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Candidate surname

Other names

**Pearson BTEC  
Level 1/Level 2  
First Award**

Centre Number

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Learner Registration Number

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**Tuesday 14 May 2019**

Afternoon (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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Answer ALL questions. Write your answers in the spaces provided.

For multiple-choice questions put a cross in each correct box  to indicate your answer. If you change your mind, put a line through the box  and then put a cross in another box .

SECTION A : Biology

1 Different processes happen in the human body to keep the temperature constant.

Figure 1 shows two people.

Person A is too cold.

Person B is too warm.

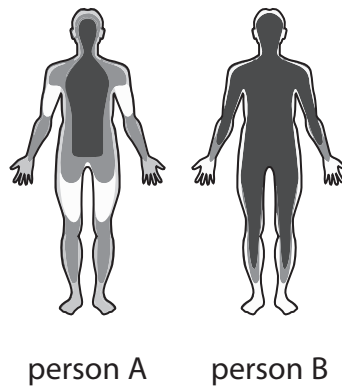


Figure 1

(a) (i) Give **one** process that happens in the body of person A to warm up their body. (1)

.....

(ii) Give **two** processes that happen in the body of person B to cool down their body. (2)

1 .....

2 .....

(b) The processes used to keep the body temperature constant are involuntary responses. State what is meant by the term **involuntary response**. (1)

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(Total for Question 1= 4 marks)



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2 (a) Figure 2 shows a type of neurone.

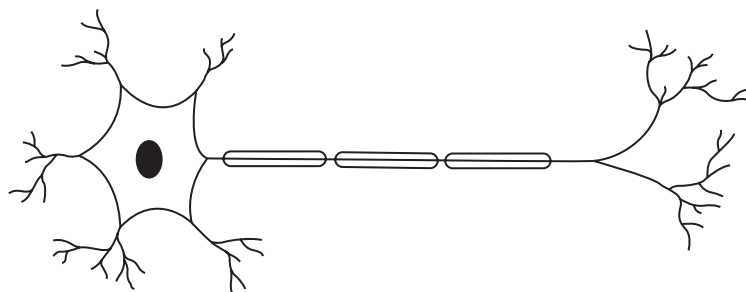


Figure 2

- (i) Draw a line to the nucleus of the neurone. (1)
- (ii) State the function of the nucleus. (1)

- (iii) Draw a cross (x) on the axon of the neurone. (1)
- (iv) Name the system in the body that contains neurones. (1)

(b) Figure 3 shows the gap between neurone A and neurone B.

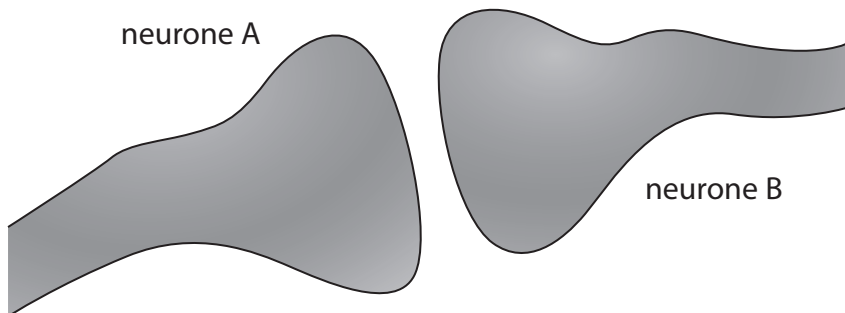


Figure 3

Complete the description to show how an impulse travels from neurone A to neurone B. (2)

An electrical impulse travels along neurone A.

Neurone A releases ..... which travel across the gap called the .....

They attach to neurone B and an electrical impulse travels along neurone B.

(Total for Question 2 = 6 marks)



3 (a) A genotype can be heterozygous or homozygous.

State what is meant by the term **heterozygous**.

(1)

.....

.....

(b) State what is meant by the term **phenotype**.

(1)

.....

.....

(c) The peppered moth can be either white speckled or black.

The black moth is caused by a genetic mutation.

In areas of high pollution, tree trunks are much darker because of high levels of soot in the atmosphere.

Figure 4 shows both types of moth on a tree trunk in an area with high levels of soot.



**Figure 4**

Explain why, in areas with high levels of soot, this genetic mutation is beneficial to black moths.

(2)

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(d) Pea plants can produce either green peas or yellow peas.  
The allele for yellow peas is Y.  
The allele for green peas is y.

The allele for yellow peas is dominant.

A parent pea plant with the genotype YY is crossed with a parent pea plant with the genotype yy.

Explain why all the offspring pea plants produce yellow peas.  
You may use a Punnett square to support your answer.

(4)

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**(Total for Question 3 = 8 marks)**

**TOTAL FOR SECTION A = 18 MARKS**

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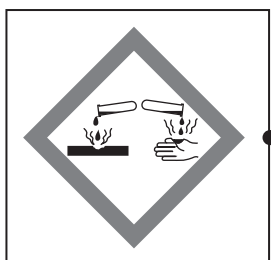
**SECTION B : Chemistry**

4 (a) Different substances have different hazard symbols.

Draw a line from each hazard symbol to its hazard.

(3)

**hazard symbol**



**hazard**

• corrosive

• explosive

• flammable

• harmful to the environment

• irritant

• oxidising

• toxic

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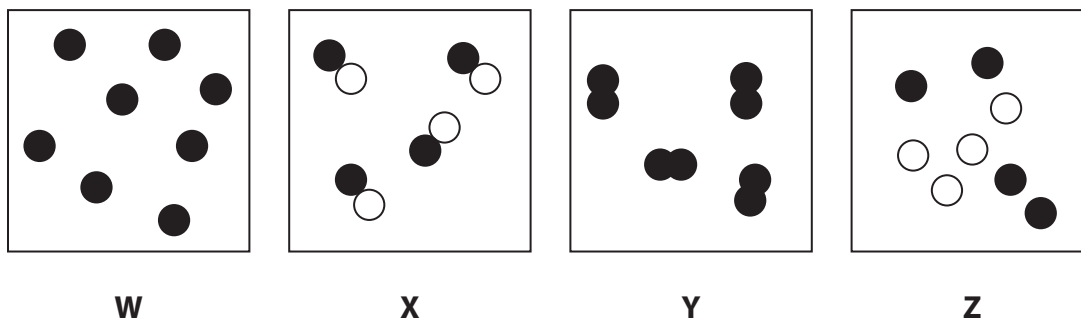
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(b) Substances can be atoms or molecules.

They can be elements, compounds or mixtures.

Figure 5 shows four substances W, X, Y and Z.



**Figure 5**

(i) Which substance is a mixture?

(1)

- A** substance **W**
- B** substance **X**
- C** substance **Y**
- D** substance **Z**

(ii) Which substance is a compound?

(1)

- A** substance **W**
- B** substance **X**
- C** substance **Y**
- D** substance **Z**

(iii) One of the substances could be oxygen.

Give the formula for a molecule of oxygen.

(1)

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**(Total for Question 4 = 6 marks)**

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P 6 0 9 3 7 A 0 7 1 6

5 Magnesium is a metal.

(a) Magnesium reacts with hydrochloric acid to produce magnesium chloride and hydrogen.

(i) Write the word equation for this reaction.

(1)

..... + ..... → ..... + .....

(ii) Identify the formula for hydrochloric acid.

(1)

- A HCl
- B HNO<sub>3</sub>
- C H<sub>2</sub>SO<sub>4</sub>
- D NaOH

(iii) A student reacts a piece of magnesium ribbon with hydrochloric acid.

State **one** observation the student would see as the magnesium reacts with the acid.

(1)

.....

(iv) The hydrogen produced can be tested using a lit splint.

Give the positive result of this test.

(1)

.....

.....

(b) Magnesium has different isotopes.

A sample of magnesium contains:

- 79% magnesium-24
- 10% magnesium-25
- 11% magnesium-26

Calculate the relative atomic mass of this sample of magnesium.

(2)

relative atomic mass of magnesium = .....

**(Total for Question 5 = 6 marks)**

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6 Figure 6 shows some information about aluminium.

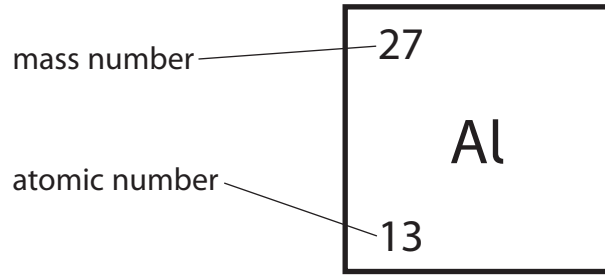


Figure 6

Describe, using the information in Figure 6, the structure of an atom of aluminium.

You may use diagrams to support your answer.

(6)

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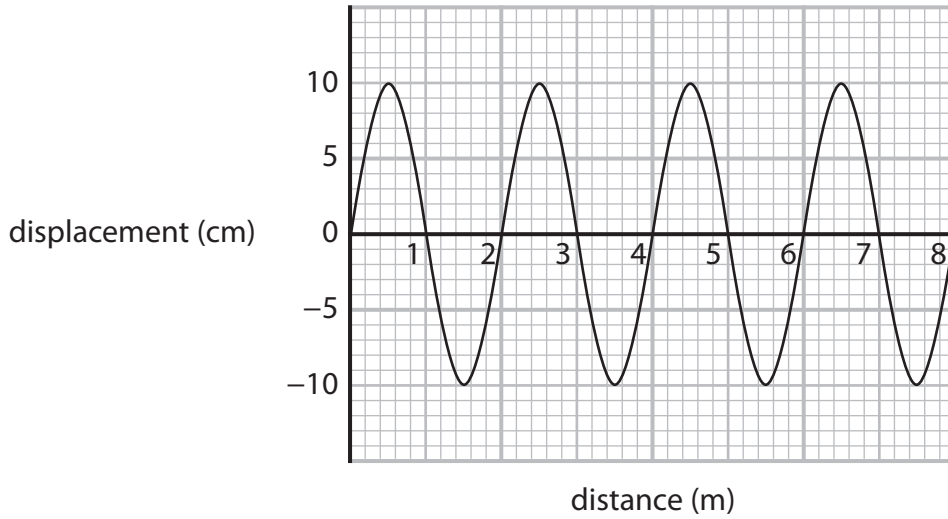
**(Total for Question 6 = 6 marks)**

**TOTAL FOR SECTION B = 18 MARKS**



**SECTION C : Physics**

7 (a) Figure 7 shows a wave.



**Figure 7**

(i) Give the amplitude of the wave.

(1)

amplitude of wave = ..... cm

(ii) Give the wavelength of the wave.

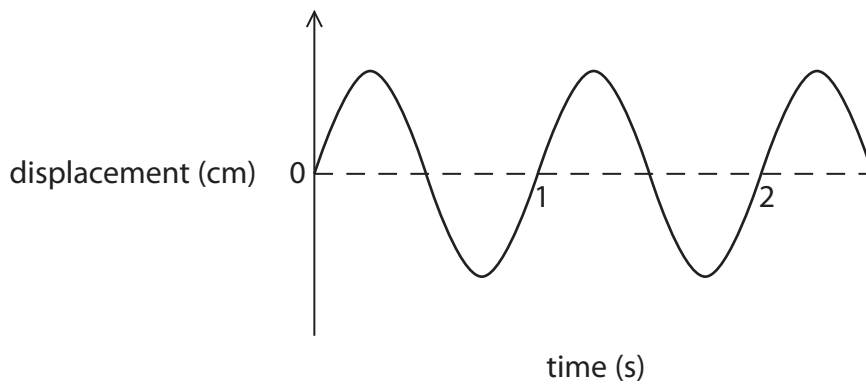
(1)

wavelength of wave = ..... m

(iii) Figure 8 shows a different wave.

Draw, on Figure 8, another wave with a higher frequency than the wave shown.

(1)



**Figure 8**

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(b) A wave has a wavelength of 3.0 m and a frequency of 10 Hz.

Calculate the wave speed.

$$\text{wave speed (m/s)} = \text{wavelength (m)} \times \text{frequency (Hz)} \quad (1)$$

wave speed = ..... m/s

**(Total for Question 7 = 4 marks)**

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8 (a) Figure 9 shows a digital alarm clock.



Figure 9

(i) State **one** form of useful energy produced by the digital alarm clock.

(1)

(ii) State **one** form of wasted energy produced by the digital alarm clock.

(1)

(b) Figure 10 shows the energy transfers in a digital alarm clock.

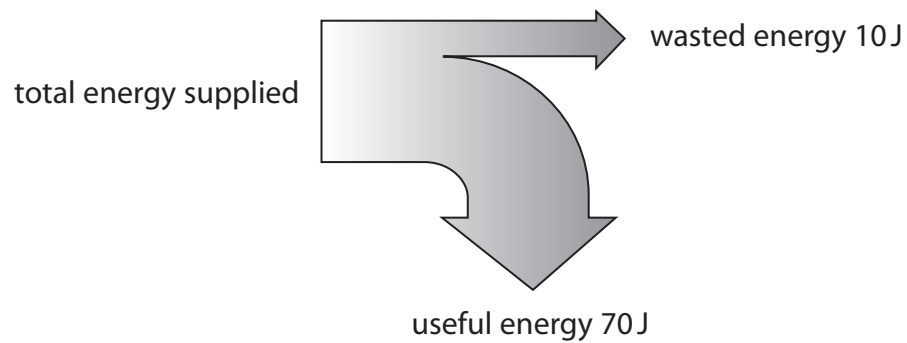


Figure 10

Calculate the efficiency of the digital alarm clock.

(2)

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

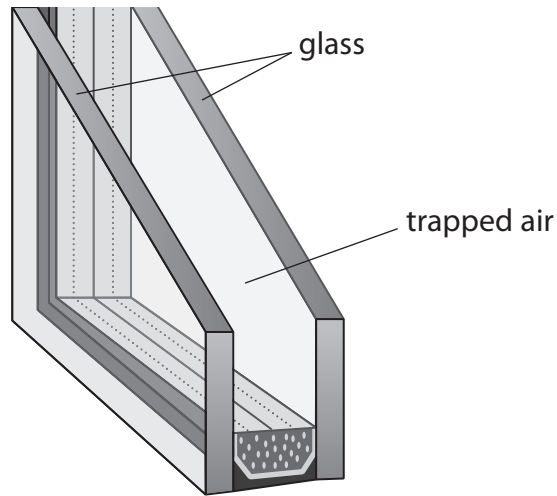
efficiency = ..... %



(c) Figure 11 shows a double glazed window.

A double glazed window has two sheets of glass.

Air is trapped between the two sheets of glass.



**Figure 11**

Explain how the double glazed window reduces heat loss from inside a house.

(4)

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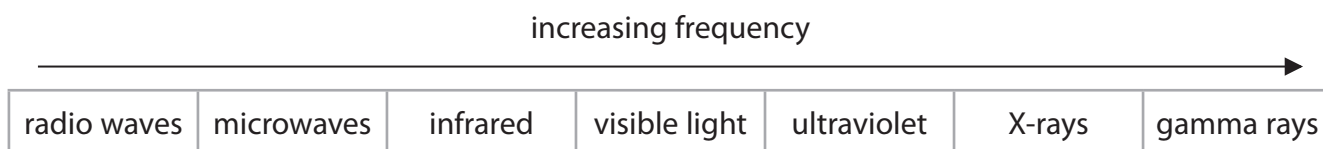
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**(Total for Question 8 = 8 marks)**



9 Figure 12 shows the electromagnetic spectrum.

The electromagnetic spectrum consists of a series of electromagnetic waves arranged in order of increasing frequency.



**Figure 12**

Discuss the uses and harmful effects of **two** of the electromagnetic waves in the spectrum. (6)

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**(Total for Question 9 = 6 marks)**

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

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