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GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B652/01

PHYSICS B

Unit 2 Modules P4 P5 P6 (Foundation Tier)

B621940111

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)

Monday 31 January 2011
Afternoon

Duration: 1 hour

B652201

Candidate forename		Candidate surname	

Centre number						Candidate number				

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. Pencil may be used for graphs and diagrams only.
- 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).
- Answer **all** the questions.
- 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.
- A list of physics equations is printed on page two.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

EQUATIONS

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

$$v = u + at$$

$$s = \frac{(u + v)}{2} t$$

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

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

Answer **all** the questions.

Section A – Module P4

1 This question is about nuclear radiation.

(a) Look at the list of words.

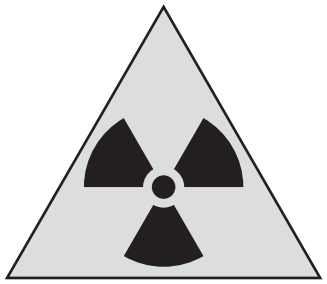
A alpha particles

B background

C steel

D radioisotope

E uranium



(i) What is the name of the radiation that is **always** present in the atmosphere?

Choose from the list.

A B C D E

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

(ii) Which type of radiation is used in **smoke detectors**?

Choose from the list.

A B C D E

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

(iii) What is the name of a **fuel** used in nuclear power stations?

Choose from the list.

A B C D E

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

(iv) Which one can be **made** radioactive in a nuclear reactor?

Choose from the list.

A B C D E

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

(v) Which one is used for **tracers** in hospitals?

Choose from the list.

A B C D E

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

Turn over for the remainder of question 1

(b) Nuclear radiation is given out by the nucleus of an unstable atom.

Two types of nuclear radiation are alpha particles and beta particles.

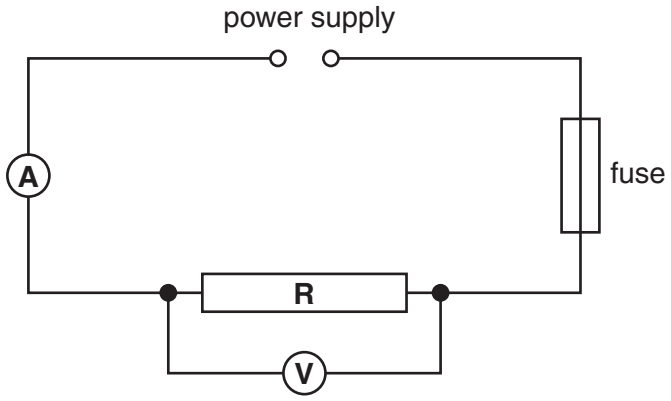
Complete the sentences.

(i) An alpha particle is a ..... nucleus. **[1]**

(ii) A beta particle is a fast moving ..... . **[1]**

[Total: 7]

2 Raphael sets up a circuit.



(a) He measures the current in the resistor, **R**, and the voltage across it.

Look at his results.

current = 0.5 amps

voltage = 6 volts

Calculate the resistance of **R**.

The equations on page 2 may help you.

.....

.....

.....

answer ..... Ω **[2]**

(b) Raphael has a **fuse** in his circuit.

Complete the sentence.

If the current becomes too large, the fuse ……. the circuit. **[1]**

[Total: 3]

3 Katie is shopping.

She walks on a vinyl (a type of **plastic**) floor.

She then touches a metal object and gets an **electrostatic shock**.

Describe how she gets a shock.

In your answer write about

- how the charge is produced
- the materials involved
- what happens to the charge.

.....

.....

.....

.....

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

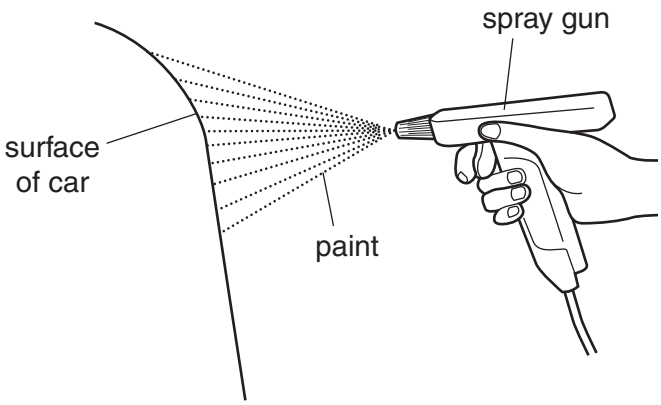
[Total: 3]

4 This question is about a **use** of electrostatics.

Cars are spray painted. The paint particles are all positively charged (+).

Spray painting

- gives an **even** coat of paint
- paints **all** parts of the car
- wastes **less** paint.



Complete the sentences to describe how static electricity is useful for spray painting.

The paint particles are all positively charged.

This causes the paint particles to ..... each other and produce a ..... spray.

The surface of the car has ..... electrostatic charge so the paint is ..... to it. **[2]**

[Total: 2]

5 Samuel learns about using **nuclear radiation** in **hospitals**.

His teacher tells him to get information about this from the internet.

Samuel writes a summary of what he finds out.

Finish the sentences to complete Samuel's findings.

1 Nuclear radiation can damage …… in a patient's body.

2 Nuclear radiation is used to …… hospital equipment.

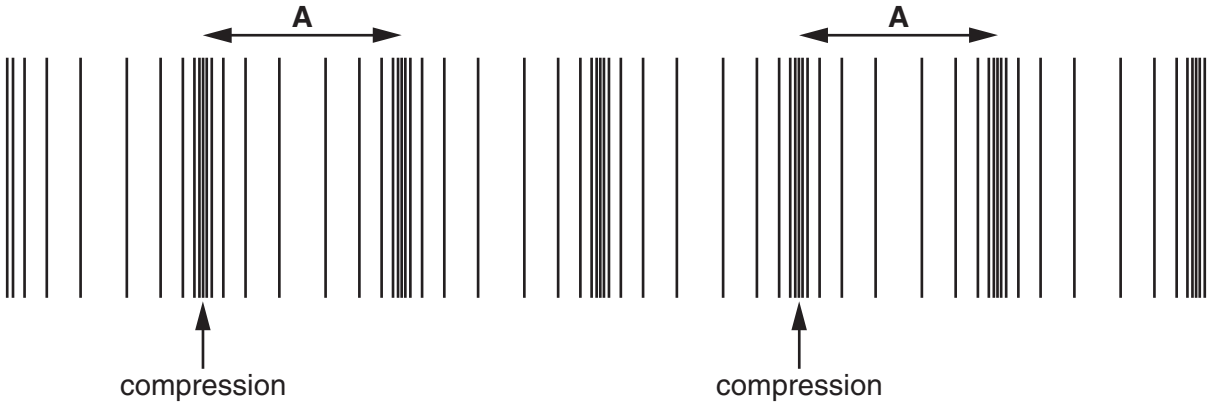
3 Gamma rays are used to treat patients with …… .

[3]

[Total: 3]

6 Ultrasound is a longitudinal wave.

Look at the diagram of a longitudinal wave.



Complete the sentences.

(a) On the diagram, the letter **A** shows the distance from one compression to the next.

This distance is called the ..... . **[1]**

(b) An ultrasound wave travels by air molecules moving backwards and forwards.

A place where the air molecules are **closest** is called a **compression**.

A place where the air molecules are **furthest apart** is called a ..... . **[1]**

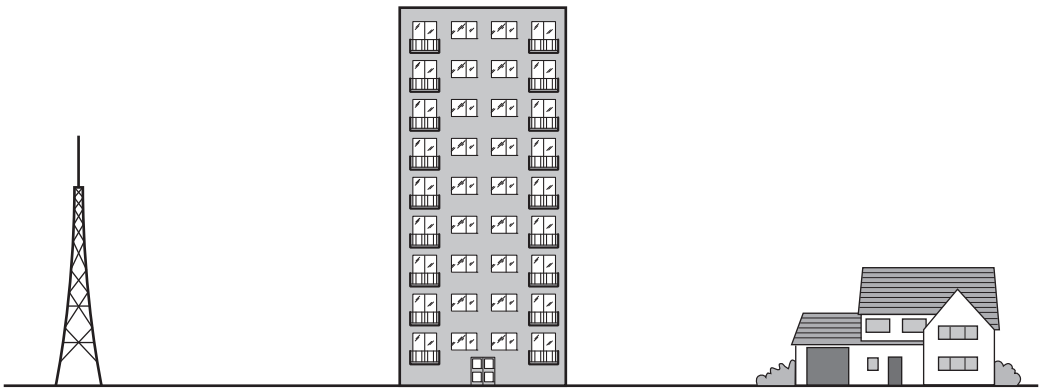
[Total: 2]

Section B – Module P5

7 This question is about communicating with waves.

Radio waves are emitted from a transmitter.

Look at the diagram.



(a) The house has a radio.

The radio needs a piece of equipment to receive the radio signals.

Write down the **name** of this piece of equipment.

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

(b) The radio signals cannot get through the block of flats.

The radio waves still reach the house.

Describe two ways they do this.

1 .....

.....

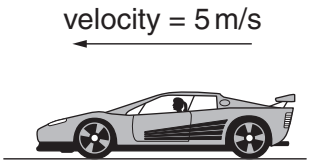
2 .....

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

[Total: 4]

8 This question is about **velocity** and **speed**.

Look at the diagram of the car.



(a) How is speed different to velocity?

.....

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

(b) Look at the diagram of the car accelerating.

(i) The car is travelling with a velocity of 5 m / s.

It then accelerates at 0.5 m / s^2.

Calculate the final velocity after 12 s.

The equations on page 2 may help you.

.....

.....

answer ..... m/s **[2]**

(ii) What happens to the **momentum** of the car when it accelerates?

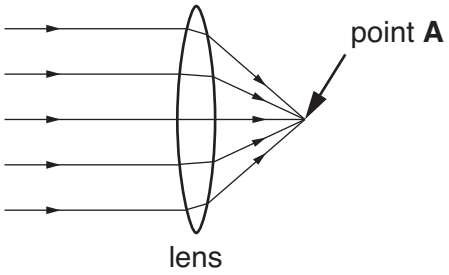
..... **[1]**

[Total: 4]

9 This question is about using light.

Lenses are used to change the direction of light.

Look at the diagram.



(a) The light changes direction as it passes through the lens.

What is this process called?

Choose from

diffraction **interference** **reflection** **refraction**

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

(b) Complete the following sentences about this lens.

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

Each word may be used **once**, **more than once** or **not at all**.

concave **convex** **focal** **long** **parallel** **short**

Converging lenses are also called ..... lenses.

This lens converges ..... rays of light to pass through point **A**.

Point **A** is called the ..... point.

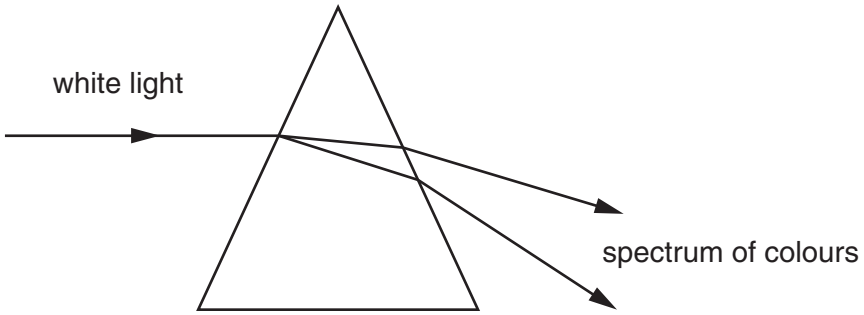
The distance between the lens and point **A** is called the ..... length.

A projector uses a ..... lens. **[4]**

Turn over for the remainder of question 9

(c) A prism can be used to split up white light into a spectrum of colours.

Look at the diagram.



(i) The white light splits into different colours.

What is the name of this process?

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

(ii) Two of the colours are red and blue.

Blue light passing through the prism behaves differently to red light.

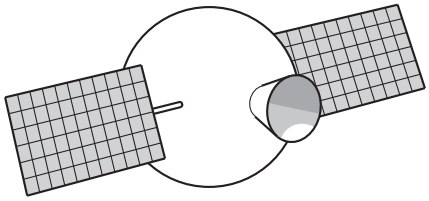
Describe this difference.

.....

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

[Total: 7]

10 Artificial satellites orbit Earth.



(a) Write down **two** things artificial satellites can be used for.

1 .....

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

(b) Geostationary satellites orbit Earth.

To maintain circular motion these satellites need a centripetal force.

(i) What provides the centripetal force for these satellites?

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

(ii) What is meant by a satellite in **geostationary** orbit?

.....

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

(iii) How long does it take a geostationary satellite to orbit the Earth?

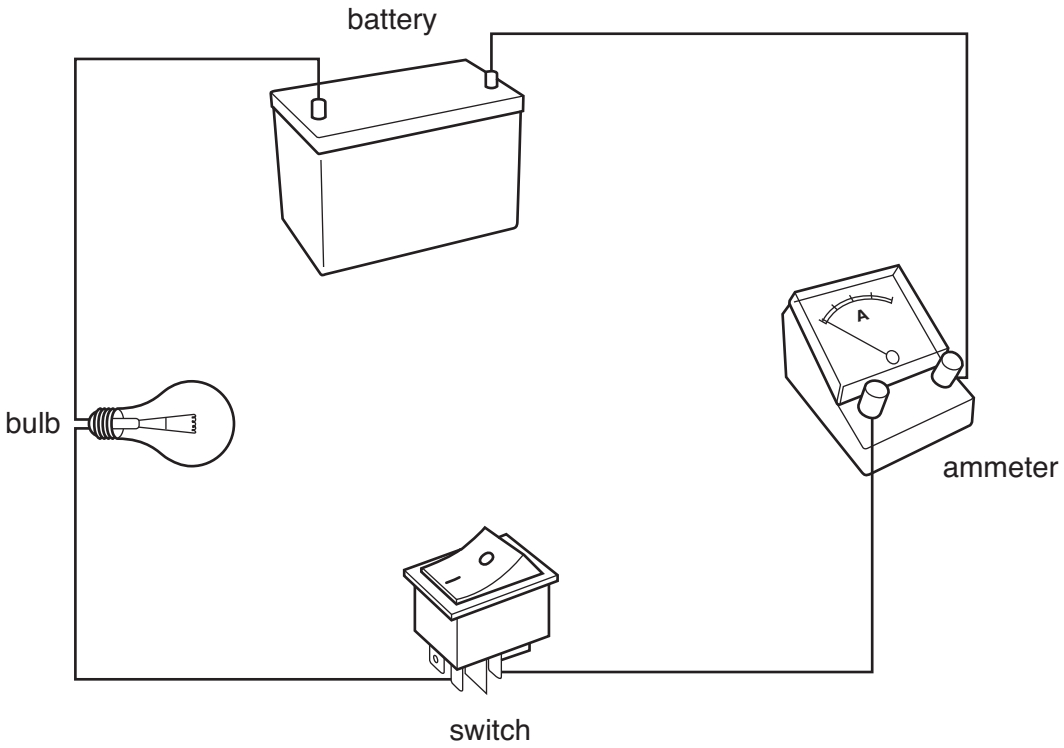
answer ..... hours **[1]**

[Total: 5]

Section C – Module P6

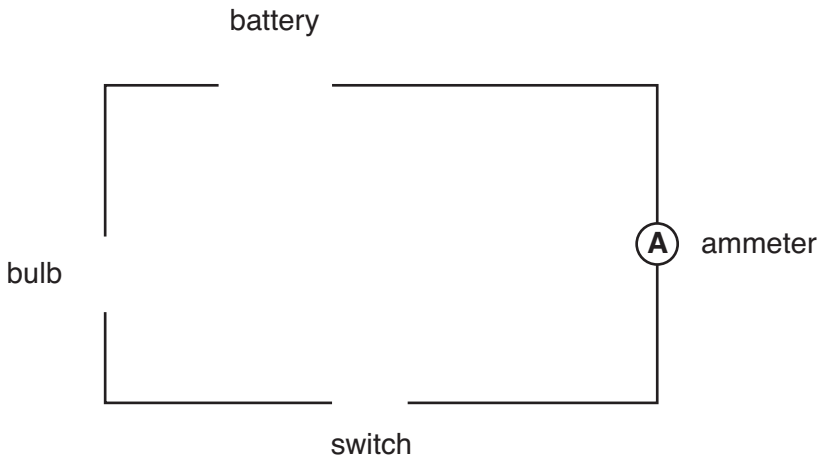
11 This is a question about circuits and circuit symbols.

(a) Freya connects this circuit.



Complete the diagram of this circuit. Use the correct circuit symbols for the components.

The ammeter has been done for you.



[3]

(b) Freya wants to vary the brightness of the bulb.

What **other** component must she connect to the circuit?

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

(c) Freya closes the switch. The bulb becomes very hot and lights up.

What happens to the **resistance** of the bulb as it gets hotter?

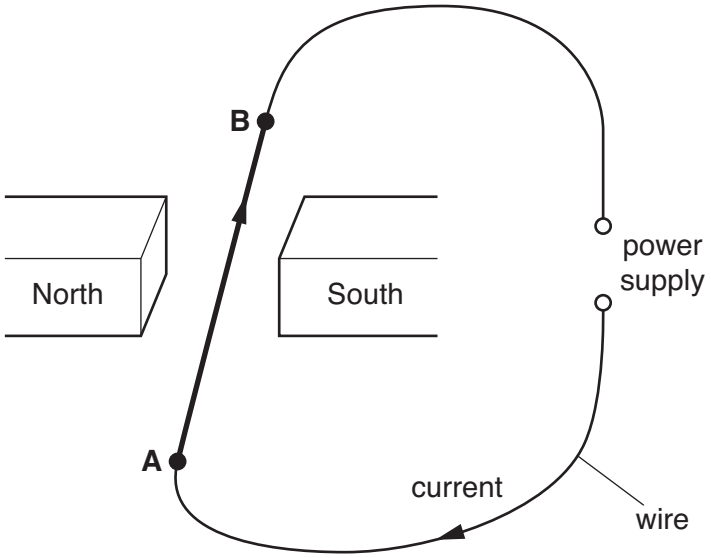
Choose from

decreases **increases** **stays the same**

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

[Total: 5]

12 (a) Look at the diagram of a wire in a magnetic field.



The current flows in the direction shown in the diagram.

The wire moves **downwards**.

(i) The current is reversed. It now flows from **B** to **A**.

The magnet has not changed.

In which direction will the wire now move?

Choose from

upwards

downwards

to North pole of magnet

to South pole of magnet

towards A

towards B

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

(ii) The current now flows in its original direction from **A** to **B**.

The magnetic field is reversed.

In which direction will the wire now move?

Choose from

upwards

downwards

to North pole of magnet

to South pole of magnet

towards A

towards B

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

(b) Electric motors have magnets in them.

Some household appliances contain electric motors.

Write down the name of **one** household appliance that contains an electric motor.

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

[Total: 3]

13 Many electronic devices are used around the home.

(a) Glynn needs an electronic device to **switch on** his outside light when it gets dark.

What component should he use?

Choose from

capacitor **LED** **LDR** **solar cell**

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

(b) Glynn's house has temperature controls. These contain thermistors.

Look at the table.

temperature in °C	current in mA
15	6.5
20	6.9
25	7.3
30	7.6

The table shows how the temperature affects the current in the thermistor.

The voltage across the thermistor is constant.

Use the table to complete the sentence.

As the temperature increases the resistance of the thermistor ..... . **[1]**

[Total: 2]

14 Electricity is generated when an electromagnet rotates inside a coil of wire.

Describe **three** ways this generator can be changed to produce a **higher** voltage.

.....

.....

.....

.....

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

[Total: 3]

15 This question is about using different types of transformer.

Complete the table to show the type of transformer required for each use.

Put a tick (✓) in the correct box for each use.

The first one has been done for you.

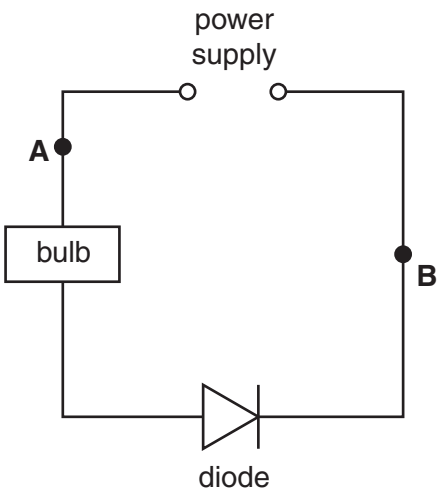
use	step up transformer	step down transformer	isolating transformer
to light a 12V lamp from the mains		✓	
output from a power station			
bathroom shaver socket			
mobile phone charger from the mains			
electrical substation to a school			

[2]

[Total: 2]

16 Some electrical circuits use diodes.

(a) Look at the circuit.



The bulb lights up.

(i) Put arrows (→) on the circuit at **A** and **B** to show the current direction. **[1]**

(ii) What is the job of a diode?

.....

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

(b) Some circuits use a capacitor.

What is the job of a capacitor?

.....

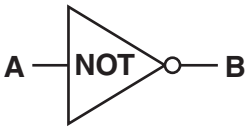
..... **[1]**

[Total: 3]

17 This question is about logic circuits.

Different circuits use different types of logic gates and components.

(a) One type of logic gate is called a **NOT** gate.



Complete the truth table for a **NOT** gate.

A	B
0	
1	

[1]

(b) Some logic circuits use more than one logic gate.

A latch is a combination of logic gates. Latches are used in burglar alarms and car alarms.

Suggest why these alarm circuits use a latch.

.....

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

[Total: 2]

END OF QUESTION PAPER

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