

Monday 21 May 2012 – Morning

**GCSE TWENTY FIRST CENTURY SCIENCE
PHYSICS A**

A332/01 Unit 2: Modules P4 P5 P6 (Foundation Tier)

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)

Duration: 40 minutes



Candidate
forename

Candidate
surname

Centre number

Candidate number

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

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

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

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

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

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

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

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

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

Electric Circuits

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

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

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

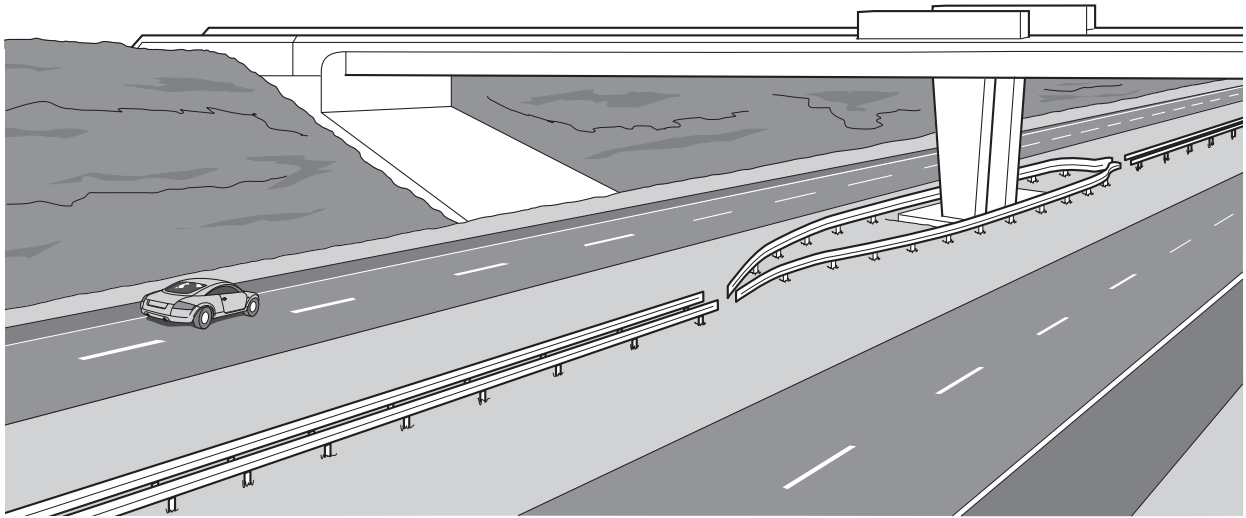
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

The Wave Model of Radiation

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

Answer **all** the questions.

- 1 A car is travelling along a motorway.



- (a) (i) The car takes 100 s to travel 2000 m.
What is its average speed?

Put a ring around the correct answer.

0.05 m/s

20 m/s

1900 m/s

2100 m/s

[1]

- (ii) Why is the speed described as **average speed**?

It is the average speed of all the cars on the motorway.

☐

It is calculated using the total time taken and total distance travelled.

☐

It is the only speed that the car travels at on the motorway.

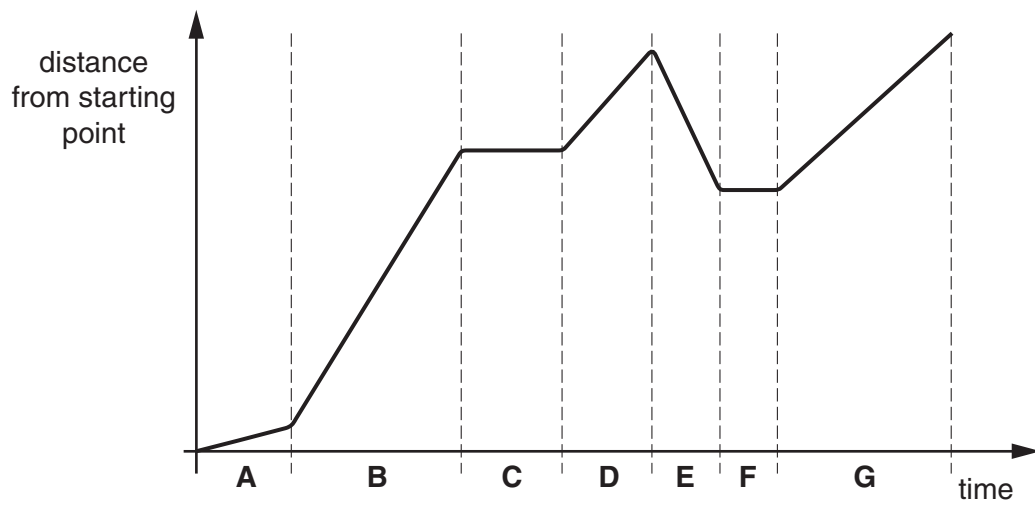
☐

It is the speed shown on the car's speedometer.

☐

[1]

(b) The graph below is a distance-time graph for a car travelling along a straight track.



Some of the following statements are true and some are false.

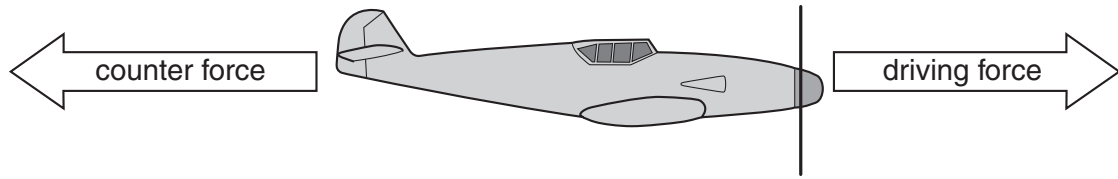
For each statement put a tick (✓) in the correct box to show if it is **true** or **false**.

	true	false
The car is moving fastest in part A .	<input type="checkbox"/>	<input type="checkbox"/>
The car came to a complete stop twice.	<input type="checkbox"/>	<input type="checkbox"/>
The speed was constant in part B .	<input type="checkbox"/>	<input type="checkbox"/>
The car moved backwards in part E .	<input type="checkbox"/>	<input type="checkbox"/>

[2]

[Total: 4]

- 2 The picture shows a toy plane.
The plane has a motor that pushes it along.
Two of the forces that act on the plane are shown.



Here is some information about the plane at one particular time.

mass	0.5 kg
speed	8 m/s
driving force	10 N
counter force	3 N

- (a) Use the information to calculate the momentum of the plane at this time.

momentum = unit [2]

- (b) Use the information to explain why the momentum of the plane increases over the next few seconds.

.....

.....

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..... [2]

[Total: 4]

- 3 There are many sports that take place in the Olympics.
All of the sports involve forces.

(a) In cycling, it is important to reduce the amount of resistive force.



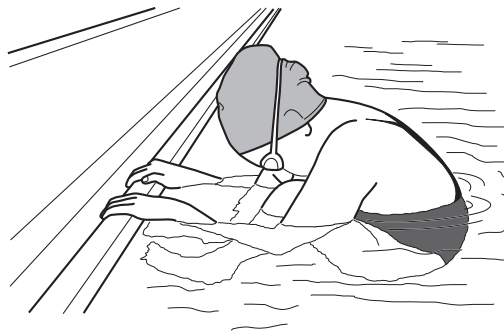
Some of the following statements are true and some are false.

For each statement, put a tick (✓) in the correct box to show if it is **true** or **false**.

	true	false
Friction acts in the opposite direction to the movement.	<input type="checkbox"/>	<input type="checkbox"/>
The cyclist leans forward to reduce air resistance.	<input type="checkbox"/>	<input type="checkbox"/>
Air resistance pushes the cyclist forwards.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

(b) In swimming, a backstroke race is started by pushing against the side of the swimming pool.



When one object exerts a force on another, it always experiences a force in return.
Which **two** forces make an interaction pair when a swimmer starts a race?

Put rings around the two correct answers.

the swimmer's
weight

the swimmer
pushing against
the wall

friction from the
water pushing
against the swimmer

the wall pushing
against the
swimmer

the swimmer's
gravitational
potential energy

the kinetic energy of
the swimmer

[1]

(c) A gold medal winner is standing on the podium.



Complete the sentences using words from this list.

down friction hard
partner reaction up

When the athlete is standing on the podium, he pushes on the surface.



The surface pushes on the athlete with an equal force.

The force from the surface is called the of the surface.

[1]

[Total: 4]

- 4 Rob is choosing between two different types of walkie talkie.

digital walkie talkie	analogue walkie talkie
 <p>£199</p>	 <p>£70</p>
<p>Great signal over long distances! Amazing signal quality!</p>	<p>Cheap and easy to use! Perfect for short distances!</p>

- (a) There are several differences between analogue and digital signals.

Draw **three** lines to join each **description** to the type of **signal** that it describes.

description

made from a series of on and off pulses only

signal can vary continuously and may take any value

it is easier to remove noise from this signal

signal

digital

analogue

[2]

- (b) The digital walkie talkie can be used over longer distances than the analogue walkie talkie. It is easier to recreate the original signal using a digital walkie talkie, even if the signal received is poor.

Explain why signals that travel further have a lower quality.

Include in your answer

- what happens to the amplitude of the signal
- what can be picked up by the signal as it travels.

.....

.....

.....

..... [2]

- (c) All walkie talkies use radio waves.
Which of the following statements about radio waves are true and which are false?

Put a tick (✓) in the correct box next to each statement to show if it is **true** or **false**.

	true	false
Radio waves are strongly absorbed by the atmosphere.	<input type="checkbox"/>	<input type="checkbox"/>
Radio waves travel at a very fast speed.	<input type="checkbox"/>	<input type="checkbox"/>
Radio waves are part of the electromagnetic spectrum.	<input type="checkbox"/>	<input type="checkbox"/>
Radio waves have a higher frequency than X-rays.	<input type="checkbox"/>	<input type="checkbox"/>

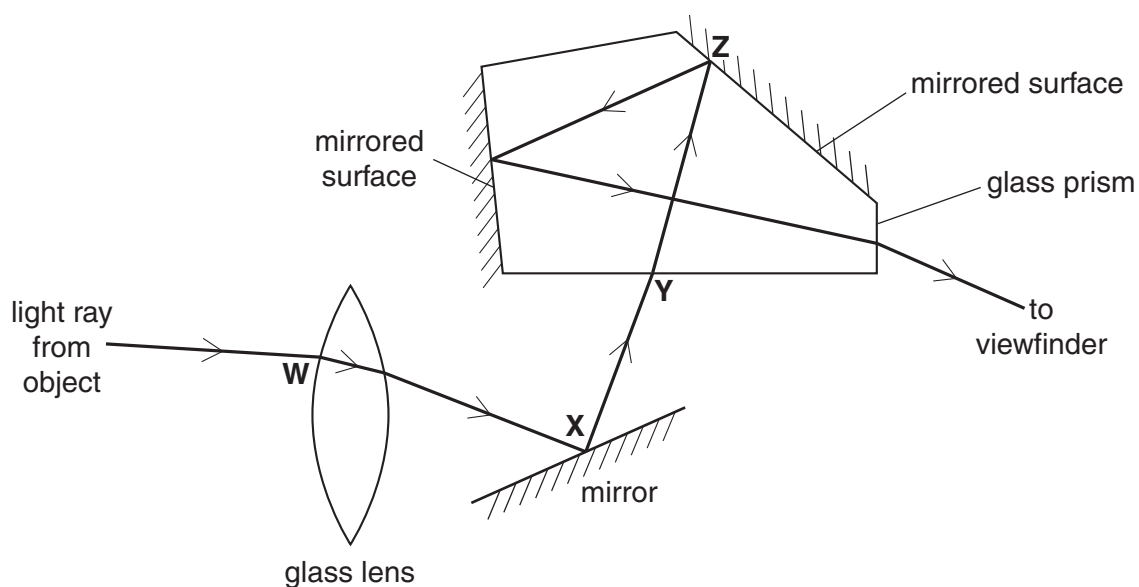
[2]

[Total: 6]

- 5 Millie is taking a picture using a camera with a flash.



- (a) The diagram shows one path of light through the camera.



- (i) When light travels, it can be **reflected** or **refracted**. These effects happen at different places in the camera. Which effects happen at places **W**, **X**, **Y** and **Z** in the diagram? Put ticks (✓) in the correct boxes.

place	reflection	refraction
W		
X		
Y		
Z		

[3]

- (ii) Some effects happen because light changes speed.
Which of the following will make light change speed?

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

light travelling in a straight line through the air ☐

light passing from air into glass ☐

light hitting a mirror and bouncing off ☐

[1]

- (b) Millie's camera flash uses part of the electromagnetic spectrum.
Which part of the spectrum does the flash use?

Put a ring around the correct answer.

gamma ray

infrared light

visible light

ultraviolet light

[1]

- (c) Millie reads this information about cameras.

Light enters the camera through a gap that is about 50 mm wide.
The wavelength of visible light is about 0.000 5 mm.
This means that the light does not diffract when it enters the camera.

Explain

- what diffraction is
- why light does **not** diffract when it passes through the gap.

.....

.....

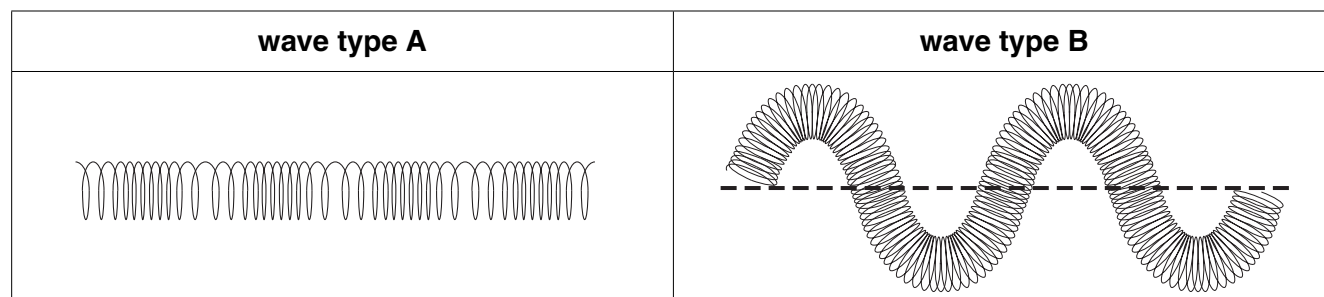
.....

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..... [2]

[Total: 7]

6 A long spring can be used to show different types of wave.



(a) Which type of wave is shown in each of the diagrams above?

wave type A

wave type B

[1]

(b) (i) Which of the following describes the **wavelength** of wave type B?
Put a tick (✓) in the box next to the correct answer.

the distance from one end of the spring to the other end

☐

the distance from the wave crest to the wave trough of the spring

☐

the thickness of the spring

☐

the distance from the first wave crest to the second wave crest

☐

the distance from a wave crest to the dotted line

☐

[1]

(ii) Which of the following describes the **amplitude** of wave type B?
Put a tick (✓) in the box next to the correct answer.

the distance from one end of the spring to the other end

☐

the distance from the wave crest to the wave trough of the spring

☐

the thickness of the spring

☐

the distance from the first wave crest to the second wave crest

☐

the distance from a wave crest to the dotted line

☐

[1]

(c) To make wave type A, one end of the spring is moved 4 times every second.
The wavelength is 50 cm.
How fast is the wave travelling?
Put a (ring) around the correct answer.

0.5 m/s

2 m/s

4 m/s

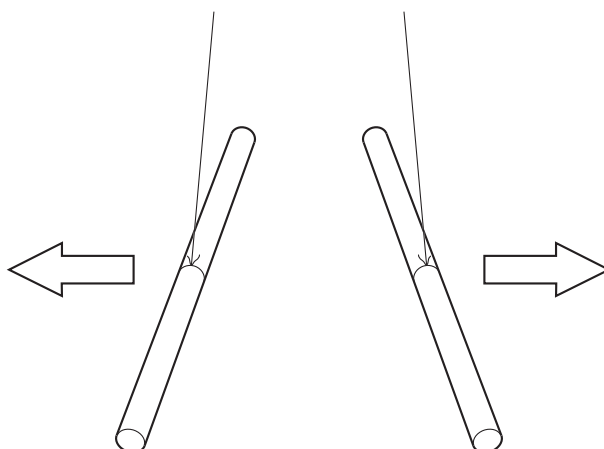
8 m/s

200 m/s

[1]

[Total: 4]

- 7 George charges two identical plastic rods by rubbing them with a cloth. He hangs the rods close to each other. The rods move away from each other.



- (a) Explain why the rods move away from each other.

Include in your answer

- what happens when the rods are rubbed with the cloth
- why the rods move away from each other.

.....

.....

.....

.....

..... [3]

- (b) George repeats the experiment with metal rods.

The rods do not move.

Join two boxes to make a sentence that helps to explain why the rods do not move.

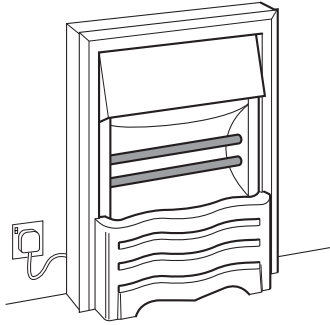
You should draw **one** straight line.

Metal rods contain lots of charges...	...which can not move.
Metal rods contain few charges...	...which are free to move.
Metal rods contain no charges...	...which move only when connected to a battery.

[1]

[Total: 4]

- 8 Ella buys a new electric heater.



- (a) The bars in the heater act as resistors.

Complete the sentence to explain why the bars act as resistors.
Use a word from this list.

current resistance voltage

Resistors get hot when passes through them.

[1]

- (b) Ella plugs the heater into the mains electricity supply.

- (i) What is the voltage of the mains supply in our homes?

Put a ring around the correct answer.

1.5V 12V 110V 230V

[1]

- (ii) The heater uses a current of 10 A.
What is the total resistance of the circuit?
Show your calculation.

resistance = ohms [2]

- (c) Ella is worried that using the heater is going to cost her a lot of money.
The average power of the heater is 2.3 kW.
The cost for one kilowatt-hour is 20p.

How much would it cost Ella to use the heater for 2 hours?

cost = p [1]

- (d) Ella wants to make a model of the heater. She does not want the model to get too hot. She uses a thermistor in her circuit.

Draw the circuit symbol for a thermistor in the space between the pieces of wire below.

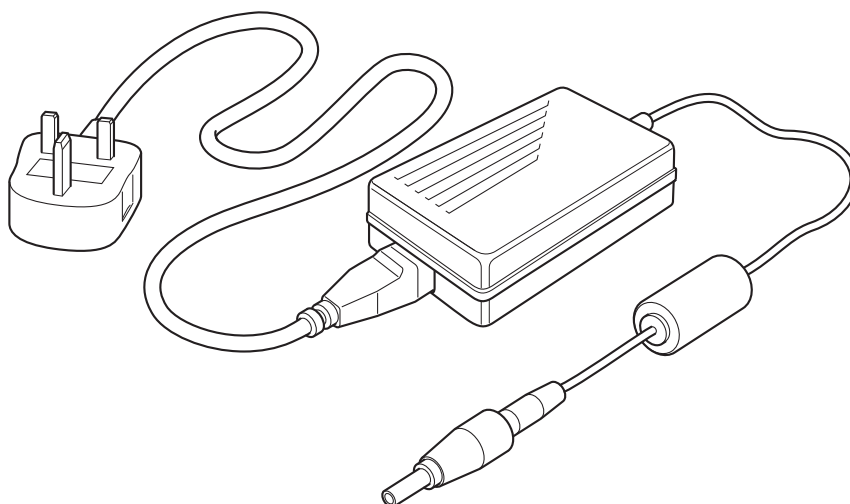
wire

wire

[1]

[Total: 6]

- 9 Vikram's laptop computer has a large device in its charging cable.



- (a) The device has a component which changes the voltage from mains voltage to a smaller voltage that can be used by the laptop. What is the name of this device in the charging cable?

Put a ring around the correct answer.

generator

LDR

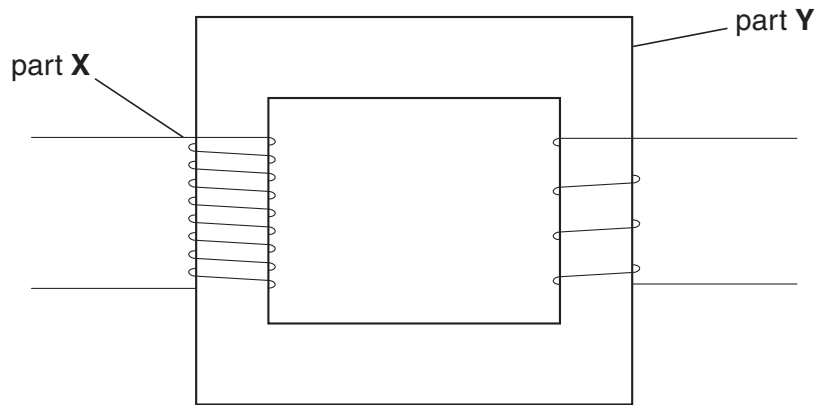
transformer

voltmeter

[1]

Question 9 continues on page 16

(b) The diagram below shows a simplified construction of this component.



What is part **X** and what is part **Y**?

Draw **two** lines to match each **part** to its correct **description**.

part	description
	iron core
part X	aluminium core
	steel core
part Y	coil of thread
	coil of copper wire

[2]

[Total: 3]

END OF QUESTION PAPER

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