

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
March 2006



PHYSICS (SPECIFICATION A) (MODULAR)
Physics in Action (Module 23)

346023

Wednesday 8 March 2006 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

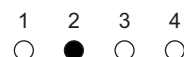
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Physics in Action' printed on it.
- Attempt **one Tier only**, either the Foundation Tier **or** the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

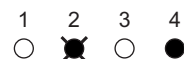
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

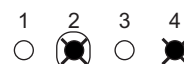


- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **FIVE**.

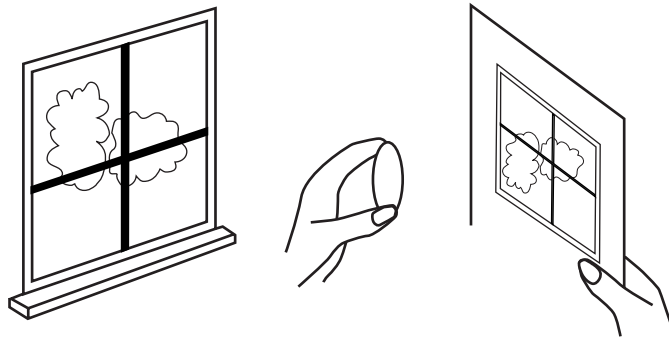
In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

A student uses a converging lens to form an image of distant clouds on a blank sheet of paper.



Match words from the list with the numbers **1–4** in the sentences.

focus

parallel

real

sharp

The rays of light from the distant clouds are almost . . . **1**

The image formed on the paper is called a . . . **2** . . . image.

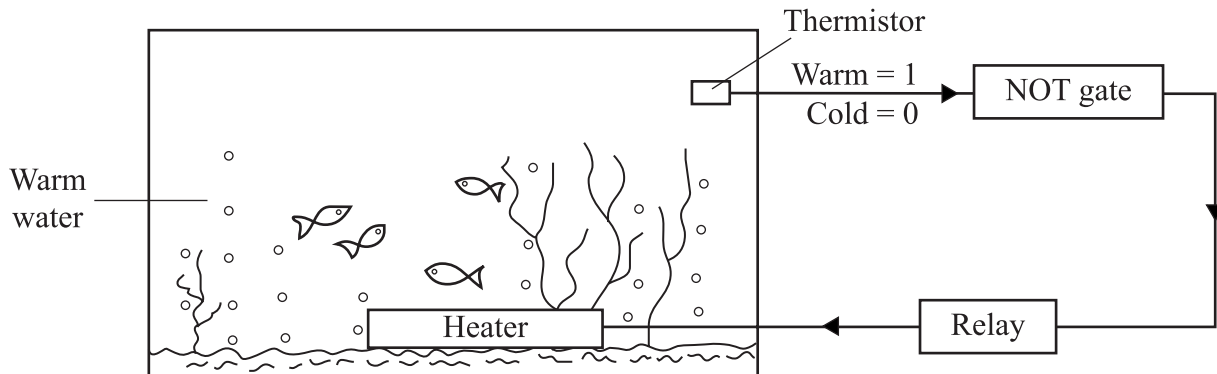
The student moves the paper to where the image is most . . . **3**

The paper is then close to the . . . **4** . . . of the lens.

QUESTION TWO

This question is about an electronic system which controls the heater in a tropical fish tank.

The diagram shows how the system works.



The flow chart shows how the system keeps the water at the right temperature.

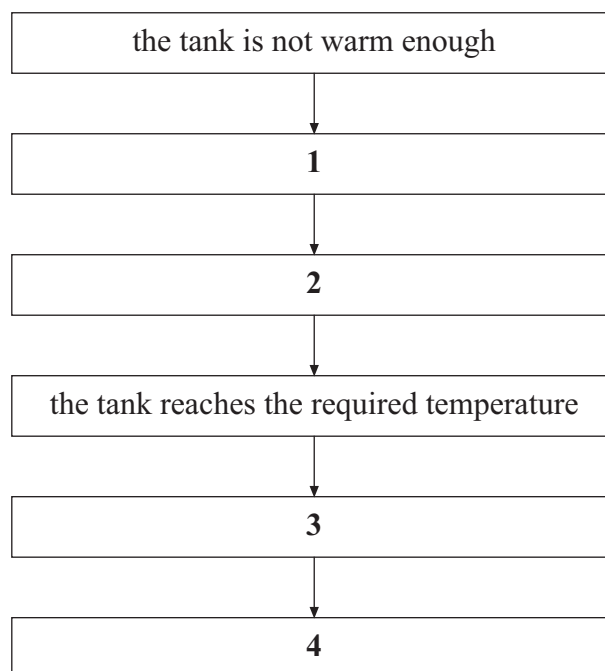
Match words from the list with the boxes **1–4** in the flow chart.

the heater switches on

the heater switches off

the thermistor gives a high output

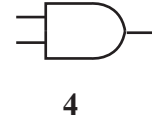
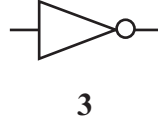
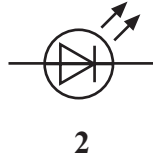
the thermistor gives a low output



Turn over ►

QUESTION THREE

There are symbols for the components shown in circuit diagrams.



Match components from the list with the symbols **1–4**.

AND gate

LED (light emitting diode)

NOT gate

relay

QUESTION FOUR

Match each electrical device in the list with the numbers **1–4** in the table.

buzzer

LDR

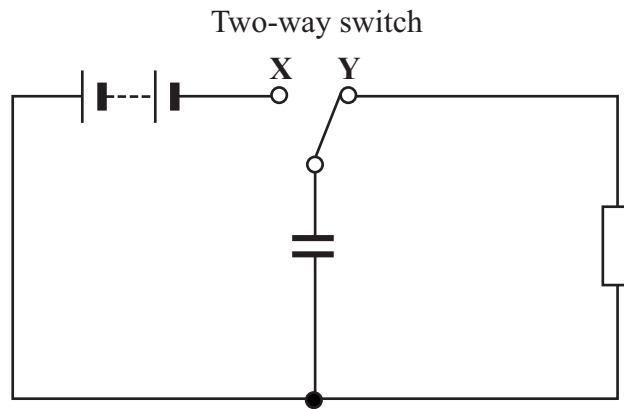
LED

relay

Description	Device
enables one circuit to control another	1
its resistance changes when the amount of light changes	2
may be used as a warning light	3
transfers electrical energy to sound	4

QUESTION FIVE

The diagram shows a circuit for charging and discharging a capacitor.



Match words from the list with the numbers **1–4** in the sentences.

charge

current

potential difference

resistance

When the two-way switch is moved from position **Y** to position **X**, the . . . **1** . . . stored by the capacitor increases. The . . . **2** . . . across the capacitor also increases.

When the two-way switch is moved from position **X** to position **Y**, a . . . **3** . . . flows through the resistor. The greater the . . . **4** . . . of the resistor, the longer it takes to discharge the capacitor.

Turn over ►

SECTION B

Questions **SIX** and **SEVEN**.

In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

In electronic systems, different components do different jobs.

Which **two** of the following could be used as input sensors?

LED

moisture switch

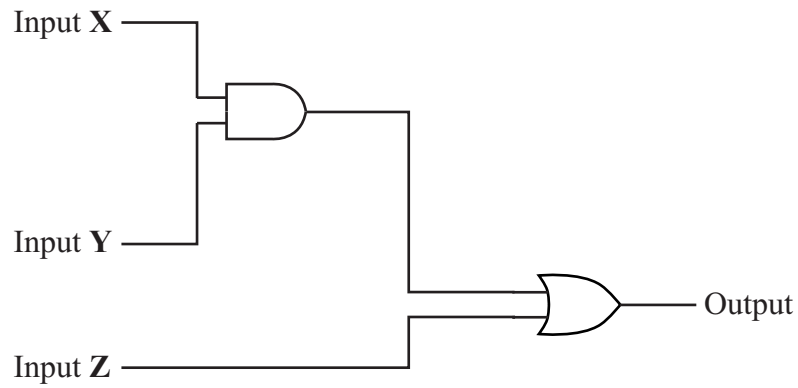
motor

NOT gate

thermistor

QUESTION SEVEN

This processor uses two logic gates.



Which **two** of the rows **J**, **K**, **L**, **M** and **N** of the truth table are correct?

	Input X	Input Y	Input Z	Output
J	0	0	0	0
K	0	0	1	0
L	0	1	0	1
M	1	1	0	1
N	1	1	1	0

Turn over for the next question

Turn over ►

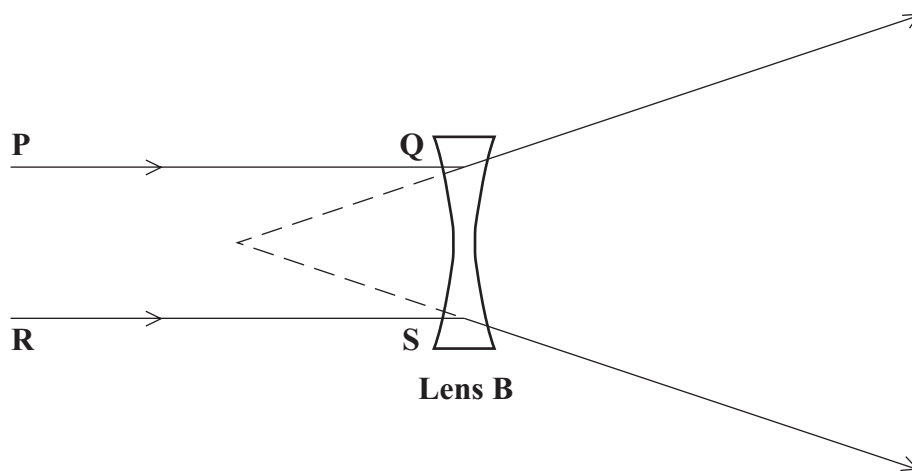
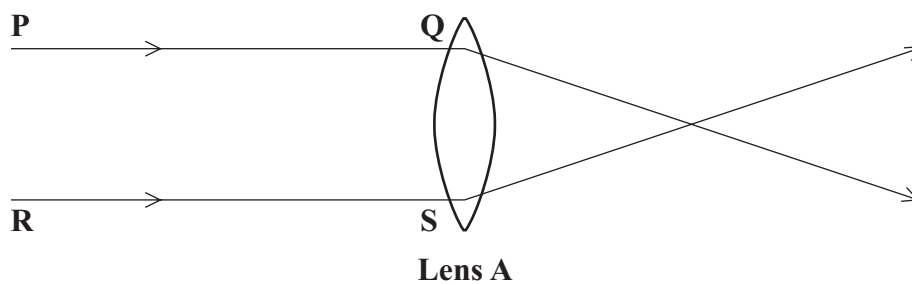
SECTION CQuestions **EIGHT** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION EIGHT

The diagrams show two lenses.

**8.1** The rays **PQ** and **RS** are . . .

- A** converging.
- B** diverging.
- C** parallel.
- D** virtual.

8.2 Which statement is correct?

- A** Both lenses have a real focus.
- B** Neither lens has a real focus.
- C** Only lens **A** has a real focus.
- D** Only lens **B** has a real focus.

8.3 Which statement about the focus of a diverging lens is correct?

- A** Light goes from it.
- B** Light goes to it.
- C** Light seems to go from it.
- D** Light seems to go to it.

8.4 A student makes two statements about the lenses.

- Statement 1: **Lens A** is a converging lens.
- Statement 2: **Lens B** is a diverging lens.

Which statement is correct?

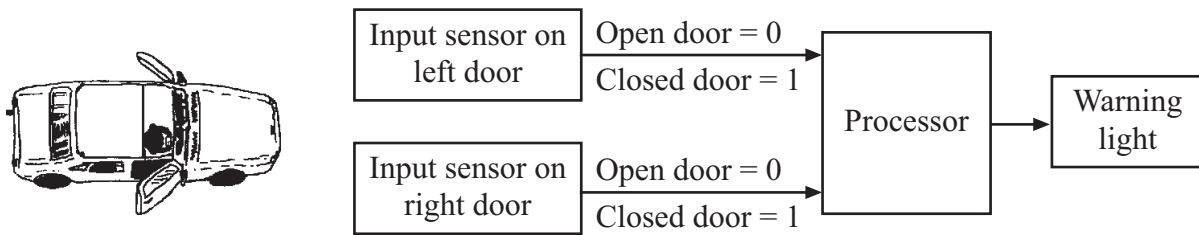
- A** Both of them
- B** Neither of them
- C** Statement 1 only
- D** Statement 2 only

Turn over for the next question

Turn over ►

QUESTION NINE

A warning light in a car switches on when one or both of the front doors are opened.



9.1 What can be used for the input sensors?

- A LEDs
- B Pressure switches
- C Relays
- D Thermistors

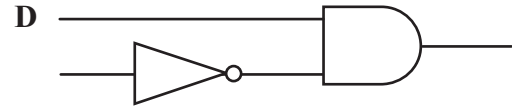
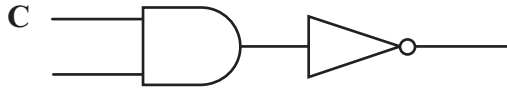
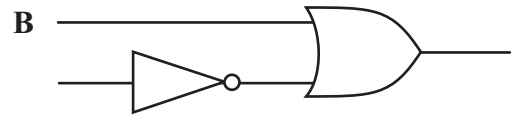
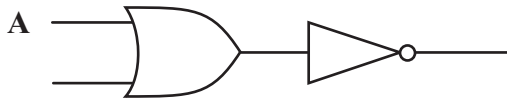
9.2 Which row of the table, **A**, **B**, **C** or **D**, is correct for the system?

	Left door	Right door	Warning light
A	Open	Open	Off
B	Open	Closed	On
C	Closed	Open	Off
D	Closed	Closed	On

9.3 Which gate, or gates, from this list are suitable for the processor?

- A An AND gate only
- B An OR gate only
- C Two NOT gates followed by an AND gate
- D Two NOT gates followed by an OR gate

9.4 Which other arrangement of gates could be used for this system?



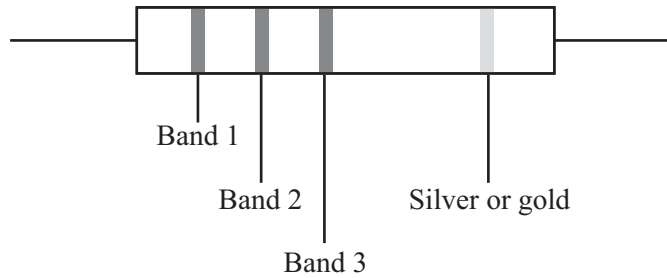
Turn over for the next question

Turn over ►

QUESTION TEN

The table and the diagram show the colour code for resistors.

0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White



10.1 What value of resistance is shown by the following code?

Band 1 – green Band 2 – black Band 3 – black

- A 5 ohms
- B 50 ohms
- C 500 ohms
- D 5000 ohms

10.2 What colour bands, from 1 to 3, would be on a 2 kilohm resistor?

- | | Band 1 | Band 2 | Band 3 |
|---|---------------|---------------|---------------|
| A | black | black | red |
| B | black | red | black |
| C | red | black | black |
| D | red | black | red |

10.3 A gold band means that the resistor is guaranteed to an accuracy of 5 %.

What is the value range for a resistor with a gold band and the following colours?

Band 1 – yellow Band 2 – black Band 3 – black

- A 38 ohms to 42 ohms
- B 375 ohms to 415 ohms
- C 375 ohms to 425 ohms
- D 385 ohms to 425 ohms

10.4 Why do light-dependent resistors (LDRs) **not** have this colour code?

- A They are input sensors.
- B They are too small.
- C They do not have a constant resistance.
- D They have a resistance which is too high for the code.

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

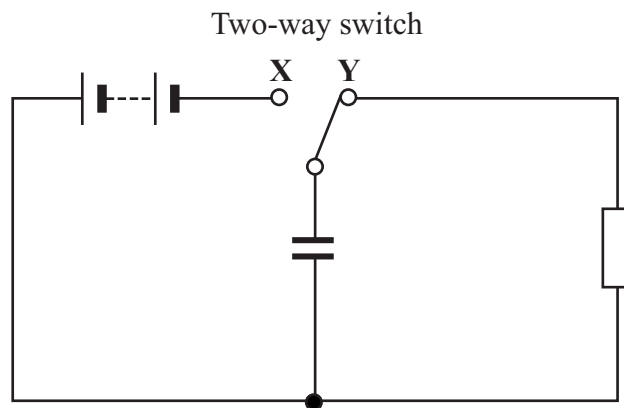
In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows a circuit for charging and discharging a capacitor.



Match words from the list with the numbers **1–4** in the sentences.

charge

current

potential difference

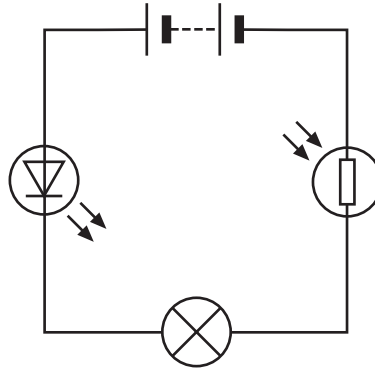
resistance

When the two-way switch is moved from position **Y** to position **X**, the . . . **1** . . . stored by the capacitor increases. The . . . **2** . . . across the capacitor also increases.

When the two-way switch is moved from position **X** to position **Y**, a . . . **3** . . . flows through the resistor. The greater the . . . **4** . . . of the resistor, the longer it takes to discharge the capacitor.

QUESTION TWO

This circuit shows four components connected in series.



Match words from the list with the numbers **1–4** in the sentences.

as shown

darkened

illuminated

reversed

The lamp lights when the LDR is . . . **1** . . . and the LED is . . . **2**

The lamp does not light when the LDR is . . . **3** . . . or the LED is . . . **4**

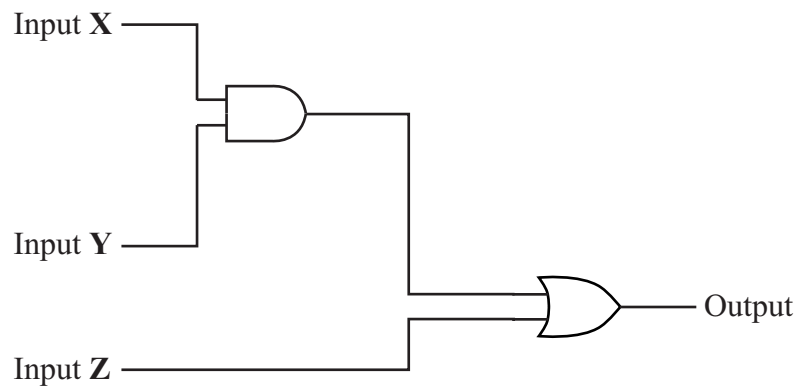
Turn over for the next question

Turn over ►

SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

QUESTION THREE

This processor uses two logic gates.

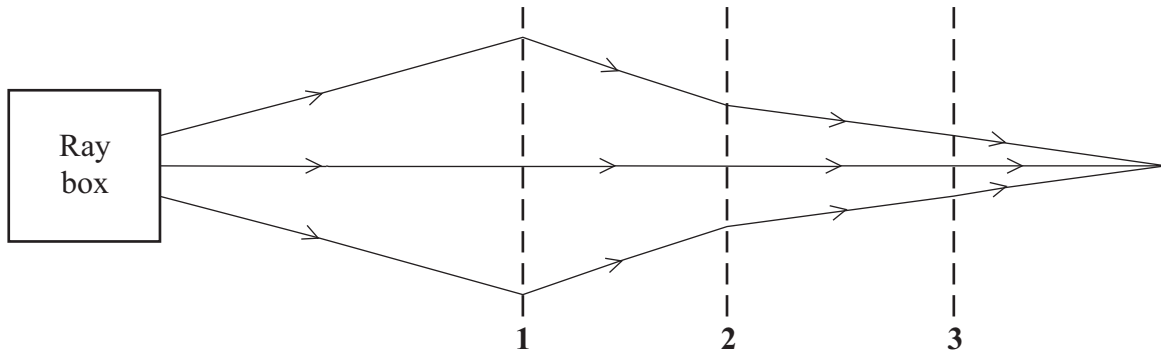
Which **two** of the rows **J**, **K**, **L**, **M** and **N** of the truth table are correct?

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J	0	0	0	0
K	0	0	1	0
L	0	1	0	1
M	1	1	0	1
N	1	1	1	0

QUESTION FOUR

A ray box produces three rays which pass through three glass objects in positions labelled **1**, **2** and **3**.

The three objects are a thin flat glass sheet, a converging lens and a diverging lens, but **not** necessarily in that order.



By using the paths of the rays, the order can be found.

Which **two** conclusions are correct?

1 is the converging lens and 2 is the flat glass sheet

1 is the converging lens and 3 is the flat glass sheet

1 is the diverging lens and 2 is the flat glass sheet

2 is the converging lens and 3 is the flat glass sheet

2 is the diverging lens and 3 is the flat glass sheet

Turn over for the next question

Turn over ►

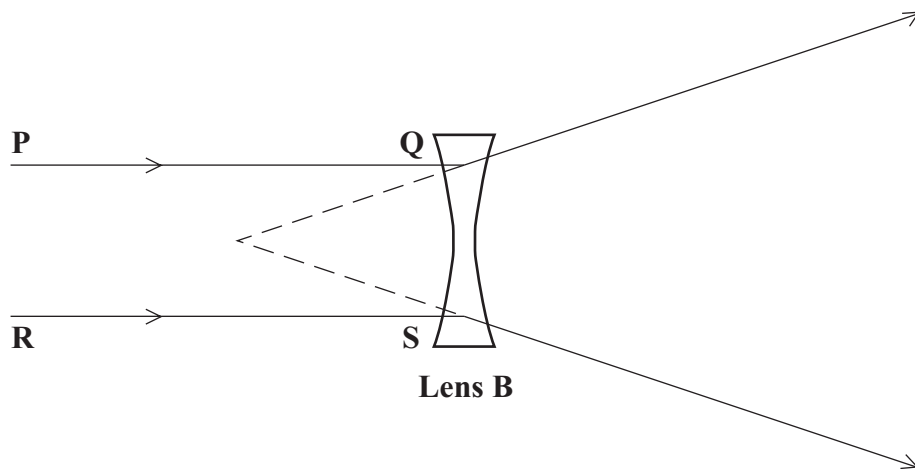
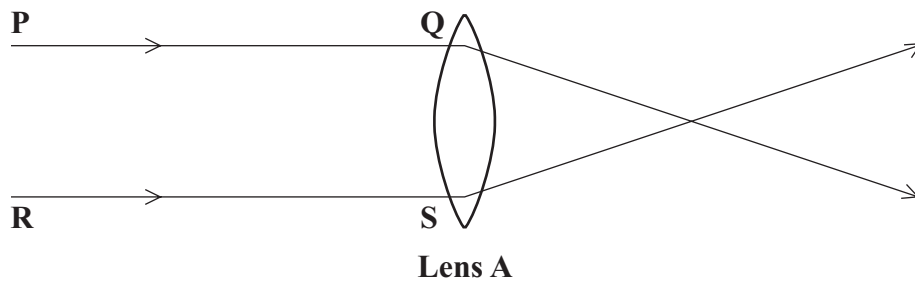
SECTION CQuestions **FIVE** to **TEN**.

Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION FIVE

The diagrams show two lenses.

**5.1** The rays **PQ** and **RS** are . . .

- A** converging.
- B** diverging.
- C** parallel.
- D** virtual.

5.2 Which statement is correct?

- A Both lenses have a real focus.
- B Neither lens has a real focus.
- C Only lens **A** has a real focus.
- D Only lens **B** has a real focus.

5.3 Which statement about the focus of a diverging lens is correct?

- A Light goes from it.
- B Light goes to it.
- C Light seems to go from it.
- D Light seems to go to it.

5.4 A student makes two statements about the lenses.

- Statement 1: **Lens A** is a converging lens.
- Statement 2: **Lens B** is a diverging lens.

Which statement is correct?

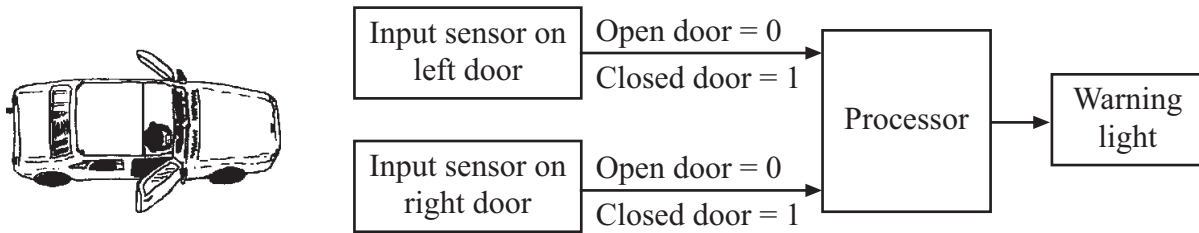
- A Both of them
- B Neither of them
- C Statement 1 only
- D Statement 2 only

Turn over for the next question

Turn over ►

QUESTION SIX

A warning light in a car switches on when one or both of the front doors are opened.



6.1 What can be used for the input sensors?

- A** LEDs
- B** Pressure switches
- C** Relays
- D** Thermistors

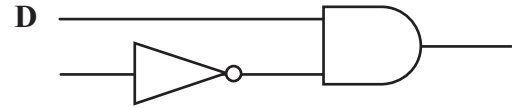
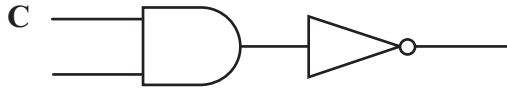
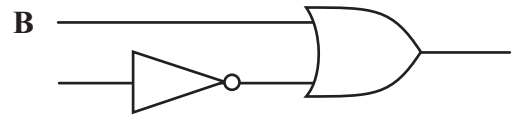
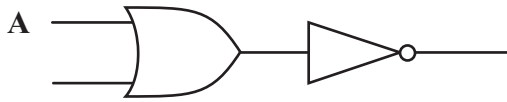
6.2 Which row of the table, **A**, **B**, **C** or **D**, is correct for the system?

	Left door	Right door	Warning light
A	Open	Open	Off
B	Open	Closed	On
C	Closed	Open	Off
D	Closed	Closed	On

6.3 Which gate, or gates, from this list are suitable for the processor?

- A** An AND gate only
- B** An OR gate only
- C** Two NOT gates followed by an AND gate
- D** Two NOT gates followed by an OR gate

6.4 Which other arrangement of gates could be used for this system?



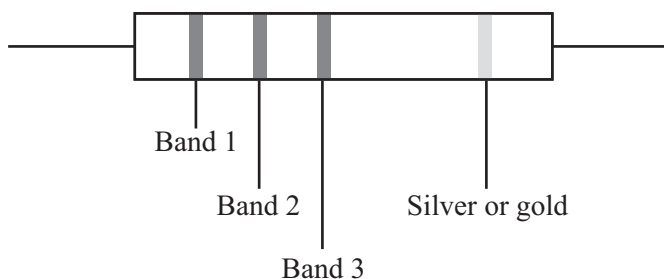
Turn over for the next question

Turn over ►

QUESTION SEVEN

The table and the diagram show the colour code for resistors.

0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Grey
9	White



7.1 What value of resistance is shown by the following code?

Band 1 – green Band 2 – black Band 3 – black

- A 5 ohms
- B 50 ohms
- C 500 ohms
- D 5000 ohms

7.2 What colour bands, from 1 to 3, would be on a 2 kilohm resistor?

- | | Band 1 | Band 2 | Band 3 |
|---|---------------|---------------|---------------|
| A | black | black | red |
| B | black | red | black |
| C | red | black | black |
| D | red | black | red |

7.3 A gold band means that the resistor is guaranteed to an accuracy of 5 %.

What is the value range for a resistor with a gold band and the following colours?

Band 1 – yellow Band 2 – black Band 3 – black

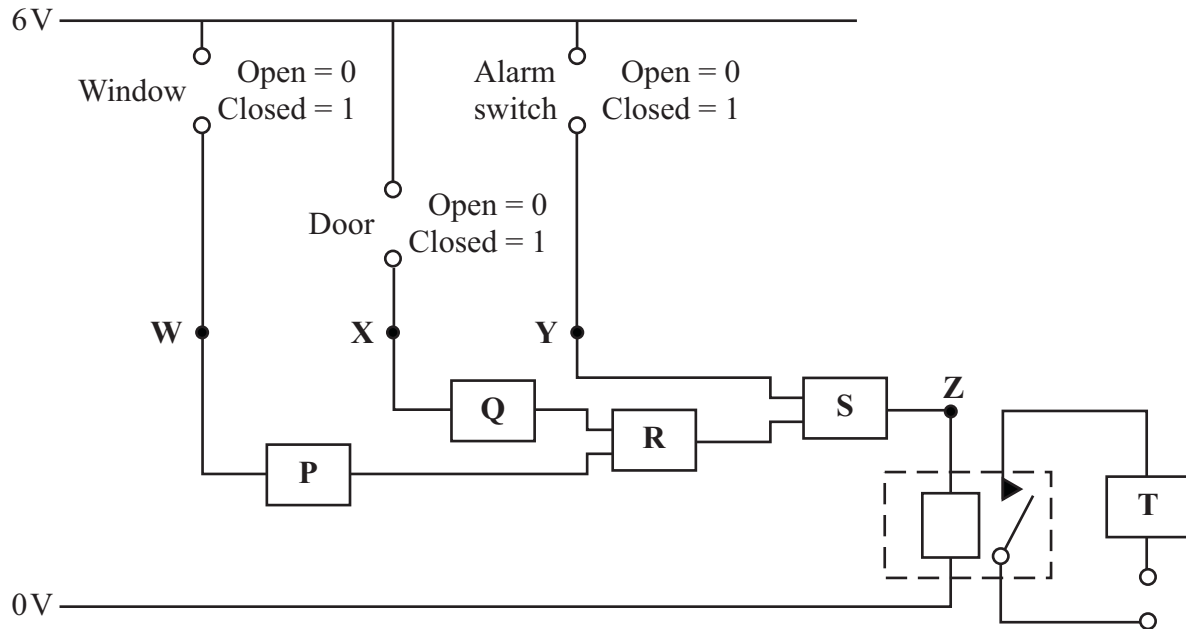
- A 38 ohms to 42 ohms
 - B 375 ohms to 415 ohms
 - C 375 ohms to 425 ohms
 - D 385 ohms to 425 ohms
- 7.4** Why do light-dependent resistors (LDRs) **not** have this colour code?
- A They are input sensors.
 - B They are too small.
 - C They do not have a constant resistance.
 - D They have a resistance which is too high for the code.

Turn over for the next question

Turn over ►

QUESTION EIGHT

The electronic circuit shown is to be used to control a burglar alarm. When the alarm switch is closed, a bell sounds if either the window or the door is opened.



8.1 Which component is an AND gate?

- A P
- B Q
- C R
- D S

8.2 Which component is an OR gate?

- A P
- B R
- C S
- D T

8.3 Which components are NOT gates?

- A** P and Q
- B** Q and R
- C** R and S
- D** S and P

8.4 A timer gives a short delay between switching the alarm on and the alarm becoming active.

The timer is added between . . .

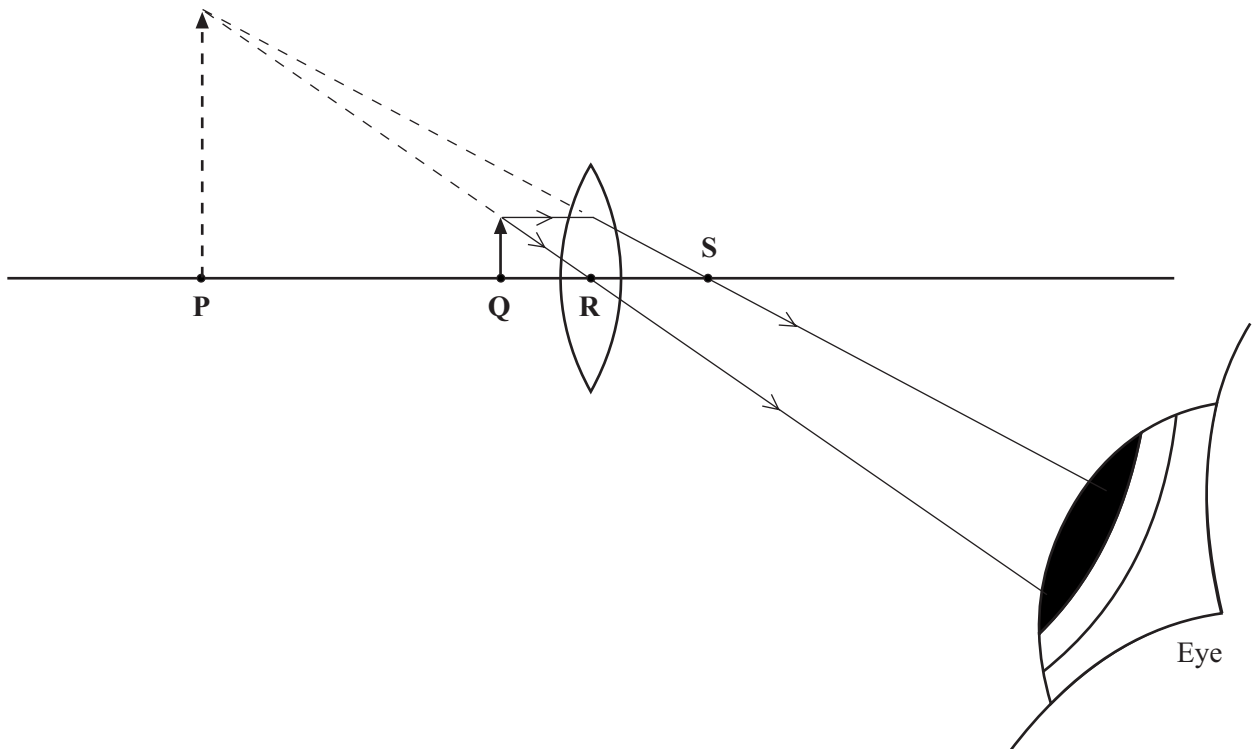
- A** P and R
- B** W and P
- C** X and Q
- D** Y and S

Turn over for the next question

Turn over ►

QUESTION NINE

The diagram shows a ray diagram for a converging lens.



9.1 The focus of the lens is at . . .

- A P
- B Q
- C R
- D S

9.2 The object is at . . .

- A P
- B Q
- C R
- D S

9.3 The image is formed at . . .

A P

B Q

C R

D S

9.4 The image formed is . . .

A real and larger than the object.

B real and smaller than the object.

C virtual and larger than the object.

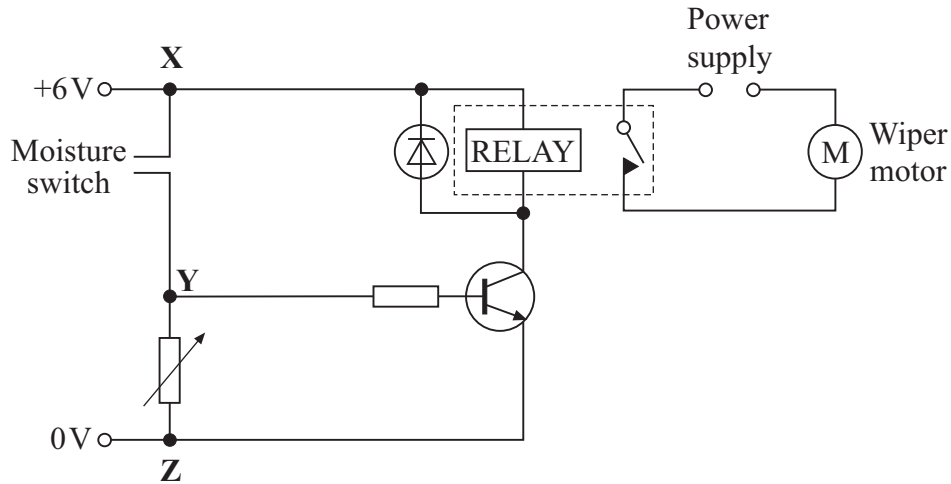
D virtual and smaller than the object.

Turn over for the next question

Turn over ►

QUESTION TEN

A car has a device that automatically switches on the windscreen wipers when it starts to rain. This circuit is used to control the wiper motor.



When rain falls on the moisture switch, the switch closes.

10.1 When the moisture switch closes, the potential difference (p.d.) across **YZ** . . .

- A does not change.
- B falls to 0 V.
- C falls to a value above 0 V.
- D increases.

10.2 The transistor . . .

- A protects the relay from damage.
- B switches on when the p.d. across **YZ** drops below a certain value.
- C switches on when the p.d. across **YZ** rises above a certain value.
- D switches off when the p.d. across **YZ** rises above a certain value.

10.3 The diode . . .

- A** protects the relay when the relay is switched on.
- B** protects the relay when the relay is switched off.
- C** protects the transistor when the relay is switched on.
- D** protects the transistor when the relay is switched off.

10.4 Why is a relay needed to switch on the wiper motor?

- A** The current in the transistor circuit is too high for the wiper motor.
- B** The current in the wiper motor circuit is too high for the transistor.
- C** The rain would conduct electricity.
- D** The transistor circuit power supply would cancel out the motor's power supply.

END OF TEST

There are no questions printed on this page

There are no questions printed on this page

There are no questions printed on this page