

Write your name here					
Surname			Other names		
Pearson Edexcel		Centre Number		Candidate Number	
Level 1/Level 2 GCSE (9-1)		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	
<h1>Chemistry</h1>					
<h2>Paper 1</h2>					
Foundation Tier					
Thursday 17 May 2018 – Morning				Paper Reference	
Time: 1 hour 45 minutes				1CH0/1F	
You must have: Calculator, ruler					Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an asterisk (*), marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- A periodic table is printed on the back cover of this paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box .
If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

- 1 Figure 1 shows the dot and cross diagram for a molecule of ammonia.

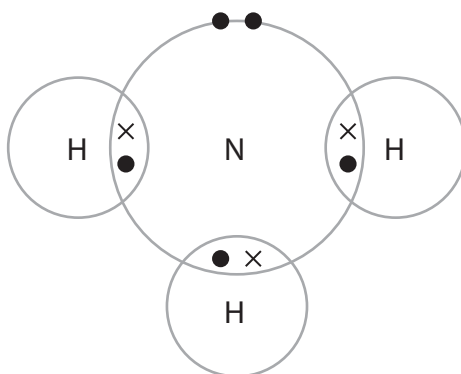


Figure 1

- (a) (i) What do the dots and crosses represent in the diagram?

(1)

- A electrons
 B neutrons
 C protons
 D nuclei

- (ii) Give the formula for the molecule of ammonia.

(1)

- (b) (i) Ammonia can be manufactured by the Haber process.

The word equation for the reaction is



State the meaning of the \rightleftharpoons symbol.

(1)

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- (ii) In the Haber process, the percentage yield of ammonia at equilibrium changes with temperature.

Figure 2 shows how the percentage yield of ammonia at equilibrium changes with temperature.

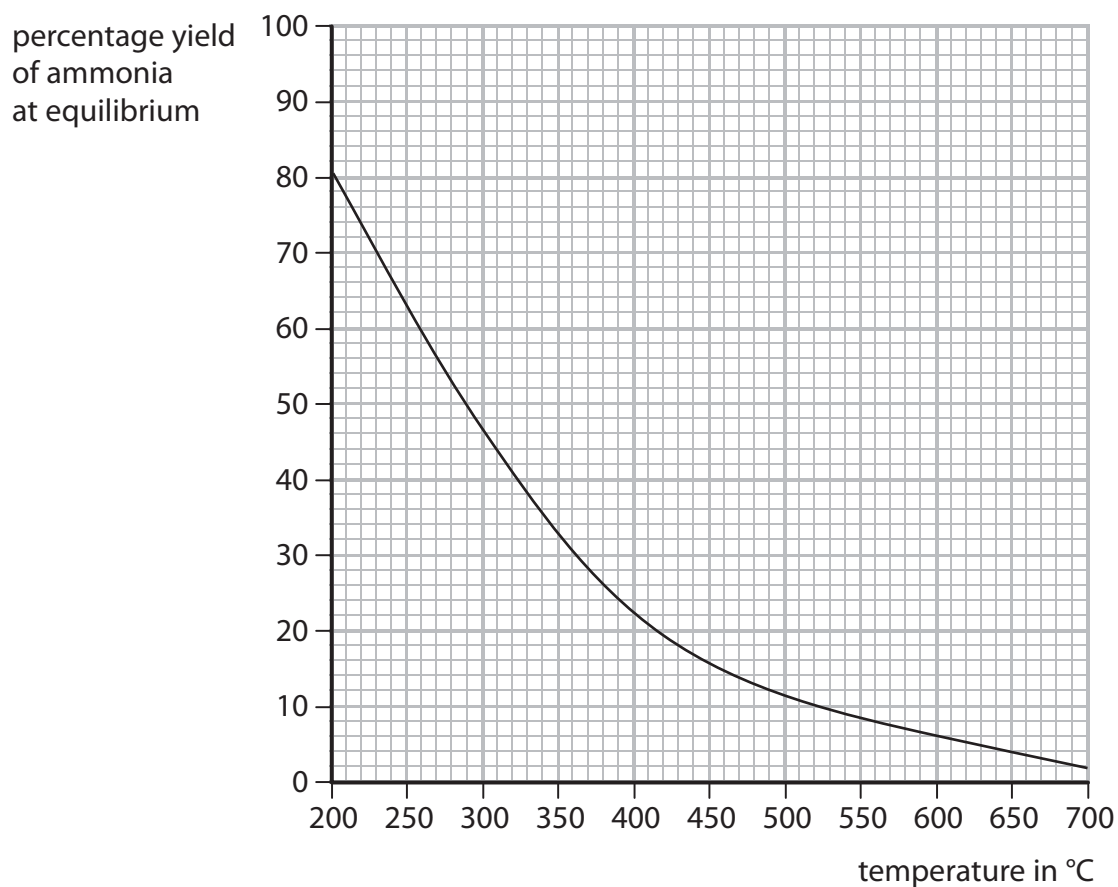


Figure 2

State what happens to the percentage yield of ammonia at equilibrium as the temperature increases.

(1)

- (iii) Use the graph to find the percentage yield of ammonia at equilibrium at 450°C.

(1)

percentage yield of ammonia at equilibrium =



(c) Ammonia reacts with nitric acid to form ammonium nitrate.

(i) Complete the word equation for this reaction.

(1)

..... + →

(ii) An ammonium ion has the formula NH_4^+ .

A nitrate ion has the formula NO_3^- .

Which of the following is the formula for ammonium nitrate?

(1)

A $(\text{NH})_4\text{NO}_3$

B $(\text{NH}_4\text{NO})_3$

C NH_4NO_3

D $(\text{NHNO})_{12}$

(iii) Explain why farmers spread ammonium nitrate on their fields.

(2)

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(Total for Question 1 = 9 marks)



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2 (a) A titration of sodium hydroxide solution with hydrochloric acid can be carried out as follows

- 1 a pipette is used to measure 25.00 cm^3 of sodium hydroxide solution into a conical flask
- 2 a few drops of indicator are added to the sodium hydroxide solution
- 3 the burette is filled with hydrochloric acid
- 4 the hydrochloric acid is added to the sodium hydroxide solution until the indicator changes colour.

(i) Describe how the pipette should be used to measure exactly 25.00 cm^3 of sodium hydroxide solution into the conical flask.

(2)

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(ii) The burette is first washed with water.
It is then rinsed with some of the acid before it is filled with the acid to begin the titration.

Explain why the burette is rinsed with the acid.

(2)

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(b) Universal indicator solution is not a suitable indicator for an acid-alkali titration.

- (i) Give the name of an indicator that is suitable for use in the titration of sodium hydroxide solution with hydrochloric acid.

(1)

- (ii) Universal indicator goes through a series of gradual colour changes as the pH changes in a solution.

Give a reason why universal indicator is not a suitable indicator to use in an acid-alkali titration.

(1)

- (c) Figure 3 shows some titration results obtained from an experiment in which an alkali is titrated with an acid.

	titration		
	rough	1	2
final burette reading in cm^3	25.75	49.35	23.70
initial burette reading in cm^3	0.00	25.75	0.00
volume of acid used in cm^3	25.75	23.60	23.70

Figure 3

Calculate the accurate volume of acid reacting with the alkali.

(2)

accurate volume of acid reacting cm^3

(Total for Question 2 = 8 marks)

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3 (a) Atoms contain electrons, neutrons and protons.

(i) Draw one line to link each particle to its correct relative charge.

(2)

particle	relative charge
electron	+1
neutron	0
proton	-1

(ii) Which of the following is the relative mass of a proton?

(1)

- A 0
- B $\frac{1}{1837}$
- C 1
- D -1

(b) Argon is in group 0 of the periodic table.

Identify, using the periodic table on the back cover of this paper, which of these elements is in the same period as argon.

(1)

- A bromine
- B iron
- C magnesium
- D xenon

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(c) Figure 4 shows the atomic number and mass number of two isotopes of argon.

isotope	atomic number	mass number
argon-38	18	38
argon-40	18	40

Figure 4

Describe the structure of an atom of argon-38 and of an atom of argon-40.

(3)

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(Total for Question 3 = 7 marks)

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4 (a) The molecular formula of butene is C_4H_8 .

Which of the following is the empirical formula of butene?

(1)

- A CH
- B CH_2
- C C_4H_8
- D $(CH_2)_4$

(b) Calculate the relative formula mass of butene, C_4H_8 .

(relative atomic masses: H = 1, C = 12)

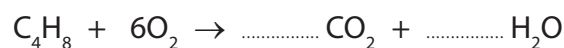
(2)

relative formula mass

(c) When burnt completely in air, butene forms carbon dioxide and water.

(i) Balance the equation for this reaction by putting numbers in the spaces provided.

(2)



(ii) Describe the test to show that a gas is carbon dioxide.

(2)

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- (d) Substance X is a gas at room temperature.
It is a simple molecular, covalent substance.

Which row of the table shows the properties that substance X is most likely to have? (1)

	boiling point in °C	relative solubility in water
<input type="checkbox"/> A	-6	low
<input type="checkbox"/> B	600	high
<input type="checkbox"/> C	-6	high
<input type="checkbox"/> D	600	low

- (e) Diamond has a giant covalent structure.

State one property of diamond that is the result of its giant covalent structure. (1)

(Total for Question 4 = 9 marks)

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5 Two compounds of barium are barium sulfide and barium chloride.

(a) The hazard symbol shown in Figure 5 is on bottles containing barium metal.



Figure 5

State the meaning of this hazard symbol.

(1)

(b) Give the names of the elements combined in barium sulfide.

(1)

(c) Barium chloride is toxic.

Explain one safety precaution that should be taken when using barium chloride.

(2)

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- (d) (i) A beaker of barium chloride solution and a beaker of dilute sulfuric acid were placed on a balance, as shown in Figure 6.

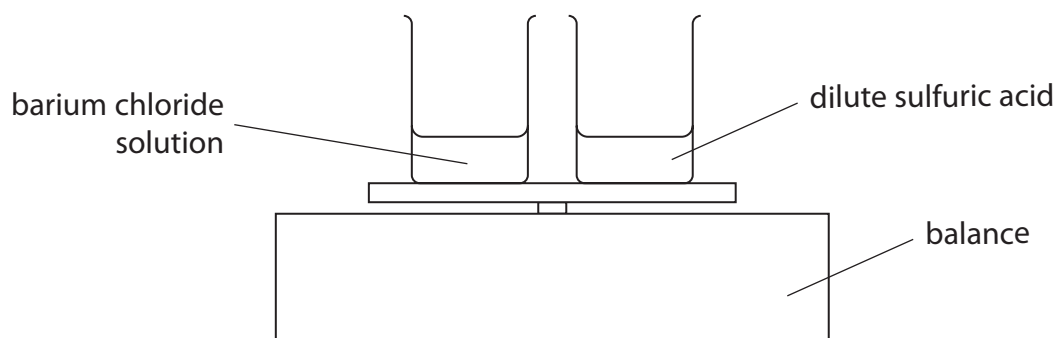


Figure 6

The total mass reading on the balance was 25.7 g.

The dilute sulfuric acid was poured into the barium chloride solution and the beaker replaced on the balance, as shown in Figure 7.

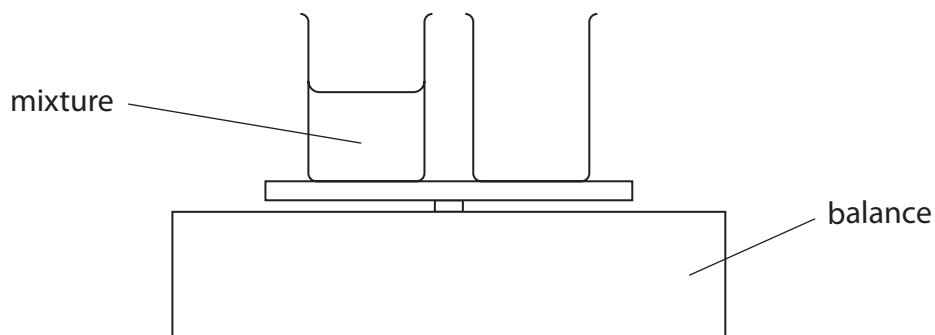


Figure 7

The mixture formed contained a white precipitate.

State the total mass reading on the balance after the reaction.

(1)

- (ii) Give the name of the white precipitate formed by the reaction of barium chloride solution with dilute sulfuric acid.

(1)



(e) Solid sodium chloride is dissolved in water.

The sodium chloride solution is electrolysed in the apparatus shown in Figure 8.

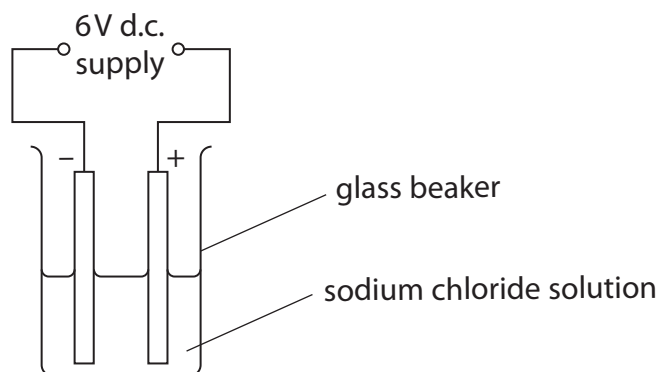


Figure 8

(i) State why sodium chloride solution, rather than solid sodium chloride, must be used in this experiment.

(1)

(ii) The formulae of the ions present in the sodium chloride solution are



Circle the ions that would be attracted to the anode.

(1)

(iii) Molten lead bromide can be electrolysed to form molten lead and bromine gas.

Explain how a student could modify the apparatus shown in Figure 8 to carry out this electrolysis.

(2)

(Total for Question 5 = 10 marks)



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6 An ink is a mixture of coloured substances dissolved in water.

(a) Which method is used to separate the coloured substances in the ink?

(1)

- A chromatography
- B crystallisation
- C filtration
- D fractional distillation

(b) The apparatus shown in Figure 9 can be used to separate water from ink.

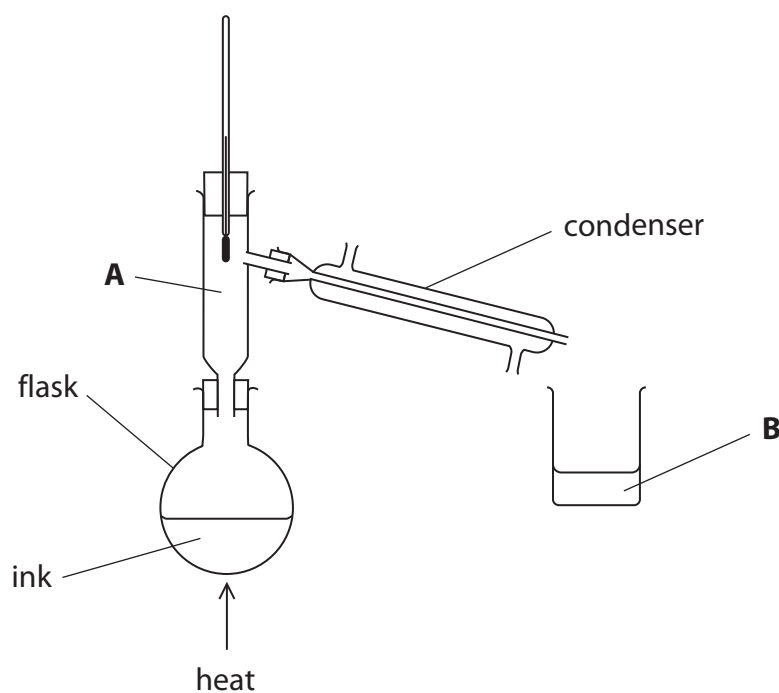


Figure 9

(i) Cold water flows through the condenser.

On Figure 9 use arrows to show where the water should flow in and where it should flow out.

(1)

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(ii) Explain why a condenser is used.

(2)

(iii) The flask was heated with a Bunsen burner.

Give the name of an alternative piece of apparatus that could be used to heat the flask.

(1)

(c) The particles in the ink in the flask can be shown as in Figure 10.

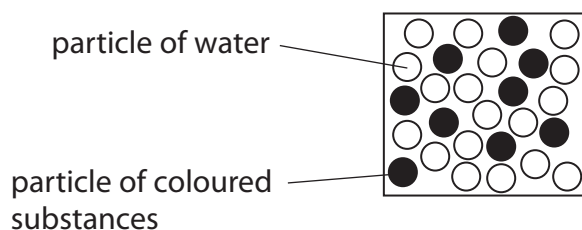
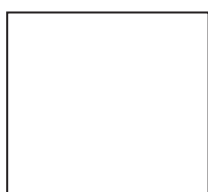


Figure 10

In the boxes below, draw the arrangement of particles that would be expected at **A** and **B** shown in Figure 9.

(2)



particles at **A**



particles at **B**



(d) Changes of state between the three states of matter are shown in Figure 11.



Figure 11

The changes shown are physical changes.

Explain why these changes are called physical changes rather than chemical changes.

(2)

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(Total for Question 6 = 9 marks)

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7 *(a) Pure metals are often converted into more useful alloys.
For example, aluminium is converted into an alloy used in aircraft, iron is converted into an alloy used in cutlery and gold alloys are used in jewellery. These processes of alloying change the structures of the metals.

Some properties of pure aluminium, iron and gold are shown in Figure 12.

	density in g cm ⁻³	malleability	relative strength
aluminium	2.70	easy to bend	low
iron	7.75	easy to bend	low
gold	19.3	easy to bend	low

Figure 12

Explain how alloying changes these pure metals to make the alloys more suitable for the given uses.

(6)

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(b) Iron objects can corrode when exposed to the atmosphere.

(i) Corrosion involves the oxidation of iron.

State what is meant by **oxidation**.

(1)

(ii) Painting iron objects prevents corrosion.

Explain why painting iron objects prevents corrosion.

(2)

(iii) Corrosion of iron objects can be prevented by painting them or by electroplating them.

State one **other** way of preventing the corrosion of iron objects.

(1)



(c) The apparatus shown in Figure 13 was used to electroplate a spoon with nickel.

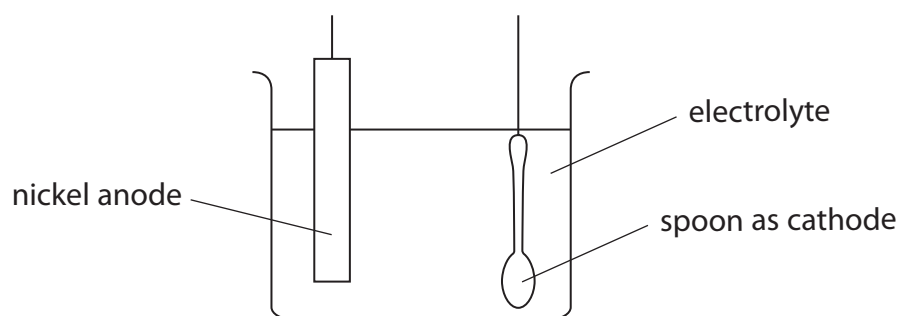


Figure 13

- (i) State to what the anode and cathode have to be connected in order to carry out the electroplating.

(1)

- (ii) Predict the name of a substance that could be dissolved in water to form the electrolyte for this electroplating.

(1)

(Total for Question 7 = 12 marks)

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8 (a) State **two** characteristic properties of metals.

(2)

property 1.....

property 2.....

(b) Acids are used to make salts.

Give the name of the acid used to make chlorides.

(1)

(c) Salts of metals can be prepared by reacting the metal with an acid to produce the salt and hydrogen.

(i) Describe the test to show that the gas is hydrogen.

(2)

(ii) Nickel is a metal.

Explain how the structure of a nickel atom, Ni, changes when it forms a nickel ion, Ni²⁺.

(2)

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- (d) A nickel sulfate solution is made by dissolving 23.5 g of nickel sulfate to make 250 cm³ of solution.

Calculate the concentration of the solution in g dm⁻³.

(2)

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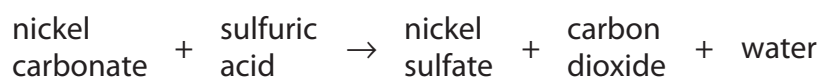
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concentration = g dm⁻³

- (e) Excess solid nickel carbonate is added to dilute sulfuric acid in a beaker.



Nickel sulfate is formed in solution.

Describe how a sample of pure, dry nickel sulfate crystals can be obtained from the mixture of nickel sulfate solution and excess solid nickel carbonate in the beaker.

(3)

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(Total for Question 8 = 12 marks)

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9 Most metals are extracted from ores found in the Earth's crust.

The method used to extract a metal from its ore is linked to the reactivity of the metal.

Part of the reactivity series is shown in Figure 14.

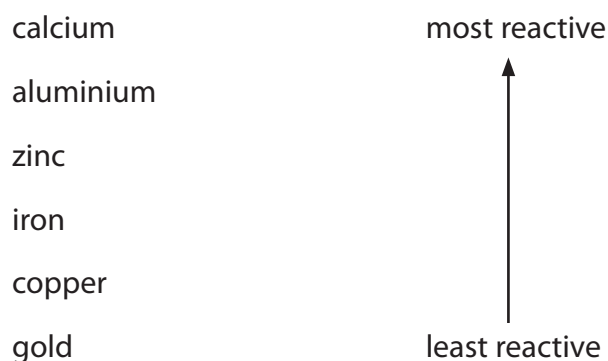
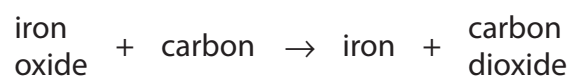


Figure 14

(a) Iron ore contains iron oxide.

Iron is extracted from iron oxide by heating the oxide with carbon.



(i) In this reaction

- A carbon is reduced
- B iron oxide is neutralised
- C iron oxide is reduced
- D iron is oxidised

(1)

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(ii) The formula of the iron oxide is Fe_2O_3 .

Calculate the maximum mass of iron that can be obtained from 240 tonnes of iron oxide, Fe_2O_3 .

(relative atomic masses: O = 16, Fe = 56)

(3)

mass of iron = tonnes

(b) Aluminium cannot be extracted by heating its oxide with carbon. Aluminium has to be extracted from its oxide by electrolysis.

Explain why.

(2)

(c) Predict the method that will have to be used to extract calcium from its ore.

(1)

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*d) Aluminium is extracted from its ore by electrolysis.
Iron is extracted from its ore by heating with carbon.
Both metals can also be obtained by recycling.

Explain the advantages of recycling aluminium and iron rather than extracting them from their ores.

(6)

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(Total for Question 9 = 13 marks)



10 (a) Hydrogen burns in air at a temperature well above 100°C to form water.

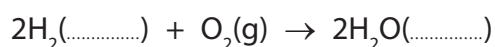
(i) The boiling points of hydrogen and water are shown in Figure 15.

	boiling point in °C
hydrogen	-253
water	100

Figure 15

Use this information to add the missing state symbols to the equation for the reaction taking place as the hydrogen burns.

(2)



(ii) The atom economy for the reaction in (i) is 100%.

State how the equation shows that the atom economy is 100%.

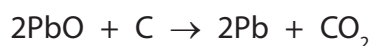
(1)

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(b) Lead can be obtained by heating its oxide with carbon.

The balanced equation for the reaction is



Calculate the atom economy for the production of lead in this reaction.

(relative atomic masses: C = 12, O = 16, Pb = 207

relative formula masses: PbO = 223, CO₂ = 44)

Give your answer to two significant figures.

(4)

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atom economy = %

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- (c) (i) In an experiment to produce lead, 7.67 g of lead are obtained.
The theoretical yield of lead for the experiment is 11.80 g.

Calculate the percentage yield of lead in this experiment.

(2)

percentage yield =

- (ii) In most reactions, the percentage yield of any product is less than 100%.

Give **two** reasons why the percentage yield is less than 100%.

(2)

reason 1

reason 2

(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 MARKS



The periodic table of the elements

1	2	3	4	5	6	7	0	
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	15 O oxygen 8	16 F fluorine 9	17 Ne neon 10
19 K potassium 19	20 Ca calcium 20	23 Sc scandium 21	24 Ti titanium 22	25 V vanadium 23	26 Cr chromium 24	27 Mn manganese 25	28 Fe iron 26	29 Co cobalt 27
37 Rb rubidium 37	38 Sr strontium 38	39 Y yttrium 39	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45
55 Cs caesium 55	56 Ba barium 56	57 La* lanthanum 57	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77
85 At astatine [210]	86 Rn radon [222]	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]	87 Fr francium [223]
103 Lu lutetium 103	104 Hf hafnium 104	105 Ta tantalum 105	106 W tungsten 106	107 Re rhenium 107	108 Os osmium 108	109 Ir iridium 109	110 Pt platinum 109	111 Au gold 111
121 La lanthanum 121	122 Ce cerium 122	123 Pr praseodymium 123	124 Nd neodymium 124	125 Pm promethium [147]	126 Sm samarium 126	127 Eu europium 127	128 Gd gadolinium 128	129 Tb terbium 129
137 Rb rubidium 137	138 Sr strontium 138	139 Y yttrium 139	140 Zr zirconium 140	141 Nb niobium 141	142 Mo molybdenum 142	143 Tc technetium [98]	144 Ru ruthenium 144	145 Rh rhodium 145
153 Eu europium 153	154 Gd gadolinium 154	155 Tb terbium 155	156 Dy dysprosium 156	157 Ho holmium 157	158 Er erbium 158	159 Tm thulium 159	160 Yb ytterbium 160	161 Lu lutetium 161
173 Lu lutetium 173	174 Hf hafnium 174	175 Ta tantalum 175	176 W tungsten 176	177 Re rhenium 177	178 Os osmium 178	179 Ir iridium 179	180 Pt platinum 180	181 Au gold 181
187 Fr francium [223]	188 Ra radium [226]	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]	87 Fr francium [223]
115 In indium 115	116 Sn tin 116	117 Pb lead 117	118 Bi bismuth 117	119 Po polonium [209]	120 At astatine [210]	121 Rn radon [222]	122 Fr francium [223]	123 Ac actinium [227]
133 La lanthanum 133	134 Ce cerium 134	135 Pr praseodymium 135	136 Nd neodymium 136	137 Pm promethium [147]	138 Sm samarium 138	139 Eu europium 139	140 Gd gadolinium 140	141 Tb terbium 141
151 La lanthanum 151	152 Ce cerium 152	153 Pr praseodymium 153	154 Nd neodymium 154	155 Pm promethium [147]	156 Sm samarium 156	157 Eu europium 157	158 Gd gadolinium 158	159 Tb terbium 159
169 La lanthanum 169	170 Ce cerium 170	171 Pr praseodymium 171	172 Nd neodymium 172	173 Pm promethium [147]	174 Sm samarium 174	175 Eu europium 175	176 Gd gadolinium 176	177 Tb terbium 177
185 La lanthanum 185	186 Ce cerium 186	187 Pr praseodymium 187	188 Nd neodymium 188	189 Pm promethium [147]	190 Sm samarium 190	191 Eu europium 191	192 Gd gadolinium 192	193 Tb terbium 193
201 La lanthanum 201	202 Ce cerium 202	203 Pr praseodymium 203	204 Nd neodymium 204	205 Pm promethium [147]	206 Sm samarium 206	207 Eu europium 207	208 Gd gadolinium 208	209 Tb terbium 209
217 La lanthanum 217	218 Ce cerium 218	219 Pr praseodymium 219	220 Nd neodymium 220	221 Pm promethium [147]	222 Sm samarium 222	223 Eu europium 223	224 Gd gadolinium 224	225 Tb terbium 225
232 La lanthanum 232	233 Ce cerium 233	234 Pr praseodymium 234	235 Nd neodymium 235	236 Pm promethium [147]	237 Sm samarium 237	238 Eu europium 238	239 Gd gadolinium 239	240 Tb terbium 240
253 La lanthanum 253	254 Ce cerium 254	255 Pr praseodymium 255	256 Nd neodymium 256	257 Pm promethium [147]	258 Sm samarium 258	259 Eu europium 259	260 Gd gadolinium 260	261 Tb terbium 261

1	H hydrogen 1
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relative atomic mass
atomic symbol
name
atomic (proton) number

Key

* The elements with atomic numbers from 58 to 71 are omitted from this part of the periodic table.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

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