Write your name here

Surname	Other names

Pearson BTEC Level 1/Level 2 First Award

Centre Number

Learner Registration Number

Applied Science

Unit 1: Principles of Science

Wednesday 1 March 2017 – 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 learner registration 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.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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Pearson

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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 put a cross in another box ☒.

SECTION A: Physics

1 The chart shows the main parts of the electromagnetic spectrum.

radio waves	microwaves	infrared	visible light	ultraviolet	X-rays	gamma rays

(a) Give **one** use of infrared radiation.

(1)

.....

(b) State **one** possible harmful effect of excessive exposure to X-rays.

(1)

.....

(c) Different parts of the electromagnetic spectrum have different frequencies.

(i) State what is meant by the term **frequency**.

(1)

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.....

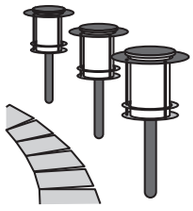
(ii) Name the part of the electromagnetic spectrum with the highest frequency.

(1)

.....

(Total for Question 1 = 4 marks)

2 Lee investigates solar powered lamps.



(a) Solar energy is a renewable energy source.

(i) Name **one** other renewable energy source.

(1)

.....

(ii) Name **one** form of useful energy the solar powered lamps produce.

(1)

.....

(iii) Name the form of energy the solar powered lamps waste.

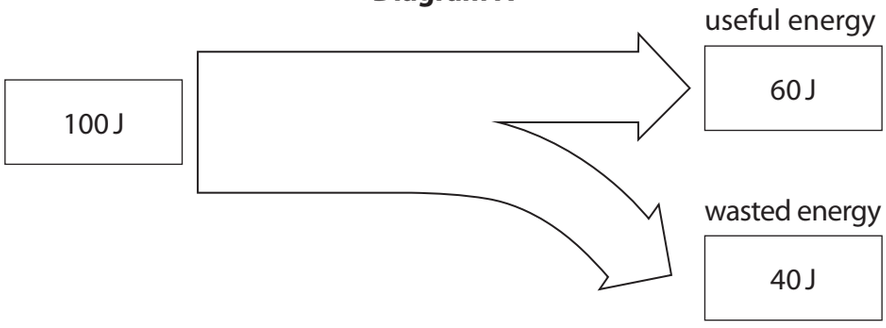
(1)

.....

(b) Lee researches the efficiency of solar powered lamps.

(i) Diagram A shows the energy transfer for a solar powered lamp.

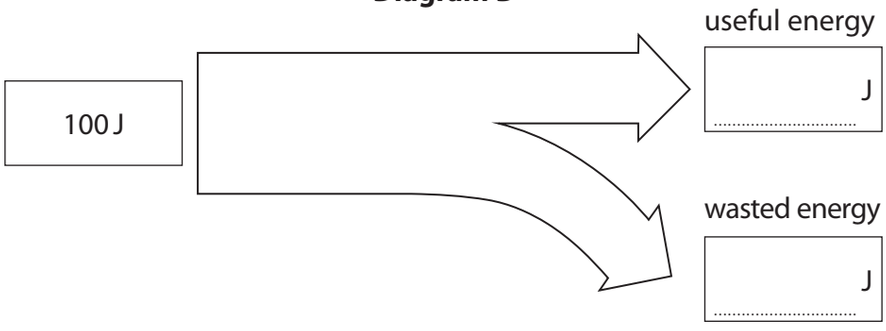
Diagram A



Complete diagram B for a solar powered lamp that is more efficient.

(1)

Diagram B



(ii) The efficiency of a solar powered lamp is 75%.

The amount of useful energy produced by the solar powered lamp was 30 J.

Calculate the total energy supplied to the solar powered lamp.

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

Show your working.

(2)

..... J

(Total for Question 2 = 6 marks)

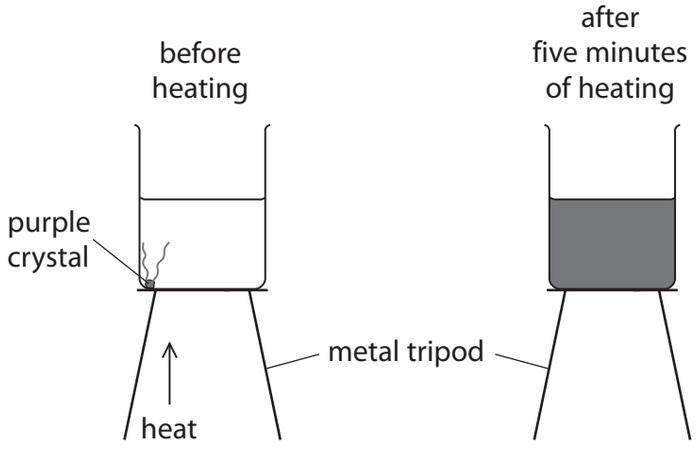
3 Tanuka investigates the process of convection.

She places a soluble purple crystal into a beaker of cold water.

She heats the water with a Bunsen burner for 5 minutes.

After 5 minutes, she turns the Bunsen burner off.

She sees that the crystal has dissolved and spread throughout the water, changing the colour of the water to purple.



(a) The Bunsen burner burns a fuel called natural gas.

(i) Name the type of energy stored in natural gas.

(1)

.....

(ii) Natural gas is a non-renewable energy source.

State what is meant by a **non-renewable energy source**.

(1)

.....

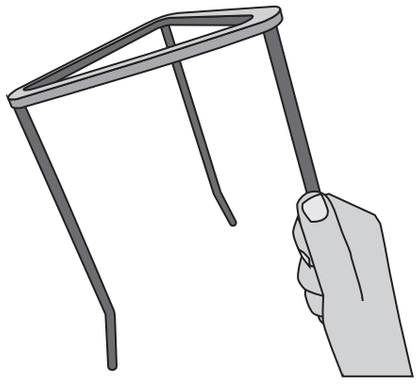
.....

(b) The diagram shows how the experiment looked before heating and after five minutes of heating.

Explain how convection currents cause the dissolved purple crystal to spread throughout the water.

(4)

(c) Tanuka clears her equipment away at the end of the experiment.



She picks up her tripod and finds the bottom of the tripod is warm.

Explain how the process of conduction has made the bottom of the tripod warm.

(2)

(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS

SECTION B : Biology

4 Roy is running a long distance race.

During the race, his body temperature increases and his blood glucose concentration decreases.

(a) State **two** ways Roy's body responds to lower his temperature.

(2)

1 .....

2 .....

(b) Roy's body releases a hormone to increase the concentration of glucose in his bloodstream.

(i) Identify the hormone released.

(1)

☒ **A** glucagon

☒ **B** glucose

☒ **C** glycogen

☒ **D** insulin

(ii) Name the process in the body that maintains temperature and blood glucose concentration.

(1)

.....

(iii) Name the system in the body that produces and releases hormones.

(1)

.....

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(iv) Name the organ that produces and releases the hormones that regulate blood glucose concentration.

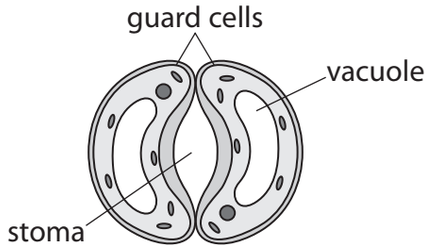
(1)

.....

(Total for Question 4 = 6 marks)

5 Stomata are present in the surface of leaves to allow gas exchange.

The diagram shows a stoma.



(a) The guard cells have been labelled.

Draw a line to label a nucleus in a guard cell.

(1)

(b) A vacuole in the guard cell has been labelled.

The vacuole contains cell sap.

State the function of a vacuole.

(1)

.....

.....

(c) Guard cells contain chloroplasts.

Photosynthesis takes place in the chloroplasts.

Describe the process of photosynthesis.

(2)

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.....

(d) The stoma in the diagram is open.

At night the stoma closes.

Explain how the guard cells change to allow the stoma to close.

(2)

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(Total for Question 5 = 6 marks)

6 Aisha accidentally steps on a sharp pin.

She quickly lifts her foot away from the sharp pin.

Explain how the reflex arc makes Aisha lift her foot.

(6)

(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

SECTION C: Chemistry

7 (a) Holly-Mae has four substances, an acid, an alkali, a base and pure water.

(i) Which **one** of the substances would turn blue litmus paper red?

(1)

☒ **A** the acid

☒ **B** the alkali

☒ **C** the base

☒ **D** the pure water

(ii) Identify the pH range for an alkali.

(1)

☒ **A** 1–14

☒ **B** 1–6

☒ **C** 6–8

☒ **D** 8–14

(b) Water is a compound.

(i) Give the formula for a molecule of water.

(1)

.....

(ii) State what is meant by the term **compound**.

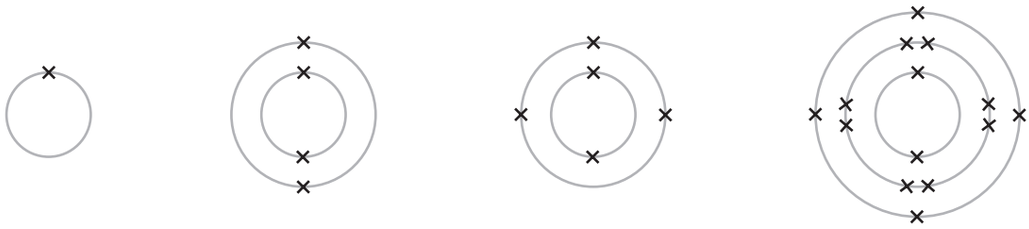
(1)

.....

.....

(Total for Question 7 = 4 marks)

8 The diagram shows the electronic structure of elements A, B, C and D.



A B C D

(a) (i) Write the electronic configuration of element D.

(1)

.....

(ii) Which element, A, B, C or D, is in group 2?

(1)

☒ **A** element A

☒ **B** element B

☒ **C** element C

☒ **D** element D

(iii) Which element, A, B, C or D, is in period 3?

(1)

☒ **A** element A

☒ **B** element B

☒ **C** element C

☒ **D** element D

(iv) Give the atomic number of element C.

(1)

.....

(b) Lithium has an atomic number of 3.

It has two naturally occurring isotopes, lithium-6 and lithium-7.

(i) Give **one** similarity and **one** difference between the atomic structure of the lithium isotopes.

(2)

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.....

(ii) Lithium, Li, reacts with oxygen in the air to form lithium oxide, Li_2O.

Write a balanced equation for the reaction.

(2)

.....

(Total for Question 8 = 8 marks)

9 Pedro has the following information on reactions of acids.

metal carbonate + acid → metal salt + water + carbon dioxide

metal + acid → metal salt + hydrogen

Describe experiments Pedro can carry out to test if substances are metals, metal carbonates or neither.

You may use diagrams to help your answer.

(6)

(Total for Question 9 = 6 marks)

TOTAL FOR SECTION C = 18 MARKS
TOTAL FOR PAPER = 54 MARKS

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