Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A332/01

TWENTY FIRST CENTURY SCIENCE

PHYSICS A

UNIT 2: Modules P4 P5 P6
Foundation Tier

FRIDAY 19 JUNE 2009: Morning
DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

DC (KN) OV91050 15706/2

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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 4 and 5.**

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

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

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved by the force

change in energy = work done

change in GPE = weight × vertical height difference

kinetic energy = $\frac{1}{2}$ × mass × [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

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

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.**

Opposite is a speed-time graph.

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?

Look at list one and put a (ring) around the correct number.
Look at list two and put a (ring) around the correct unit.

LIST ONE

0.02

50

98

102

200

LIST TWO

h/km

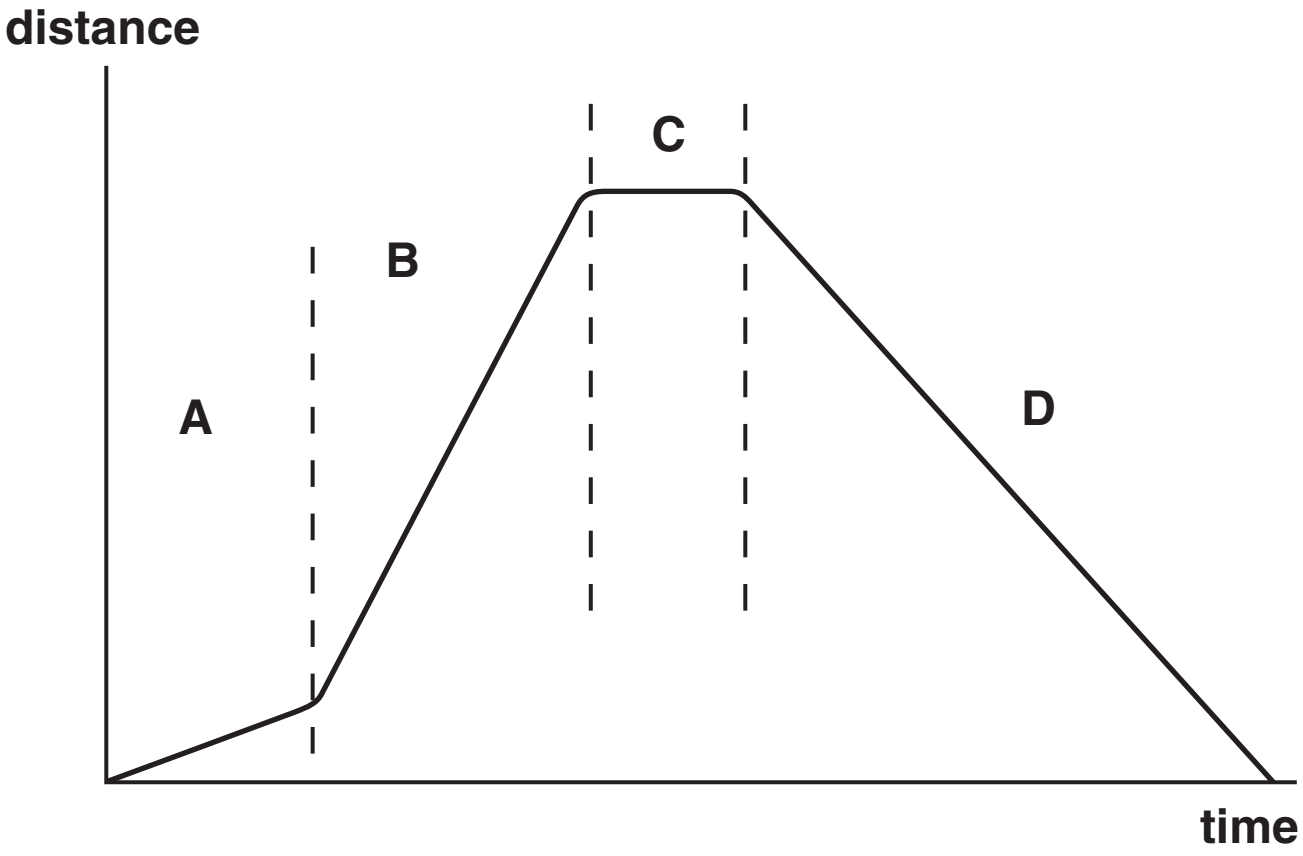
km/h

m/s

mph

[2]

(b) The graph below shows the <u>DISTANCE-TIME</u> graph for Ann's Journey after she left the motorway.



Write down the letter <u>A</u>, <u>B</u>, <u>C</u> or <u>D</u> 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.

Look at the statements below.

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.

Look at the statements below.

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]

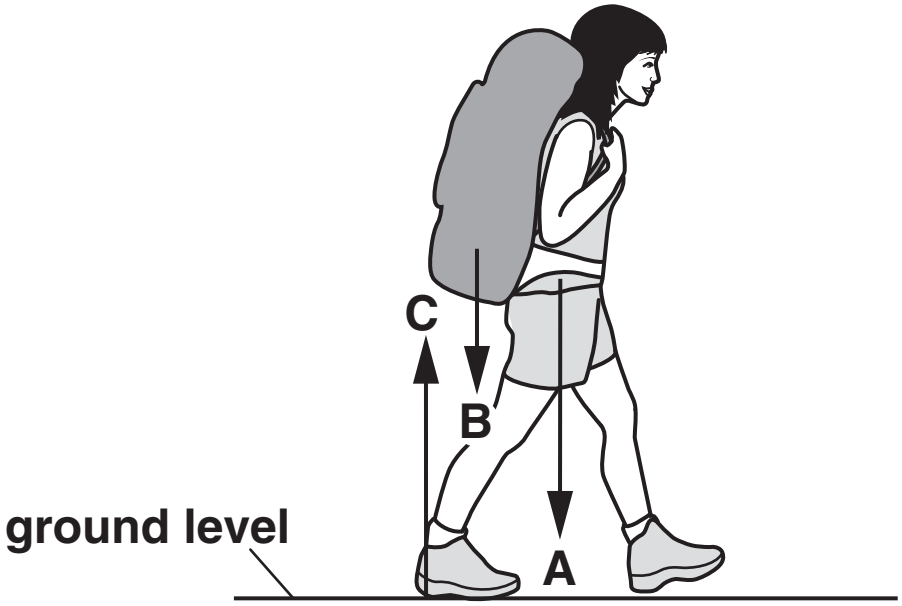
[TOTAL: 4]

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

The diagram below shows the forces.



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

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

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 <u>BEST</u> words from the list below.

<u>FRICTION</u>

<u>GRAVITY</u>

<u>INTERACTION</u>

<u>OPPOSITE</u>

<u>REACTION</u>

<u>THE SAME</u>

Use a different word for each sentence.

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) Below are three labels A, B and C which were found on 3 different devices that use electricity.

A	B	C
110V a.c. 50 Hz 2000W	230V a.c. 50 Hz 3000W	5V d.c. 10W

(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.

Input:	**230 V**	**50 Hz**	**70 mA**
Output:	**11 V**	**400 mA**	

(i) Complete the sentences about the transformer.

Use words from the list below to complete the following sentences.

INCREASED

INPUT

NOT CHANGED

OUTPUT

REDUCED

The transformer has _____

the voltage.

The transformer has _____

the current.

[2]

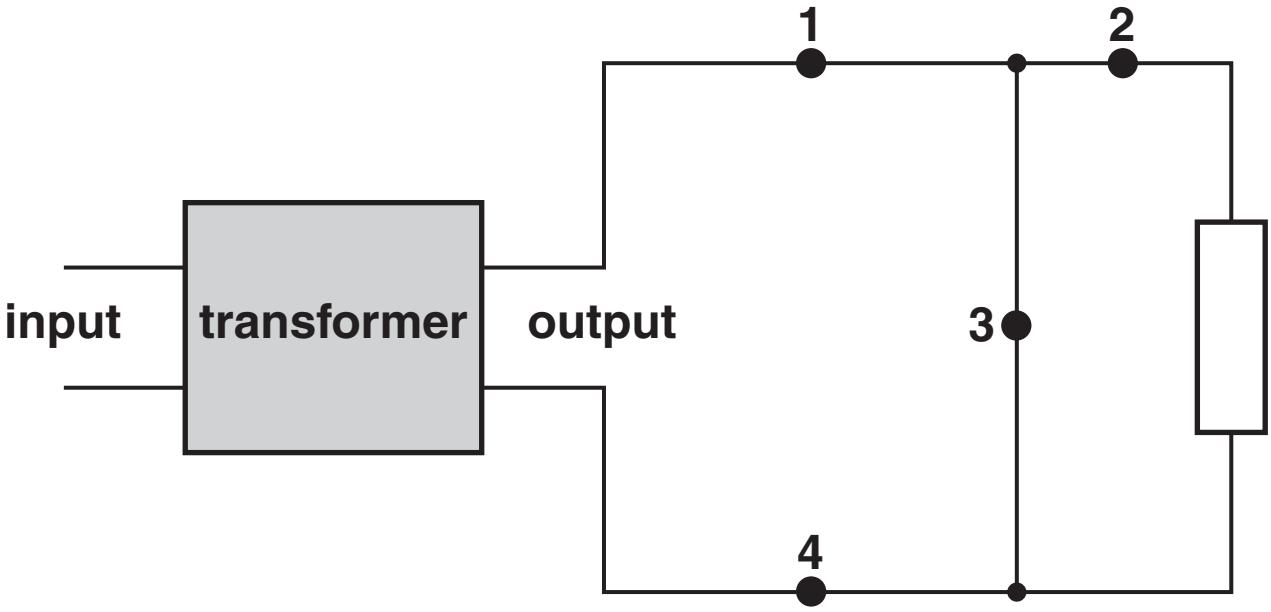
(ii) The statements below are about transformers.

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 below 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 below 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 below are correctly working out the energy used?

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

2000 × 3 ÷ 60 = 100 kWh ☐

2 × 3 = 6 J ☐

2 × 3 ÷ 60 = 0.1 kWh ☐

2000 × 3 = 6000 J ☐

2000 × 3 × 60 = 360 000 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.

These are <u>INFRARED</u>, <u>LIGHT</u> and <u>RADIO</u>.

(i) Below is a diagram of the spectrum. Put these three types of radiation in the correct places in the spectrum.

		microwave			ultraviolet	X-ray	

[2]

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

Draw a <u>STRAIGHT</u> line from each <u>TYPE OF WAVE</u> to the correct <u>JOB</u>.

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

TYPE OF WAVE	JOB
infrared waves	carry picture and sound information to the TV
light waves	carry picture information from TV to person
radio waves	carry information from remote control to the TV

[2]

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

(i) Use the best words in the list below to complete the following sentences.

DECODES

DIFFRACTS

0 AND 1 S

RADIO WAVES

SOUND WAVES

TRANSMITS

Use a different word for each sentence.

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?

Look at the list below.

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 words from the list below to help you answer the following 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]

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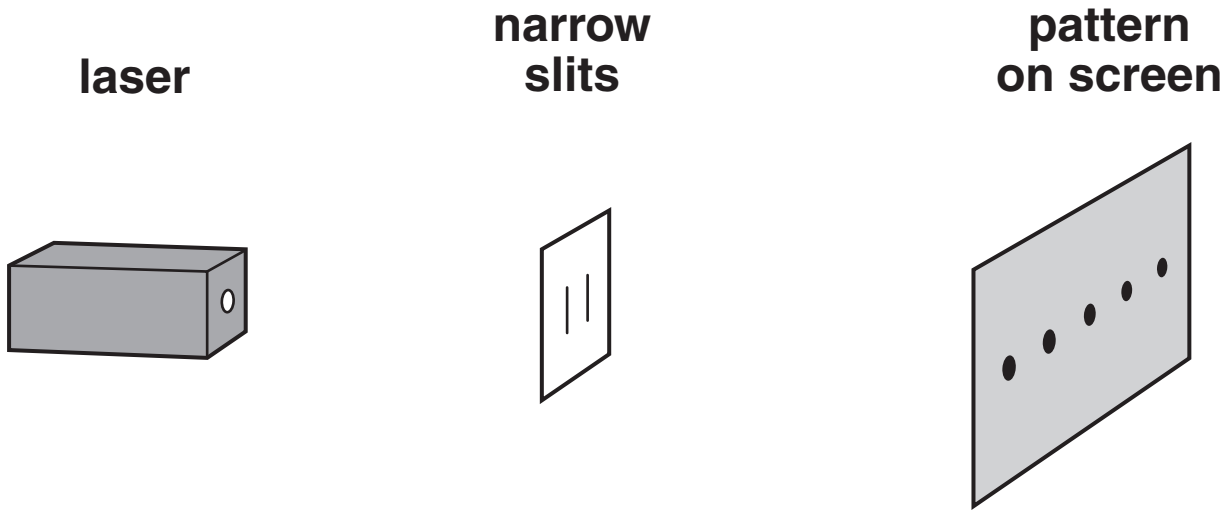
8 Miss Curie demonstrates the interference of light waves to her class by shining a laser beam through two narrow slits. This produces a pattern of bright and dark areas on a screen.



Below 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 the 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