

Write your name here

Surname

Other names

Edexcel

International GCSE

Centre Number

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Candidate Number

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Chemistry

Unit: 4CH0

Paper: 2CR

Monday 10 June 2013 – Afternoon

Time: 1 hour

Paper Reference

4CH0/2CR

You must have:

Ruler
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.

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.
- Keep an eye on the time.
- 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 ►

P43318A

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1/1/1/



PEARSON

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

Period

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	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁷ Li Lithium 3 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁹ Be Beryllium 4 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹¹ B Boron 5 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹² C Carbon 6 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁴ N Nitrogen 7 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁶ O Oxygen 8 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹ F Fluorine 9 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰ Ne Neon 10 </div>															
3	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²³ Na Sodium 11 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁴ Mg Magnesium 12 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁷ Al Aluminium 13 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁸ Si Silicon 14 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ³¹ P Phosphorus 15 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ³² S Sulfur 16 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ^{35.5} Cl Chlorine 17 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁴⁰ Ar Argon 18 </div>															
4	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ³⁹ K Potassium 19 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁴⁰ Ca Calcium 20 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁷⁰ Ga Gallium 31 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁷³ Ge Germanium 32 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁷⁵ As Arsenic 33 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁷⁹ Se Selenium 34 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁸⁰ Br Bromine 35 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁸⁴ Kr Krypton 36 </div>															
5	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁸⁶ Rb Rubidium 37 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ⁸⁸ Sr Strontium 38 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹¹⁵ In Indium 49 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹¹⁹ Sn Tin 50 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹²² Sb Antimony 51 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹²⁸ Te Tellurium 52 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹²⁷ I Iodine 53 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹³¹ Xe Xenon 54 </div>															
6	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹³³ Cs Caesium 55 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹³⁷ Ba Barium 56 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁴ Tl Thallium 81 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁷ Pb Lead 82 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁹ Bi Bismuth 83 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²¹⁰ Po Polonium 84 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²¹⁰ At Astatine 85 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²²² Rn Radon 86 </div>															
7	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²²³ Fr Francium 87 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²²⁶ Ra Radium 88 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰¹ Hg Mercury 80 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹⁷ Au Gold 79 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹⁵ Pt Platinum 78 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹² Ir Iridium 77 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹² Os Osmium 76 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁸⁶ Re Rhenium 75 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁸⁴ W Tungsten 74 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁸¹ Ta Tantalum 73 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁸⁴ W Tungsten 74 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁸⁶ Re Rhenium 75 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹⁰ Os Osmium 76 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹² Ir Iridium 77 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹⁵ Pt Platinum 78 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ¹⁹⁷ Au Gold 79 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰¹ Hg Mercury 80 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁴ Tl Thallium 81 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁷ Pb Lead 82 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²⁰⁹ Bi Bismuth 83 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²¹⁰ Po Polonium 84 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²¹⁰ At Astatine 85 </div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> ²²² Rn Radon 86 </div>

Key

Relative atomic mass
Symbol
Name
Atomic number



Answer ALL questions.

1 Use the Periodic Table on page 2 to help you answer this question.

Give the name or symbol of

(a) the element in group 3 and period 4.

(1)

(b) an element in period 3 that is a good conductor of electricity.

(1)

(c) the element in group 7 that is the most reactive.

(1)

(d) the element in group 5 that is present in a molecule of ammonia.

(1)

(e) an element with an atom containing 8 electrons in its outer shell.

(1)

(Total for Question 1 = 5 marks)



2 (a) The list shows some techniques used to separate mixtures.

- A crystallisation
- B filtration
- C fractional distillation
- D paper chromatography
- E simple distillation

Complete the table to show the best method of obtaining each substance from the mixture.

In each case, choose one of the letters A, B, C, D or E. Each letter may be used once, more than once or not at all.

(4)

Substance	Mixture	Letter
sand	sand and water	
solid copper(II) sulfate	aqueous copper(II) sulfate	
red food dye	mixture of food dyes	
kerosene	crude oil	

(b) Gold occurs in ores, which are mixtures of gold and other substances. Several elements and compounds are used in the extraction of gold from its ores.

Each box below represents the substances present in one part of the extraction process.

Classify the contents of each box as a compound, an element or a mixture by writing your choice below each box.

(3)

	(Au) (NaCN) (O ₂) (H ₂ O)	(NaCN) (NaCN) (NaCN) (NaCN)	(Au) (H ₂ O) (H ₂ O) (Au)
Compound, element or mixture			

(Total for Question 2 = 7 marks)



3 A student added some pieces of iron to a boiling tube containing dilute hydrochloric acid. She observed fizzing and the formation of a solution, X.

(a) Identify the gas that causes the fizzing and describe a test for it.

(2)

Gas.....

Test.....

(b) Solution X contains chloride ions.

(i) The student confirmed this by adding some silver nitrate solution. She observed a white precipitate of silver chloride.

Give the formula of the white precipitate, and name the other solution she should have added before the silver nitrate solution.

(2)

Formula of white precipitate.....

Other solution.....

(ii) Complete the word equation for the reaction in this test.

(1)

iron chloride + silver nitrate → silver chloride +

(c) Solution X also contains ions of iron. The student thought that these ions had the formula Fe^{2+} or Fe^{3+} .

What reagent should she add to decide whether solution X contains Fe^{2+} or Fe^{3+} ions? State the result of the test in each case.

(3)

Reagent.....

Result with Fe^{2+} ions.....

Result with Fe^{3+} ions.....

(Total for Question 3 = 8 marks)



4 A teacher added some of the Group 1 elements to separate samples of water.

(a) State two observations that could be made when a small piece of sodium is added to a large trough containing water.

(2)

1

.....

2

.....

(b) In another experiment she added a small piece of a different Group 1 element and noticed that the reaction was less vigorous.

Which element did she add in this experiment?

(1)

.....

(c) In another experiment she added a small piece of potassium to a large trough containing water. This time she observed a lilac flame.

(i) Identify the gas that burned.

(1)

.....

(ii) Give the formula of the ion that caused the flame to be lilac.

(1)

.....



(d) When the Group 1 elements react with water, each of their atoms loses an electron from its outer shell. For sodium and potassium, these processes can be represented by the equations

- $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$
- $\text{K} \rightarrow \text{K}^+ + \text{e}^-$

Explain, by referring to the electronic configurations of sodium and potassium, why potassium is more reactive than sodium.

(4)

.....

.....

.....

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.....

.....

.....

(Total for Question 4 = 9 marks)



5 Fractional distillation and cracking are important steps in processing crude oil.

(a) Place ticks (✓) in the columns to show which statements apply to each step.
You may place a tick in one column, in both columns or in neither column.

The first one has been done for you.

(5)

Statement	Fractional distillation	Cracking
Crude oil is heated	✓	
A catalyst may be used		
Alkenes are formed		
Decomposition reactions occur		
Fuels are obtained		
Separation is the main purpose		

(b) The formula $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ represents one of the compounds in crude oil.

(i) Give the molecular formula of this compound.

(1)

(ii) Give the displayed formula of this compound.

(1)

(iii) Give the empirical formula of this compound.

(1)

(iv) Give the name of this compound.

(1)

(v) Give the general formula of the homologous series that contains this compound.

(1)



(c) The products of the complete combustion of hydrocarbons are carbon dioxide and water.

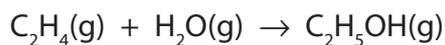
(i) Balance the equation to show the complete combustion of ethene (C₂H₄). (2)



(ii) Draw a dot and cross diagram to show the bonding in an ethene molecule. Show only the outer electrons in each atom. (2)



(d) Ethanol can be manufactured by the hydration of ethene. The equation for this reaction is



(i) Identify the catalyst and state the temperature used in this process.

(2)

Catalyst.....

Temperature.....

(ii) A 20 mol sample of ethanol was produced using this reaction.

Deduce the amount, in moles, of ethene needed and the volume, in dm^3 , that this amount of ethene would occupy at room temperature and pressure.

Assume that all of the ethene is converted into ethanol and that the molar volume of ethene is 24 dm^3 at rtp.

(3)

Amount of ethene mol

Volume of ethene

Volume = dm^3

(Total for Question 5 = 19 marks)

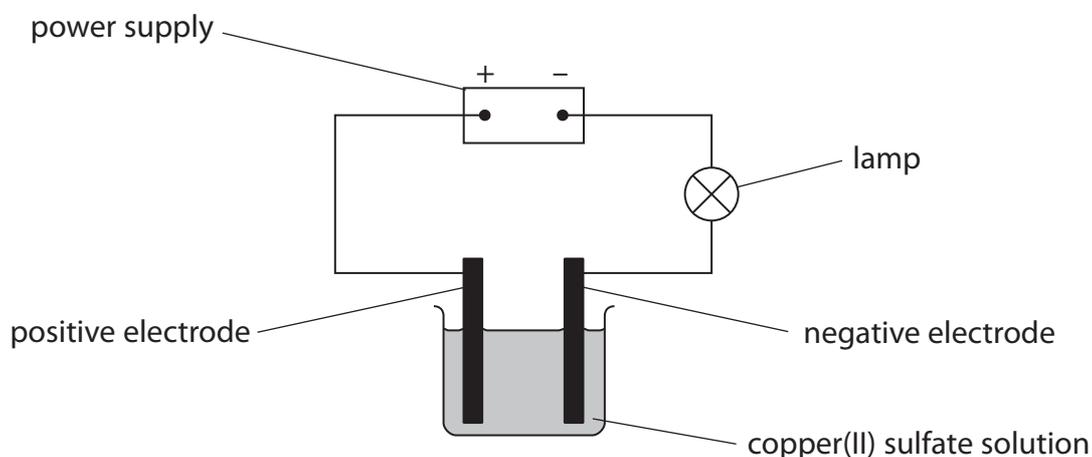


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- 6 Most experiments involving electrolysis use inert electrodes, which do not take part in the reactions. However, in some experiments the electrodes do take part in the reactions.

A student investigates the electrolysis of copper(II) sulfate solution using copper electrodes which do take part in the reaction. She uses this apparatus.



She uses this method.

- weigh two clean strips of copper
- use one strip as the positive electrode and the other as the negative electrode
- after electrolysis wash the strips of copper with ethanol (a liquid that boils at 78°C)
- dry the strips of copper and reweigh them

The ionic half-equations for the reactions at the electrodes are



- (a) Suggest why the copper strips would dry more quickly when washed with ethanol rather than with water.

(1)

(b) The student's results are shown in the table.

	Positive electrode	Negative electrode
Mass of electrode before electrolysis in g	8.78	7.95
Mass of electrode after electrolysis in g	8.46	8.25

The table shows that the decrease in mass of the positive electrode was 0.32 g.

(i) Calculate the increase in mass, in grams, of the negative electrode. (1)

Increase in mass =g

(ii) The ionic half-equations show that the increase in mass of the negative electrode should be the same as the decrease in mass of the positive electrode.

Suggest two reasons why the increase in mass of the negative electrode in the student's experiment was less than expected. (2)

1

2

(c) Another student investigated the effect of changing the electrical charge, in faradays, passed during the electrolysis.

He wanted to find how this affected the increase in mass of the negative electrode.

One faraday is the electrical charge of one mole of electrons.

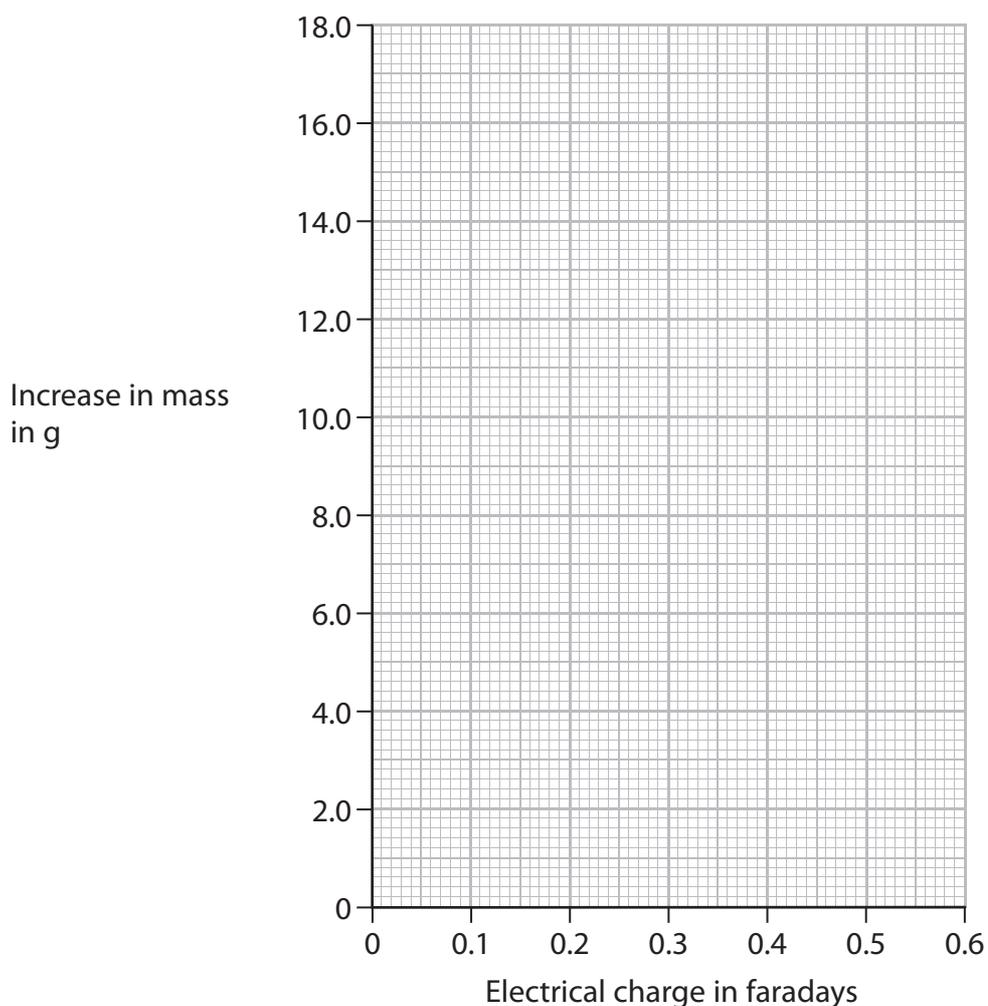
His results are shown in the table.

Experiment	1	2	3	4	5	6	7	8	9
Electrical charge in faradays	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
Increase in mass in g	3.20	4.80	7.40	8.00	9.60	11.20	12.80	14.40	16.00

(i) On the grid, plot a graph of increase in mass against electrical charge.

Draw a straight line of best fit. Start your line at the origin (0,0).

(3)



(ii) Draw a circle around the anomalous result.

(1)

(iii) Suggest why the straight line should go through the origin.

(1)

.....
.....

(iv) Explain why the graph shows that the increase in mass is directly proportional to the electrical charge passed.

(1)

.....
.....

(v) Use your graph to estimate the increase in mass, in grams, of the copper electrode that would be produced by passing an electrical charge of 0.55 faradays.

(2)

Increase in mass =g

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS



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