



C4.3 Mastery Quiz: Quantitative Chemistry

Section A

CHEMISTRY ONLY

1. Calculate the relative formula mass (M_r) of 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 acids produce in aqueous solutions?

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

[1]

A. H^+

B. OH^-

C. 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. What is the pH of potassium hydroxide solution?

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

[1]

A. 1

B. 7

C. 14

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

[1]

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

A. (l)

B. (s)

C. (aq)

6. 200 g sodium hydroxide was dissolved in water to make 1 dm³ solution.

Choose the concentration of this sodium hydroxide solution.

[1]

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

A. 0.2 g/dm³

B. 0.005 g/dm³

C. 200 g/dm³





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

Tick () **one** box.

[1]

A. 19

B. 2.06×10^{23}

C. 6.02×10^{23}

8. Convert 250 cm^3 to dm^3 .

Tick () **one** box.

[1]

A. 250 dm^3

B. 0.25 dm^3

C. 250000 dm^3

9. A student carried out an acid-base titration.

He placed a white tile under the conical flask before he started.

Why did he do this?

Tick () **one** box.

[1]

A. The white tile protects the desk from acid

B. The white tile lifts up the conical flask so it is closer to the burette.

C. The white tile allows the student to see any colour change clearly



10. A student carried out a titration which involved a neutralisation reaction between sodium hydroxide solution and hydrochloric acid. She added the acid to the burette, and the alkali to a conical flask. She carefully added the acid to the conical flask until the alkali was neutralised.

This was repeated 5 times.

The table below displays the students results.

| Titre | Volume of acid required to neutralise the alkali (cm^3) |
|-------|--------------------------------------------------------------------|
| 1 | 21.4 |
| 2 | 21.5 |
| 3 | 20.5 |
| 4 | 21.1 |
| 5 | 21.4 |

Calculate the average titre.

Tick (✓) one box.

[1]

A. 21.22

B. 21.43

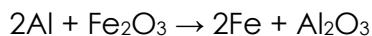
C. 21.35



**HIGHER TIER ONLY**

11. 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 (\checkmark) **one** box.

[1]

A. Aluminium

B. Iron Oxide

C. Iron

12. Select the **correct** statement.

Tick (\checkmark) **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.

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

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

[1]

A. Little or no water molecules are mixed with the acid molecules. The concentration of H⁺ ions is low.

B. Little or no water molecules are mixed with the acid molecules. The concentration of H⁺ ions is high.

C. Many water molecules are mixed with the acid molecules. The concentration of H⁺ ions is low.





14. Ethanedioic acid ($\text{H}_2\text{C}_2\text{O}_4$) is a solid at room temperature.

Calculate the mass of ethanedioic acid equal to 0.048 moles.

Relative formula mass (M_r): $\text{H}_2\text{C}_2\text{O}_4 = 90$

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

[1]

A. 4.32 g

B. 0.0005 g

C. 1875 g

15. What mass of ethanedioic acid ($\text{H}_2\text{C}_2\text{O}_4$) is needed to make 0.25 dm^3 of a solution with concentration 0.05 mol/dm^3 ?

Relative formula mass (M_r): $\text{H}_2\text{C}_2\text{O}_4 = 90$

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

[1]

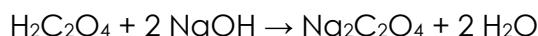
A. 18 g

B. 1.125 g

C. 0.0125 g

16. A student found that 25.0 cm^3 of sodium hydroxide solution was neutralised by 15.00 cm^3 of 0.0480 mol/dm^3 ethanedioic acid solution.

The equation for the reaction is:



0.00072 moles of ethanedioic acid reacted.

- a. Use the equation provided to calculate the number of moles of sodium hydroxide solution that reacted.

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

[1]

A. 0.00072 moles

B. 0.00036 moles

C. 0.00144 moles



- b. Another student carried out the same reaction. They reacted 0.5 moles of sodium hydroxide solution with ethanedioic acid. The volume of sodium hydroxide solution reacted was 25.0 cm^3 .

Calculate the concentration of the sodium hydroxide solution in mol/dm³

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

[1]

A. 20 mol/dm^3

B. 0.02 mol/dm^3

C. 0.0125 mol/dm^3

17. Two balloons are filled with a gas. Both balloons are at standard room temperature and pressure.



Balloon A

Filled with 10 g of hydrogen gas (H_2)

Balloon B

Filled with 20 g of helium gas (He)

Relative formula mass (M_r): H = 1 He = 4

Which statement below is correct?

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

[1]

A. Balloon A will have a greater volume

B. Balloon B will have a greater volume

C. The balloons will have the same volume





Section B

1. (a) A student carried out an acid-base titration.

She used the following equipment:

- A pipette
- 25 cm³ of potassium hydroxide solution
- A conical flask
- Indicator
- A burette filled with sulfuric acid

Describe how the student could use the equipment listed above to complete the titration.

[5]

(b) Hydrochloric acid (HCl) is a strong acid.

What ions do all acids produce in aqueous solutions?

[1]

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

What colour will she observe?

[1]



**HIGHER TIER ONLY**

1. 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.

Mass of sodium carbonate = _____ g

[5]

- (b) Another student carried out this reaction and produced 36 g of water.

Calculate the number of moles of water he produced.

Number of moles = _____

[1]

- (c) The acid used in this reaction has a concentration of 1.0×10^{-3} mol/dm³. It has a pH of 2.

What is the pH of a solution of the same acid, with a concentration of 1.0×10^{-5} mol/dm³?

pH = _____

[2]



(d) The carbon dioxide was collected at room temperature and pressure.

The volume of one mole of any gas at room temperature and pressure is 24.0 dm^3 .

How many moles of carbon dioxide is in 45 cm^3 ?

Give your answer in three significant figures.

= _____ mol

[3]

