Paper Reference(s) 1SC0/1CF
Pearson Edexcel GCSE Level 1/Level 2 (9–1)

Combined Science
PAPER 2
Foundation Tier

Total Marks

Time: 1 hour 10 minutes plus your additional time allowance

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

Pearson

YOU MUST HAVE

Calculator, ruler

YOU WILL BE GIVEN

Diagram Booklet, Periodic Table

INSTRUCTIONS

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 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.

In the question 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.

There is a periodic table provided.

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.

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 If liquid water is cooled below 0 °C it turns into the solid, ice.

(a) (i) Give the name for the change of state from liquid to solid.
(1 mark)

_____

_____

(continued on the next page)

1 continued.

(ii) Here are five statements about ice and water.

Place ticks in boxes by the TWO statements that are correct.
(2 marks)

the molecules move faster in water than in ice	
the molecules are more randomly arranged in ice than in water	
the molecules start moving when water becomes ice	
the molecules are arranged regularly in ice but not in water	
the molecules have more energy in ice than in water	

(continued on the next page)

1 continued.

(b) Look at Figure 1 for Question 1(b) in the Diagram Booklet. It shows a label from a bottle of drinking water.

(i) Explain why this drinking water should not be described as pure water.
(2 marks)

_____

_____

_____

(ii) State the information from Figure 1 that shows that the drinking water is neutral.
(1 mark)

_____

_____

(continued on the next page)

1 continued.

(iii) Calculate the mass of calcium ions in 250 cm^3 of this drinking water.
(2 marks)

mass = _____ mg

(c) State how you know that calcium is a metal from its position in the periodic table.
(1 mark)

(Total for Question 1 = 9 marks)

2 (a) When chromium reacts with oxygen, chromium oxide is formed.

(i) Write the word equation for this reaction.
(1 mark)

_____ + _____ →

_____

(ii) What type of reaction occurs when chromium reacts with oxygen?
(1 mark)

☐ A condensation

☐ B evaporation

☐ C neutralisation

☐ D oxidation

(continued on the next page)

2 continued.

(iii) Calculate the relative formula mass of chromium oxide, Cr_2O_3.
(2 marks)

(relative atomic masses: O = 16, Cr = 52)

_____

_____

_____

relative formula mass = _____

(continued on the next page)

2 continued.

(b) Three different metals are added to separate test tubes of acid.

Look at Figure 2 for Question 2(b) in the Diagram Booklet. It shows the observations.

(i) Place the metals in order of reactivity from most to least reactive.
(1 mark)

most reactive _____

_____

least reactive _____

(continued on the next page)

2 continued.

(ii) Hydrogen is given off when magnesium reacts with acid.
The hydrogen is tested by collecting the gas in a test tube and igniting it.

What is the safest way to ignite the gas?
(1 mark)

☐ A add fuel to the test tube

☐ B heat the test tube with a Bunsen burner

☐ C put a lighted splint at the open end of the test tube

☐ D put the test tube in an oven

(iii) State the observation made in this test that shows that the gas is hydrogen.
(1 mark)

_____

_____

_____

(continued on the next page)

2 continued.

(c) Iron is extracted by heating iron oxide with carbon. Electrolysis of molten iron oxide is not used to extract iron.

(i) State why iron can be extracted by heating iron oxide with carbon.
(1 mark)

_____

_____

_____

(continued on the next page)

2 continued.

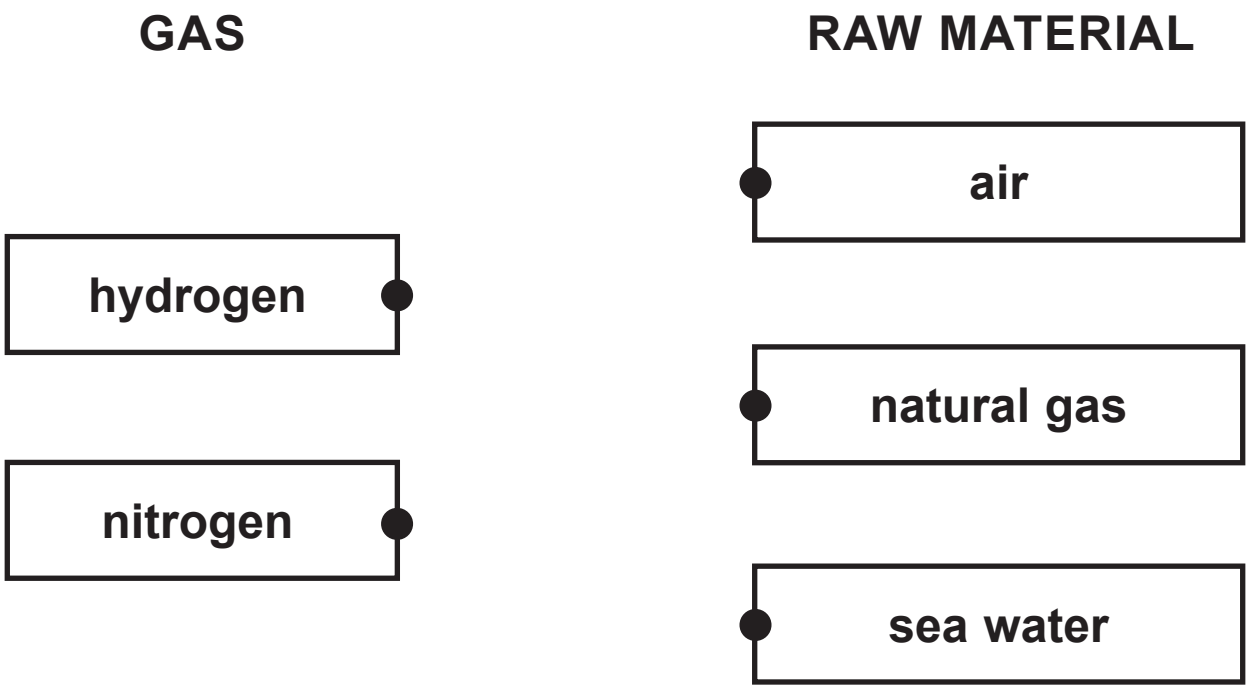
(ii) State why electrolysis is NOT used to extract iron.
(1 mark)

(Total for Question 2 = 9 marks)

3 Ammonia is made by reacting nitrogen with hydrogen.

(a) The nitrogen and hydrogen are obtained from raw materials.

Draw one straight line from each gas to the raw material it is obtained from.
(2 marks)



(continued on the next page)

3 continued.

(b) When nitrogen and hydrogen are reacted together, the reaction can reach a dynamic equilibrium.

Use words from the list below to complete the sentences about dynamic equilibrium.
(2 marks)

backward

different

equal

faster

reversible

In a dynamic equilibrium two reactions occur at the same time.

These are the forward reaction and the

_____ reaction.

The rates of the two reactions are

_____ .

(continued on the next page)

3 continued.

(c) The reaction between nitrogen and hydrogen happens at a pressure of 200 atmospheres.

Another unit of pressure is Pascals, Pa
(1 atmosphere = 101 325 Pa).

Calculate the value of 200 atmospheres in Pascals.
(2 marks)

_____

_____

_____

pressure = _____ Pa

(continued on the next page)

3 continued.

(d) Look at Figure 3 for Question 3(d) in the Diagram Booklet. It shows molecules of nitrogen, hydrogen and ammonia before the reaction and at equilibrium.

(i) Look at the table for Question 3(d)(i) in the Diagram Booklet. Complete the table showing

- the number of hydrogen molecules before reaction
- the number of hydrogen molecules at equilibrium
- the change in the number of hydrogen molecules.

(1 mark)

(ii) Complete the equation for this reaction.
(2 marks)

_____ + _____ $\rightleftharpoons$ $2NH_3$

(Total for Question 3 = 9 marks)

4 (a) Hydrochloric acid reacts with solid **B**.
Solid **B** is an alkali.

A student carries out an experiment to see how the pH changes when different masses of solid **B** are added to dilute hydrochloric acid.

Look at steps 1–5 for Question 4(a) in the Diagram Booklet. The student uses this method.

(i) Give a safety precaution that should be taken during the experiment.
(1 mark)

_____

_____

_____

(continued on the next page)

4 continued.

(ii) Give an improvement to step 4 that would produce more accurate results.
(1 mark)

_____

_____

_____

(iii) What is the most likely change in pH during the experiment?
(1 mark)

☐ A from 1 to 7

☐ B from 1 to 12

☐ C from 7 to 12

☐ D from 12 to 1

(continued on the next page)

4 continued.

(iv) If some methyl orange indicator is added to the acid in step 2, the mixture changes colour during the experiment.

State the colour change.
(2 marks)

colour at start in acid _____

colour at end _____

(continued on the next page)

4 continued.

(b) Concentrated hydrochloric acid can be broken down using electricity.
Look at Figure 4 for Question 4(b) in the Diagram Booklet. It shows the apparatus that can be used.

(i) Give the name of the piece of apparatus labelled **X**.
(1 mark)

_____

_____

(ii) The rod labelled **Y** in Figure 4 is made of graphite.

What is the name of this piece of apparatus?
(1 mark)

☐ A electrode

☐ B electrolysis

☐ C electrolyte

☐ D electron

(continued on the next page)

4 continued.

(iii) Give ONE reason why graphite is a suitable material to make Y.
(1 mark)

_____

_____

(iv) Complete the balanced equation for the reaction that occurs.
(1 mark)

(Total for Question 4 = 9 marks)

5 The scientist John Dalton lived over 200 years ago.

(a) John Dalton suggested an early model of atoms.

When Dalton first described atoms he said that

- **all elements are made of atoms**
- **atoms are not formed of any smaller particles**
- **all atoms of the same element are identical.**

Give two differences between Dalton's model of atoms and today's model of atoms.
(2 marks)

1 _____

_____

_____

_____

_____

(continued on the next page)

5 continued.

2 _____

_____

_____

_____

_____

(continued on the next page)

5 continued.

(b) Dalton also investigated different gases.

One of the gases that Dalton investigated was ethene.

Look at Figure 5 for Question 5(b) in the Diagram Booklet. It shows the structure of one molecule of ethene.

Give the molecular formula and the empirical formula of ethene.
(2 marks)

molecular formula _____

empirical formula _____

(continued on the next page)

5 continued.

(c) Another gas that Dalton investigated was chlorine.

Chlorine gas reacts with water.
The two products are a solution of hydrogen chloride and the substance HClO.

(i) Complete the balanced equation for this reaction, including the three missing state symbols.
(3 marks)

_____(_____) + _____(_____) ⇌

_____(_____) + HClO (aq)

(continued on the next page)

5 continued.

(ii) Hydrogen chloride solution is acidic.

Look at Figure 6 for Question 5(c)(ii) in the Diagram Booklet. It shows the formulae of four ions.

Give the formula of the ion in Figure 6 that causes the hydrogen chloride solution to be acidic.
(1 mark)

formula _____

(iii) An acid reacts with an alkali.

Give the name of this type of reaction.
(1 mark)

_____

_____

(continued on the next page)

5 continued.

(iv) Describe what you would SEE when some copper carbonate powder is added to a beaker of dilute sulfuric acid.
(2 marks)

(Total for Question 5 = 11 marks)

6 (a) A sample of potable water contains impurities.

Why is this sample of water potable even though it contains impurities?
(1 mark)

☐ A the impurities have no smell

☐ B the impurities are colourless

☐ C the impurities are harmless

☐ D the impurities are soluble

(continued on the next page)

6 continued.

(b) Waste water can be used to produce drinking water. The processes used include sedimentation, filtration and chlorination.

(i) What is sedimentation?
(1 mark)

☐ A the waste water is heated so the impurities evaporate

☐ B the waste water has an acid added to remove impurities

☐ C the impurities in the waste water settle to the bottom of their container

☐ D the impurities in the waste water are bleached

(continued on the next page)

6 continued.

(ii) State why the waste water is filtered.
(1 mark)

(iii) State the reason for chlorination.
(1 mark)

(continued on the next page)

6 continued.

(c) Some salts can be added to waste water to remove impurities.
In an experiment, different masses of salt **A** were added to 1000 cm^3 samples of waste water.
The experiment was repeated with salt **B**.
Look at Figure 7 for Question 6(c) in the Diagram Booklet. It shows the percentages of impurities removed from the waste water.

It was concluded that the best way to purify 1000 cm^3 of the waste water is to add 100 mg of salt **B**.

Use the information about salt **A** and salt **B** in Figure 7 to evaluate this conclusion.
(3 marks)

(continued on the next page)

6 continued.

*(d) A sample of water was contaminated with a dissolved solid.

Devise a plan to separate pure water from this mixture, including a test to show that the water obtained is neutral.

Look at Figure 8 for Question 6(d) in the Diagram Booklet. You may use some or all of the apparatus shown in Figure 8 and any other laboratory apparatus.
(6 marks)

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(continued on the next page)

6 continued.

(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

END OF PAPER