

Write your name here

| | |
|---------|-------------|
| Surname | Other names |
|---------|-------------|

Pearson Edexcel
International GCSE

| | |
|----------------------|----------------------|
| Centre Number | Candidate Number |
| <input type="text"/> | <input type="text"/> |

Chemistry
Unit: 4CH0
Paper: 2C

| | |
|--|-----------------------------------|
| Wednesday 17 January 2018 – Afternoon Time: 1 hour | Paper Reference 4CH0/2C |
|--|-----------------------------------|

| | |
|-------------------------------------|-------------|
| You must have: Calculator | 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.*
- Show all the steps in any calculations and state the units.
- 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 ☒.

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.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P53146A

©2018 Pearson Education Ltd.

1/1/1/1/



Pearson

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

| | | | | | | | | | | | |
|---|---|-----------------------|---|---|-----------------------|-----------------------|-----------------------|-----------------------|--|----------------------|----------------------|
| 1 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 | | | |
| 1 | <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1 H Hydrogen 1 </div> | | | | | | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 4 He Helium 2 </div> | | |
| 2 | 7 | 9 | | | 11 | 12 | 14 | 16 | 19 | 20 | |
| | Li Lithium 3 | Be Beryllium 4 | | | B Boron 5 | C Carbon 6 | N Nitrogen 7 | O Oxygen 8 | F Fluorine 9 | Ne Neon 10 | |
| 3 | 23 | 24 | | | 27 | 28 | 31 | 32 | 35.5 | 40 | |
| | Na Sodium 11 | Mg Magnesium 12 | | | Al Aluminium 13 | Si Silicon 14 | P Phosphorus 15 | S Sulfur 16 | Cl Chlorine 17 | Ar Argon 18 | |
| 4 | 39 | 40 | | | 70 | 73 | 75 | 79 | 80 | 84 | |
| | K Potassium 19 | Ca Calcium 20 | | | Ga Gallium 31 | Ge Germanium 32 | As Arsenic 33 | Se Selenium 34 | Br Bromine 35 | Kr Krypton 36 | |
| 5 | 86 | 88 | | | 115 | 119 | 122 | 128 | 127 | 131 | |
| | Rb Rubidium 37 | Sr Strontium 38 | | | In Indium 49 | Sn Tin 50 | Sb Antimony 51 | Te Tellurium 52 | I Iodine 53 | Xe Xenon 54 | |
| 6 | 133 | 137 | | | 204 | 207 | 209 | 210 | 210 | 222 | |
| | Cs Caesium 55 | Ba Barium 56 | | | Tl Thallium 81 | Pb Lead 82 | Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 | |
| 7 | 223 | 226 | | | | | | | | 227 | 227 |
| | Fr Francium 87 | Ra Radium 88 | | | | | | | | Ac Actinium 89 | Ac Actinium 89 |

Key

| |
|----------------------|
| Relative atomic mass |
| Symbol |
| Name |
| Atomic number |

DO NOT WRITE IN THIS AREA

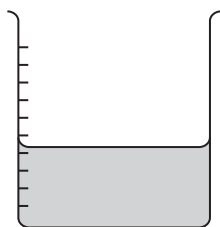
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

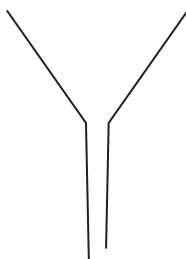


Answer ALL questions.

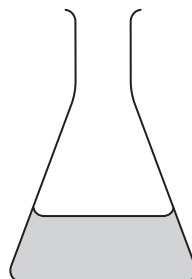
1 These pieces of apparatus are used in chemistry experiments.



P



Q



R



S

(a) Name these pieces of apparatus.

(4)

P

Q

R

S

(b) Apparatus P contains dilute hydrochloric acid.

Litmus indicator is added to this acid.

What is the final colour of the litmus?

- A** blue
 B green
 C orange
 D red

(1)

(c) Apparatus R contains potassium hydroxide solution.

Litmus indicator is added to this alkaline solution.

What is the final colour of the litmus?

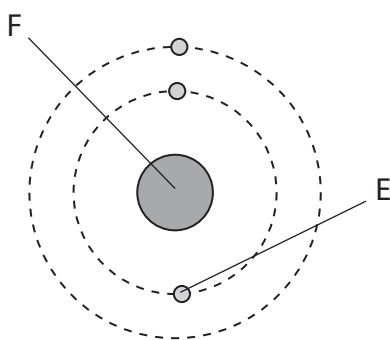
- A** blue
 B green
 C orange
 D red

(1)

(Total for Question 1 = 6 marks)



2 The diagram shows an atom of lithium with atomic number 3 and mass number of 6.



(a) Name the particle labelled E.

(1)

(b) Name the part of the atom labelled F.

(1)

(c) Name the two types of particle found in part F.

(2)

1

2

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(d) Another type of lithium atom has atomic number 3 and mass number 7.

- (i) State the name given to atoms with the same atomic number but different mass numbers.

(1)

- (ii) Draw a diagram to show the arrangement of electrons in an atom of lithium with atomic number 3 and mass number 7.

(1)

(e) A sample of lithium contains 92.5% of atoms with mass number 7 and 7.5% of atoms with mass number 6.

Calculate the relative atomic mass of lithium.

(2)

relative atomic mass =

(Total for Question 2 = 8 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



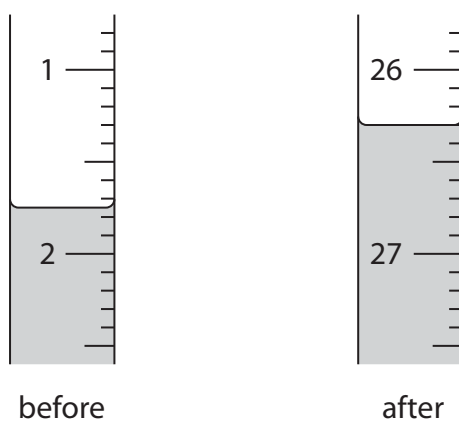
3 A student is provided with a solution of dilute sulfuric acid and a solution of sodium hydroxide. The student does a titration using 25.0 cm^3 of the sodium hydroxide solution. She adds the acid from a burette.

(a) Which type of reaction occurs between dilute sulfuric acid and sodium hydroxide?

(1)

- A displacement
- B neutralisation
- C precipitation
- D redox

(b) The diagram shows the student's burette readings for the titration.



(i) Use the readings to complete the table, giving all values to the nearest 0.05 cm^3 .

(3)

| | |
|---------------------------------------|--|
| burette reading after adding acid | |
| burette reading before adding acid | |
| volume in cm^3 of acid added | |

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- (ii) Explain why the student needs to repeat the titration in order to obtain a reliable value for the volume of acid required to react exactly with 25.0 cm^3 of sodium hydroxide solution.

(2)

.....

.....

.....

.....

.....

.....

.....

(Total for Question 3 = 6 marks)

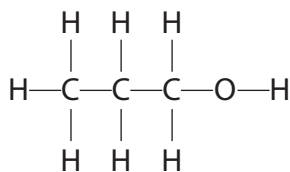
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



- 4 (a) This is the displayed formula of an organic compound, X.



- (i) Give the molecular formula of compound X. (1)

- (ii) A student describes compound X as a saturated hydrocarbon.
Explain whether the student is correct. (3)

- (b) Compound X and ethanol are members of the homologous series of alcohols.

One property of members of a homologous series is that they have similar chemical reactions.

- Give one other property of members of a homologous series. (1)

DO NOT WRITE IN THIS AREA

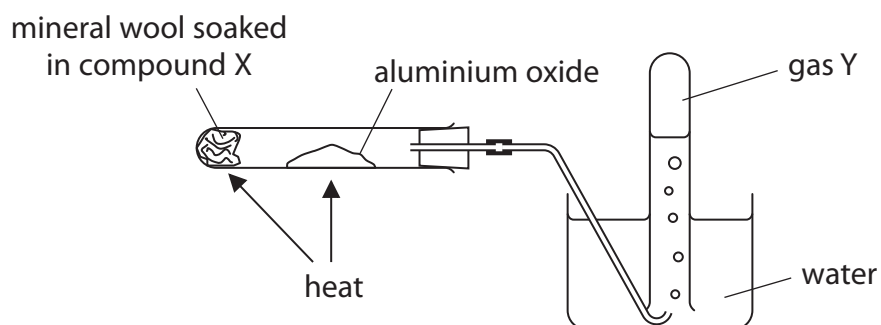
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) This apparatus is used for a dehydration reaction using compound X.

This reaction is similar to the dehydration reaction of ethanol.



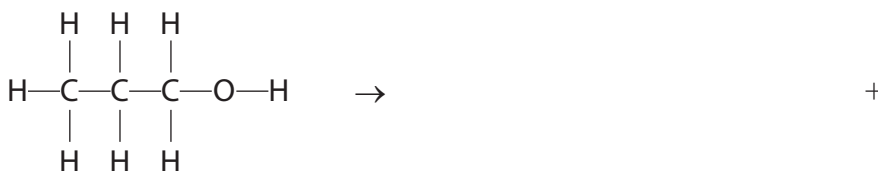
The reaction produces gas Y and one other product.

(i) State the purpose of the aluminium oxide. (1)

(ii) State a property of gas Y that allows it to be collected over water. (1)

(iii) Give a reason why the first sample of gas Y collected is not pure. (1)

(iv) Complete the equation for the dehydration reaction showing the displayed formula of gas Y and the molecular formula of the other product. (2)



(v) Give the name of gas Y. (1)

(Total for Question 4 = 11 marks)



5 Chromium is a shiny metal that has many uses.

Most chromium is extracted from the ore chromite, FeCr_2O_4

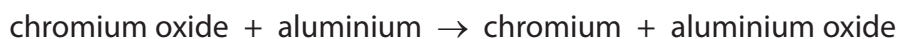
(a) Complete the table by giving the names of the elements in FeCr_2O_4

(1)

| Chemical symbol | Name of element |
|-----------------|-----------------|
| Fe | |
| Cr | |
| O | |

(b) In the extraction process, chromite is converted into chromium(III) oxide, Cr_2O_3

Chromium is made by this reaction



(i) Write a chemical equation for this reaction.

(2)

(ii) Explain what the reaction shows about the reactivity of chromium compared to the reactivity of aluminium.

(2)

(iii) Explain why the reaction between chromium oxide and aluminium is described as a redox reaction.

(2)

DO NOT WRITE IN THIS AREA

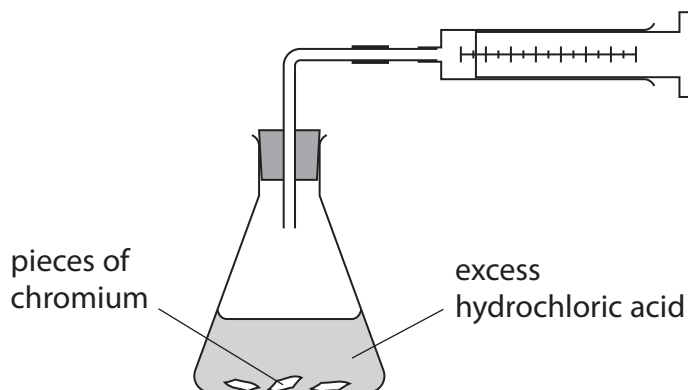
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

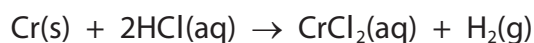


(c) Chromium metal reacts with dilute hydrochloric acid to form hydrogen gas.

This apparatus is used to investigate the reaction.



The equation for the reaction is



A student adds 0.13 g of a sample of chromium metal to excess dilute hydrochloric acid.

- (i) Calculate the maximum volume of hydrogen gas that the student could produce in this experiment at room temperature and pressure (rtp).

[molar volume of a gas is 24 dm^3 at rtp]

(3)

maximum volume = dm^3

- (ii) The student does the experiment at rtp and finds that the volume collected is less than the calculated maximum.

Give two possible reasons for this.

(2)

1

2

(Total for Question 5 = 12 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



6 Lithium fluoride, LiF, and magnesium oxide, MgO, are ionic compounds.

(a) (i) Calculate the relative formula mass (M_r) of MgO.

(1)

$M_r = \dots\dots\dots$

(ii) Give the formulae of the two ions in LiF.

(1)

..... and

(b) Explain why

- ionic compounds have high melting points
- the melting point of magnesium oxide is much higher than the melting point of lithium fluoride

(4)

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) Explain why ionic compounds do not conduct electricity when solid, but do conduct electricity when molten or in aqueous solution.

(2)

.....

.....

.....

.....

.....

.....

.....

(Total for Question 6 = 8 marks)

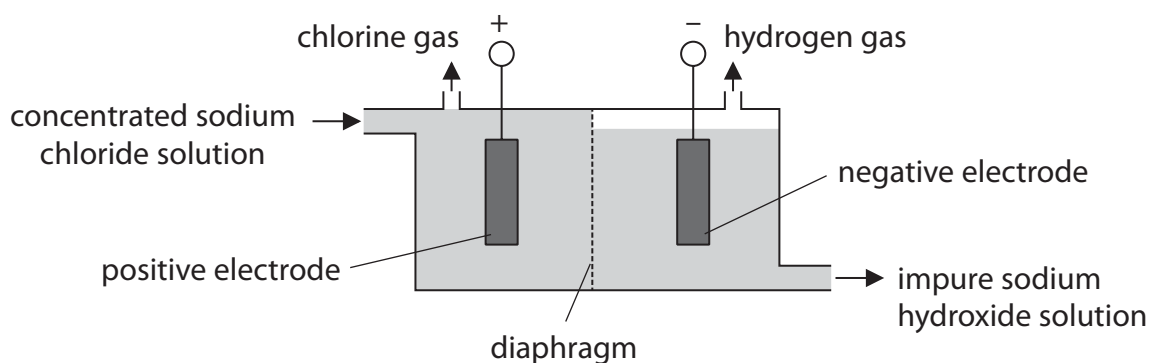
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



7 The diagram shows the electrolysis of concentrated sodium chloride solution in a diaphragm cell.



(a) (i) The ionic half-equation for the reaction at the positive electrode is



Use this equation to explain why oxidation occurs at the positive electrode.

(2)

.....

.....

.....

.....

(ii) At the negative electrode, water molecules gain electrons to form hydroxide ions and hydrogen gas.

Complete the ionic half-equation for this reaction.

(2)



(b) Chlorine reacts with sodium hydroxide to produce a mixture of water, sodium chloride and sodium chlorate(I), NaOCl.

Write a chemical equation for this reaction.

(1)

.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



(c) Chlorine is used in the manufacture of the addition polymer poly(chloroethene).

(i) Explain how an addition polymer is formed from its monomers.

(2)

.....

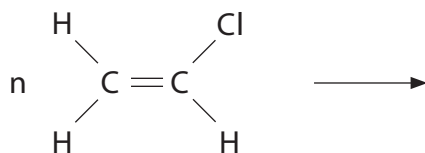
.....

.....

.....

(ii) Complete this equation by drawing the displayed formula of poly(chloroethene).

(2)



(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

BLANK PAGE

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Pearson Education Ltd. will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.

