

**Thursday 2 February 2012 – Morning**

**GCSE GATEWAY SCIENCE PHYSICS B**

**B652/01** Unit 2 Modules P4 P5 P6 (Foundation Tier)

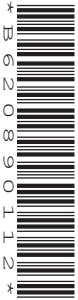
Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration: 1 hour**

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



|                       |  |                      |  |
|-----------------------|--|----------------------|--|
| Candidate<br>forename |  | Candidate<br>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. 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.
- A list of physics equations is printed on page two.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

**EQUATIONS**

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

$$v = u + at$$

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

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

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

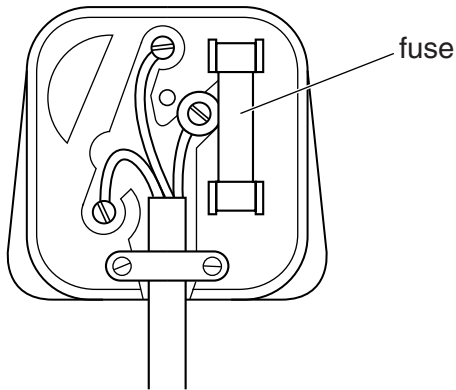
Answer **all** the questions.

**Section A – Module P4**

1 Dave has electrical appliances in his home.

(a) He looks at the mains plug for his metal toaster.

Look at the diagram.



(i) Which wire is colour coded **blue**?

Choose from

**earth**

**live**

**neutral**

answer .....

[1]

(ii) Which wire is colour coded **green and yellow**?

Choose from

**earth**

**live**

**neutral**

answer .....

[1]

(iii) What is the job of the **fuse** in this mains plug?

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

(b) Dave has a games console. It is double insulated.

It has only two wires.

Which **two** wires are connected to the games console?

Choose from

**live and earth**

**neutral and earth**

**live and neutral**

answer .....

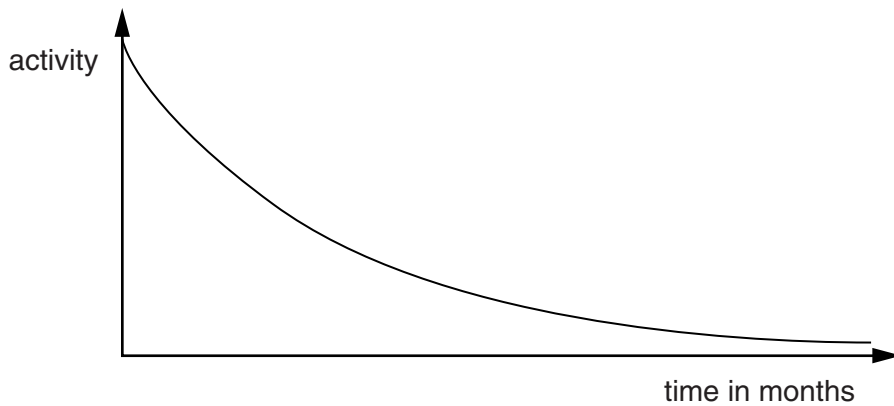
[1]

[Total: 4]

2 Nuclear radiation is used in hospitals.

(a) A radiographer measures the activity of the radioactive source every month.

Look at the graph of her results.



(i) Complete the sentences.

Time is measured in months.

Activity is measured in ..... per second.

[1]

(ii) Describe what happens to the activity of this source.

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

(b) Doctors can use nuclear radiation to help patients.

Explain how the doctor can treat patients using nuclear radiation.

In your answer write about

- what can be treated
- how the treatment works.

.....

.....

.....

.....

..... [2]

(c) Some hospital equipment is exposed to a high dose of gamma radiation before it is used.

Explain why.

.....

..... [1]

[Total: 5]

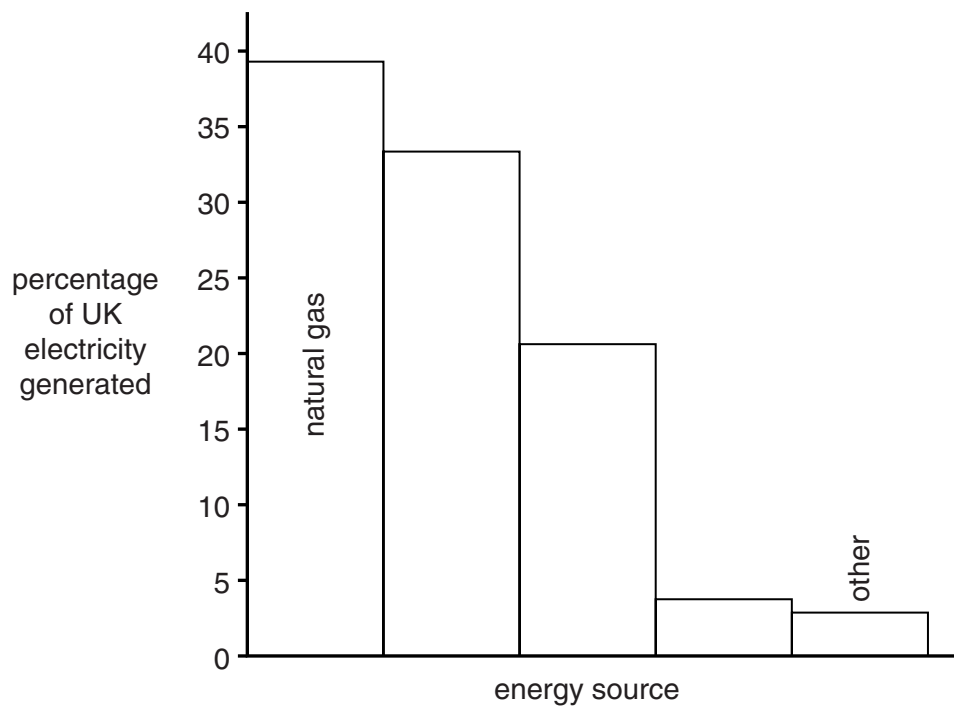
3 Several energy sources are used to generate electricity in the UK.

Look at the table.

| energy source | percentage of UK electricity generated |
|---------------|--|
| coal          | 33.4                                   |
| natural gas   | 39.3                                   |
| nuclear       | 20.6                                   |
| renewable     | 3.8                                    |
| other         | 2.9                                    |

(a) Complete the labels on the bar graph.

Two have been done for you.



[1]

(b) **Nuclear** power stations use a fuel to produce energy.

(i) Write down the name of the nuclear fuel.

..... [1]

(ii) The fuel releases heat during a nuclear reaction.

Write down the name of this reaction and describe what the heat is used for.

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

(c) Scientists working in the nuclear industry make materials radioactive.

How do they do this?

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

[Total: 5]

4 **Ultrasound** is used in hospitals.

Ultrasound has a very high frequency.

(a) What does **frequency** mean?

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

(b) Write down one **use** for ultrasound in hospitals.

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

[Total: 2]

5 Static electricity has many uses.

(a) One use of static electricity is in defibrillators.



The paddles of the defibrillator are charged.

(i) Describe how the doctor restarts the patient's heart.

In your answer write about

- what the doctor does with the charged paddles
- how she makes sure charge reaches the heart.

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

(ii) What happens to the heart when the charge passes through it?

..... [1]

(b) Static electricity can be **dangerous**.

Describe **one situation** where static electricity is dangerous.

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

[Total: 4]



Section B – Module P5

6 Natural satellites and artificial satellites orbit the Earth.

(a) The Earth has only one **natural** satellite.

Write down its name.

..... [1]

(b) Artificial satellites are built by people.

They are held in orbit around the Earth by a **force**.

(i) Write down the **name** of this force.

..... [1]

(ii) Write down one **use** of an artificial satellite.

..... [1]

[Total: 3]

7 Radio waves and microwaves are used in communications.

Radio waves carry signals from a transmitter to a radio receiver.

Look at the diagram.



(a) The mountain is between the transmitter and the radio receiver.

(i) The radio waves from the transmitter reach the radio receiver.

Suggest **two** ways the radio waves get to the receiver.

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

(ii) Which part of the radio receives the radio signals?

..... [1]

(iii) Satellite TV signals are sent by transmitters.

What is needed to collect and receive these satellite signals?

..... [1]

(b) Microwaves have a wavelength of about 0.5 cm.

How is the **wavelength** of radio waves **different**?

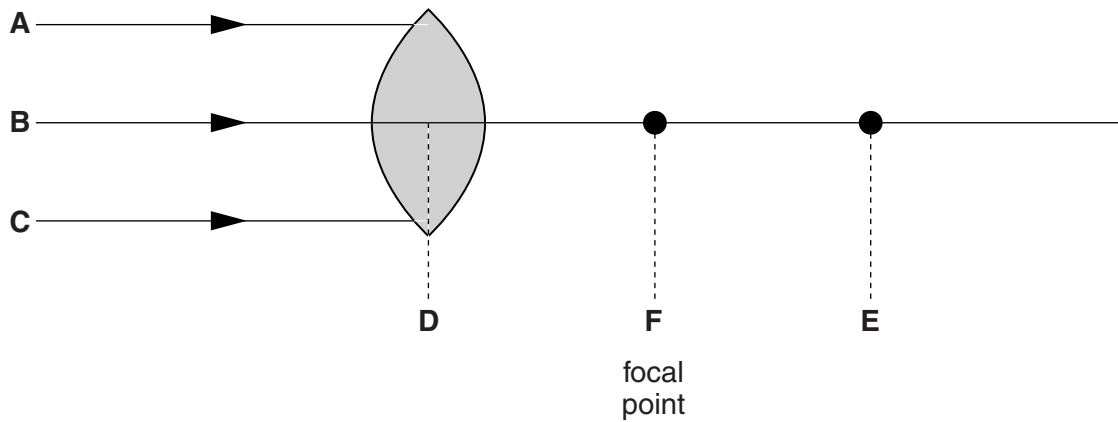
..... [1]

[Total: 5]

8 Look at the diagram of a convex (converging) lens.

Three rays of light, **A**, **B** and **C**, pass through the lens.

(a) (i) Complete the ray diagram. One ray has been done for you.



[1]

(ii) Complete the sentence.

The **focal length** of this lens is the distance between letter ..... and letter .....

[1]

(iii) This fat lens is replaced by a **thinner** convex lens.



What, if anything, will happen to the focal length?

..... [1]

(b) Convex lenses are useful.

Write about one use for a convex lens.

In your answer

- name the device that uses the convex lens
- name the type of image made
- describe where the image is produced.

.....  
 .....  
 .....  
 .....

[2]

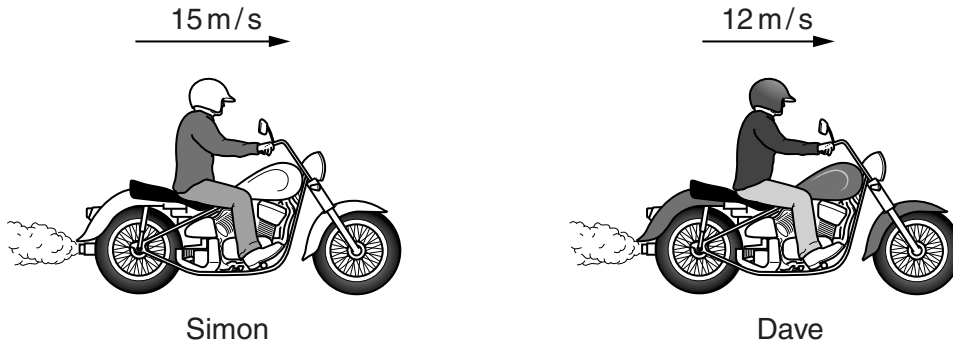
[Total: 5]

Turn over

9 Simon and Dave are riding bikes.

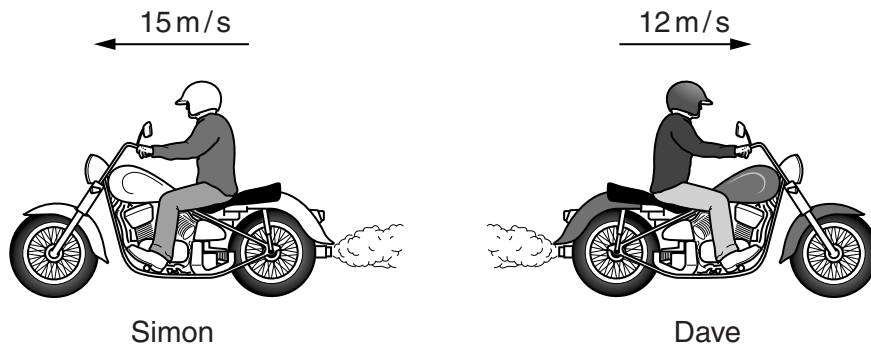
They are moving in the **same** direction.

Look at the diagram.



(a) Simon turns his bike around and moves in the opposite direction.

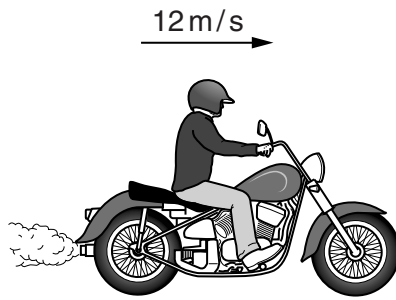
Look at the diagram.



What happens to the **relative** speed of the bikes?

..... [1]

(b) Look at the diagram of Dave riding his bike.



Dave has a mass of 80 kg and his bike has a mass of 220 kg.

His speed is 12 m/s.

Calculate the **momentum** of Dave and his bike.

The equations on page 2 may help you.

.....  
 .....

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

(c) Dave's initial speed is 12 m/s.

He accelerates at  $0.5 \text{ m/s}^2$  for 5 s.

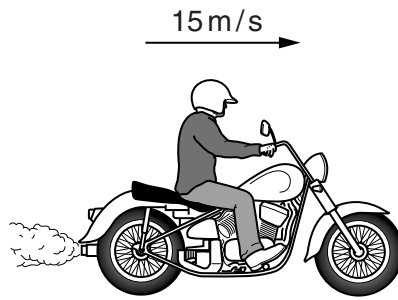
Calculate Dave's **final** speed.

The equations on page 2 may help you.

.....  
 .....

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

(d) Look at the diagram of Simon riding his bike.



Simon **accelerates** from 15 m/s to 33 m/s.

This takes 12 s.

Calculate the **distance** travelled during this acceleration.

The equations on page 2 may help you.

.....  
.....

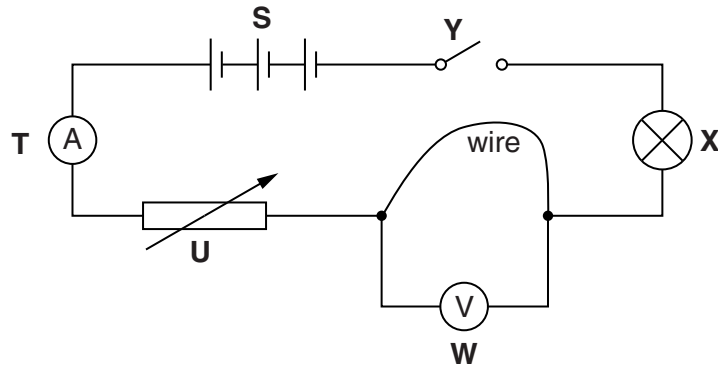
answer ..... m

[2]

[Total: 7]

Section C – Module P6

10 Asif sets up a circuit.



(a) (i) Which circuit symbol represents a **switch**?

Choose from

S            T            U            W            X            Y

answer .....

[1]

(ii) Which circuit symbol represents a **variable resistor**?

Choose from

S            T            U            W            X            Y

answer .....

[1]

(b) When the circuit is complete Asif writes down two measurements

- current through the wire = 0.4 A
- voltage across the wire = 8V.

Calculate the **resistance** of the wire.

The equations on page 2 may help you.

.....

.....

.....

.....

answer .....  $\Omega$

[2]

(c) Asif put a **different** piece of wire in the circuit.

The new wire has a resistance of  $30\ \Omega$ .

After the circuit has been complete for several minutes the wire becomes hot.

What could the resistance be when the wire is hot?

Choose from

- 15                      25                      30                      35

answer .....  $\Omega$

[1]

[Total: 5]

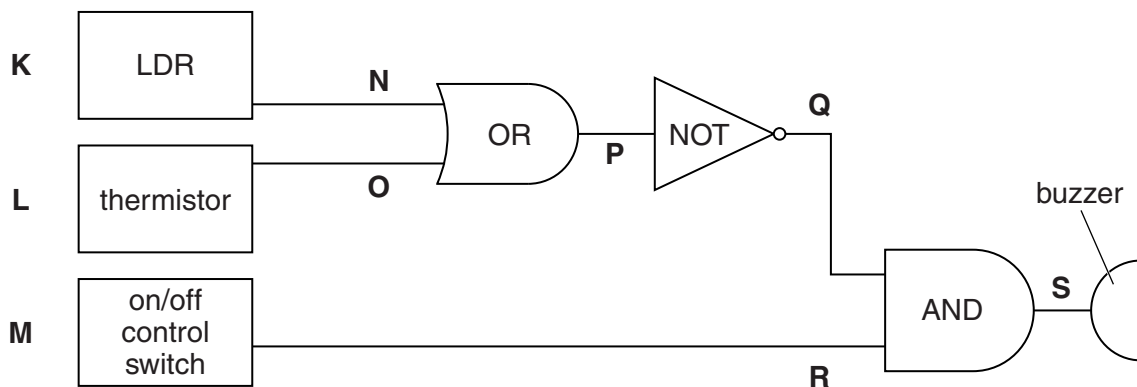
11 Georgina grows tomatoes in large greenhouses.

She wants to protect the tomatoes.

She designs an electronic system with three logic gates.

A buzzer sounds if it gets too **cold** during the **night**.

Look at the diagram of the electronic system.



(a) (i) Which letter shows the output of the **whole** system?

answer .....

[1]

(ii) What do the LDR and thermistor respond to?

Complete the sentences.

The **LDR** responds to a change in .....

The **thermistor** responds to a change in .....

[2]



(b) (i) Complete the sentence about the **input signal** to logic gates.

The input signal to a logic gate is a high or a low ..... [1]

(ii) Truth tables describe how logic gates work.

Complete the sentences to describe the truth table for a **NOT** gate.

When the input is ..... the output is .....

When the input is ..... the output is ..... [2]

(c) (i) Georgina adds another component to the system.

This keeps the buzzer sounding once it is triggered.

Write down the **name** of this component.

..... [1]

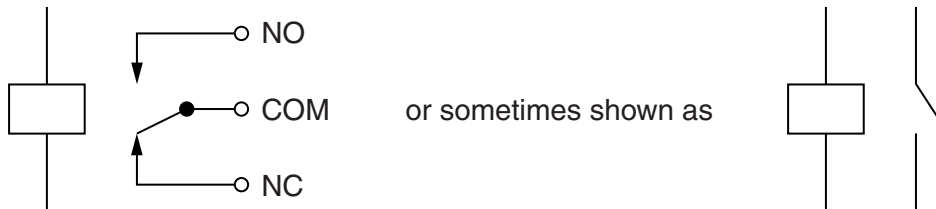
(ii) Georgina thinks that the system can be improved further.

A heater can be turned on automatically instead of sounding the buzzer.

The heater runs on mains electricity.

Another component is needed to link the logic circuit and the mains circuit.

Here are two different symbols for the same component.



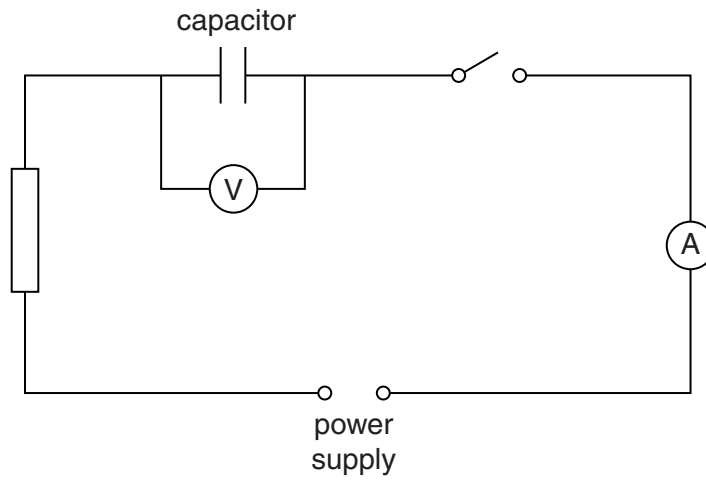
Write down the **name** of this component.

..... [1]

[Total: 8]

12 Jonas sets up a circuit to investigate a **capacitor**.

Look at the circuit.



Describe what happens when the circuit is switched on.

In your answer include ideas about

- charge
- voltage.

.....

.....

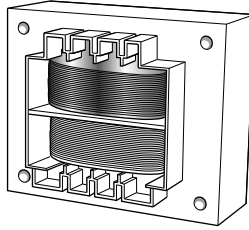
.....

..... [3]

[Total: 3]

13 This question is about transformers and electric motors.

(a) Transformers are used in many everyday appliances.



There are three types of transformer

- step up
- isolating
- step down.

(i) Which type is used in a bathroom shaver socket?

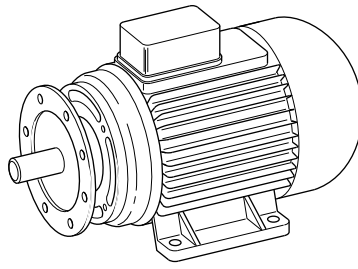
answer .....

[1]

(ii) Explain how this type of transformer makes the circuit safer.

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

(b) Electric motors are used in many household appliances, such as washing machines.



(i) Write down the name of one **other** appliance in the home that has an electric motor in it.

..... [1]

(ii) Electric motors spin when **supplied** with an electric current.

If the motor is made to spin it **produces** an electric current.

Complete the sentence.

The motor is now working in reverse and is acting as a ..... [1]

[Total: 4]

**END OF QUESTION PAPER**

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