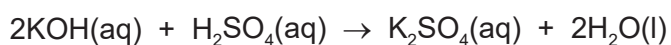


SMART EXAM RESOURCES
SUBJECT: CHEMISTRY
TOPIC: STOICHIOMETRY
SET-2-QP-MS

CALCULATE CONCENTRATION

1

In a titration, 25.0 cm³ of 0.0800 mol / dm³ aqueous potassium hydroxide, KOH(aq), is neutralised by 20.0 cm³ of dilute sulfuric acid, H₂SO₄(aq).



Calculate the concentration of H₂SO₄, in g/dm³ using the following steps.

- Calculate the number of moles of KOH used.

..... mol

- Determine the number of moles of H₂SO₄ which react with the KOH.

..... mol

- Calculate the concentration of H₂SO₄ in mol/dm³.

..... mol/dm³

- Calculate the concentration of H₂SO₄ in g/dm³.

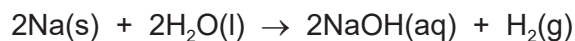
..... g/dm³
[5]

MARK SCHEME:

Question	Answer	Marks
	$M1 \text{ mol KOH} = 0.0800 \times 25 / 1000$ $= 0.002(00) / 2(00) \times 10^{-3}$ $M2 \text{ mol H}_2\text{SO}_4 = M1 / 2 = 0.002 / 2$ $= 0.001(00) / 1(00 \times 10^{-3}$ $M3 = M2 \times 1000 / 20 = 0.001 \times 1000 / 20$ $= 0.05(00) / 5.(00) \times 10^{-2}$ $M4 = 98$ $M5 = 98 \times M3 = 98 \times 0.05(00) = 4.9(0) \text{ (g / dm}^3\text{)}$	5

2

The equation for the reaction is shown.



Calculate the concentration of NaOH(aq) formed, in g/dm³, when 0.345 g of sodium is added to 50.0 cm³ of distilled water. Assume there is no change in volume.

Use the following steps.

- Calculate the number of moles of Na added.

= mol

- Determine the number of moles of NaOH formed.

= mol

- Calculate the concentration of NaOH in mol/dm³.

concentration of NaOH = mol/dm³

- Determine the M_r of NaOH and calculate the concentration of NaOH in g/dm³.

concentration of NaOH = g/dm³

MARK SCHEME:

M1 $\text{mol Na} = 0.345 / 23 = 0.015(00)$ (1)	5
M2 $\text{mol NaOH} = \text{M1} = 0.015(00)$ (1)	
M3 $\text{M2} \times 1000 / 50 = 0.015(00) \times 20 = 0.3(00)$ (1)	
M4 $M_r \text{ NaOH} = 40(1)$	
M5 $\text{M4} \times \text{M3} = 40 \times 0.3 = 12.0$ (g / dm ³) (1)	

3

- (ii) A student found that 2.5 g of zinc carbonate required 20 cm³ of dilute nitric acid to react completely.

Calculate the concentration of dilute nitric acid using the following steps:

- calculate the mass of 1 mole of ZnCO₃

..... g

- calculate the number of moles of ZnCO₃ reacting

..... moles

- determine the number of moles of HNO₃ reacting

..... moles

- calculate the concentration of HNO₃.

..... mol/dm³
[4]

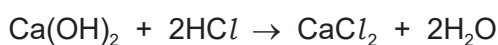
MARK SCHEME:

M1 125 M2 $2.5 / 125 = 0.02(00)$ M3 $0.02(00) \times 2 = 0.04(00)$ M4 $0.04(00) \times 1000 / 20 = 2(.00)$	4
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4

A 25.0 cm³ sample of limewater is placed in a conical flask. The concentration of Ca(OH)₂ in the limewater is determined by titration with dilute hydrochloric acid, HCl.

The equation for the reaction is shown.



20.0 cm³ of 0.0500 mol/dm³ HCl reacts with the 25.0 cm³ of Ca(OH)₂.

Determine the concentration of Ca(OH)₂ in g/dm³. Use the following steps.

- Calculate the number of moles in 20.0 cm³ of 0.0500 mol/dm³ HCl.

..... mol

- Determine the number of moles of Ca(OH)₂ in 25.0 cm³ of the limewater.

..... mol

- Calculate the concentration of Ca(OH)₂ in mol/dm³.

..... mol/dm³

- Determine the concentration of Ca(OH)₂ in g/dm³.

..... g/dm³
[5]

MARK SCHEME:

M1 Mol $\text{HCl} = 0.0500 \times 20.0 / 1000 = 0.001(00)$ M2 Mol $\text{Ca(OH)}_2 = \text{M1} / 2 = 0.00100 / 2 = 0.0005(00)$ M3 $\text{M2} \times 1000 / 25 = 0.0005(00) \times 40 = 0.02(00)$ M4 $M_r \text{Ca(OH)}_2 = 74$ M5 $\text{M4} \times \text{M3} = 74 \times 0.02 = 1.48 \text{ (g / dm}^3\text{)}$	5
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5

- a Manganese(IV) oxide is added to 20 cm³ of aqueous hydrogen peroxide. The total volume of oxygen gas produced is 72 cm³ at r.t.p.



Calculate the concentration of the aqueous hydrogen peroxide in g/dm³ using the following steps.

- Calculate the number of moles of oxygen gas produced.

..... mol

- Determine the number of moles of hydrogen peroxide which reacts.

..... mol

- Calculate the concentration of aqueous hydrogen peroxide in mol/dm³.

..... mol/dm³

- Calculate the concentration of aqueous hydrogen peroxide in g/dm³.

..... g/dm³
[5]

- b Suggest the identity of one **other** metal oxide which also catalyses this reaction.

..... [1]

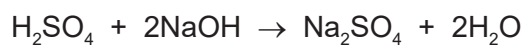
MARK SCHEME

a	M1 $\text{mol O}_2 = 72 / 24000 = 0.003(00)$ (1) M2 $\text{mol H}_2\text{O}_2 = \text{M1} \times 2 = 0.002 \times 2 = 0.006(00)$ (1) M3 $\text{conc H}_2\text{O}_2 = \text{M2} \times 1000 / 20 = 0.006 \times 1000 / 20 = 0.3(00)$ (1) M4 $M_r \text{ H}_2\text{O}_2 = 34$ (1) M5 $= \text{M4} \times \text{M3} = 34 \times 0.3 = 10.2 \text{ (g / dm}^3\text{)}$ (1)	5
b	any transition metal oxide	1

6

20.0 cm³ of H₂SO₄ reacts with 25.0 cm³ of 0.200 mol/dm³ NaOH.

The equation for the reaction is shown.



Calculate the concentration of H₂SO₄ using the following steps.

- Calculate the number of moles in 25.0 cm³ of 0.200 mol/dm³ NaOH.

..... mol

- Determine the number of moles of H₂SO₄ that react with the NaOH.

..... mol

- Calculate the concentration of H₂SO₄.

..... mol/dm³
[3]

MARK SCHEME

0.005 / 5×10^{-3} (1)	3
0.0025 / 2.5×10^{-3} (1)	
0.125 (1)	