

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

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Learner Registration Number

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**Monday 3 February 2020**

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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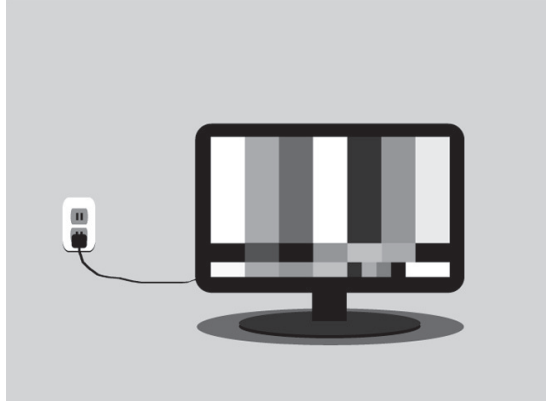
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Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Answer ALL questions.

SECTION A: Physics

1 Figure 1 shows a television.



(Source: © J.D.S/Shutterstock)

Figure 1

Figure 2 shows how energy is transferred in the television.

Complete the energy transfer diagram in Figure 2 for the television.

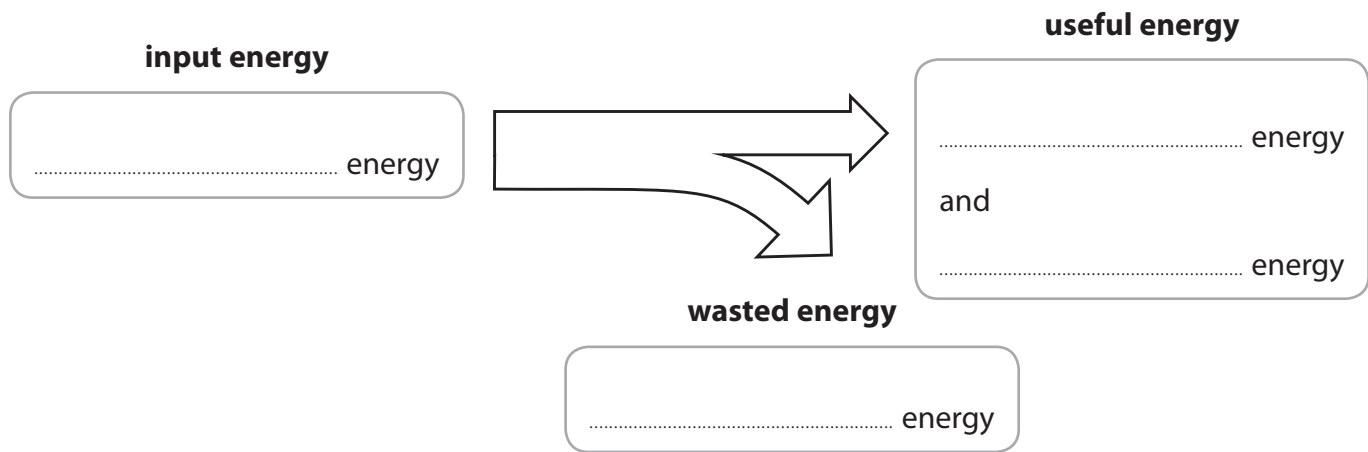


Figure 2

(Total for Question 1 = 4 marks)

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2 Figure 3 shows a car.

The car uses a fuel called petrol in its engine.



(Source: © HSNphotography/Shutterstock)

**Figure 3**

(a) Petrol is produced from a fossil fuel.

(i) Name **one** fossil fuel.

(1)

(ii) Fossil fuels are non-renewable energy sources.

Give **one** reason why fossil fuels are non-renewable.

(1)

(iii) Name the type of energy store in the petrol.

(1)

(b) The petrol engine in the car has a low efficiency.

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

(1)



(c) An electric car uses a battery that needs to be charged.

The battery charger has a power of 15 000 W.

The cost of electricity is 17 pence per kWh.

Calculate the cost of using the battery charger for 7 hours.

(2)

cost = ..... pence

**(Total for Question 2 = 6 marks)**

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3 Radio waves are used for broadcasting.

Figure 4 represents a radio wave.

One feature of the wave is labelled X.

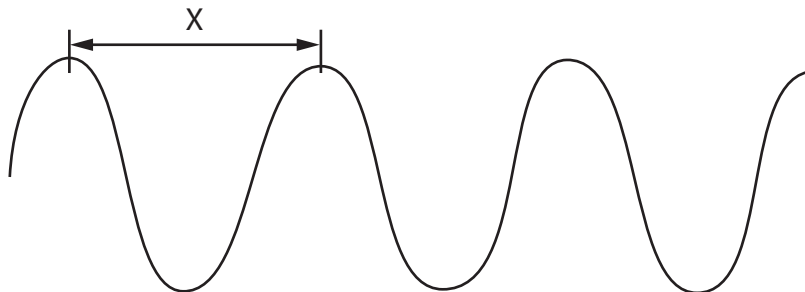


Figure 4

(a) Name the feature labelled X in Figure 4.

(1)

(b) Radio waves have a range of frequencies.

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

(1)

(c) State **two** reasons why radio waves are suitable for broadcasting.

(2)

1

2



(d) A radio station broadcasts a radio wave.

The radio wave has a wavelength of 0.3 m.

The radio wave has a wave speed of 300 000 000 m/s.

Calculate the frequency of the radio wave.

(4)

Use the equation:

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

Give your answer in standard form.

Show your working.

frequency of radio wave = ..... Hz

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

**TOTAL FOR SECTION A = 18 MARKS**

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**SECTION B: Chemistry**

4 (a) A bottle of concentrated nitric acid has two hazard symbols.

Draw **one** line from each hazard symbol to the hazard it represents.

(2)

**hazard symbol**

**hazard**



corrosive



explosive

irritant

oxidising

toxic

(Source: © BALRedaan/Shutterstock)

(b) A sample of distilled water has a pH of 7.

A teacher adds a few drops of concentrated nitric acid to the distilled water to make a solution.

Suggest the pH of the solution.

(1)

(c) Nitric acid is a compound.

(i) Identify the formula of nitric acid.

(1)

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



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

(2)

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

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5 (a) Figure 5 shows an outline of part of the periodic table.

The shapes show the positions of four elements.

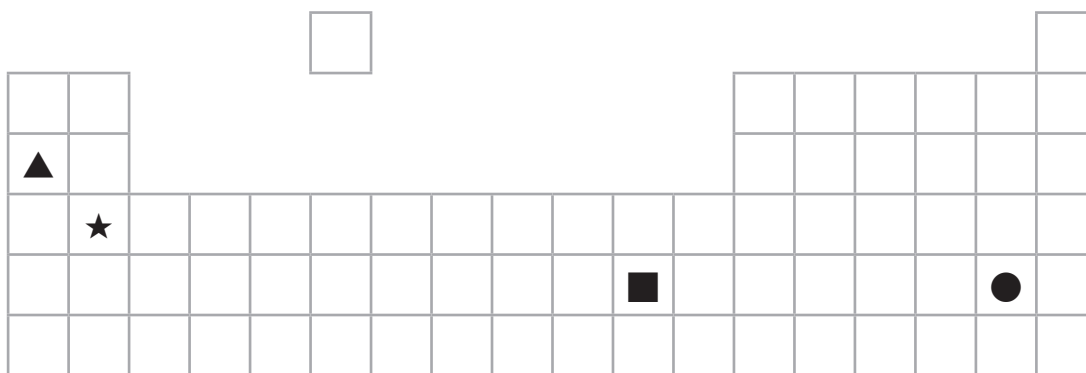


Figure 5

(i) Which shape shows the position of a non-metal element?

(1)

- A ▲
- B ■
- C ★
- D ●

(ii) Which shape shows the position of an element in group 2?

(1)

- A ▲
- B ■
- C ★
- D ●

(iii) Which shape shows the position of an element of electronic configuration 2.8.1?

(1)

- A ▲
- B ■
- C ★
- D ●



(iv) State the charge on an electron.

(1)

(b) On a periodic table, the relative atomic mass of chlorine is shown as 35.5.

Explain why the relative atomic mass of chlorine is shown as 35.5.

(2)

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

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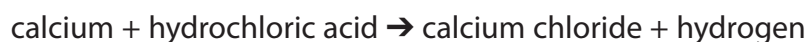


6 Dilute hydrochloric acid is poured into two test tubes.

A sample of calcium is reacted with dilute hydrochloric acid in the first test tube.

A sample of calcium carbonate is reacted with dilute hydrochloric acid in the second test tube.

The word equations for the reactions are



The two reactions produce different gases, hydrogen and carbon dioxide.

Describe how to collect and test each of these gases.

You may draw diagrams to help your answer.

(6)

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

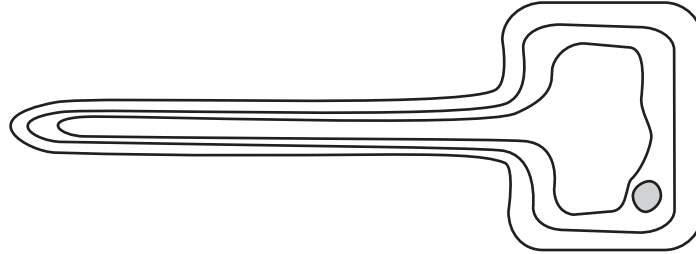
**TOTAL FOR SECTION B = 18 MARKS**



**SECTION C: Biology**

7 (a) Root hair cells are found in the roots of plants.

Figure 6 shows a root hair cell.



**Figure 6**

(i) Label the vacuole on Figure 6.

(1)

(ii) Identify a function of the vacuole.

(1)

- A controls the activities of the cell
- B is the site of photosynthesis
- C is the site of respiration
- D stores cell sap

(iii) State the function of the root hair cell.

(1)

(b) Give **one** adaptation of the root hair cell.

(1)

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



8 (a) Which process maintains a constant internal environment in the human body? (1)

- A homeostasis
- B inheritance
- C photosynthesis
- D transpiration

(b) Blood glucose concentration is an internal condition maintained in the human body.

(i) Give **one other** internal condition that is maintained in the human body. (1)

(ii) Name the hormone that lowers blood glucose concentration. (1)

(iii) Name the organ that releases hormones to control blood glucose concentration. (1)

(c) The endocrine system uses hormones.

The nervous system uses electrical impulses.

Explain **two other** differences between the nervous system and the endocrine system. (4)

1 .....

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2 .....

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(Total for Question 8 = 8 marks)

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9 Sheep can have black wool or white wool.

A black sheep (ww) is mated with a white sheep (Ww).

The first offspring had white wool and the second offspring had black wool.

Figure 7 shows a pedigree analysis for the sheep.

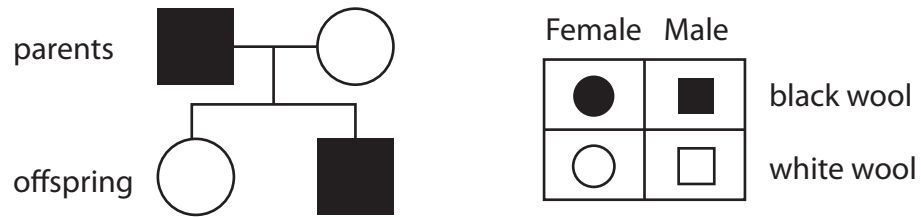


Figure 7

Explain why the first offspring had white wool and the second offspring had black wool.

You may include a Punnett square in your answer.

(6)

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

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

