Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson BTEC Level 1/Level 2 First Award

Centre Number | | | | | | |

Learner Registration Number | | | | | | | | |

Wednesday 3 February 2021

Morning (Time: 1 hour) | Paper Reference **20460E**

Applied Science

Unit 1: Principles of Science

You must have:
A calculator and a ruler.

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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1/1/1/1/1/1/1/1

P 6 7 6 7 9 A 0 1 2 0

Pearson

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 ☒.

SECTION A: Chemistry

1 Copper is an element in the periodic table.

Figure 1 shows part of a periodic table.

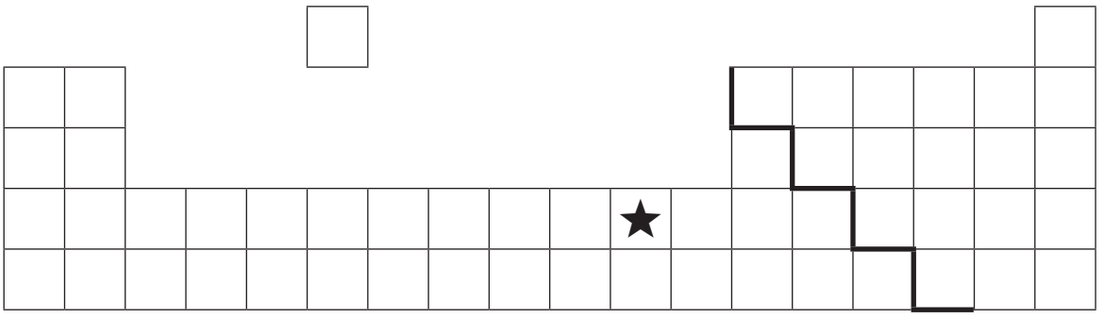

Figure 1

(a) The ★ symbol in Figure 1 shows the position of copper.

The position of the ★ shows that copper is:

(1)

☒ **A** an acid

☒ **B** an alkali

☒ **C** a metal

☒ **D** a non-metal

(b) Copper reacts with oxygen to form copper oxide.

Complete the word equation for this reaction.

(2)

..... + ... → .....

(c) Copper atoms can exist as isotopes.

Two isotopes of copper are copper-63 and copper-65.

A sample of copper contains 50% copper-63 and 50% copper-65.

What is the relative atomic mass of this sample of copper?

(1)

☒ **A** 32.00

☒ **B** 32.50

☒ **C** 64.00

☒ **D** 128.00

(Total for Question 1 = 4 marks)

2 Silicon is an element.

Figure 2 shows a silicon atom.

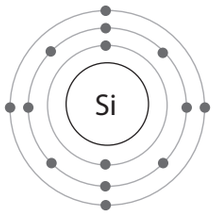

Figure 2

(a) The silicon atom contains 14 electrons.

Write the electronic configuration for the silicon atom.

(1)

..... • ..... • .....

(b) The silicon atom contains 14 neutrons.

(i) State where in the atom the neutrons are found.

(1)

.....

(ii) State the charge of a neutron.

(1)

.....

(c) Silicon is in group 4 and period 3 of the periodic table.

Figure 3 shows part of a periodic table.

Draw a cross (**X**) in a box in Figure 3 to show the correct position of silicon.

(1)

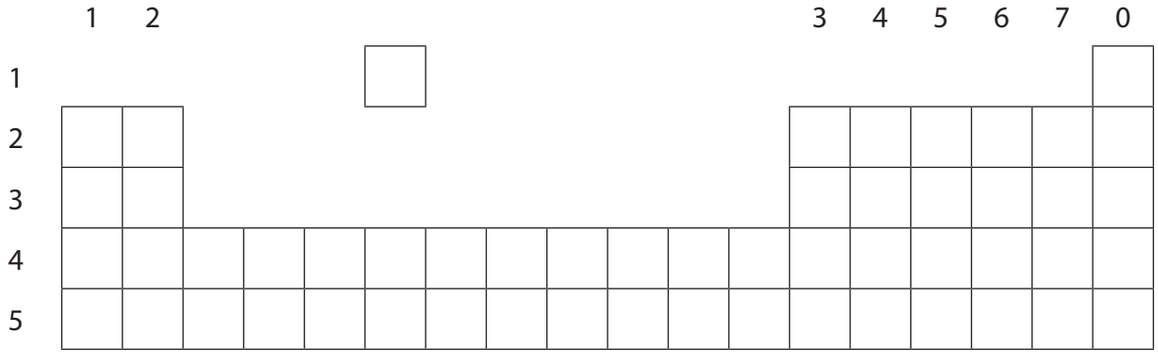

Figure 3

(d) The silicon atom contains 14 electrons and 14 neutrons.

Complete Figure 4 to show the mass number and the atomic number of this silicon atom.

(2)

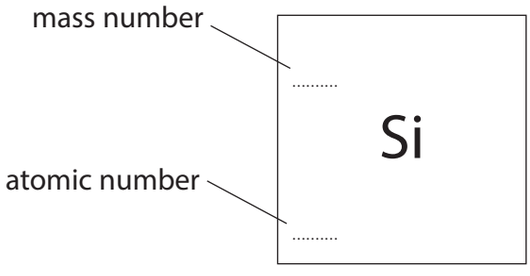

Figure 4

(Total for Question 2 = 6 marks)

3 Figure 5 shows a bottle containing dilute sulfuric acid and a bottle containing dilute sodium hydroxide solution.

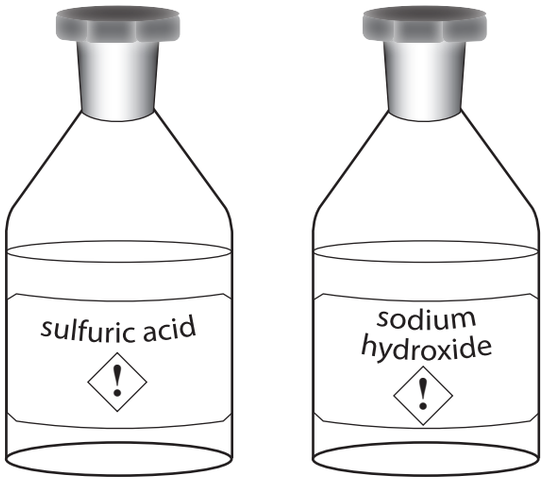

Figure 5

(a) State a meaning of the hazard symbol shown on the bottles in Figure 5.

(1)

.....

(b) Write the chemical formula for sodium hydroxide.

(1)

.....

(c) Sulfuric acid (H_2SO_4) is a compound.

State why sulfuric acid is a compound.

(2)

.....

.....

.....

.....

(d) A learner has two colourless solutions: solution A and solution B.

The learner:

- pours some of solution A into a clean test tube
- adds a few drops of universal indicator to solution A and notices solution A turns red
- adds solution B, drop by drop, until the mixture turns green.

Explain the conclusions the learner can make from the **two** colour changes seen.

(4)

(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS

SECTION B: Biology

4 The human body consists of organ systems.

(a) The endocrine system produces hormones.

Glucagon is a hormone.

(i) State what glucagon controls in the human body.

(1)

.....

(ii) Name the organ that releases glucagon.

(1)

.....

(iii) State how hormones are transported around the human body.

(1)

.....

(b) The nervous system is another organ system.

Figure 6 shows how the nervous system can produce an involuntary response and a voluntary response.

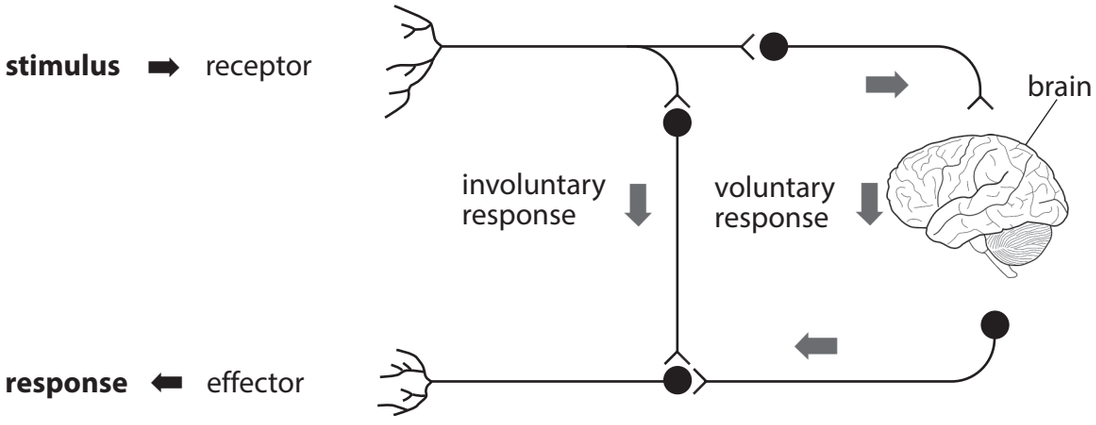

Figure 6

Give **one** reason why the involuntary response in Figure 6 is quicker than the voluntary response.

(1)

.....

.....

(c) The nervous system consists of the central nervous system and the peripheral nervous system.

Name the **two** types of neurone in the peripheral nervous system.

(2)

1 .....

2 .....

(Total for Question 4 = 6 marks)

5 Figure 7 shows a sperm cell.

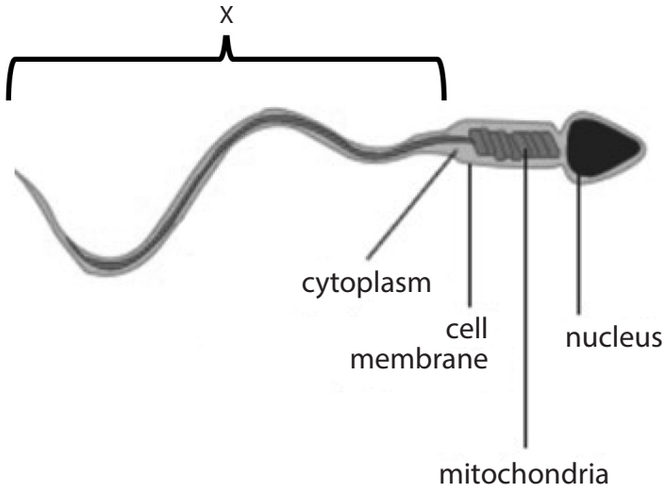

Figure 7

(a) Name the part of the sperm cell labelled X in Figure 7.

(1)

.....

(b) The sperm cell contains DNA.

(i) Name the organelle that contains the DNA in the sperm cell.

(1)

.....

(ii) Describe the shape of a DNA molecule.

(2)

.....

.....

(c) The sperm cell contains large numbers of mitochondria.

Explain the function of the mitochondria in the sperm cell.

(2)

.....

.....

.....

.....

(Total for Question 5 = 6 marks)

6 Figure 8 shows a cross section of a plant stem.

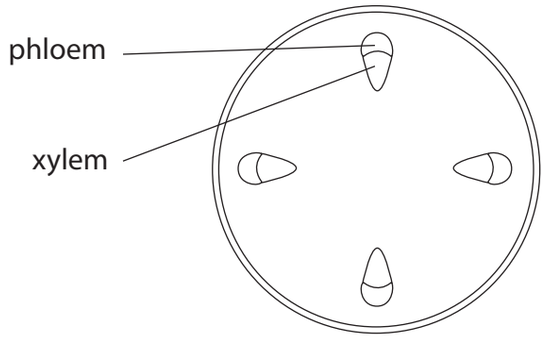

Figure 8

Explain the structure and function of the phloem and xylem in the plant stem.

(6)

(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

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SECTION C: Physics

7 Figure 9 shows a washing machine.

Inside the washing machine, a rotating drum moves the clothes around.

(Source © OrangeVector/Shutterstock)

Figure 9

(a) State **one** form of energy output when the drum is moving.

(1)

.....

(b) (i) The total energy input of the washing machine is 27 000 J.

The useful energy output of the washing machine is 17 000 J.

Calculate the amount of energy wasted.

(1)

energy wasted = ... J

(ii) The washing machine uses 27 000 J of energy in 60 seconds.

Calculate the power of the washing machine.

You should include the unit of power in your answer.

(2)

$$\text{power} = \frac{\text{energy used (J)}}{\text{time (s)}}$$

power = ... unit (.....)

(Total for Question 7 = 4 marks)

DO NOT WRITE IN THIS AREA

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8 Figure 10 shows a propane burner.

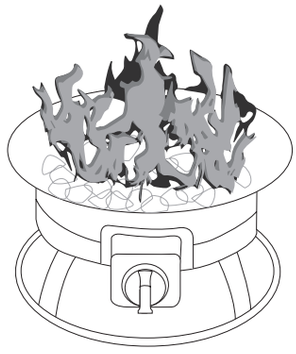

Figure 10

The energy stored in propane is transferred in a propane burner.

(a) State the form of useful energy transferred when the propane is burned.

(1)

.....

(b) State the form of energy stored in propane.

(1)

.....

(c) Energy sources can be renewable or non-renewable.

Propane is a non-renewable energy source.

Complete Table 1 to show if the energy sources are renewable or non-renewable.

The first row has been completed for you.

(2)

energy source	renewable	non-renewable
propane	no	yes
biofuel		
hydroelectric		
nuclear		
wind		

Table 1

(d) Figure 11 shows a metal saucepan filled with cold water on top of a propane burner.

Energy is transferred through the saucepan into the water by conduction.

After some time, all the water in the saucepan is hot.

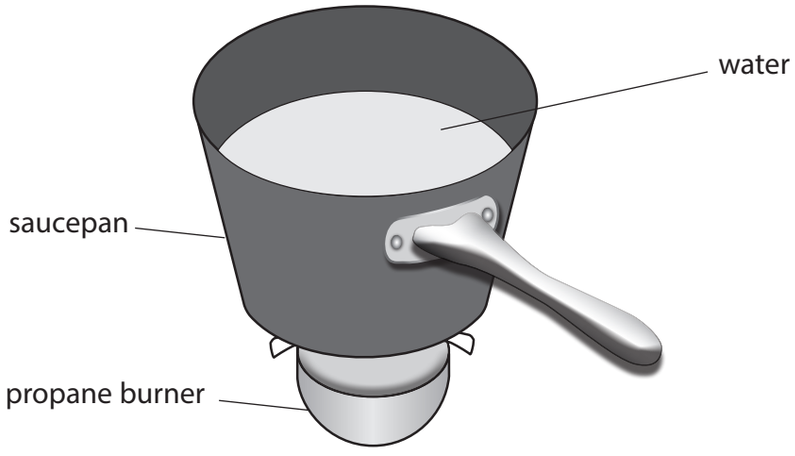

Figure 11

Explain how **all** the water in the saucepan becomes hot.

You may use a diagram to support your answer.

(4)

(Total for Question 8 = 8 marks)

9 Figure 12 shows the electromagnetic spectrum.

Two parts of the electromagnetic spectrum are labelled.

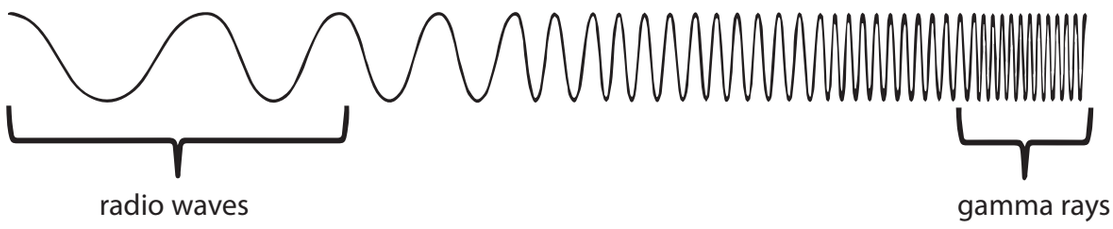

Figure 12 – not to scale

Radio waves are at one end of the spectrum.

Gamma rays are at the other end of the spectrum.

Compare the features and any harmful effects of radio waves and gamma rays.

(6)

features .....

.....

.....

.....

.....

.....

harmful effects .....

.....

.....

.....

.....

.....

(Total for Question 9 = 6 marks)

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

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