnO_2 in the sample?
(Relative atomic mass: Mn = 54.9; formula masses: MnSiO_3 = 131.0, MnO_2 = 86.9)
- A. 34.3 %
B. 44.6 %
C. 55.4 %
D. 63.5 %
79. 8.90 g of an impure sample of silver oxide (Ag_2O) is heated strongly. 7.75 g of silver are obtained. What is the percentage by mass of Ag_2O in the sample?
(Relative atomic masses: O = 16.0, Ag = 107.9)
- A. 53.5 %
B. 77.1 %
C. 87.1 %
D. 93.5 %

Supplementary Exercise – Topic 3 (Part 3 Note)

80. Lithium hydroxide can absorb carbon dioxide. The reaction can be represented by the following equation:



What is the mass of lithium hydroxide needed for absorbing 11.0 g of carbon dioxide?

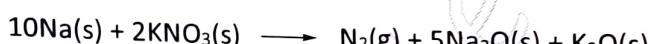
(Relative atomic masses: H = 1.0, Li = 6.9, C = 12.0, O = 16.0)

- A. 5.98 g
- B. 12.0 g
- C. 17.9 g
- D. 23.9 g

81. A car airbag contains sodium azide (NaN_3) and potassium nitrate. Sodium azide decomposes according to the following equation:



The sodium produced reacts immediately with potassium nitrate producing more nitrogen.



What is the total number of moles of nitrogen produced by 1.00 mole of sodium azide in this sequence?

- A. 1.20 moles
- B. 1.50 moles
- C. 1.60 moles
- D. 4.00 moles

82. P, Q, R and S represent four different compounds. P and Q react according to the following equation:



p grams of P react with q grams of Q to give r grams of R and s grams of S. What is the value of s?

- A. $p + q - r$
- B. $2p + q - r$
- C. $2(p + q - r)$
- D. $\frac{2p + q - r}{2}$

Supplementary Exercise – Topic 3 (Part 3 Note)

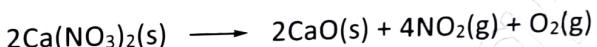
83. Carbon dioxide and hydrogen react to produce methanol (CH_3OH) according to the following equation:



In an experiment, 6.60 g of carbon dioxide are allowed to react with 1.20 g of hydrogen. What is the mass of CH_3OH obtained?

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0)

- A. 2.60 g
 - B. 3.20 g
 - C. 4.80 g
 - D. 6.40 g
84. Upon heating, calcium nitrate decomposes according to the following equation:



A sample of 82.0 g of calcium nitrate is heated strongly. What is the mass of oxygen obtained?

(Relative atomic masses: N = 14.0, O = 16.0, Ca = 40.1)

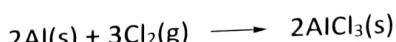
- A. 8.00 g
- B. 12.0 g
- C. 16.0 g
- D. 20.0 g

85. NaHCO_3 decomposes upon heating to form Na_2CO_3 , CO_2 and H_2O . What is the mass of Na_2CO_3 formed if 33.6 g of NaHCO_3 undergo complete decomposition?

(Relative atomic masses: H = 1.0, C = 12.0, O = 16.0, Na = 23.0)

- A. 5.30 g
- B. 10.6 g
- C. 21.2 g
- D. 42.4 g

86. Aluminium reacts with chlorine according to the following equation:



In a certain experiment, 8.10 g of aluminium were heated with excess chlorine. 38.2 g of aluminium chloride were obtained. What is the percentage yield of aluminium chloride?

(Relative atomic masses: Al = 27.0, Cl = 35.5)

- A. 36.6 %
- B. 55.3 %
- C. 73.6 %
- D. 95.4 %

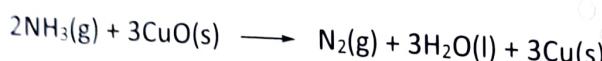
Supplementary Exercise – Topic 3 (Part 3 Note)

87. Metal M forms an oxide in which the ion of M carries +2 charge. Complete reduction of 13.4 g of this oxide by hydrogen gas produces metal M and 1.08 g of water. What is the relative atomic mass of M?

(Relative atomic masses: H = 1.0, O = 16.0)

- A. 6.30
- B. 24.3
- C. 137
- D. 207

88. Consider the reaction between ammonia and copper(II) oxide:



In an experiment, 6.80 g of ammonia are allowed to react with 35.8 g of copper(II) oxide. What is the mass of nitrogen obtained?

(Relative atomic masses: H = 1.0, N = 14.0, O = 16.0, Cu = 63.5)

- A. 2.80 g
- B. 4.20 g
- C. 5.60 g
- D. 8.40 g

89. Metal X reacts with dilute sulphuric acid according to the following equation:



When equal masses of X and zinc are added separately to excess dilute sulphuric acid, X gives more hydrogen than zinc does. Which of the following deductions is correct?

- A. The reactivity of X is higher than that of zinc.
- B. The density of X is smaller than that of zinc.
- C. The atomic number of X is greater than that of zinc.
- D. The relative atomic mass of X is smaller than that of zinc.

90. When 100 g of PURE calcium carbonate (formula mass = 100.1) reacted with excess hydrochloric acid, 44 g of carbon dioxide were obtained. However, in a similar experiment using 100 g of IMPURE calcium carbonate, 46 g of carbon dioxide were obtained. Assuming that the impurity is a metallic carbonate, what would this impurity be?

- (Formula masses: $\text{MgCO}_3 = 84.3$, $\text{ZnCO}_3 = 125.4$, $\text{FeCO}_3 = 115.8$, $\text{BaCO}_3 = 197.3$)
- A. MgCO_3
 - B. ZnCO_3
 - C. FeCO_3
 - D. BaCO_3

Supplementary Exercise – Topic 3 (Part 3 Note)

55. Hydrazine (N_2H_4) is used as rocket fuel. It reacts with oxygen according to the following equation:

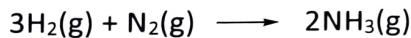


In a particular rocket engine, 2.40 g of hydrazine and 3.40 g of oxygen are allowed to react. What is the mass of water produced?

(Relative atomic masses: H = 1.0, N = 14.0, O = 16.0)

- A. 1.35 g
- B. 1.90 g
- C. 2.70 g
- D. 3.80 g

56. Ammonia is manufactured from hydrogen and nitrogen by the following process:



In a certain experiment, 80 g of ammonia were produced from 60 g of hydrogen and excess nitrogen. What is the percentage yield of ammonia?

(Relative atomic masses: H = 1.0, N = 14.0)

- A. $\frac{80}{340} \times 100\%$
- B. $\frac{80}{170} \times 100\%$
- C. $\frac{30}{80} \times 100\%$
- D. $\frac{60}{80} \times 100\%$

57. In the combustion of a certain fuel, 16.0 g of carbon dioxide are produced. This represents a 75.0 % yield. What is the theoretical yield of carbon dioxide?

- A. 12.0 g
- B. 21.3 g
- C. 32.0 g
- D. 44.3 g

58. What is the number of moles of ions in 1 mole of chromium(III) sulphate?

- A. 1
- B. 2
- C. 4
- D. 5