

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

A332/01

PHYSICS A

Unit 2: Modules P4 P5 P6
(Foundation Tier)

**Friday 19 June 2009
Morning**

Duration: 40 minutes

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use 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, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks 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.
- This document consists of **16** pages. Any blank pages are indicated.

TWENTY FIRST CENTURY SCIENCE 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

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

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Question 1 starts on page 4.

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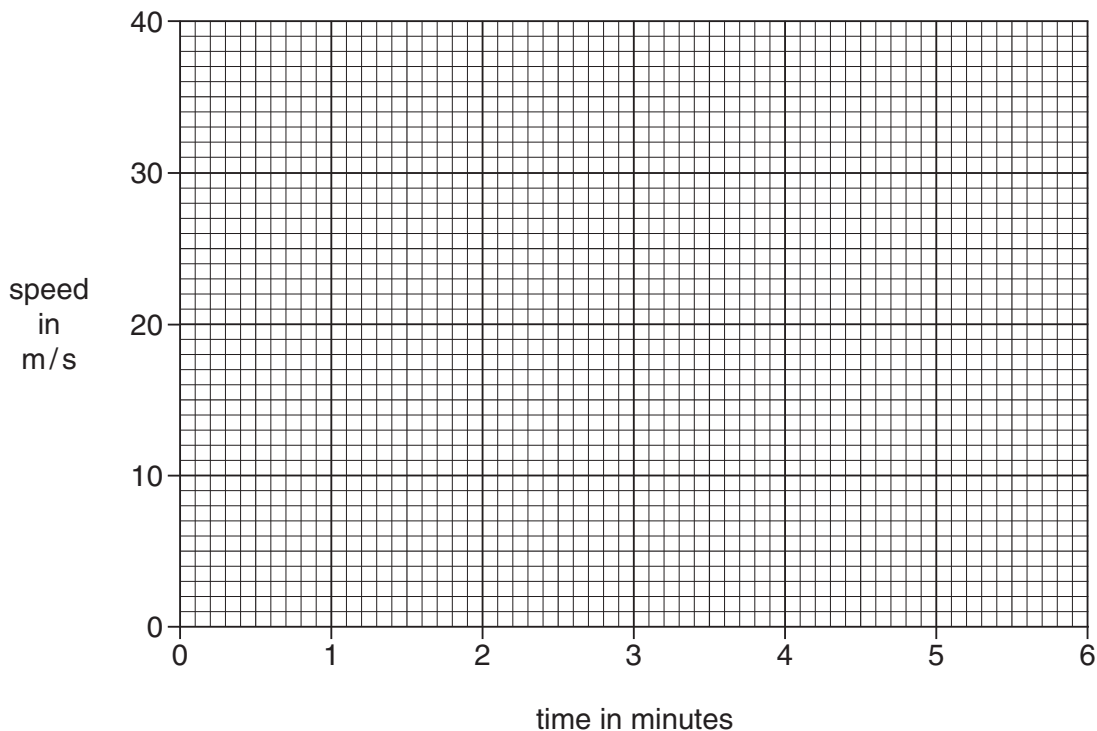
Answer **all** the questions.

1 Ann is driving along the motorway.

(a) (i) Ann started her journey by going onto the motorway.

- Ann increased her speed steadily from 0 m/s to 30 m/s in 1.5 minutes.
- She then continued at a constant speed of 30 m/s for the next 4 minutes.

Complete the **speed-time** graph to show these parts of Ann's journey.



[3]

(ii) Ann travelled a total of 100 kilometres on the motorway. It took her 2 hours.

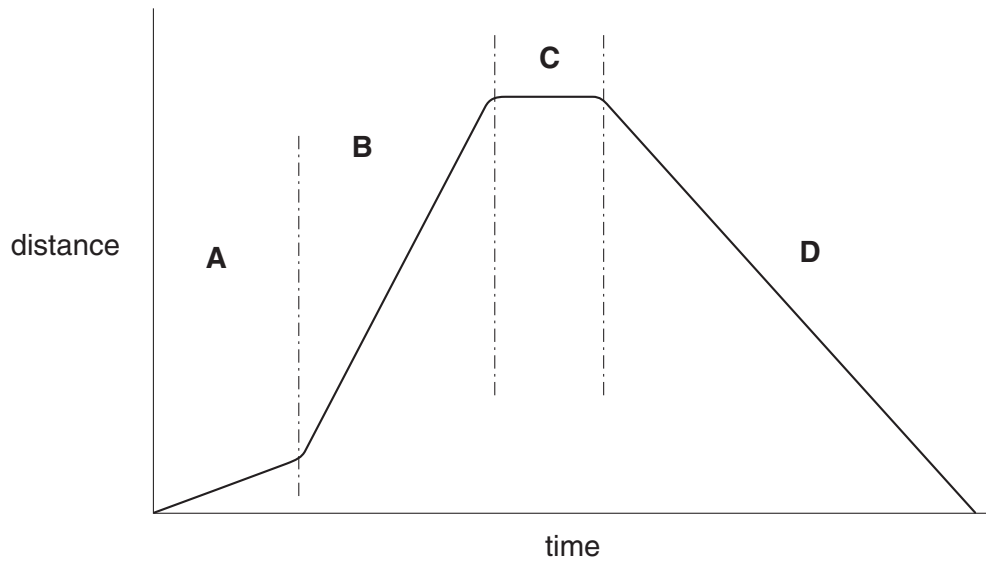
What was her average speed?

Put a **ring** around the correct number **and** a **ring** around the correct unit.

0.02	50	98	102	200
h/km	km/h	m/s	mph	

[2]

(b) This graph shows the **distance-time** graph for Ann's Journey after she left the motorway.



Write down the letter **A**, **B**, **C** or **D** of the part of the graph which shows when:

Ann is stationary [1]

Ann is travelling at her fastest speed [1]

Ann is returning towards where she started [1]

[Total: 8]

2 Bobby is learning to snowboard with his father.



(a) Bobby starts off by climbing some steps to the top of the slope.

Which of the following statements are correct?

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

Bobby's weight is increasing.

Bobby's dad is doing all the work.

Bobby is doing work against gravity.

Bobby's gravitational potential energy increases.

[2]

(b) Bobby and his dad snowboard down the slope.

Bobby is holding his dad's hand.

Bobby's dad has a much larger mass than Bobby.

Which of the following statements are true?

Put a tick (✓) in the **true** box or the **false** box for each statement.

	true	false
Bobby has the same kinetic energy as his dad.		
Bobby's kinetic energy increases as he goes faster.		
Bobby's dad goes faster because he is heavier.		

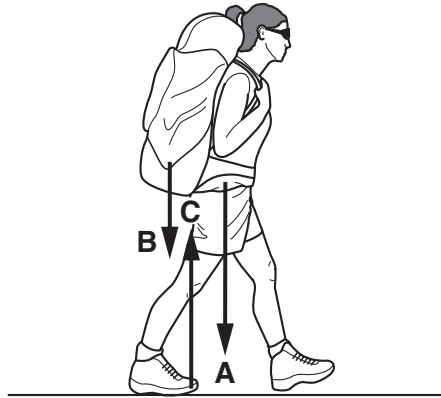
[2]

[Total: 4]

3 Alice is walking with her backpack.

There are 3 vertical forces acting on Alice and her backpack.

- A – her weight
- B – the weight of her backpack
- C – the reaction force upwards from the ground



(a) What is the resultant downward force on Alice?

Put a tick (✓) in the box next to the correct answer.

- A – B – C
- A + B + C
- A + B – C
- A – B + C

[1]

(b) Complete the following sentences about the forces involved when Alice is walking.

Choose the **best** words from the list.

Use a different word for each sentence.

friction gravity interaction opposite reaction the same

Alice's back foot produces a backward force, which pushes against the ground.

This causes a force from the ground due to

The two forces are the same size and have directions that are

These two forces are called a pair of forces.

[3]

[Total: 4]

4 (a) These three labels were found on 3 different devices that use electricity.

<p>110V a.c. 50 Hz</p> <p>2000W</p>

A

<p>230V a.c. 50 Hz</p> <p>3000W</p>

B

<p>5V d.c.</p> <p>10W</p>

C

- (i) Which appliance **A**, **B** or **C** uses a battery for its power supply? [1]
- (ii) Which appliance **A**, **B** or **C** uses the mains voltage in the UK? [1]
- (iii) Device **A** uses 2 kWh of energy.
Electricity costs 8p per kilowatt hour.
How much did it cost to use device **A**?

cost = [1]

(b) This label was found on the transformer used for a laptop computer.

<p>Input: 230V 50 Hz 70 mA</p> <p>Output: 11V 400 mA</p>
--

(i) Complete the sentences about the transformer.

Use words from the list.

increased input not changed output reduced

The transformer has the voltage.

The transformer has the current.

[2]

(ii) The following statements are about transformers.

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

A transformer has a magnet which spins around next to a coil of wire.

A transformer always reduces the size of the voltage.

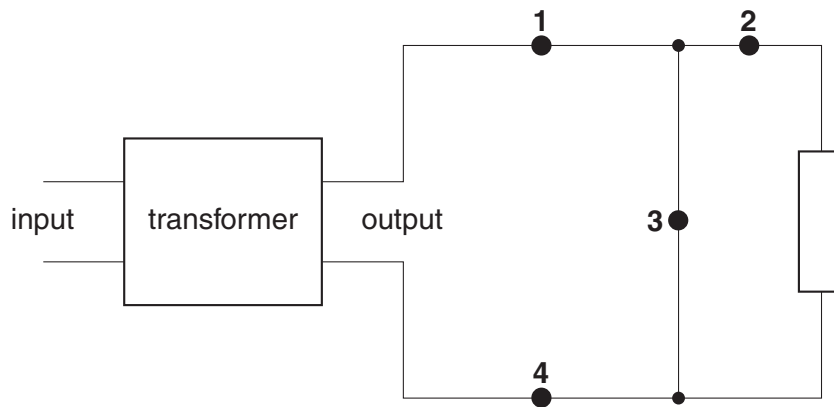
A transformer works with alternating voltages.

A transformer is made of two coils of wire on an iron core.

A transformer works with direct current.

[2]

(c) The circuit diagram shows a circuit that can be used to measure the current and voltage produced by the transformer.



(i) Where should the voltmeter be placed, at position 1, 2, 3 or 4? [1]

(ii) An ammeter connected at position 1, reads 0.4 amps.

What would an ammeter connected at position 4 read? [1]

[Total: 9]

- 5 This question is about the electrical energy used by a kettle.



- (a) Energy is transferred in the kettle.

Which of the following statements are true about the energy transfer?

Put a tick (✓) in the box next to each correct statement.

When electric charge flows through the kettle, energy is transferred to the kettle.

The power of the kettle is the rate at which energy is transferred to the kettle.

The energy transferred increases the voltage across the kettle.

All the energy transferred to the kettle heats the water.

[2]

(b) The kettle has a power rating of 2 kW.

The kettle takes 3 minutes to boil some water.

Which **two** of the calculations are correctly working out the energy used?

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

$2000 \times 3 \div 60 = 100 \text{ kWh}$

$2 \times 3 = 6 \text{ J}$

$2 \times 3 \div 60 = 0.1 \text{ kWh}$

$2000 \times 3 = 6000 \text{ J}$

$2000 \times 3 \times 60 = 360\,000 \text{ J}$

[2]

[Total: 4]

6 Matteo is watching an analogue television and using a remote control.



(a) Matteo's television uses three types of electromagnetic radiation.

infrared light radio

(i) Put these three types of radiation in the correct places in the spectrum.

	microwave			ultraviolet	X-ray
--	------------------	--	--	--------------------	--------------

[2]

(ii) The lists show the type of electromagnetic wave and the job it does.

Draw a **straight** line from each **type of wave** to the correct **job**.

Each type of wave must be joined to a different job.

type of wave

infrared waves

light waves

radio waves

job

carry picture and sound information to the TV

carry picture information from TV to person

carry information from remote control to the TV

[2]

(b) The remote control sends digital signals to the television.

(i) Complete the sentences by choosing the **best** words from this list.

Use a different word for each sentence.

decodes

diffracts

0 and 1 s

radio waves

sound waves

transmits

The remote control sends information as digital codes.

The digital signal is made up of

The television the signal to produce a copy of the original information.

[2]

(ii) What is the advantage of a digital signal compared to an analogue signal?

Put a tick (✓) in the box next to the correct advantage.

digital signals travel faster

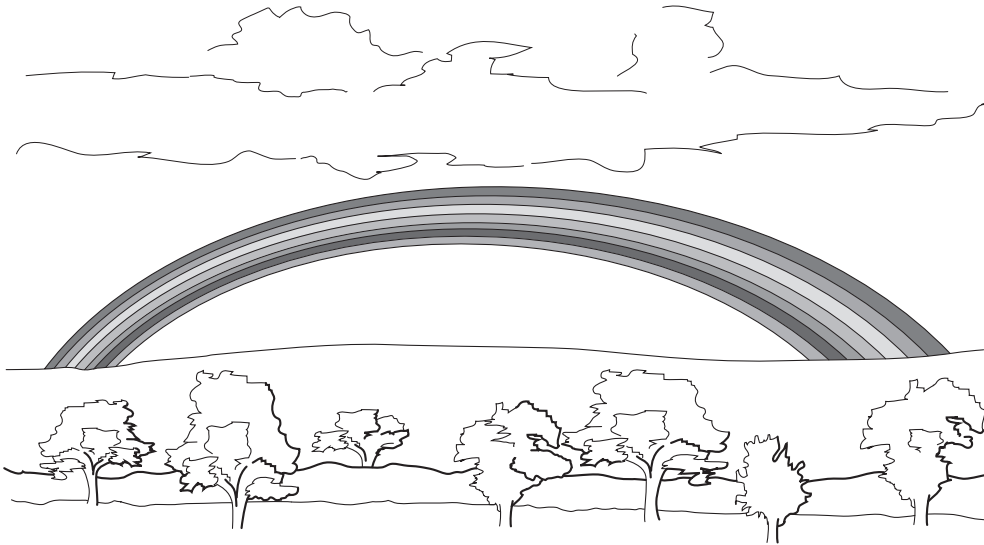
digital signals usually have higher quality

digital signals are smaller

[1]

[Total: 7]

7 Sometimes a rainbow can be seen.



The rainbow is made up of different colours of light.

Use the following list of words to help you answer the questions:

amplitude force frequency sound speed wavelength

(a) Name a property, from this list, which is always **different** for each colour of light.

.....

[1]

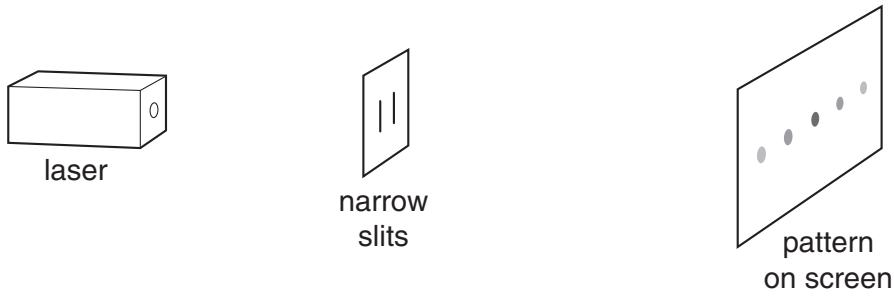
(b) Which property, from this list, is always the **same** for all of the colours of light, travelling through space?

.....

[1]

[Total: 2]

- 8 Miss Curie demonstrates the interference of light waves to her class by shining a laser beam through two narrow slits. This produces a pattern of bright and dark areas on a screen.



This is a list of words that Miss Curie used in her explanation of the experiment.

amplitude

bright

constructive

dark

destructive

diffraction

frequency

wavelength

- (a) Complete the following explanation by choosing the best words from this list.

Where the two light waves from the slits meet, the of each wave adds together.

If the waves are in step they produce a area.

This is called interference.

[3]

- (b) Which word in the list means that the waves spread out from the slits?

.....

[1]

[Total: 4]

END OF QUESTION PAPER

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