Pearson BTEC Level 1/Level 2 First Award

Centre Number

Learner Registration Number

Applied Science
Unit 1: Principles of Science

Friday 15 May 2015 – Morning
Time: 1 hour

Paper Reference
20460E

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*.

Information

- The total mark for this paper is 54.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

PEARSON

SECTION A: Physics

Answer ALL questions.

1 Jasmine boils water in this kettle to make a cup of tea.
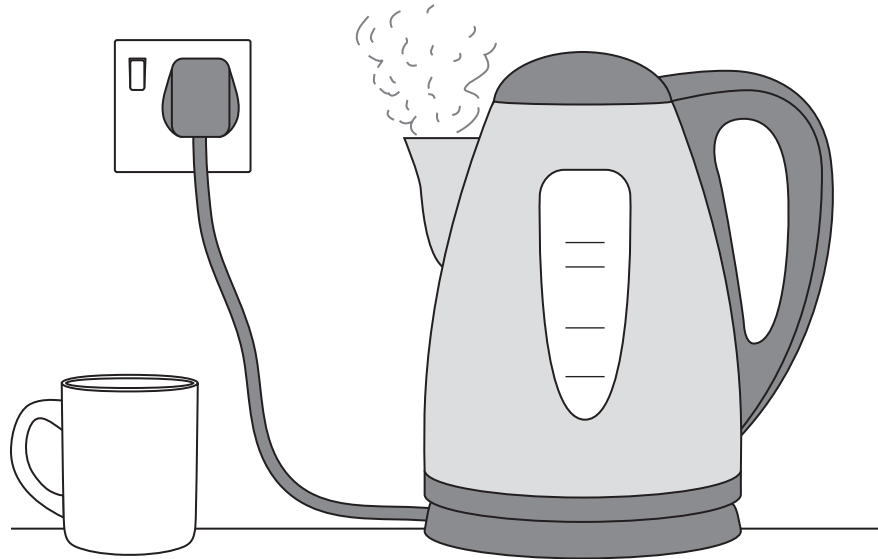
(a) (i) Name the type of energy used to power the kettle.

(1)

....

(ii) Name the type of useful energy produced when the kettle is boiling.

(1)

....

(iii) Name **one** type of energy wasted when the kettle is boiling.

(1)

....

P45826RA0216

(b) Jasmine holds a cup of tea and her hand becomes warm.

The cup transfers heat to her hand through conduction.
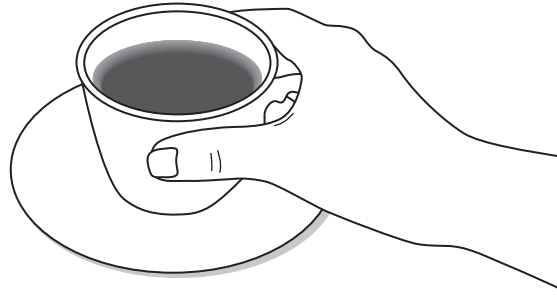
State **one** other type of heat transfer.

(1)

....

(Total for Question 1 = 4 marks)

P 4 5 8 2 6 R A 0 3 1 6

2 Charlotte visits a hydroelectric power plant.
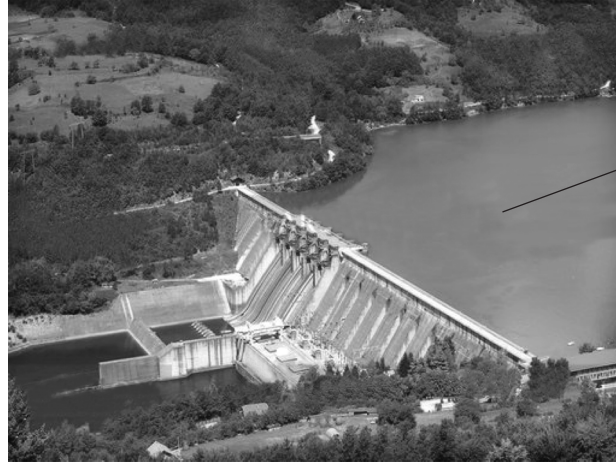
reservoir

(a) (i) Hydroelectricity is a form of renewable energy.

Give **one** other form of renewable energy.

(1)

....

(ii) Identify the type of energy stored in the water when it is in the reservoir.

(1)

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(b) Charlotte makes a model of a hydroelectric power plant.

In 10 minutes her model produced 2700 joules of energy in total.

(i) Calculate the power produced by her model.

$$\text{power(watts)} = \frac{\text{energy(joules)}}{\text{time(seconds)}}$$

(2)

.............................W

(ii) The efficiency of Charlotte's model is 90%.

Calculate the useful energy supplied by the water in ten minutes.

$$\text{efficiency} = \frac{\text{useful energy}}{\text{total energy supplied}} \times 100\%$$

(2)

.... J

(Total for Question 2 = 6 marks)

3 The diagram shows part of a wave.
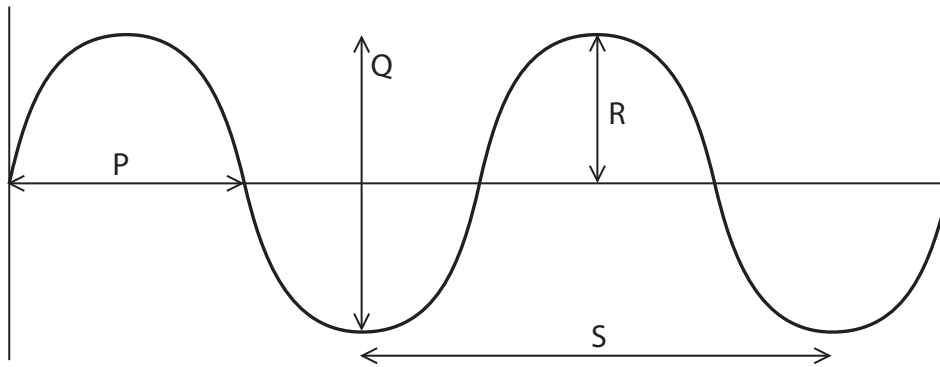
(a) Identify which arrow, P, Q, R, or S, shows the wavelength of the wave.

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(b) Give the unit for frequency.

(1)

....

(c) The diagram in box 1 shows a wave.

Box 1

Height (m)

Time (s)
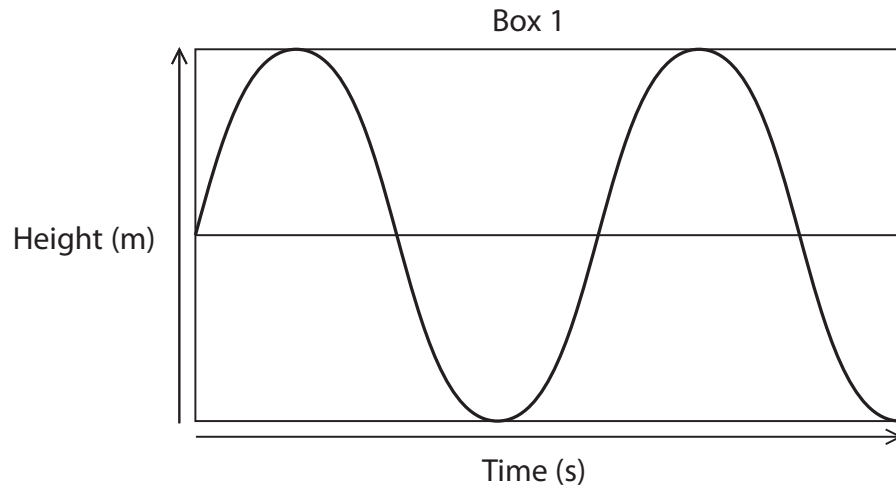
In box 2 draw a wave that has the **same amplitude** but a **higher frequency** than the wave shown in box 1.

(2)

Box 2

Height (m)

Time (s)
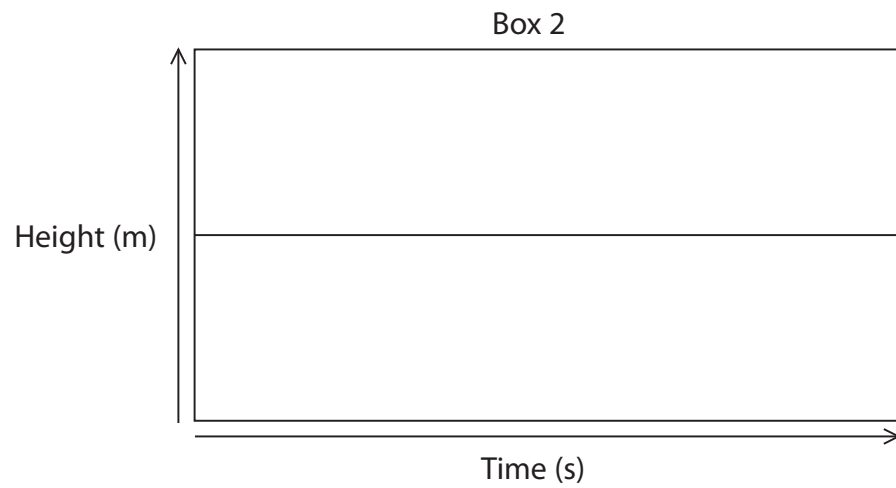
(d) The diagram shows different parts of the electromagnetic spectrum.

Radio waves	Microwaves	Infrared	Visible	Ultraviolet	X-rays	Gamma rays

Describe how radio waves and gamma rays differ in their properties and uses.

(4)

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(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS

SECTION B: Chemistry

Answer ALL questions.

4 Edward added hydrochloric acid to sodium carbonate.
The reaction produced a gas.

(a) (i) State what Edward would have **seen** during the reaction.

(1)

....

(ii) Edward thinks that the gas produced is either carbon dioxide or hydrogen.
Draw **one** line from each gas to the correct test for that gas.

(2)

Gas	Test for gas
	turns universal indicator purple
carbon dioxide	lit splint gives a squeaky pop
	turns limewater milky
hydrogen	relights a glowing splint
	turns red litmus paper blue

(iii) Give the formula for a molecule of carbon dioxide.

(1)

....

(iv) Give the formula for a molecule of hydrogen.

(1)

....

(b) Sodium carbonate is a base.

Suggest a value for the pH of a sodium carbonate solution.

(1)

....

(Total for Question 4 = 6 marks)

5 The diagrams show the arrangement of particles in four different substances.
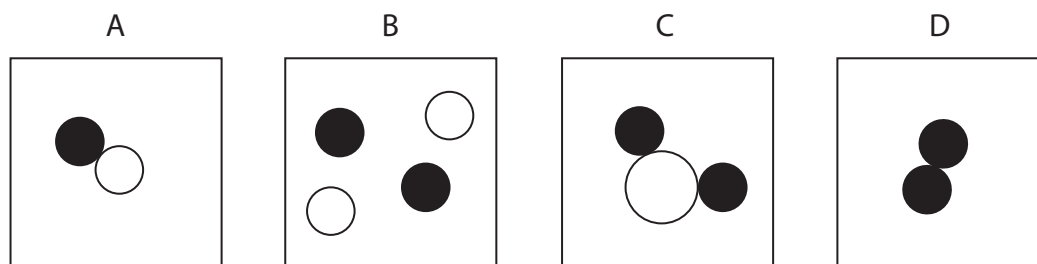
Use the diagrams to answer questions 5(a)(i) to 5(a)(iii).

Each diagram can be used once, more than once or not at all.

(a) (i) Identify which substance is an element.

(1)

....

(ii) Identify which substance is a mixture.

(1)

....

(iii) Identify which diagram could be of a molecule of water.

(1)

....

(b) Sodium chloride can be formed by the reaction of hydrochloric acid with sodium hydroxide.

(i) State the name given to this type of reaction.

(1)

....

(ii) Write a word equation for the reaction.

(2)

	+	→	+
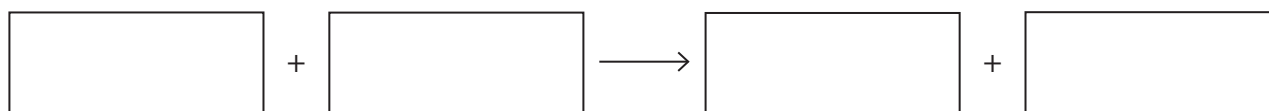
(Total for Question 5 = 6 marks)

6 The diagram shows part of the periodic table.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 0 |

| | | | | | | | 19
F
9 | |
| | | | | | | | 35.5
Cl
17 | |

Explain why fluorine and chlorine are in the positions shown.

Your answer should include ideas about

- the electronic configuration of the atoms

- periods and groups

- properties of the elements.

(6)

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(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

7 (a) Human responses can be voluntary or involuntary.

Give **one** example of a voluntary response.

(1)

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(b) The human body maintains its temperature of 37°C by homeostasis.

(i) Give **one** way in which the human body will respond to being too cold.

(1)

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(ii) Give **one** way in which the human body will respond to being too hot.

(1)

....

(c) Give **one** difference between the endocrine system and the nervous system.

(1)

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(Total for Question 7 = 4 marks)

P 4 5 8 2 6 R A 0 1 3 1 6

8 The diagram shows a plant.

flower

stem

leaf

roots
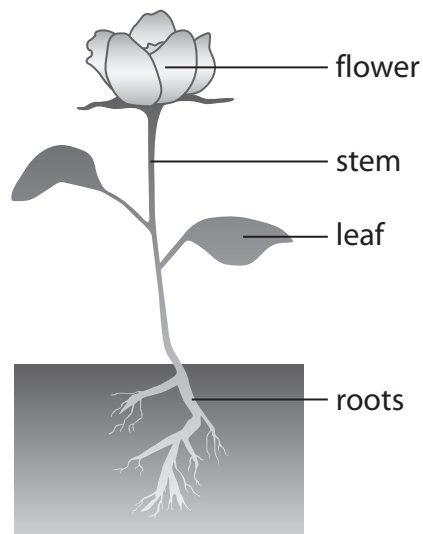
(a) State **one** function of the leaf of the plant.

(1)

....

The diagram shows a root hair cell.
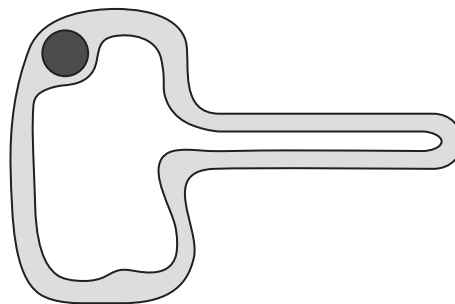
(b) (i) Draw a line to label the nucleus.

(1)

(ii) Name the component of the cell that allows entry and exit of substances.

(1)

....

(c) State **one** way that the root hair cell is adapted to absorb water and minerals from the soil.

(1)

....

....

....

(d) The xylem and phloem are present in the stem of the plant.

Explain how the xylem and phloem are adapted for their functions.

(4)

Xylem ....

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....

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....

....

Phloem ....

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(Total for Question 8 = 8 marks)

9 Mr and Mrs Williams have two children, Hannah and Sam.

Mr Williams has blue eyes (bb).

Mrs Williams has brown eyes (Bb).

Hannah has brown eyes.

Sam has blue eyes.

	Male	
	b	b
B	Bb	Bb
b	bb	bb

Female

Use the Punnett square and your knowledge of genetics to explain why Hannah has brown eyes and Sam has blue eyes.

(6)

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(Total for Question 9 = 6 marks)

TOTAL FOR SECTION C = 18 MARKS

TOTAL FOR PAPER = 54 MARKS