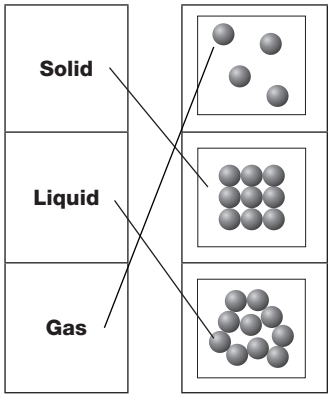
AQA Chemistry Practice Paper Answers

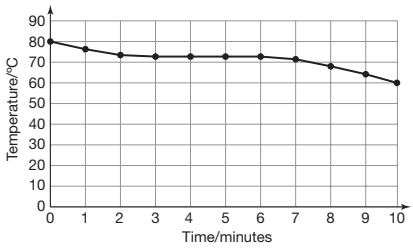
Paper 1

1.1 a



b (Suitable scale; All points plotted correctly; majority of points plotted correctly)

c (Correct line; Freezing point stated as 72°C)



H **d** Assumed that there are no forces between the particles.

1.2 a LiCl **b** OH^- **c** 30

1.3

Isotope	Number of protons	Number of electrons	Number of neutrons
$^{6}_{3}Li$	3	3	3
$^{7}_{3}Li$	3	3	4

1.4 a 7.5%

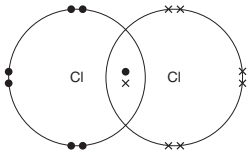
b (7 × 92.5) + (6 × 7.5); divided by 100; 6.925, or rounded to at least 1 dp.

2.1 a

Substance	Type of bonding	Melting point	Electrical conductivity
Calcium	**metallic**	842	Good
Chlorine	**covalent**	–102	Does not conduct
Calcium chloride	**ionic**	772	Conducts only when molten or in solution

b Electrons are free to move/ delocalised electrons; Carry the charge throughout the metal.

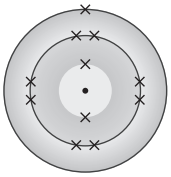
c



(each Cl has 7 electrons; 1 shared pair)

d Possible points to include: Chlorine has strong covalent bonds but weak intermolecular forces; Require little energy to break; Calcium chloride has strong ionic bonds due to strong electrostatic attraction between oppositely charged ions; Require higher amounts of energy to break; Metallic bonding is strong due to strong electrostatic attraction between positive metal ions and delocalised electrons.

2.2 a



b Equal numbers of protons and electrons, charges cancel each other out.

2.3 a Ions are free to move when molten/in solution; These can carry the charge; Ions are fixed in a solid and cannot move.

b Sodium loses 1 electron; 2 sodium atoms required; One oxygen atom; Gains 2 electrons from the two sodium atoms.

H **c** Moles Na = 5/23
= 0.2174;
Moles Na_2O = 0.2174/2
= 0.1087;
Molar mass Na_2O = 62;
Mass Na_2O = 0.1087 × 62
= 6.74 g.

3.1 a Lithium sulfate.

b 7

c Ethanoic acid.

3.2 a Aqueous/dissolved in water.

b Fizzing/magnesium carbonate disappears.

c Magnesium carbonate stops reacting/magnesium carbonate is left over/fizzing stops.

H **d** Volume needs to be converted to dm^3 so it is divided by 1000:
Moles = conc × vol
= 2 × 20/1000
= 0.04

H **e** Moles CO_2 = 0.04/2 = 0.02;
Volume CO_2 = 0.02 × 24
= 0.48 dm^3;
Using 0.1 moles HCl
Moles CO_2 = 0.1/2 = 0.05;
Volume CO_2 = 0.05 × 24 = 1.2 dm^3

3.3 a % yield = 1.18/1.90 × 100;
= 62.1% (if quoted to 1 dp, 2 marks, allow any correctly rounded number up to calculator value for 1 mark
(Allow 3 marks for correct final answer with no working)

b Any one from: Side reactions take place; Solid remaining in containers; Solid lost due to spitting during evaporation.

c $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$ (correct; balanced; state symbols)

3.4 a Until concordant results are obtained/two results within 0.1 cm^3.

b 19.75 cm^3 as anomalies discounted; 1 mark for any correct mean calculated using any of the other values.

c Moles HNO_3 = conc × vol
= 0.15 × 0.01975
= 2.963 × 10^{-3};
Moles KOH = 2.963 × 10^{-3};
Conc KOH = mol/vol
= 2.963 × 10^{-3}/0.025
= 0.1185 mol/dm^3.

d MrKOH = 56;
Conc KOH = 0.1185 × 56
= 6.64 g/dm^3

e Potassium nitrate.

f $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ (correct; state symbols)

4.1 a Potassium is more reactive than carbon.

b Potassium chloride.

c K^+

d $2Cl^- \rightarrow Cl_2 + 2e^-$

e Oxidation

4.2 a Hydrogen; Potassium is more reactive than hydrogen/metals above hydrogen in reactivity series.

H **b** $2H^+ + 2e^- \rightarrow H_2$ (correct; balanced)

c Potassium hydroxide (name required, not formula)

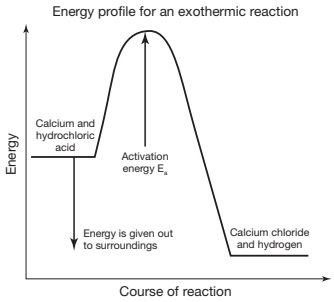
5.1 **a** Any two from: Volume of acid; Concentration of acid; Surface area of metal.

b Type of metal.

c Most reactive Calcium, Magnesium, Zinc, Iron least reactive. (All 4 correct (2); 2 or 3 correct (1))

d Calcium + hydrochloric acid → calcium chloride + hydrogen

e



H 5.2 **a** Energy needed to break bonds = (1 × C – C) + (5 × C – H) + (1 × C – O) + (1 × O – H) + (3 × O = O) = 4750;

Energy released when new bonds made = (4 × C = O) + (6 × O – H) = 5990;

Energy change = 5990 – 4750 = 1240 kJ/mol

b Exothermic; Energy required to break bonds is less than energy released when new bonds are made.

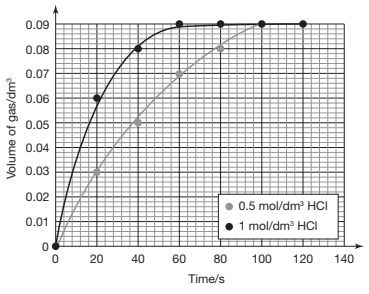
Paper 2

1.1 Concentration of hydrochloric acid.

1.2 There are more particles to react; The rate of collisions increases.

1.3 Carbon dioxide is produced/the carbon dioxide bubbles are collected; the volume of carbon dioxide produced is recorded at set time intervals.

1.4



(labelled axes; plotted; lines of best fit for both sets of data)

1.5 0.5 mol/dm³ HCl – 0.06 dm³; 1 mol/dm³ HCl – 0.07 dm³

1.6 It would increase the rate of reaction; by increasing the kinetic energy of particles/increasing the rate of effective collisions.

1.7 Increasing surface area increases the rate of reaction; as the student was testing the effect of concentration it is important to keep other variables the same.

H 1.8 The rate of reaction is highest at the early stages of the reaction in both tests because this is the stage of the reaction when there is most reacting particles; as the reaction progresses the reaction slows down as most of the reacting particles have already reacted; the 1 mol/dm³ test completes sooner, at 60 s compared to 100 s; as the rate of reaction at the start of the 1 mol/dm³ test is faster.

2.1 C_4H_{10}

2.2 C_4H_8

2.3 **a** A - Methane; B - Hexane.

b **i** Methane has a lower melting/boiling point or hexane has a higher melting/boiling point.

ii Methane is a gas at room temperature and hexane is a liquid at room temperature.

2.4 **a** **Y** – ethanol

b **X** – fermentation

2.5 **a** $C_nH_{2n+1}OH$

b OH

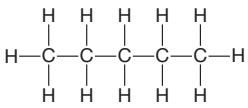
c $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

d **i** Ethanoic acid

ii It decreases.

e Ester

2.6 **a**



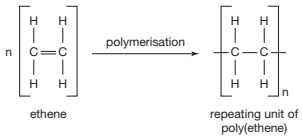
b Two from: Ethene is a alkene as it has a double bond; Ethene is unsaturated; Ethene contains two carbon atoms per molecule and pentane contains five.

c **i** Cracking

ii Heptane is heated until it is a gas; and then passed over a hot catalyst.

d **i** Ethene put under pressure; and heated; with a catalyst; will polymerise to form poly(ethane).

ii



H e Poly(ethene) is an addition polymer; it is made by adding together molecules of ethene; Condensation polymers are made from 2 different monomers which each have 2 functional groups.

3.1 Water; Iron.

3.2 Turns limewater cloudy.

3.3 **a** Calcium, Yellow-red; Lithium, Red; Sodium, Orange; Potassium, Lilac.

b Flame emission spectroscopy; Testing with sodium hydroxide.

3.4 Aluminium carbonate; Aluminium ions forms a white precipitate with sodium hydroxide; which dissolves in excess sodium hydroxide; Hydrochloric acid reacts with carbonate to form carbon dioxide which turns limewater cloudy.

4.1 **a** **i** Nitrogen

ii Carbon dioxide

b Higher temperature; 460°C compared to 20°C; water boils at 100°C.

4.2 **a** It is a greenhouse gas/increases greenhouse effect; causing global warming/climate change OR a consequence of global warming, e.g. sea level rise, flooding, melting ice-caps etc.

b Radiation from the Sun enters the atmosphere and hits Earth; It absorbs short wavelength radiation and warms up; Long wavelength radiation is reflected and absorbed by greenhouse gases, warming the atmosphere.

c **i** Two from: Soot; Carbon monoxide; Sulfur dioxide; Oxides of nitrogen.

ii One from: Soot - Global dimming and lung damage; Carbon monoxide - A toxic gas which binds to haemoglobin in blood, preventing the transport of oxygen around the body; Sulfur dioxide - Dissolves in clouds to cause acid rain and causes respiratory problems; Oxides of nitrogen - Dissolves in clouds to cause acid rain and causes respiratory problems.

5.1 **a** In iron, all the atoms are the same size so they can slip over each other; Steel contains carbon and iron; The atoms are different sizes which stops the iron atoms slipping apart.

b Iron ore is a finite resource OR the amount of iron ore is rapidly declining; Mining iron ore is environmentally damaging; Extracting iron from its ore using a blast furnace/at high temperatures; is energy intensive; and it produces carbon dioxide; Recycling iron

uses much less energy - reducing the financial cost and production of carbon dioxide.

0 marks	1-2 marks	3-4 marks	5-6 marks
No valid points are made or only information from the text is given in the answer	Some relevant points are made; some evidence of interpreting information given in the text.	Relevant points are made which demonstrate a good knowledge and understanding of relevant scientific ideas.	Relevant points are expressed clearly and show the application of an excellent knowledge and understanding of relevant scientific ideas.

5.2 **a** A naturally occurring mineral from which metals can be extracted.

b Reduction

c Any one from: Potassium/sodium/calcium/magnesium/aluminium.

5.3 **a** To remove solids in the water, such as leaves and soil.

b To sterilise it, killing microbes that may cause disease.

5.4 The student could evaporate it; any impurities such as salts would remain OR The student could test its boiling point, e.g. by using distillation – pure water should boil at 100°C, impurities would increase the boiling point.

5.5 **a** It is a catalyst.

b **i** An equilibrium is achieved when rate of the forward reaction is exactly the same as the rate of the backward reaction (allow when the concentration of reactants and products remain constant).

H **ii** In this equilibrium the forward reaction to form ammonia is exothermic; therefore if the temperature is low the yield from the exothermic reaction increases.

iii In this gaseous equilibrium if the pressure is high this will favour the reaction that produces the least number of molecules, that is, the forward reaction to form ammonia.