

**1** Which calcium compound contains the **greatest** percentage by mass of calcium?

**A** calcium carbonate

**B** calcium nitrate

**C** calcium hydroxide

**D** calcium sulfate

Your answer

**[1]**

**2** How many electrons are removed from  $2.02 \times 10^{-2}$  g of Ne(g) atoms to form  $\text{Ne}^+(\text{g})$  ions?

**A**  $3.36 \times 10^{-26}$

**B**  $1.66 \times 10^{-27}$

**C**  $6.02 \times 10^{20}$

**D**  $1.22 \times 10^{22}$

Your answer

**[1]**

- 3** A sample of boron contains the isotopes  $^{10}\text{B}$  and  $^{11}\text{B}$ .  
The relative atomic mass of the boron sample is 10.8.

What is the percentage of  $^{11}\text{B}$  atoms in the sample of boron?

- A** 8.0%
- B** 20%
- C** 80%
- D** 92%

Your answer

**[1]**

**4** What is the number of hydrogen atoms in 0.125 mol of  $\text{C}_2\text{H}_5\text{OH}$ ?

**A**  $7.525 \times 10^{22}$

**B**  $4.515 \times 10^{23}$

**C**  $3.7625 \times 10^{23}$

**D**  $3.612 \times 10^{24}$

Your answer

**[1]**

- 5** One molecule of a gas has a mass of  $2.658 \times 10^{-23}$  g.

What is a possible formula of the gas?

**A** CH<sub>4</sub>

**B** O<sub>2</sub>

**C** SO<sub>2</sub>

**D** SO<sub>3</sub>

Your answer

**[1]**

- 6** 3.528 g of a Group 2 metal, **M**, is reacted with an excess of chlorine. The reaction forms 9.775 g of a chloride.

What is metal **M**?

- A** magnesium
- B** calcium
- C** strontium
- D** barium

Your answer

**[1]**

- 7** Sir Humphry Davy discovered several elements including sodium, potassium, magnesium, calcium and strontium.

(a) Explain which block in the Periodic Table sodium and magnesium belong to.

.....  
 ..... **[1]**

(b) A sample of magnesium,  $A_r = 24.305$ , is found to consist of three isotopes. The accurate relative isotopic masses and % abundances of two of the isotopes are shown in the table.

| Isotope          | Relative isotopic mass | % abundance |
|------------------|------------------------|-------------|
| $^{24}\text{Mg}$ | 23.985                 | 78.99%      |
| $^{25}\text{Mg}$ | 24.986                 | 10.00%      |

Determine the relative isotopic mass of the third isotope of magnesium in the sample.

Give your answer to **5** significant figures.

relative isotopic mass = ..... **[2]**

- 8** Which statement gives the numerical value of the Avogadro constant?
- A** The number of moles in 12 g of carbon-12.
- B** The number of electrons lost by 20.05 g of calcium when it reacts with oxygen.
- C** The number of molecules in 16.0 g of oxygen.
- D** The number of atoms in 1 mole of chlorine molecules.

Your answer

**[1]**

- 9** 0.80 g of element **X** is reacted with 0.40 g of  $O_2$  to form an oxide with the formula  $X_2O_3$ .

What is the identity of element **X**?

- A** Aluminium
- B** Titanium
- C** Germanium
- D** Molybdenum

Your answer

**[1]**

**10** This question is about magnesium, bromine and magnesium bromide.

- (a) Relative atomic mass is defined as 'the weighted mean mass compared with 1/12th mass of carbon-12'.

Explain what is meant by the term **weighted mean mass**.

.....  
.....  
.....  
..... **[1]**

- (b) (i) Draw a 'dot-and-cross' diagram for  $\text{MgBr}_2$ .

Show outer electron shells only.

**[2]**

- (ii) Calculate the total number of **ions** in 1.74 g of magnesium bromide,  $\text{MgBr}_2$ .

Give your answer to **3** significant figures.

number of ions = ..... **[3]**

- 11** A compound of nickel, **J**, has the formula  $(\text{NH}_4)_2[\text{Ni}(\text{SCN})_x(\text{NH}_3)_y]$  and contains  $\text{SCN}^-$  and  $\text{NH}_3$  ligands.

The percentage by mass of three of the elements in compound **J** is shown below:  
Ni, 16.26%; S, 35.56%; N, 31.00%.

- (a)** Calculate the values of  $x$  and  $y$  in the formula of compound **J**.

$x =$  .....

$y =$  .....

**[3]**

**12** Which sample contains the greatest number of molecules?

**A** 140.0g  $\text{C}_2\text{H}_2$

**B** 180.0g  $\text{C}_2\text{H}_6$

**C** 240.0g  $\text{C}_4\text{H}_{10}$

**D** 400.0g  $\text{C}_6\text{H}_6$

Your answer

**[1]**

**13** 0.541 g of an element **X** is reacted with oxygen to form 0.790 g of the oxide **X<sub>2</sub>O<sub>3</sub>**.

What is the element **X**?

**A** Al

**B** Cr

**C** Ga

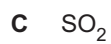
**D** Sc

Your answer

**[1]**

- 14** The mass of 4 molecules of a substance is  $2.125 \times 10^{-22}$  g.

What is the possible formula of the substance?



Your answer

**[1]**

**15** Which sample contains the greatest number of molecules?

**A** 35.0 g of  $\text{C}_2\text{H}_2$

**B** 45.0 g of  $\text{C}_2\text{H}_6$

**C** 60.0 g of  $\text{C}_4\text{H}_{10}$

**D** 100.0 g of  $\text{C}_6\text{H}_6$

Your answer

**[1]**

- 16** 0.688g of an oxide of manganese is reduced by hydrogen gas to form manganese metal and 0.235g of water.

What is the formula of the oxide of manganese?

- A** MnO
- B** MnO<sub>2</sub>
- C** Mn<sub>2</sub>O<sub>3</sub>
- D** Mn<sub>3</sub>O<sub>4</sub>

Your answer

**[1]**

**17** How many hydrogen atoms are in 2.50 g of pharmacolite,  $\text{CaHAsO}_4 \cdot 2\text{H}_2\text{O}$  ( $M_r = 216.0$ )?

**A**  $6.97 \times 10^{21}$

**B**  $2.09 \times 10^{22}$

**C**  $2.79 \times 10^{22}$

**D**  $3.48 \times 10^{22}$

Your answer

**[1]**