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

Tuesday 16 May 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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P 4 8 3 0 2 A 0 1 1 6

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: Biology

1 The diagram shows a sperm cell.

(a) (i) State the function of the cytoplasm.

(1)

.....

.....

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

(1)

.....

(iii) Name the cell component where respiration takes place.

(1)

.....

.....

(b) State the function of the tail of the sperm cell.

(1)

.....

.....

(Total for Question 1 = 4 marks)

2 The image shows a chromosome.

(a) State where chromosomes are found in a cell.

(1)

.....

(b) DNA contains complementary base pairs.

Cytosine (C) pairs with guanine (G).

Name the base that pairs with thymine (T).

(1)

.....

(c) The allele for brown eyes is B.
The allele for blue eyes is b.
A father is heterozygous for brown eyes, and has the genotype Bb.
A mother is homozygous for blue eyes.

Complete the Punnett square using this information.

(2)

		mother	
father	B		
	b		

(d) Explain **one** beneficial effect of genetic mutations on organisms.

(2)

.....

.....

.....

.....

(Total for Question 2 = 6 marks)

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3 (a) Name the **two** organs of the central nervous system.

(2)

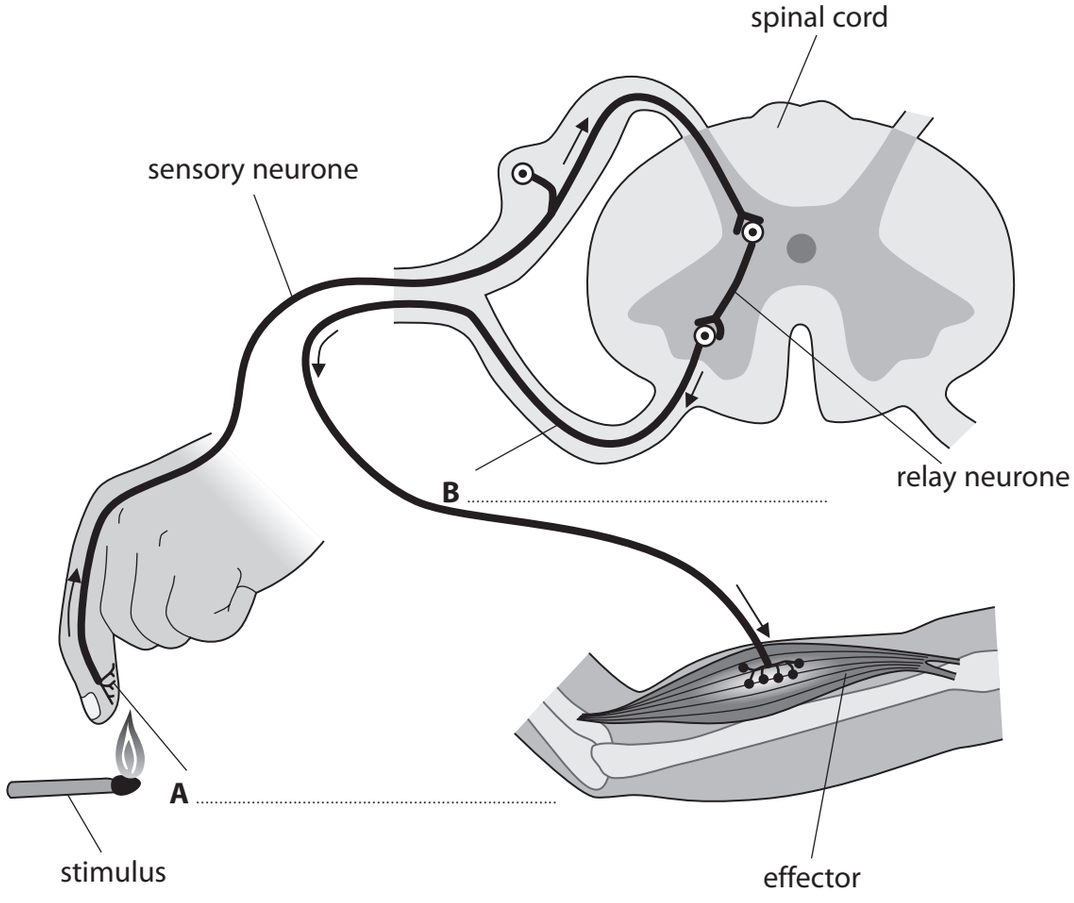
1 .....

2 .....

(b) The diagram shows a reflex arc.

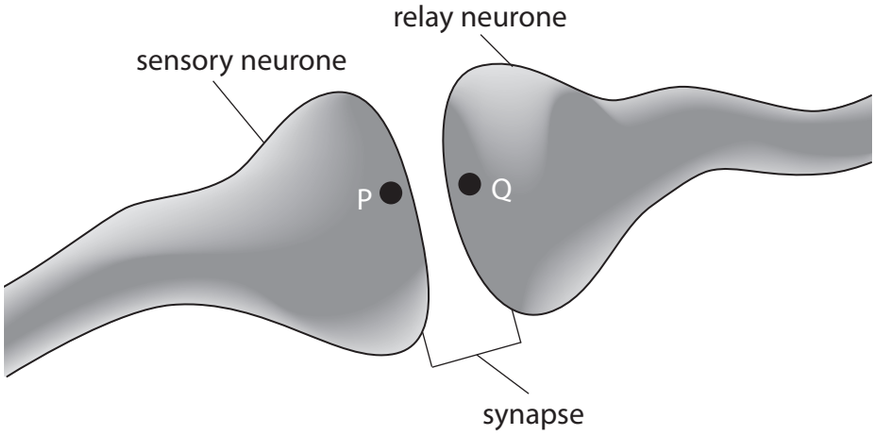
Complete the labels, **A** and **B**, of the reflex arc.

(2)



(c) The diagram shows a sensory neurone and a relay neurone.

The gap between the neurones is called a synapse.



Explain how information travels from point P to point Q.

(4)

(Total for Question 3 = 8 marks)

TOTAL FOR SECTION A = 18 MARKS

SECTION B: Chemistry

4 (a) The diagram shows four substances, W, X, Y and Z.

W X Y Z

(i) Which of the substances are elements?

(1)

- ☒ **A** W and X
- ☒ **B** W and Y
- ☒ **C** X and Y
- ☒ **D** X and Z

(ii) Give the letters of **all** the substances from the diagram that are molecules.

(1)

.....

(iii) A container of substance X is labelled with this hazard symbol.

State the meaning of this hazard symbol.

(1)

.....

(iv) Write the chemical formula for substance Z.

(1)

.....

(b) Hydrogen is an element.

Describe the test for hydrogen.

(2)

Test.....

.....

Result.....

.....

(Total for Question 4 = 6 marks)

5 (a) Sam adds sodium hydroxide solution to hydrochloric acid to form a neutral solution.

He then adds universal indicator solution.

(i) State the pH of the neutral solution.

(1)

.....

(ii) State the colour of the universal indicator in the neutral solution.

(1)

.....

(b) Indigestion is caused by excess stomach acid.

When indigestion remedies are taken, a neutralisation reaction takes place.

Explain why this is a neutralisation reaction.

(2)

.....

.....

.....

.....

(c) The reaction of zinc oxide with sulfuric acid is another neutralisation reaction.

Complete the symbol equation to show the products of this reaction.

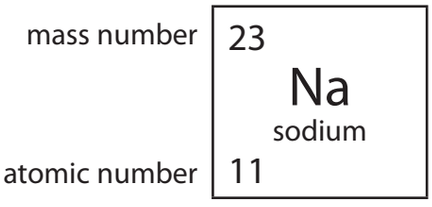
(2)

$ZnO + H_2SO_4 \rightarrow$ ..... + ...

(Total for Question 5 = 6 marks)

6 The diagram shows some information about sodium.

This information can be used to determine its electronic configuration.



Explain the position of sodium in the periodic table, referring to its electronic configuration.

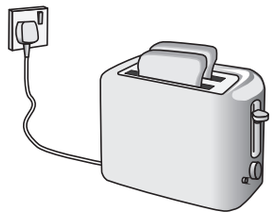
(6)

(Total for Question 6 = 6 marks)

TOTAL FOR SECTION B = 18 MARKS

SECTION C: Physics

7 The picture shows a toaster.



(a) Name the type of energy used to power the toaster.

(1)

.....

(b) Name the type of energy used to toast the bread.

(1)

.....

(c) Name **one** type of energy wasted by the toaster.

(1)

.....

(d) The toaster transfers 138 000 joules of energy in 60 seconds.

Calculate the power of the toaster.

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

Show your working.

(1)

Power = ... W

(Total for Question 7 = 4 marks)

8 Radio waves and X-rays are two parts of a spectrum of waves.

(a) (i) Name this spectrum of waves.

(1)

.....

(ii) State **one** other wave in this spectrum.

(1)

.....

(b) Explain why some healthcare workers stand behind a screen made of lead when taking X-ray images.

(2)

.....

.....

.....

.....

(c) The speed of radio waves is 3×10^8 m/s.

A radio wave has a frequency of 600 000 Hz.

Calculate the wavelength of this radio wave.

wave speed (m/s) = wavelength (m) $\times$ frequency (Hz)

Give your answer in standard form.

Show your working.

(4)

Wavelength = ... m

(Total for Question 8 = 8 marks)

9 Fuels are used to provide energy.

Biofuels are renewable fuels.

Plants can be used to make biofuels.

Fossil fuels are non-renewable fuels.

Fossil fuels can be obtained from under the ground.

Discuss the advantages and disadvantages of using biofuels rather than fossil fuels to provide energy.

(6)

(Total for Question 9 = 6 marks)

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

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