| Surname | Other na | mes |
|--|---------------|--------------------------------------|
| Edexcel GCSE | Centre Number | Candidate Number |
| Chemistry// Unit C2: Discoverin | | Science |
| | | I |
| | | Higher Tier |
| Tuesday 5 March 2013 – N Time: 1 hour | Morning | Higher Tier Paper Reference 5CH2H/01 |

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.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets
 - use this as a guide as to how much time to spend on each question.
- Questions labelled with an asterisk (*) are ones where the quality of your written communication will be assessed
 - you should take particular care with your spelling, punctuation and grammar, as well as the clarity of expression, on these questions.

Advice

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

Turn over ▶

PEARSON

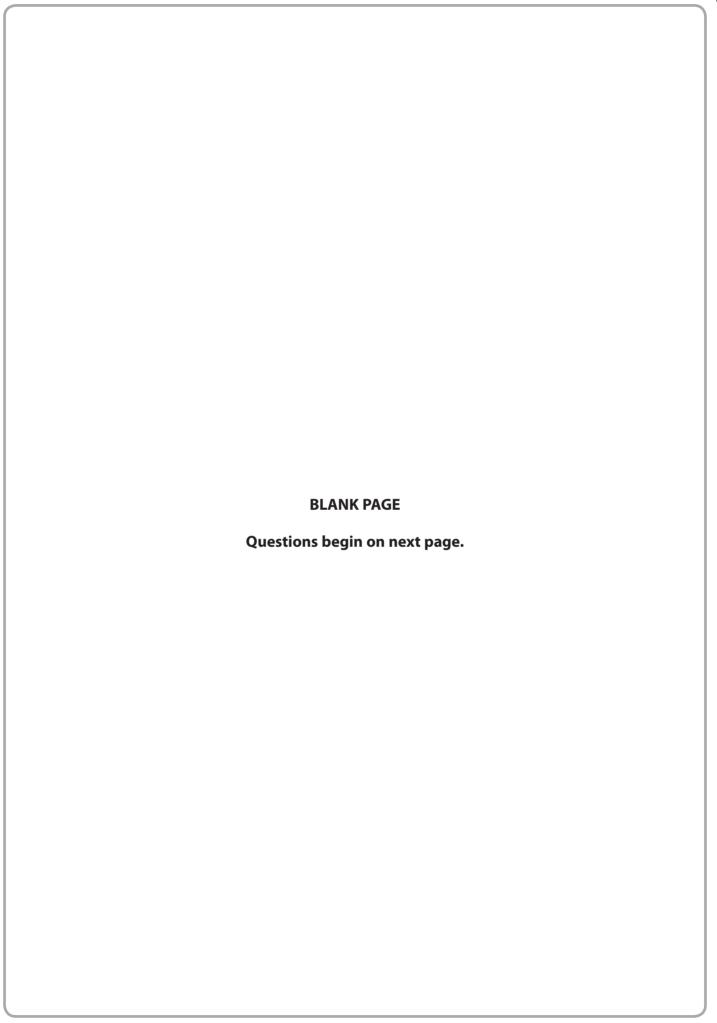
The Periodic Table of the Elements

| 0 4 He helium 2 | 20 Ne | 40 argon 18 | 84 Kr krypton 36 | 131 Xe xeron 54 | [222] Rn radon 86 | t fully |
|------------------------|---|------------------------------------|------------------------------------|-------------------------------------|--------------------------------------|---|
| 7 | 19 fluorine 9 | 35.5 Cl chlorine 17 | 80 Br bromine 35 | 127 | [210] At astatine 85 | orted but not |
| 9 | 16 O oxygen 8 | 32 S sulfur 16 | 79 Se selenium 34 | 128 Te tellurium 52 | [209] Po polonium 84 | ve been repo |
| S | 14 N nitrogen 7 | 31 Phosphorus | 75 As arsenic 33 | Sb antimony 51 | 209 Bi bismuth 83 | s 112-116 hav authenticated |
| 4 | 12 C carbon 6 | 28 Silicon 14 | 73 Ge germanium 32 | Sn tin 50 | 207 Pb lead 82 | Elements with atomic numbers 112-116 have been reported but not fully authenticated |
| ဇာ | 17 B Soron | 27 Al aluminium 13 | 70 Ga gallium 31 | 115 In indium 49 | 204 T thallium 81 | ents with ato |
| ' | | | 65 Zn zinc 30 | 112 Cd cadmium 48 | 201 Hg mercury 80 | Elem |
| | | | 63.5 Cu copper 29 | 108 Ag silver 47 | 197 Au gold 79 | Rg roentgenium 111 |
| | | | 59 nickel 28 | 106 Pd palladium 46 | 195 Pt platinum 78 | Ds darmstadtium 110 |
| | | | 59 Co cobalt 27 | 103 Rh rhodium 45 | 192 Ir iridium 77 | [268] Mt meitherium 109 |
| 1 Hydrogen | | | 56 iron 26 | 101 Ru ruthenium 44 | 190 Os osmium 76 | [277] Hs hassium 108 |
| | | | 55 Mn manganese 25 | [98] Tc technetium 43 | 186 Re rhenium 75 | [264] Bh bohrium 107 |
| | nass ool umber | | 52 Cr chromium 24 | 96 Mo molybdenum 42 | 184 W tungsten 74 | [266] Sg seaborgium 106 |
| Key | relative atomic mass atomic symbol name atomic (proton) number | | 51 V vanadium 23 | 93 Nb niobium 41 | 181 Ta tantalum 73 | [262] Db dubnium 105 |
| | relativ ato atomic | | 48 Ti titanium 22 | 91 Zr zirconium 40 | 178 Hf hafnium 72 | [261] Rf rutherfordium 104 |
| ' | | . | Sc scandium 21 | 89 × yttrium 39 | 139 La* lanthanum 57 | [227] Ac* actinium 89 |
| 2 | 9 Be beryllium 4 | 24 Mg magnesium 12 | 40 Ca calcium 20 | Sr strontium 38 | 137 Ba barium 56 | [226] Ra radium 88 |
| - | 7 Li Ilithium 3 | 23 Na sodium 11 | 39 K potassium 19 | 85 Rb rubidium 37 | 133 Cs caesium 55 | [223] Fr francium 87 |

^{*} The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

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





Answer ALL questions

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

Salts

1 Sodium carbonate and copper chloride are both ionic solids.

They are both soluble in water.

(a) Which row of the table shows the most likely melting points of these two salts?Put a cross (⋈) in the box next to your answer.

(1)

| | melting point / °C | |
|-----|--------------------|-----------------|
| | sodium carbonate | copper chloride |
| A 🗵 | 17 | 498 |
| В | 851 | 9 |
| C 🗵 | 851 | 498 |
| D 🗵 | 9 | 17 |

(b) Copper chloride contains copper ions, Cu^{2+} , and chloride ions, Cl^- . Give the formula of copper chloride.

(1)

(c) Complete the sentence by putting a cross (\boxtimes) in the box next to your answer.

If a flame test is carried out on copper chloride, the colour in the flame is

(1)

- B yellow
- C lilac
- **D** green-blue



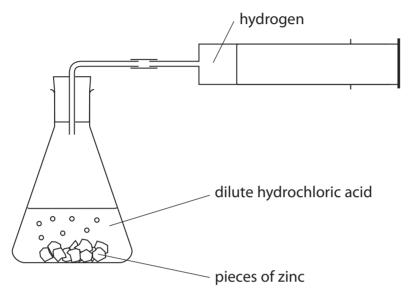
| (d) Describe how this apparatus can be used to show that sodium carbonate reac with dilute acid to form carbon dioxide. | (3) |
|--|----------|
| conical flask | |
| | |
| | |
| (e) Copper carbonate is an insoluble salt. Describe how you would use sodium carbonate and copper chloride to produ pure, dry sample of copper carbonate. | ice a |
| pure, ary sample or copper curbonate. | (3) |
| | |
| | |
| (Total for Question 1 = 9 | 9 marks) |
| | <u>.</u> |

Rates of reaction

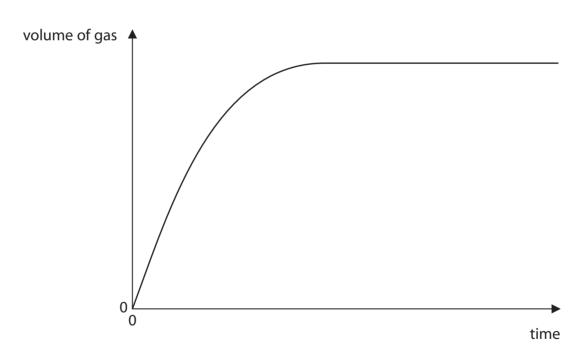
2 (a) Zinc is a metal.

Zinc reacts with dilute hydrochloric acid to produce zinc chloride and hydrogen.

Edward used this apparatus to investigate the speed of the reaction between zinc and dilute hydrochloric acid.



(i) Edward's results for 50 °C are shown on the graph.



Sketch a line on the graph to show the results that Edward should expect to obtain if he carried out the experiment to completion at 30 °C.

(2)



| (ii) | When zinc powder is used, instead of larger pieces of zinc, the reaction is faster. | |
|-------|--|-------|
| | Explain, using ideas about particles, why the reaction is faster when zinc powder is used. | |
| | | (2) |
| | | |
| | | |
| | | |
| (iii) | Balance the equation for the reaction of zinc with dilute hydrochloric acid by putting a number in the space provided. | (1) |
| | $Zn + \dots HCI \rightarrow ZnCl_2 + H_2$ | (1) |
| (iv | The reaction between zinc and dilute hydrochloric acid is exothermic. | |
| | Explain, in terms of breaking and forming bonds, why this reaction is exothermic. | |
| | | (3) |
| | | |
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| | | |
| b) Ca | talysts are added to some reactions. | |
| | ite the effect of catalysts on reactions. | |
| | | (1) |
| | | |
| | (Total for Question 2 = 9 ma | arks) |
| | | |

| | | | Mixtures | |
|-------|-------------|------|---|-----|
| 3 | (a) Co | mpl | ete the sentence by putting a cross (🗵) in the box next to your answer. | |
| | A r | nixt | ture of two immiscible liquids can be separated by using | (1) |
| | \times | A | fractional distillation | |
| | \times | В | a separating funnel | |
| | \times | C | evaporation | |
| | \boxtimes | D | filtration | |
| | (b) Ox | yge | n is a simple molecular, covalent substance. | |
| | (i) | The | e electronic configuration of oxygen is 2.6. | |
| | | Dra | aw a dot and cross diagram for a molecule of oxygen, O ₂ . | |
| | | Sh | ow the outer electrons only. | (3) |
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| | (ii) | The | e boiling point of oxygen is −183 °C. | |
| | | | olain, in terms of the forces between the molecules, why oxygen has a very v boiling point. | |
| | | | | (2) |
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| distillation. | | | (3) |
|---------------|--------|------------------|----------|
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| | (Total | for Question 3 = | 9 marks) |
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| | | | Calcium carbonate | |
|---|-----|-------|--|--------|
| 4 | (a) | Cal | lcium oxide is manufactured by heating calcium carbonate. | |
| | | The | e waste product of this process is carbon dioxide. | |
| | | (i) | Calculate the relative formula mass of carbon dioxide, CO_2 . (Relative atomic masses: $C = 12$, $O = 16$) | |
| | | | | (1) |
| | | ••••• | relative formula mass = | |
| | | (ii) | The equation for the reaction is | |
| | | | $CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$ | |
| | | | Calculate the maximum mass of calcium oxide that can be obtained by heating 25 tonnes of calcium carbonate. (Relative atomic masses: $C = 12$, $O = 16$, $Ca = 40$) | |
| | | | | (3) |
| | | | | |
| | | | mass calcium oxide = | tonnes |
| | (b) | (i) | State what is meant by theoretical yield . | (1) |
| | | (ii) | Explain why the actual yield for a reaction is usually less than the theoretical yield for the reaction. | (2) |
| | | | | |



| Suggest reasons why manufacturers try t | |
|---|----------------------------------|
| | (2) |
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| | (Total for Question 4 = 9 marks) |
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| | Group 1 | |
|---|--|-----|
| 5 | Lithium, sodium and potassium all react with cold water. | |
| | (a) Lithium, sodium and potassium are in group 1 of the periodic table. | |
| | Complete the sentence by putting a cross (\boxtimes) in the box next to your answer. | |
| | These elements are | (1) |
| | ■ A halogens | (1) |
| | ■ B noble gases | |
| | | |
| | D alkali metals | |
| | (b) When sodium is added to cold water, it forms a molten ball which floats on the surface of the water. | |
| | Explain why this happens. | (2) |
| | | |
| | | |
| | | |
| | (c) Write the balanced equation for the reaction of sodium with water. | (3) |
| | | |
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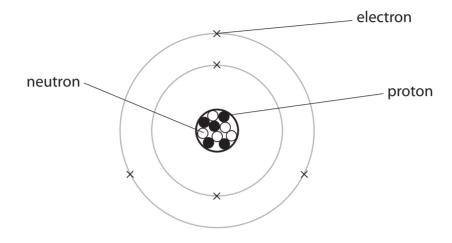
| *(d) Sodium and potassium react with cold water to give similar products. | |
|--|------|
| The electronic configuration of sodium is 2.8.1. The electronic configuration of potassium is 2.8.8.1. | |
| Explain the similarities and differences in the way sodium and potassium react with cold water by considering their reactions and their electronic configurations. | |
| | (6) |
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| (Total for Question 5 = 12 ma | rks) |
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Isotopes

6 Boron exists as two isotopes.

These are boron-10, $^{10}_{5}$ B, and boron-11, $^{11}_{5}$ B.

(a) The diagram shows an atom of the isotope, boron-10.



(i) State the electronic configuration of boron.

(1)

(ii) Complete the sentence by putting a cross (⋈) in the box next to your answer.In the periodic table, boron is in period

(1)

- **B** 3
- **⋈ C** 5
- (iii) The table shows the three particles present in atoms and their relative masses and charges.

Complete the table.

(2)

| particle | relative mass | relative charge |
|----------|---------------|-----------------|
| electron | 1 1837 | |
| neutron | | |
| proton | | +1 |

| | ample of boron contains 20% boron-10 and 80% boron-11. | |
|-------------|---|-------|
| | part (a) you were given the structure of a boron-10 atom. | |
| | scribe the structure of a boron-11 atom and explain why, in this sample, boron a relative atomic mass of 10.8. | |
| | | (6) |
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|) Me tab | ndeleev was a Russian chemist who produced the first version of the periodic le. | |
| | e one similarity and one difference between his version of the periodic table I the periodic table shown on page 2. | |
| | | |
| | | |
| | | (2) |
| | (Total for Question 6 = 12 m | arks) |
| | · · · · · · | |



