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)

WEDNESDAY 26 MAY 2010: 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 (NF/SLM) MEP60518 31700/1

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. 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 pages four and five.**

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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

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

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

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

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

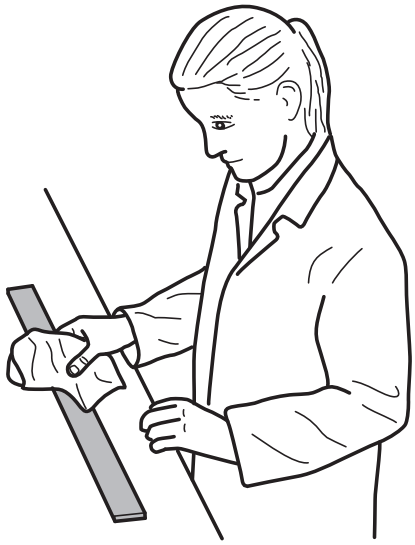
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

THE WAVE MODEL OF RADIATION

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

Answer ALL the questions.

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



(a) When she rubs the rod with the duster, the rod becomes negatively charged.

(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

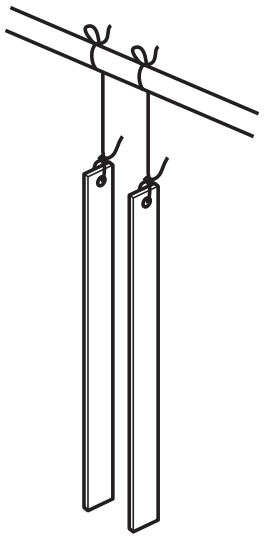
NORTH

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

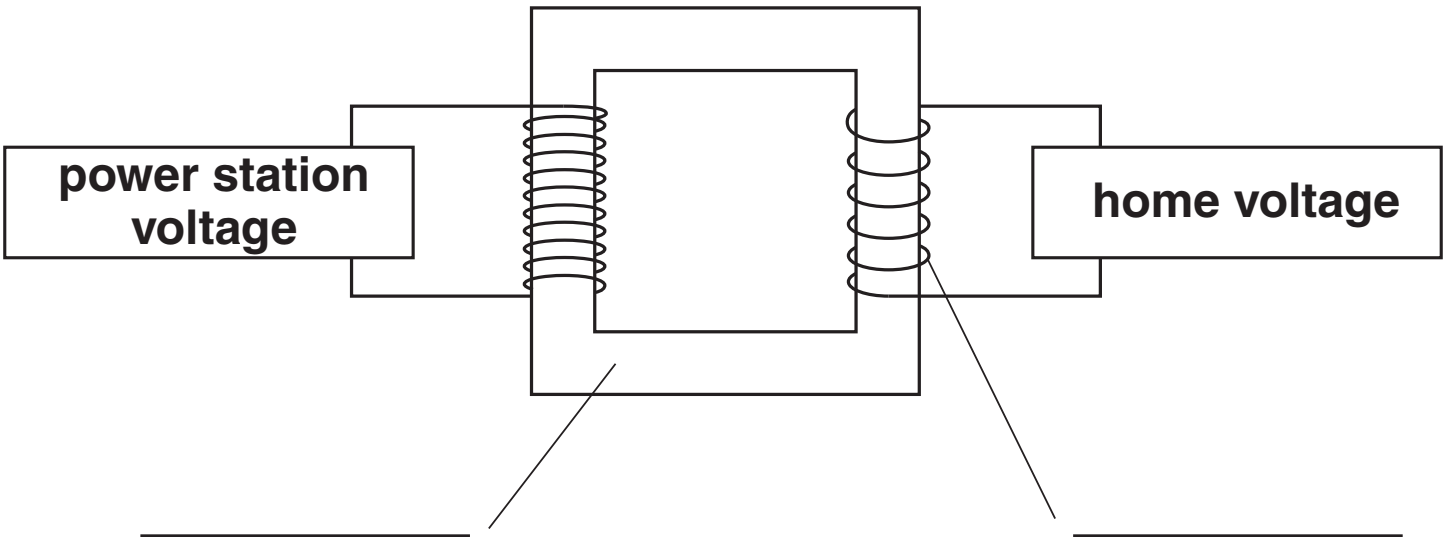
TRANSMISSION LINE

[1]

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

Use words from this list.

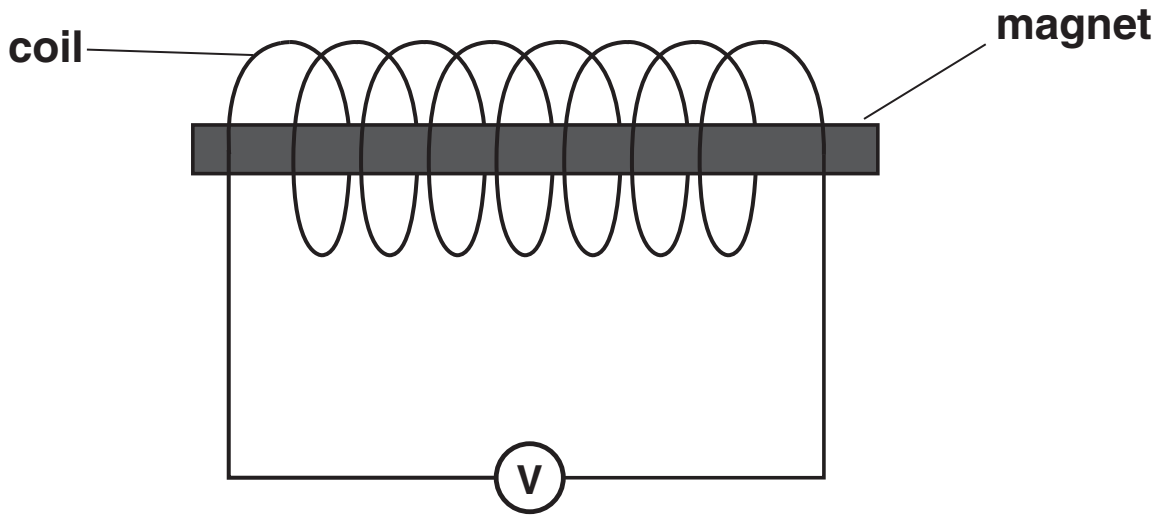
COIL OF WIRE CORE SWITCH WAVE



[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	☐

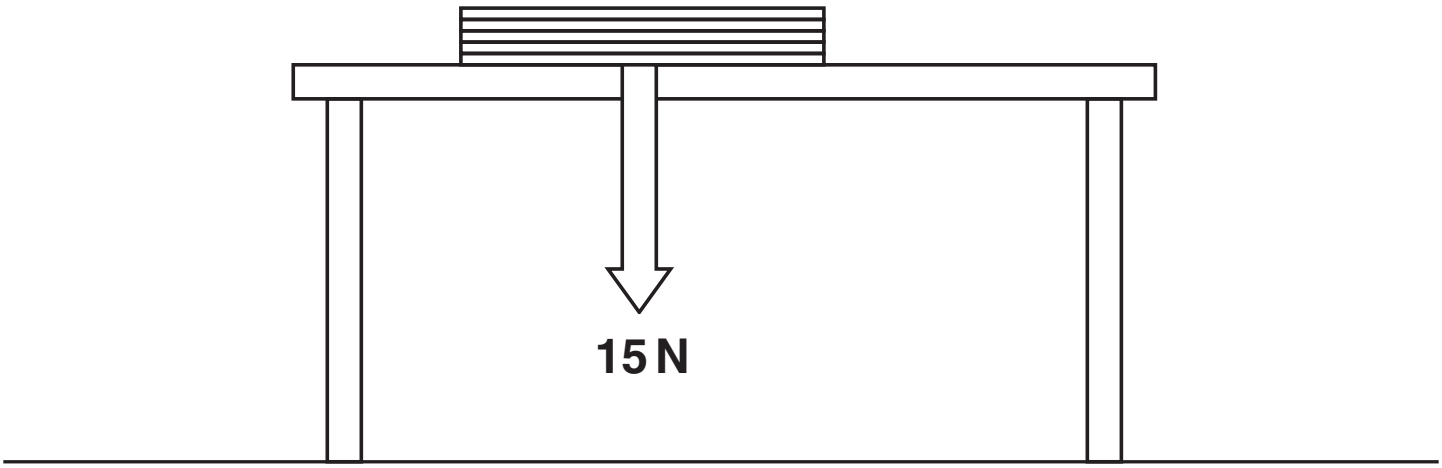
[2]

[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 pages 4 or 5.

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]

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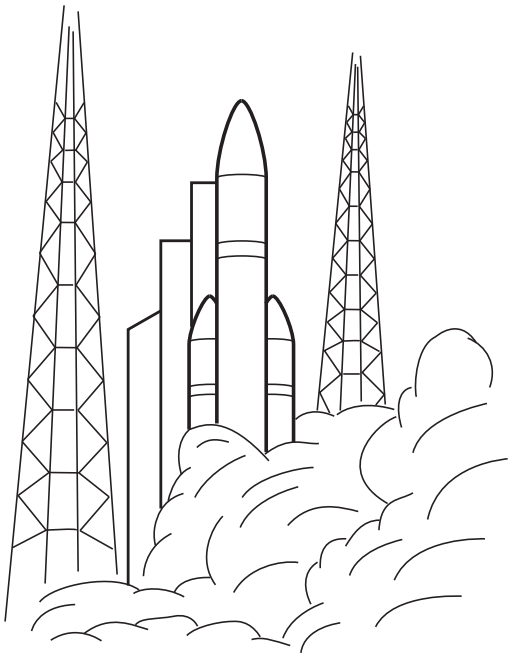
4 In 2007, an Ariane rocket set a new record for a launch.

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** $\frac{13\,000}{20}$

[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]

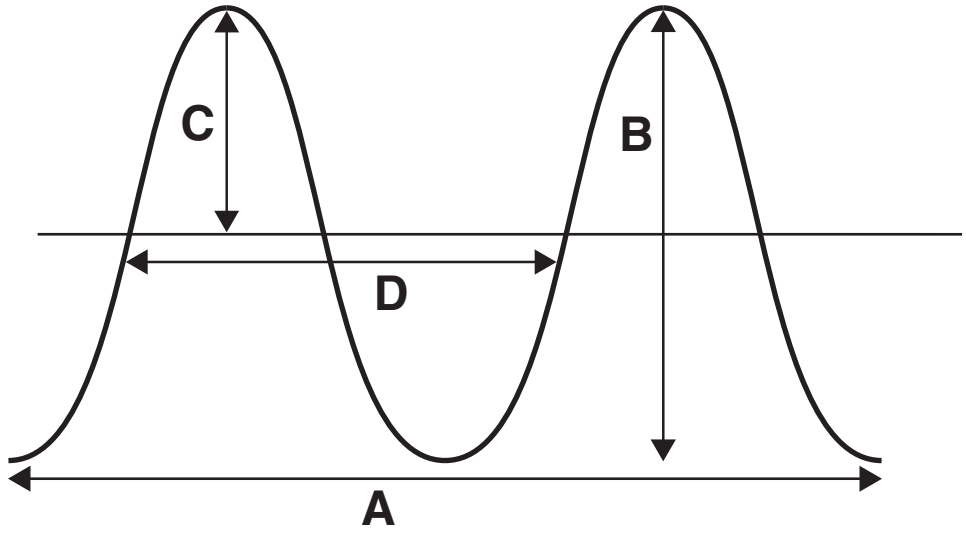
(b) Waves are either LONGITUDINAL or TRANSVERSE.

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 <u>AMPLITUDE</u> of the wave?

answer _____ **[1]**

(ii) Which label, A, B, C or D, shows the <u>WAVELENGTH</u> 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 pages 4 or 5.

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?

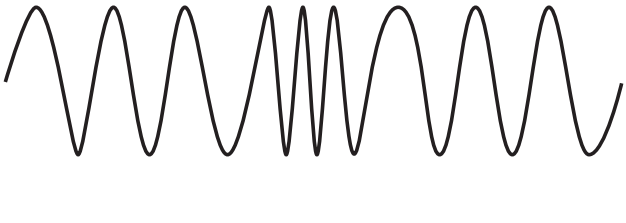
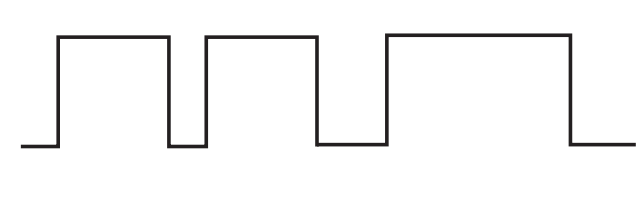
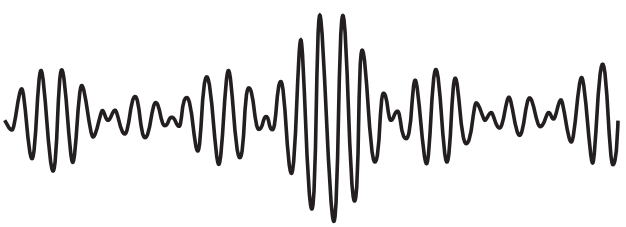
Put a tick (✔) in the box next to the correct answer.

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 <u>SIGNAL SHAPE</u> to its correct <u>SIGNAL NAME</u>.

<u>SIGNAL SHAPE</u>	<u>SIGNAL NAME</u>
	digital signal
	AM signal
	FM signal

[2]

(ii) When any signal travels it picks up <u>NOISE</u>.

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]

<u>END OF QUESTION PAPER</u>

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