

ERRATUM NOTICE

General Certificate of Secondary Education
March 2007



PHYSICS (SPECIFICATION A) (MODULAR) 346023
Physics in Action (Module 23)

Wednesday 7 March 2007 Morning Session

Instructions to Invigilators

Before the start of the examination please ask candidates to amend their question papers as follows.
(Please read out this message twice to ensure understanding.)

FOUNDATION TIER candidates. Turn to Page 12, Question Ten, 10.1

The tenth word ‘... though ...’ should read ‘... through ...’

HIGHER TIER candidates. Turn to Page 22, Question Seven, 7.1

The tenth word ‘... though ...’ should read ‘... through ...’

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Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
March 2007



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

346023

Wednesday 7 March 2007 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

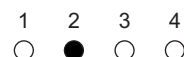
Instructions

- 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

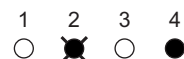
- Use a **black ball-point pen**.

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

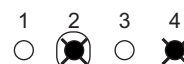


- Do **not** extend beyond the circles.

- 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 from the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

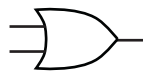
Match components from the list with the symbols **1–4**.

capacitor

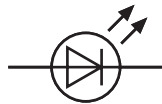
LED

OR gate

relay



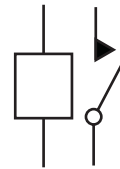
1



2



3



4

QUESTION TWO

Electronic systems contain different parts.

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

input sensors

logic gates

output devices

processors

Electronic systems have . . . **1** . . . which detect changes in the environment.

The action needed is decided by . . . **2**

These can be made using . . . **3** . . . which control . . . **4**

QUESTION THREE

In electronic systems, different components have different functions.

Match words from the list with the components **1–4** in the table.

capacitor

fan

LDR

thermistor

Function	Component
can be used as a simple timer	1
detects changes in light	2
detects changes in temperature	3
used as an output device	4

Turn over ►

QUESTION FOUR

At a funfair there is a device in one of the machines. If the machine is not level, its siren sounds and its LED lights up.

The current through the siren is much greater than the current through the LED.

The flow chart shows how the system is arranged.

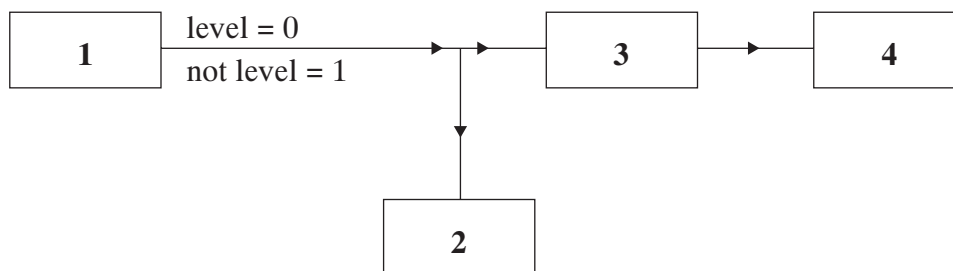
Match names from the list with the numbers **1–4** in the flow chart.

LED

relay

siren

tilt switch



QUESTION FIVE

This question is about switches.

Mercury is a metal which is liquid at room temperature. All metals conduct electricity but plastics do not.

Steel is attracted to a magnet.

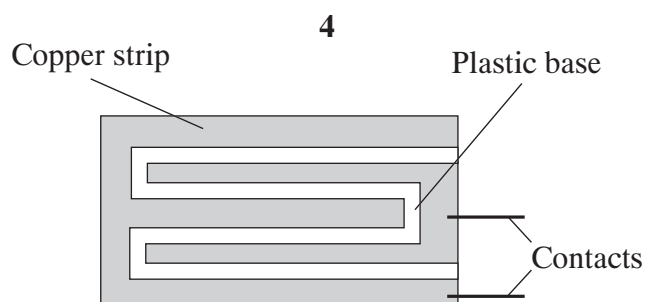
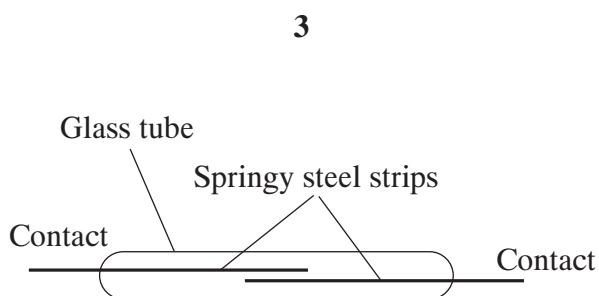
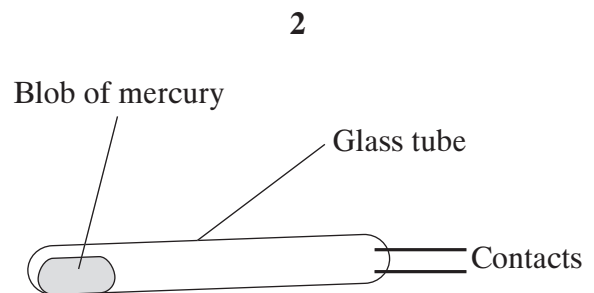
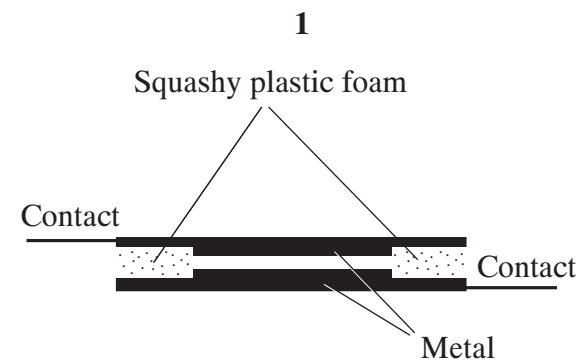
Match names from the list with the diagrams 1–4 .

magnetic switch

moisture switch

pressure switch

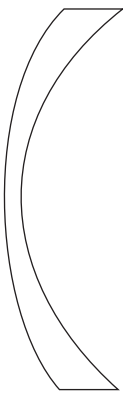
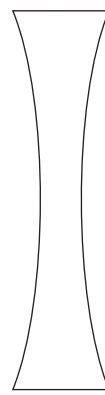
tilt switch



Turn over for the next question

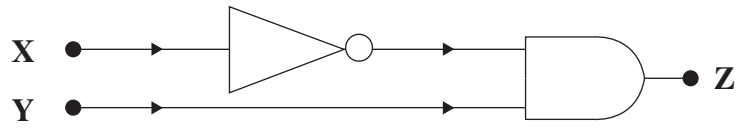
Turn over ►

SECTION BQuestions **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 SIXWhich **two** of the lenses shown are converging lenses?**P****Q****R****S****T**

QUESTION SEVEN

An electronic system using two gates is shown below.



Which **two** rows of the truth table are correct for this electronic system?

	X	Y	Z
F	0	0	1
G	0	1	0
H	0	1	1
I	1	0	0
J	1	1	1

Turn over for the next question

Turn over ►

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

Each of these questions has four parts.

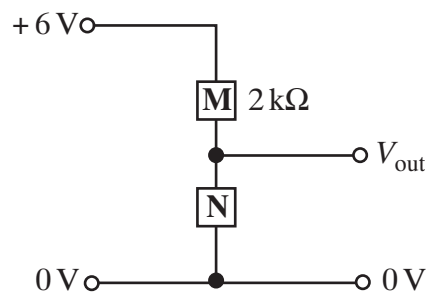
In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION EIGHT

You may find the following formula useful when answering some parts of this question.

$$V_{\text{out}} = V_{\text{in}} \times \frac{R_2}{(R_1 + R_2)}$$

The diagram shows an arrangement used in electronic circuits.

**8.1** The arrangement shown is called a . . .

- A charging circuit.
- B potential divider.
- C relay.
- D time delay switch.

8.2 What is the potential difference across **N** when its resistance is $4\text{ k}\Omega$?

- A** 2 V
- B** 3 V
- C** 4 V
- D** 6 V

8.3 What is the potential difference across **M** when the resistance of **N** is $1\text{ k}\Omega$?

- A** 2 V
- B** 3 V
- C** 4 V
- D** 6 V

8.4 The arrangement can provide the correct input to an electronic circuit.

To do this, . . .

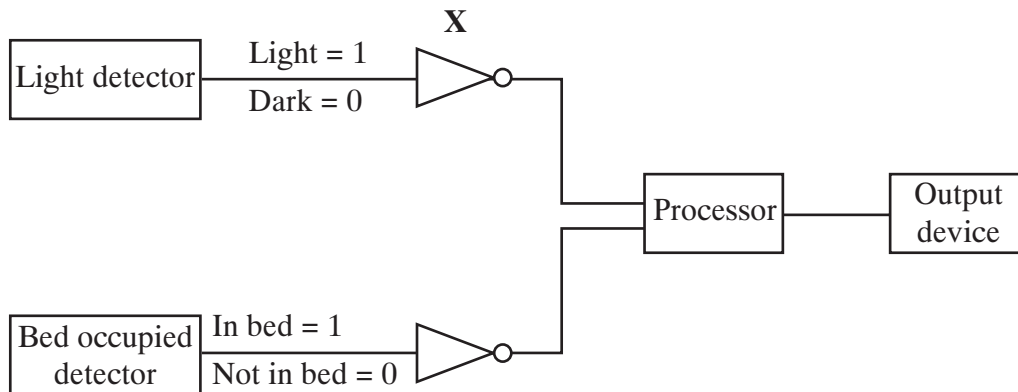
- A** **M** is a fixed resistor, and **N** is a processor.
- B** **M** is an input sensor, and **N** is a variable resistor.
- C** **M** is an output device, and **N** is a fixed resistor.
- D** **M** is a processor, and **N** is a fixed resistor.

Turn over for the next question

Turn over ►

QUESTION NINE

A hospital uses an electronic control system to alert a nurse if a patient gets out of bed at night.



9.1 Which of the following would be best as the 'bed occupied' detector?

- A** LDR
- B** LED
- C** Pressure switch
- D** Thermistor

9.2 Name the component **X** in the diagram.

- A** AND gate
- B** LED
- C** NOT gate
- D** OR gate

9.3 The processor contains . . .

- A an AND gate.
- B an OR gate.
- C both an AND gate and an OR gate.
- D neither an AND gate nor an OR gate.

9.4 The output device must warn the nurse that a patient is out of bed, but it must not wake the other patients.

Which output device would it be best to use?

- A Buzzer
- B Electric motor
- C Heater
- D LED

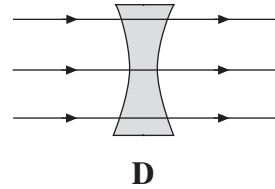
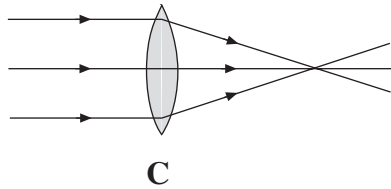
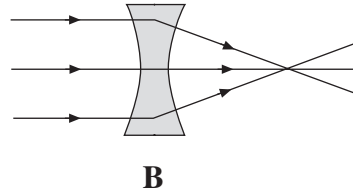
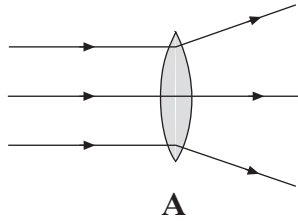
Turn over for the next question

Turn over ►

QUESTION TEN

Lenses are used in cameras and other optical instruments.

10.1 Which diagram correctly shows parallel rays of light passing through a lens?



10.2 Which statement about lenses is correct?

- A** A diverging lens does not have a focus.
- B** A diverging lens has a focus on only one side of the lens.
- C** Both a converging lens and a diverging lens have a focus on both sides of the lens.
- D** Both a converging lens and a diverging lens have a focus on only one side of the lens.

10.3 Which statement about images is correct?

- A** Real images cannot be put on a film.
- B** Real images cannot be put on a screen.
- C** Virtual images can be put on a film.
- D** Virtual images cannot be put on a screen.

10.4 Which row in the table is correct for a camera?

	Size of image compared with size of object	Distance of image from the lens compared with distance of object from the lens
A	larger	larger
B	larger	smaller
C	smaller	larger
D	smaller	smaller

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 from the list with the numbers.

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

Mark your choices on the answer sheet.

QUESTION ONE

This question is about switches.

Mercury is a metal which is liquid at room temperature. All metals conduct electricity but plastics do not.

Steel is attracted to a magnet.

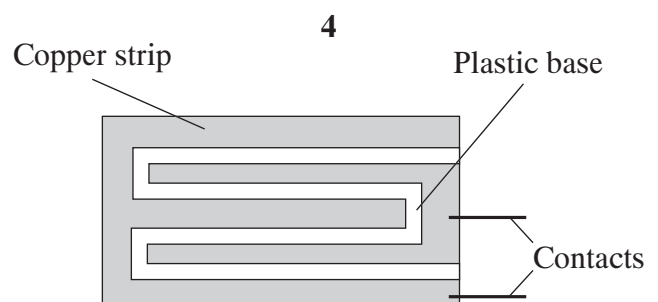
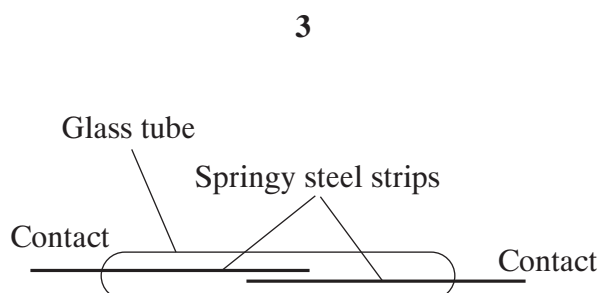
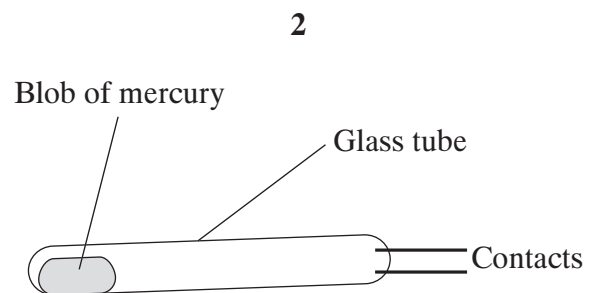
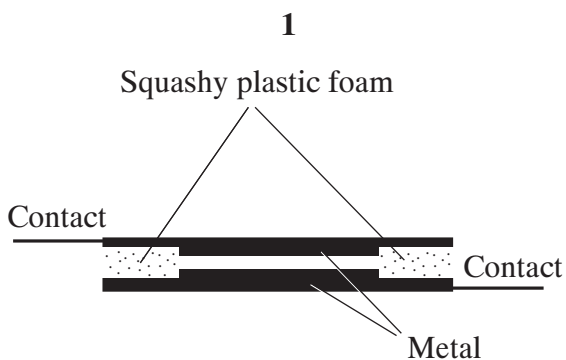
Match names from the list with the diagrams **1–4**.

magnetic switch

moisture switch

pressure switch

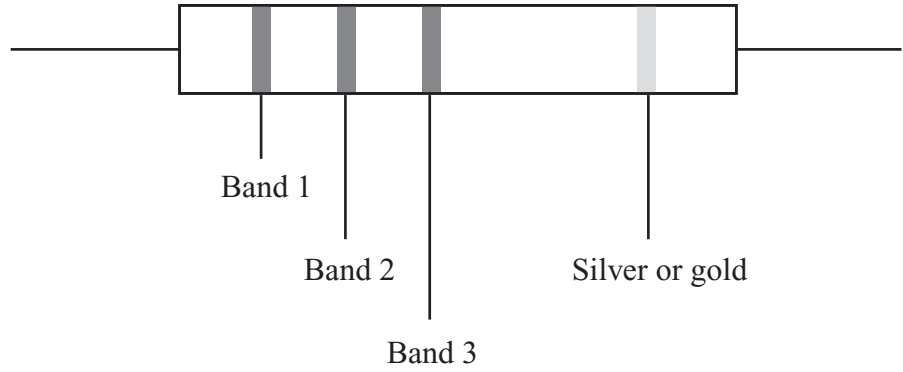
tilt switch



QUESTION TWO

The table and diagram give information about how the colour code for resistors is used.

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



Match values from the list with the numbers 1–4 in the table.

12 ohms

220 ohms

240 ohms

1000 ohms

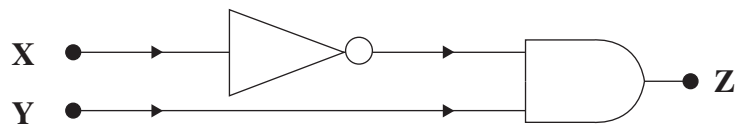
Resistor	Band 1	Band 2	Band 3
1	Brown	Black	Red
2	Brown	Red	Black
3	Red	Red	Brown
4	Red	Yellow	Brown

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

An electronic system using two gates is shown below.

Which **two** rows of the truth table are correct for this electronic system?

	X	Y	Z
F	0	0	1
G	0	1	0
H	0	1	1
I	1	0	0
J	1	1	1

QUESTION FOUR

The use of electronic systems has advantages and disadvantages.

Which **two** of the statements, **P**, **Q**, **R**, **S** and **T**, describe **disadvantages**?

P	CCTV cameras in public places mean that people lose their privacy
Q	pay-as-you-go schemes for mobile phones mean that you pay only when you use the phone
R	people feel safer on a journey if they have a mobile phone with them
S	people worry about the health risks of having mobile phone masts near schools
T	students have access to large amounts of information on the internet

Turn over for the next question

Turn over ►

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

Each of these questions has four parts.

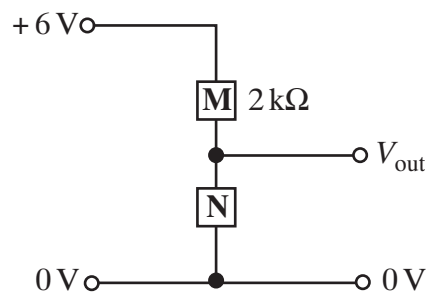
In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION FIVE

You may find the following formula useful when answering some parts of this question.

$$V_{\text{out}} = V_{\text{in}} \times \frac{R_2}{(R_1 + R_2)}$$

The diagram shows an arrangement used in electronic circuits.

**5.1** The arrangement shown is called a . . .

- A** charging circuit.
- B** potential divider.
- C** relay.
- D** time delay switch.

5.2 What is the potential difference across **N** when its resistance is $4\text{ k}\Omega$?

- A** 2 V
- B** 3 V
- C** 4 V
- D** 6 V

5.3 What is the potential difference across **M** when the resistance of **N** is $1\text{ k}\Omega$?

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- C** 4 V
- D** 6 V

5.4 The arrangement can provide the correct input to an electronic circuit.

To do this, . . .

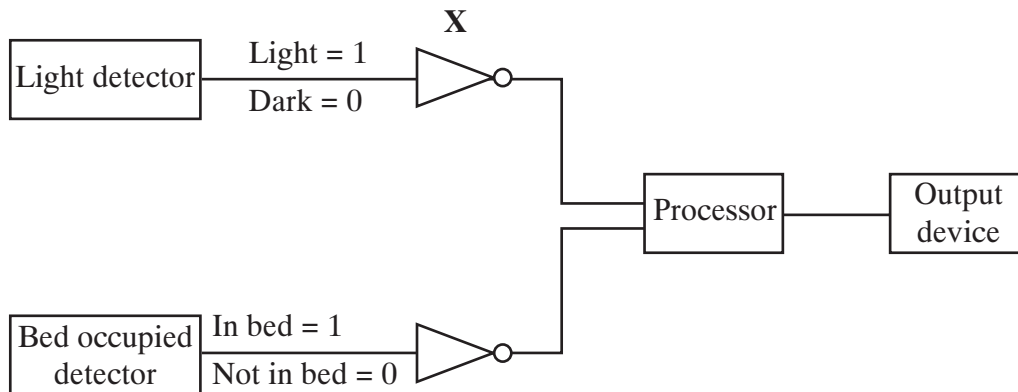
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- C** **M** is an output device, and **N** is a fixed resistor.
- D** **M** is a processor, and **N** is a fixed resistor.

Turn over for the next question

Turn over ►

QUESTION SIX

A hospital uses an electronic control system to alert a nurse if a patient gets out of bed at night.



6.1 Which of the following would be best as the 'bed occupied' detector?

- A LDR
- B LED
- C Pressure switch
- D Thermistor

6.2 Name the component **X** in the diagram.

- A AND gate
- B LED
- C NOT gate
- D OR gate

6.3 The processor contains . . .

- A an AND gate.
- B an OR gate.
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6.4 The output device must warn the nurse that a patient is out of bed, but it must not wake the other patients.

Which output device would it be best to use?

- A Buzzer
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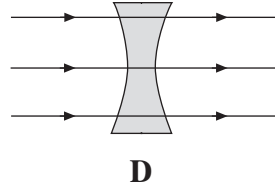
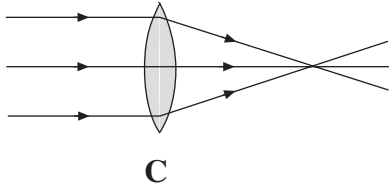
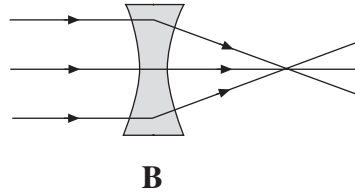
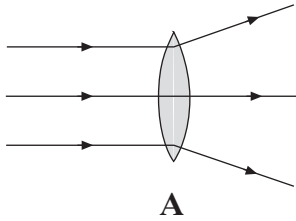
Turn over for the next question

Turn over ►

QUESTION SEVEN

Lenses are used in cameras and other optical instruments.

7.1 Which diagram correctly shows parallel rays of light passing through a lens?



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7.3 Which statement about images is correct?

- A Real images cannot be put on a film.
- B Real images cannot be put on a screen.
- C Virtual images can be put on a film.
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7.4 Which row in the table is correct for a camera?

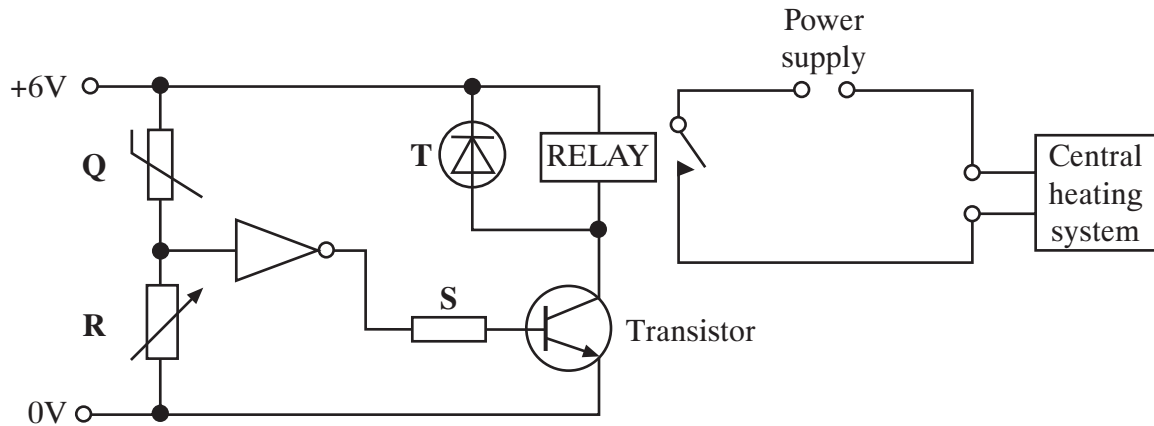
	Size of image compared with size of object	Distance of image from the lens compared with distance of object from the lens
A	larger	larger
B	larger	smaller
C	smaller	larger
D	smaller	smaller

Turn over for the next question

Turn over ►

QUESTION EIGHT

This control circuit switches on the central heating in a house when the temperature falls below a certain value.



8.1 When the temperature of **Q** rises, . . .

- A the NOT gate develops a high output.
- B the relay contacts close.
- C the voltage across **R** rises.
- D the voltage across **R** falls.

8.2 The function of **R** is to . . .

- A act as a fuse in case of a fault.
- B alter the temperature at which the central heating system switches on.
- C prevent too much current from going to the NOT gate.
- D stop current from flowing the wrong way through the diode.

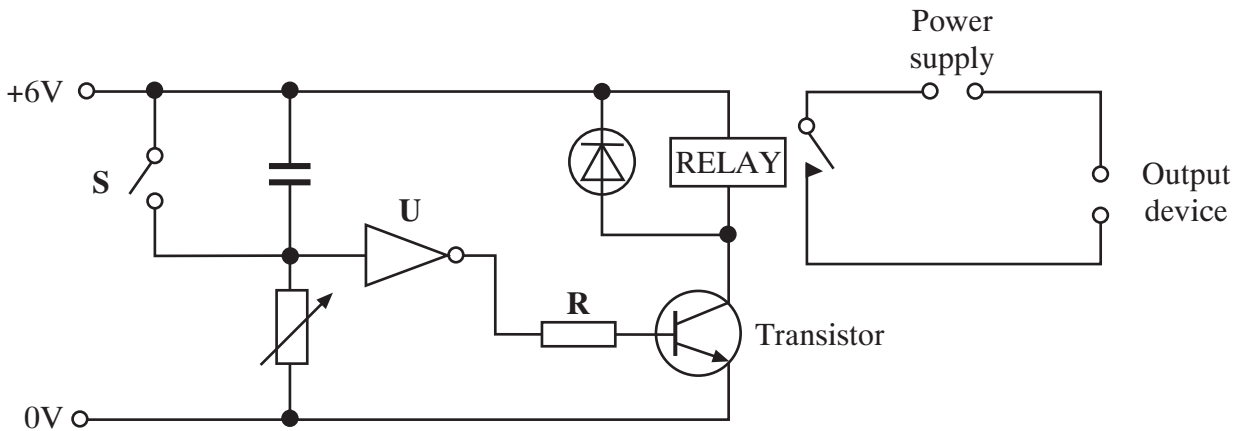
- 8.3** The function of **S** is to . . .
- A** change a.c. into d.c. .
 - B** give a high output when its input is low.
 - C** limit the current flowing through the transistor.
 - D** step up the voltage to the transistor.
- 8.4** If component **T** is left out of the circuit, . . .
- A** the circuit will not work at all.
 - B** the thermistor may be damaged.
 - C** the transistor may be damaged.
 - D** too much current will flow through the relay.

Turn over for the next question

Turn over ►

QUESTION NINE

The diagram shows the circuit of an electronic control system.



- 9.1** The function of the capacitor is to . . .
- A** allow current to flow in one direction only.
 - B** increase the potential difference supplied to the transistor.
 - C** prevent a high current from flowing through the transistor.
 - D** produce a time delay.
- 9.2** When the switch **S** is open, the capacitor is . . .
- A** charged and the input to **U** is high.
 - B** charged and the input to **U** is low.
 - C** discharged and the input to **U** is high.
 - D** discharged and the input to **U** is low.

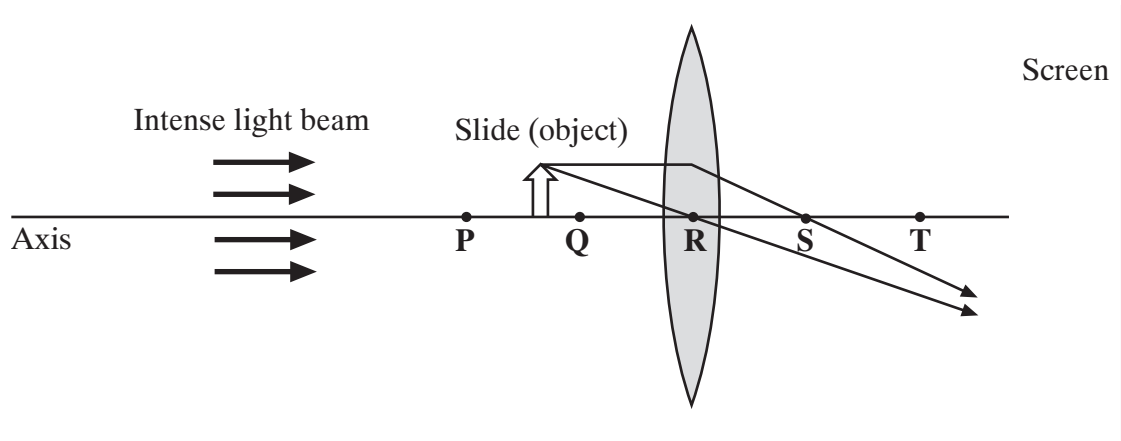
- 9.3** When the switch **S** is closed, the capacitor . . .
- A** charges and the input to **U** becomes high.
 - B** charges and the input to **U** becomes low.
 - C** discharges and the input to **U** becomes high.
 - D** discharges and the input to **U** becomes low.
- 9.4** How can the time taken to charge the capacitor be increased?
- A** By adjusting the variable resistor to give it a higher resistance
 - B** By adjusting the variable resistor to give it a lower resistance
 - C** By decreasing the capacitance of the capacitor
 - D** By increasing the value of the resistor **R**

Turn over for the next question

Turn over ►

QUESTION TEN

A slide projector has a converging lens which forms an image on the screen. Rays from the slide have been drawn in an accurate ray diagram. Points **P** to **T** correspond to features of the lens.



10.1 The image formed on the screen is . . .

- A real, inverted and diminished.
- B real, inverted and enlarged.
- C real, upright and enlarged.
- D virtual, inverted and enlarged.

10.2 Which point on the ray diagram corresponds to the focus of the lens?

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

10.3 What happens to a ray which passes from the top of the slide (object) through **Q**?

- A** After emerging from the lens, it passes through **S**.
- B** After emerging from the lens, it passes through **T**.
- C** It emerges from the lens parallel to the axis.
- D** It passes straight through the lens without being deviated.

10.4 The slide (object) is now turned upside down.

Compared to the previous image on the screen, the new image will be . . .

- A** the same way up and larger.
- B** the same way up and the same size.
- C** turned upside down and smaller.
- D** turned upside down and the same size.

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