OCR
RECOGNISING ACHIEVEMENT

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GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE PHYSICS A

A332/01

Unit 2: Modules P4 P5 P6 (Foundation Tier)

OCE/31299

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)

Wednesday 26 May 2010
Morning

Duration: 40 minutes

A33201

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

MODIFIED LANGUAGE

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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

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

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

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Question 1 starts on page 4

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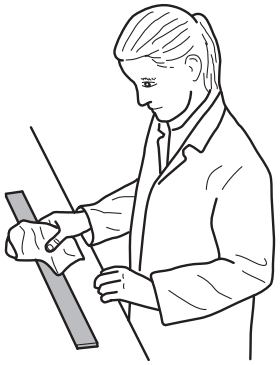
Answer **all** the questions.

1 Gemma is doing an experiment with a duster and some plastic rods.



(a) The rod becomes negatively charged when Gemma rubs it with the duster.

(i) Which particles have been transferred to the rod to make it **negatively** charged?

Put a ring around the correct answer.

electrons **neutrons** **nuclei** **protons**

[1]

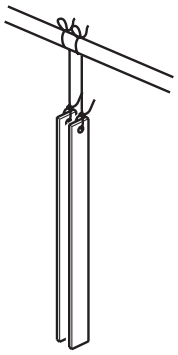
(ii) What charge does the **duster** gain, by charging the rod?

Put a ring around the correct answer.

negative **none** **north** **positive** **south**

[1]

(b) Gemma rubs a second identical rod with the same duster. The second rod also becomes negatively charged.



(i) The two charged rods are hung very close to each other. What happens to them?

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

The rods stay still and do not move.	☐
The rods move together and touch.	☐
The rods move away from each other.	☐
The rods spin around together.	☐

[1]

(ii) Explain why this happens.

.....

.....

..... **[2]**

(c) Gemma now rubs a metal rod with the duster. The metal rod does **not** become charged.

Her friend Liam explains that this is because the metal can conduct electricity.

Put a tick (✓) in the correct box to complete the best explanation of why metals can conduct electricity.

Metals can conduct electricity because…

… they have high melting points.	☐
… they have lots of free electrons that can move.	☐
… they conduct heat very well.	☐
… they are shiny.	☐

[1]

[Total: 6]

2 This question is about mains electricity.

(a) (i) Use the correct word from the list to complete the sentences about mains electricity.

Each word may only be used once or not at all.

alternating **battery** **direct** **electromagnetic** **generator** **motor**

Mains electricity is produced by a machine called a ……..…..……. .

The voltage is produced by a process called ……..…… induction.

The current produced is called ……..…… current. **[3]**

(ii) What is the voltage of the mains supply to our homes?

answer .....volts **[1]**

(iii) The voltage produced in power stations is much larger than the voltage supply to your home.

Which device is used to change the size of the voltage?

Put a (ring) around the correct answer.

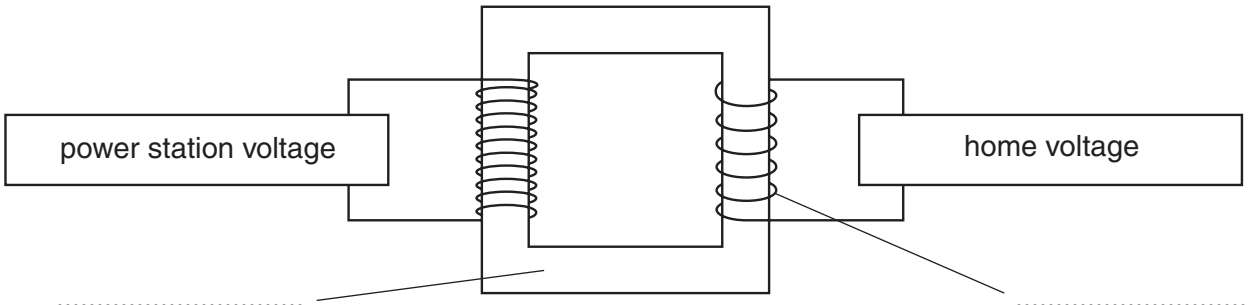
fuse **generator** **transformer** **transmission line**

[1]

(iv) Label the diagram of the device that changes the voltage.

Use words from this list.

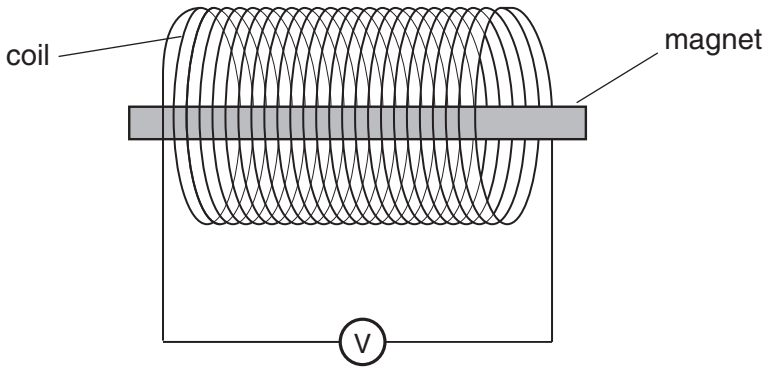
coil of wire **core** **switch** **wave**



[2]

(b) Edwin makes a model to show how a power station produces mains electricity.

He uses a magnet and a coil of wire.



(i) What does Edwin do to produce a voltage?

.....

..... **[1]**

(ii) Edwin wants a larger voltage output from the model.

Place a tick (✓) next to the **two** changes he should make.

increase the number of coils	☐
use different coloured wire	☐
use a stronger magnet	☐
use a weaker magnet	☐
use a larger voltmeter	☐

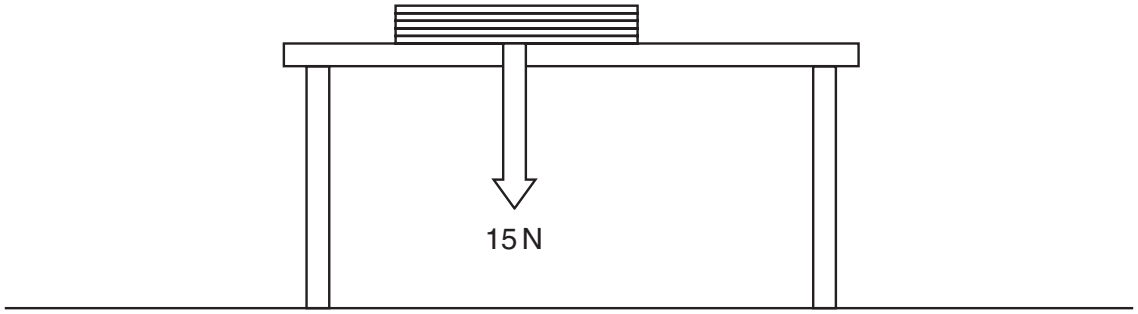
[2]

[Total: 10]

3 Laura's class are discussing forces.

(a) The diagram shows the force of a book acting on a table.

(i) Add an arrow to show the force of the table acting on the book. **[1]**



(ii) What is the value of the force of the table acting on the book?

answer .....N **[1]**

(iii) Choose the best phrase to complete the sentence.

a charged **an interaction** **a magnetic** **an unbalanced**

These two forces are an example of …… pair. **[1]**

(b) Laura now pushes the book across the table.

(i) Describe the force between the book and the table as she pushes it.

You should include:

- the name of the force between the book and the table
- the direction this force acts compared to the direction the book moves.

.....

.....

..... **[2]**

(ii) The book moved 1.5 m across the table.

The average force Laura used was 6 N.

Calculate the work done by this force.

You should show your working. Use an equation from page 2.

work done = ... joules **[2]**

(iii) Laura's pushing force is bigger than the force between the book and the table.

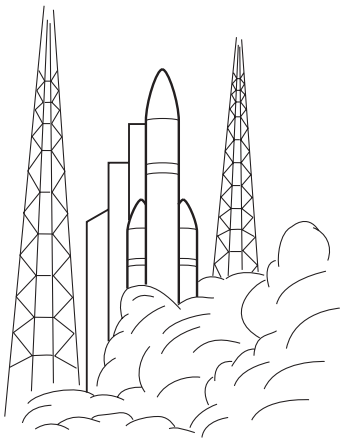
What happens to the momentum of the book as Laura pushes it across the table?

..... **[1]**

[Total: 8]

4 In 2007, an Ariane rocket set a new record for a launch.

It lifted a mass of 10 tonnes.



(a) The rocket produces a force of 13 000 kN at launch.

This is 20 times as much as a jumbo jet.

What is the force produced by a jumbo jet in kN?

Put a (ring) around the correct calculation.

13 000 + 20 **13 000 – 20** **13 000 × 20** $\frac{\textbf{13 000}}{\textbf{20}}$

[1]

(b) The rocket engine burns fuel to produce an upwards force.

Explain how this makes the rocket go upwards.

In your answer you should include:

- how burning the fuel produces the upwards force
- the forces acting on the rocket
- the relative sizes of the forces.

.....

.....

.....

.....

..... **[3]**

(c) The Ariane rocket and payload weigh 10 000 kN.

Calculate the gravitational potential energy, in kJ, of the rocket when it is 70 m from the ground.

Ignore any change in weight.

answer = ... kJ **[1]**

[Total: 5]

5 This question is about waves.

(a) Waves move from one place to another place.

Put ticks (✓) in the boxes to show what moves from place to place.

matter	☐
energy	☐
disturbances	☐
particles	☐
charge	☐

[2]

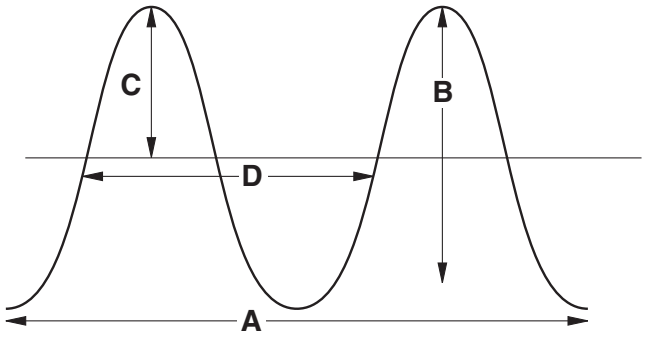
(b) Waves are either **longitudinal** or **transverse**.

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

description	**type of wave**
travels in the same direction as the vibrations	longitudinal wave
travels at right angles to the direction of the vibration	
needs a medium to travel in	transverse wave
some can travel through a vacuum	

[2]

(c) Here is a diagram of one type of wave.



(i) Which label, **A**, **B**, **C** or **D**, shows the **amplitude** of the wave?

answer ..... **[1]**

(ii) Which label, **A**, **B**, **C** or **D**, shows the **wavelength** of the wave?

answer ..... **[1]**

(d) The frequency of a wave is 5 hertz (Hz).

(i) Explain what 5 Hz means.

.....

.....

..... **[2]**

(ii) The wavelength of the 5 Hz wave is 10 m.

Calculate the **speed** of the wave.

Use the correct equation from page 2.

answer = ... m/s **[1]**

[Total: 9]

6 Simon is listening to FM radio. His dad tells him that FM stands for Frequency Modulation.

Some other radio stations use AM to transmit signals.

(a) What does AM stand for?

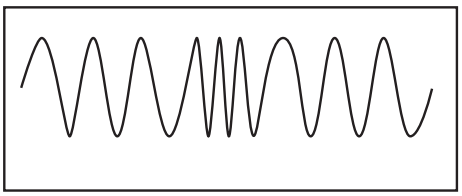
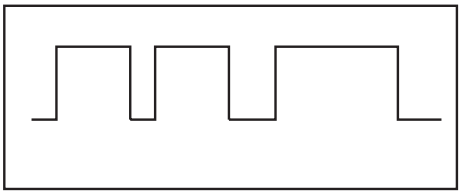
Put a tick (✓) in the box next to the correct answer.

amateur modulation	☐
american modulation	☐
amplitude modulation	☐
analogue modulation	☐

[1]

(b) Most radio stations are now switching to digital signals.

(i) Draw a straight line from each **signal shape** to its correct **signal name**.

signal shape	**signal name**
	digital signal
	AM signal
	FM signal

[2]

(ii) Any signal picks up **noise** as it travels.

The digital signals can be cleaned up by the receiver to remove the noise.

What is meant by noise in a signal?

.....

.....

..... **[1]**

[Total: 4]

END OF QUESTION PAPER

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