

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
PHYSICS A**

Unit 2 Modules P4 P5 P6 (Foundation Tier)

**FRIDAY 20 JUNE 2008**

Morning  
Time: 40 minutes

Candidates answer on the question paper.

**Additional materials (enclosed):**

None

Calculators may be used.

**Additional materials:** Pencil  
Ruler (cm/mm)



Candidate  
Forename

Candidate  
Surname

Centre  
Number

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Candidate  
Number

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**INSTRUCTIONS TO CANDIDATES**

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **42**.
- A list of physics equations is printed on page two.

**FOR EXAMINER'S USE**

Qu.	Max	Mark
1	5	
2	5	
3	4	
4	4	
5	5	
6	5	
7	4	
8	5	
9	5	
<b>TOTAL</b>	<b>42</b>	

This document consists of **17** printed pages and **3** blank pages.

## EQUATIONS

## Useful Relationships

## Explaining Motion

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved by the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

## Electric Circuits

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

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

## The Wave Model of Radiation

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

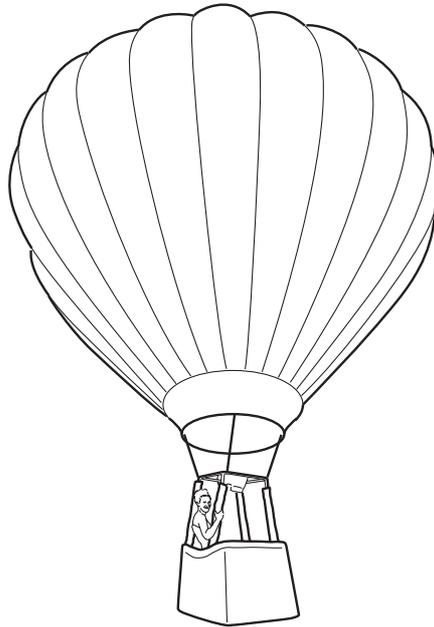
**BLANK PAGE**

**Question 1 starts on page 4**

**PLEASE DO NOT WRITE ON THIS PAGE**

Answer **all** the questions.

- 1 Simona goes for a ride in a hot air balloon.



- (a) The balloon stays still in the air.

Draw a straight line from each **force** to its **direction**.

**force**

weight of the balloon

reaction from the air

**direction**

upwards

sideways

downwards

[2]

- (b) The balloon exerts an upwards force of 650 N on Simona.

What force does Simona exert on the balloon?

Put a **ring** around the correct answer.

**650 N downwards**

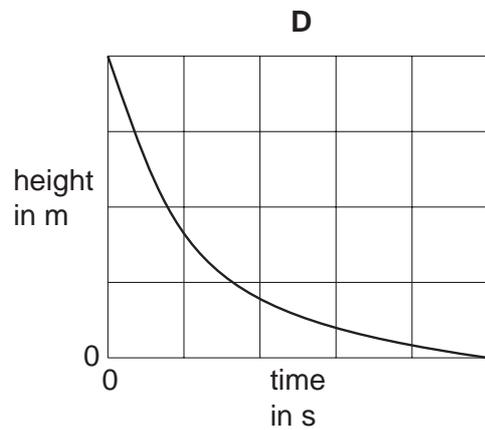
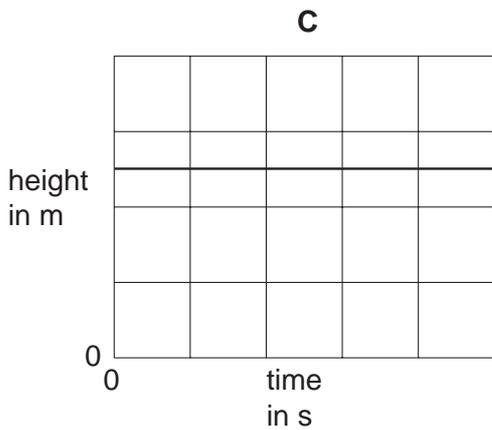
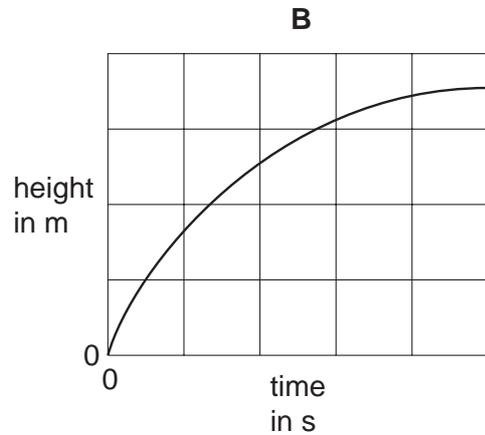
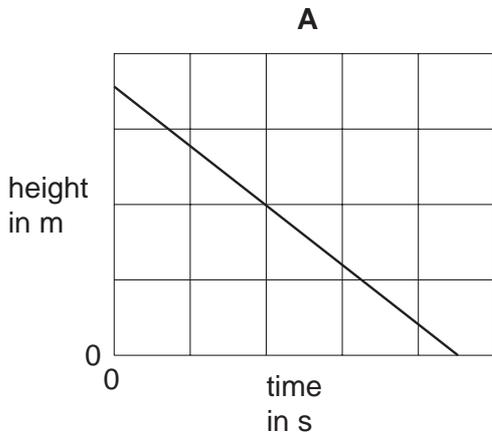
**no force at all**

**650 N upwards**

[1]

(c) At the end of the flight, the balloon drops down at a **steady speed** to land on the ground.

Here are some graphs.



Which of these graphs, **A**, **B**, **C** or **D**, correctly shows the balloon dropping down at a steady speed?

answer ..... [1]

(d) Complete the sentence about the balloon.

Choose from this list.

**gravitational potential energy**

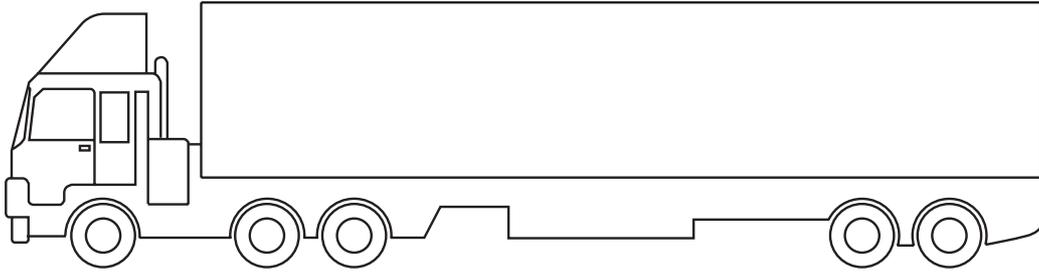
**kinetic energy**

**weight**

As the balloon falls at a steady speed, it loses ..... [1]

[Total: 5]

2 This question is about the speed of a lorry.

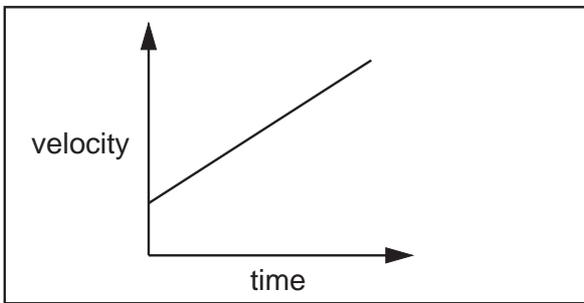


(a) The tachograph records a velocity-time graph for each journey of the lorry.

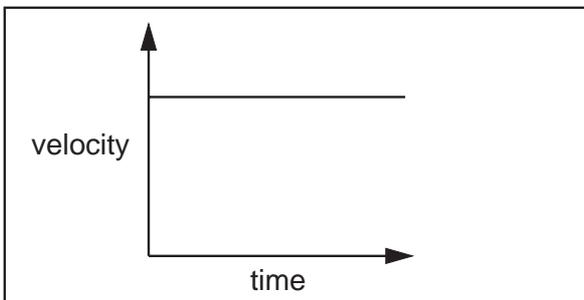
Draw a straight line from each **graph** to its best **description**.

**graph**

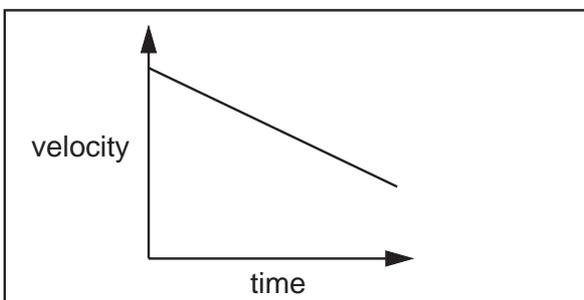
**description**



steady speed



getting faster



getting slower

not moving at all

[3]

(b) At the end of his journey, the lorry driver uses the brakes to slow down and stop.

Here are some things that happen as the lorry slows down.

Put ticks (✓) in the boxes next to the **two** correct statements.

The driver is pushed forward by his seat belt.

The brakes increase the momentum of the lorry.

The kinetic energy of the lorry is reduced through heating.

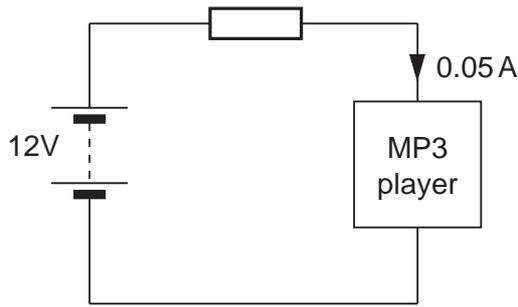
The counter force on the lorry is greater than the driving force.

The velocity of the lorry becomes gravitational potential energy.

[2]

[Total: 5]

3 Jo uses this circuit to run her MP3 player from a 12V car battery.



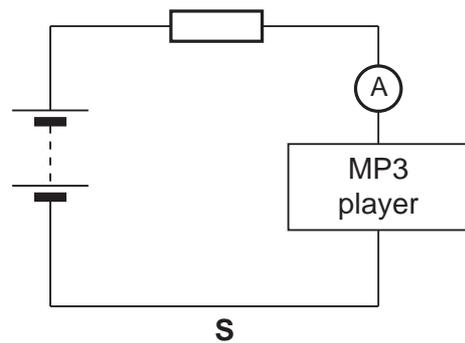
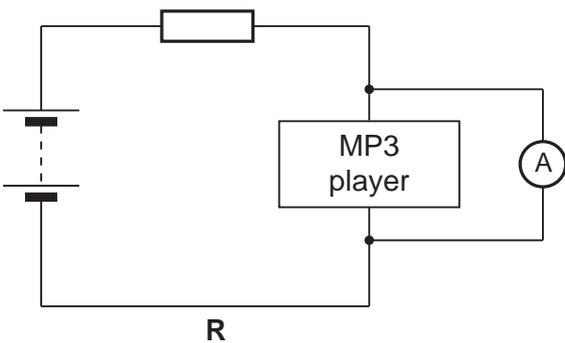
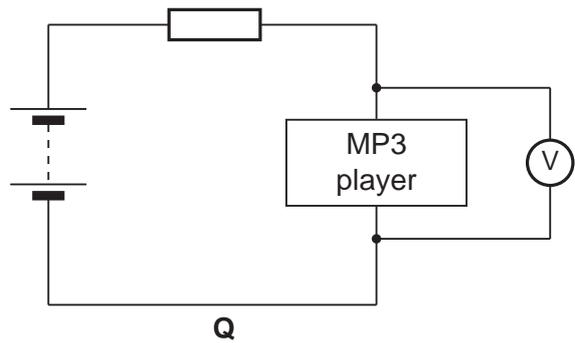
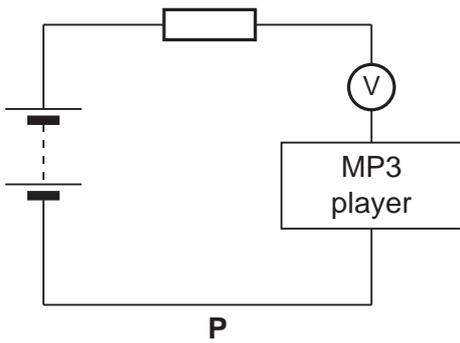
(a) Complete the sentences about the circuit. Choose from this list.

- greater than**                      **smaller than**                      **the same as**

The current in the resistor is ..... the current in the MP3 player.

The voltage across the battery is ..... the voltage across the MP3 player. [2]

(b) The potential difference across the MP3 player can be measured with a meter.



Which diagram, **P**, **Q**, **R** or **S**, shows how a meter should be connected to measure the potential difference across the MP3 player?

answer ..... [1]

(c) The MP3 player requires a potential difference of 3 V to operate properly.

It draws a current of 0.05 A from the car battery.

What is the power of the MP3 player?

Put a **ring** around the correct answer.

**0.15 W**

**0.6 W**

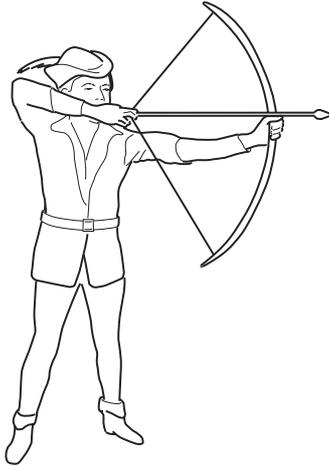
**3 W**

**60 W**

[1]

[Total: 4]

- 4 Seb shoots an arrow horizontally from a bow.



- (a) Which of these statements are correct as the arrow is released?

Put ticks (✓) in the boxes next to the **three** correct statements.

The bow loses energy.

The arrow gains momentum.

The arrow loses kinetic energy.

The bow does work on the arrow.

The bow gains gravitational potential energy.

The arrow gains gravitational potential energy.

[2]

- (b) The arrow leaves the bow horizontally over level ground.

After a flight of a few seconds it hits the ground.

Here are three sentences about the flight of the arrow.

Draw a straight line from the **start** of each sentence to its correct **end**.

**start**

**end**

The force of gravity on the arrow ...

... is reduced by heating the air.

The energy of the arrow ...

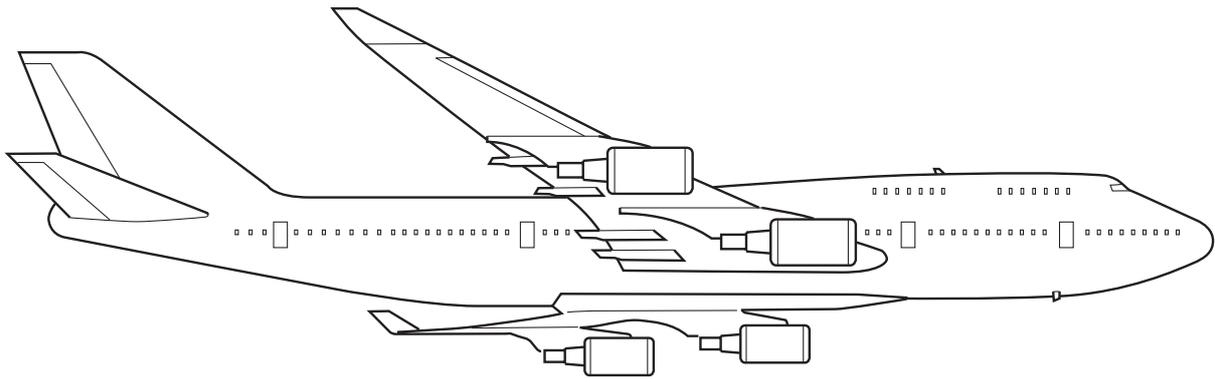
... decreases the arrow's kinetic energy.

The friction of the air ...

... increases its downwards momentum.

[2]

- 5 Some planes become electrically charged as they fly through the air.



- (a) The plane picks up particles as it flies through the air. This charges up the plane.

- (i) What particles are picked up by the plane?

Put a **(ring)** around the correct answer.

**atoms**

**electrons**

**molecules**

[1]

- (ii) What is the charge on the plane when it has picked up these particles?

Put a **(ring)** around the correct answer.

**negative**

**neutral**

**positive**

[1]

- (b) When the plane lands it is discharged through a metal wire.

Here are some statements about the wire.

Put ticks (✓) in the boxes next to the **three** correct statements.

There is an electric current in the wire as it discharges the plane.

The wire contains free electrons which can move.

The wire is repelled by the charged plane.

The wire is an insulator.

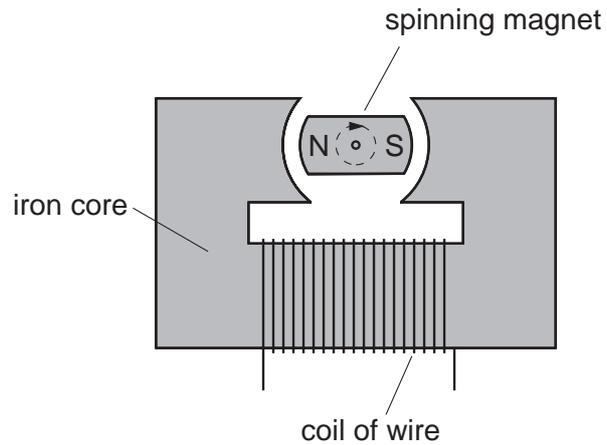
The wire has a very large resistance.

The current in the wire transfers energy by heating.

[3]

[Total: 5]

6 Power stations generate electricity by spinning magnets close to a coil of wire.



(a) Which of these changes will **increase** the voltage across the coil of wire?

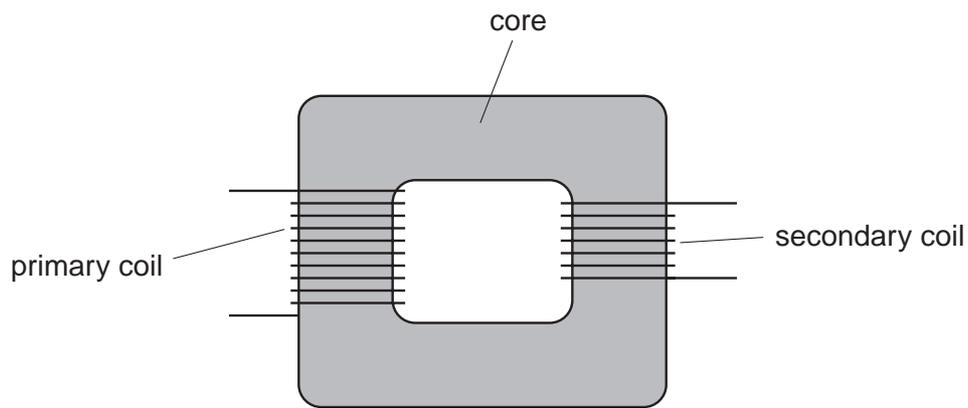
Put ticks (✓) in the boxes next to the **two** correct answers.

**The voltage across the coil increases when ...**

- ... a weaker magnet is used.
- ... the magnet is spun round faster.
- ... the number of coils of wire is increased.
- ... the core is made of copper instead of iron.

[2]

(b) Electricity from a power station is transferred to the National Grid through a transformer.



(i) Complete the sentences about a transformer. Choose words from this list.

- copper      iron      magnet      plastic**

A transformer is made from two coils of ..... wire.

The coils are wound on a core of ..... [2]

(ii) How does the changing magnetic field in one coil affect the other coil?

Draw **one** straight line from the **change in one coil** to its **effect on the other coil**.

**change in one coil**

**effect on the other coil**

changing magnetic field

induced charge

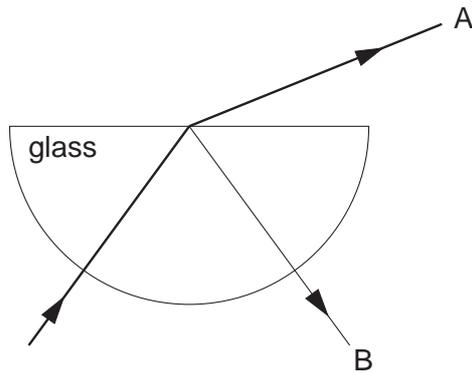
induced voltage

induced resistance

[1]

[Total: 5]

7 A beam of light passes into a transparent block of glass.



(a) Two beams of light, **A** and **B**, emerge from the block.

Draw a straight line from each **beam** to its correct **description**.

beam	description
<div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">A</div>	<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">reflected beam</div>
	<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">diffracted beam</div>
	<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">refracted beam</div>
<div style="border: 1px solid black; width: 100px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">B</div>	<div style="border: 1px solid black; width: 150px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">interfered beam</div>

[2]

(b) Complete the sentences about the beam of light as it leaves the glass.

Choose words from this list.

- |           |           |            |
|-----------|-----------|------------|
| colour    | decreased | frequency  |
| increased | unchanged | wavelength |

As the light leaves the glass, its speed is .....

This changes its .....

[2]

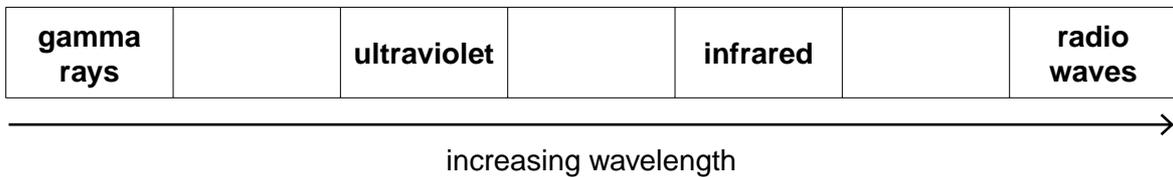
[Total: 4]

8 Jane drops a weight on her hand. The doctor uses an X-ray photograph to assess the damage.



© Zephyr / Science Photo Library

(a) Here is an incomplete spectrum of electromagnetic waves.



Which of the blank regions belongs to X-rays?

Write **X-rays** in the correct box.

[1]

(b) These sentences explain how X-rays can show the bones in Jane's hand. They are in the wrong order.

- A Some X-rays are absorbed by Jane's bones.
- B The film is developed to produce the X-ray photograph.
- C Jane's hand is placed between the film and an X-ray source.
- D A sheet of photographic film is placed in a light-proof wrapping.
- E The rest of the X-rays pass through muscle and are detected by the film.

Fill in the boxes to show the right order. The first one has been done for you.

<b>D</b>					
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[3]

(c) Complete the sentence. Choose a word from this list.

- black                  dense                  organic                  white**

X-rays are strongly absorbed by materials which are .....

[1]

[Total: 5]

**[Turn over**

9 Sam is a singer. She uses a radio microphone.



- (a) The microphone transmits Sam's sound as a digital signal. The signal is carried by a radio wave.

Here are three sentences which describe the process.

Draw a straight line from the **start** of each sentence to its correct **end**.

**start**

**end**

The radio wave is ...

... called 1 and 0.

The digital code is ...

... carrying the code.

The two symbols are ...

... made of just two symbols.

[2]

- (b) The radio waves from the microphone are picked up by the receiver.

Complete the sentence. Choose a word from this list.

**direction**

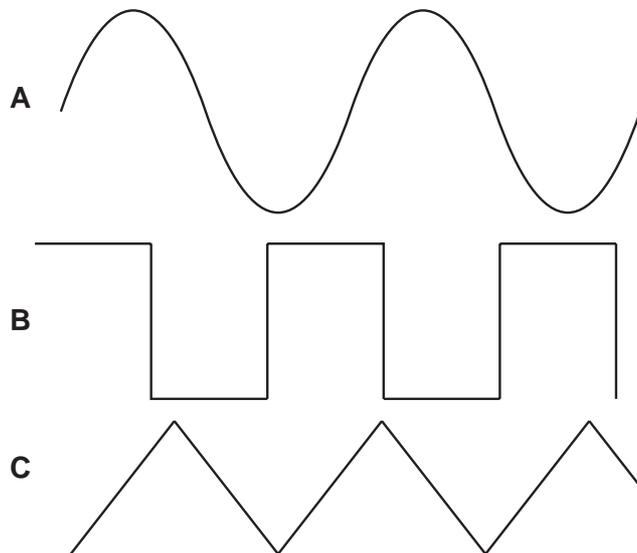
**pulsing**

**speed**

The receiver uses information coded in the ..... of the radio waves to recreate the sound waves. [1]

(c) Sam tries out a different type of radio microphone. It transmits her sound as an analogue signal.

(i) Here are three signals.



Which **two** of the signals, **A**, **B** or **C**, are analogue signals?

answer ..... and ..... [1]

(ii) Sam changes from the digital microphone to the analogue microphone.

What difference will Sam notice?

Complete the sentence. Choose a word from this list.

**better**

**unchanged**

**worse**

When Sam uses the analogue microphone, the quality of the sound will be

.....

[1]

[Total: 5]

**END OF QUESTION PAPER**

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**19**  
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