

# C4.3 Mastery Quiz: Quantitative Chemistry

## Section A

1. Calculate the relative formula mass ( $M_r$ ) of  $\text{FeBr}_3$ .

Relative atomic masses ( $A_r$ ): Fe = 56 Br = 80

Tick ( $\checkmark$ ) **one** box.

[1]

A. 136

B. 408

C. 296

2. Which ions do alkalis produce in aqueous solutions?

Tick ( $\checkmark$ ) **one** box.

[1]

A.  $\text{H}^+$

B.  $\text{OH}^-$

C.  $\text{O}^{2-}$

3. Acids react with alkalis. What is the name given to this type of reaction?

Tick ( $\checkmark$ ) **one** box.

[1]

A. Decomposition

B. Electrolysis

C. Neutralisation

D. Redox

4. Universal indicator turns purple when added to potassium hydroxide solution. Which is





likely to be the pH of potassium hydroxide solution?

Tick ( $\checkmark$ ) **one** box.

[1]

A. 1

B. 7

C. 14

5. Below shows a chemical formula of a compound.



Choose the correct number of atoms in one molecule.

[1]

Tick ( $\checkmark$ ) **one** box.

A. 1 calcium atom, 1 carbon atom, 3 oxygen atoms

B. 1 calcium atom, 3 carbonate atoms

C. 3 calcium atoms, 3 carbon atoms, 3 oxygen atoms

6. Choose the correct state symbol for an aqueous solution.

[1]

Tick ( $\checkmark$ ) **one** box.

A. (l)

B. (s)

C. (aq)

7. Below shows a symbol equation of a chemical reaction.





When this reaction was carried out in a beaker on a balance, the mass decreased.

Choose the best explanation for why.

[1]

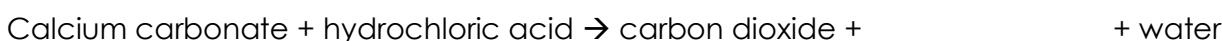
Tick ( $\checkmark$ ) **one** box.

A. Carbon dioxide gas is produced which has no mass

B. Carbon dioxide gas left the beaker

C. Reactants always have a greater mass than the products formed

8. Below shows an incomplete word equation for a chemical reaction.



Choose the missing substance.

[1]

Tick ( $\checkmark$ ) **one** box.

A. Chlorine carbonate

B. Calcium chloride

C. Hydrocarbonate

9. 200 g sodium hydroxide was dissolved in water to make 1 dm<sup>3</sup> solution.

Choose the concentration of this sodium hydroxide solution.

[1]

Tick ( $\checkmark$ ) **one** box.

A. 0.2 g/dm<sup>3</sup>

B. 0.005 g/dm<sup>3</sup>

C. 200 g/dm<sup>3</sup>

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10. How many atoms are present in one mole of fluorine atoms?

Tick () **one** box.

[1]

A. 19

B.  $2.06 \times 10^{23}$

C.  $6.02 \times 10^{23}$

11. Convert 250 cm<sup>3</sup> to dm<sup>3</sup>.

Tick () **one** box.

[1]

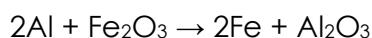
A. 250 dm<sup>3</sup>

B. 0.25 dm<sup>3</sup>

C. 250000 dm<sup>3</sup>

12. A mixture contains 50 g of aluminium and 150 g of iron oxide.

The equation for the reaction is:



Which is the limiting reactant?

Relative atomic masses (Ar): O = 16      Al = 27      Fe = 56

Tick () **one** box.

[1]

A. Aluminium

B. Iron Oxide

C. Iron





13. Select the **correct** statement.

Tick () **one** box.

[1]

- A. Ethanoic acid is a weak acid, because it partially ionises in an aqueous solution.
- B. Sulfuric acid is a strong acid because it partially ionises in an aqueous solution.
- C. Ethanoic acid is a strong acid because it fully ionises in an aqueous solution.

14. Which of the following statements correctly describes a **concentrated** acid?

Tick () **one** box.

[1]

- A. Little or no water molecules are mixed with the acid molecules. The concentration of H<sup>+</sup> ions is low.
- B. Little or no water molecules are mixed with the acid molecules. The concentration of H<sup>+</sup> ions is high.
- C. Many water molecules are mixed with the acid molecules. The concentration of H<sup>+</sup> ions is low.

15. Ethanedioic acid (H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>) is a solid at room temperature.

Calculate the mass of ethanedioic acid equal to 0.048 moles.

Relative formula mass (M<sub>r</sub>): H<sub>2</sub>C<sub>2</sub>O<sub>4</sub> = 90

Tick () **one** box.

[1]

- A. 4.32 g
- B. 0.0005 g
- C. 1875 g

## Section B





1. A student investigated the law of conservation of mass.

This is the method the student used.

1. Pour sodium carbonate solution into beaker A and pour hydrochloric acid solution into beaker B.
3. Place each beaker on a balance to measure the mass of the beakers and their contents.
4. Pour the solution from beaker B into beaker A.
5. Measure the mass of both beakers and contents again.

This is the equation for the reaction that takes place:



- (a) State the law of conservation of mass.

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[1]

- (b) The table shows the student's results.

	Mass in g
Beaker A and contents before mixing	68.76
Beaker B and contents before mixing	72.12
Beaker A and contents after mixing	79.23
Beaker B after mixing	56.65

Explain why this reaction does not appear to obey the law of conservation of mass.

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[2]

- (c) What is the resolution of the balance used to obtain the results in the table?



Tick ( $\checkmark$ ) **one** box.

0.01 g

0.1 g

1 g

100 g

[1]

- (d) Calculate the relative formula mass ( $M_r$ ) of sodium carbonate  $\text{Na}_2\text{CO}_3$

Relative atomic masses ( $A_r$ ): Na = 23 O = 16 C = 12

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Relative formula mass = \_\_\_\_\_

[2]

- (e) What is the percentage by mass of sodium in sodium carbonate ( $\text{Na}_2\text{CO}_3$ )?

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Percentage = \_\_\_\_\_

[2]

- (f) The formula of lithium chromate is  $\text{Na}_2\text{CO}_3$

The charge on a sodium ion is +1

What is the formula of the carbonate ion?

Tick ( $\checkmark$ ) **one** box.

$\text{CO}_3^+$

$\text{CO}_3^{2+}$

$\text{CO}_3^-$

$\text{CO}_3^{2-}$

[1]

- (g) Hydrochloric acid (HCl) is a strong acid.





What ions do all acids produce in aqueous solutions?

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[1]

(h) The student added a few drops of universal indicator to the hydrochloric acid.

What colour will she observe?

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[1]

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2. A student wanted to make 11.5 g of sodium chloride.

The equation for the reaction is:



Relative atomic masses, Ar: H = 1; C = 12; O = 16; Cl = 35.5; Na = 23

(a) Calculate the mass of sodium carbonate the student should react with dilute hydrochloric acid to make 11.5 g of sodium chloride.

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Mass of sodium carbonate = \_\_\_\_\_ g

[5]

(b) The acid used in this reaction has a concentration of  $1.0 \times 10^{-3}$  mol/dm<sup>3</sup>. It has a pH of 2.

What is the pH of a solution of the same acid, with a concentration of  $1.0 \times 10^{-5}$  mol/dm<sup>3</sup>?

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pH = \_\_\_\_\_

[2]

