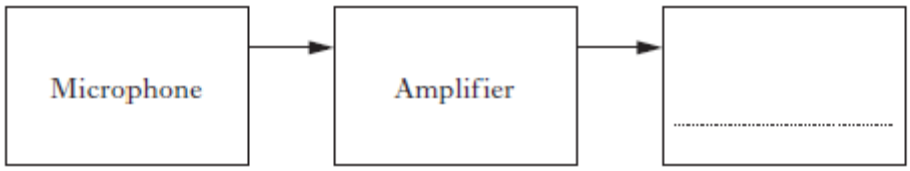
2.3 Electronics Past Paper Questions

1. An electronic megaphone is used by police to give instructions to large numbers of people.

A Megaphone is a device that amplifies the voice of the person using it.

(a) The megaphone consists of an electronic system.
An electronic system can be represented by a block diagram.
The electronic devices used for the first two parts of the electronic system are shown below.
Copy and complete the diagram adding a suitable output device



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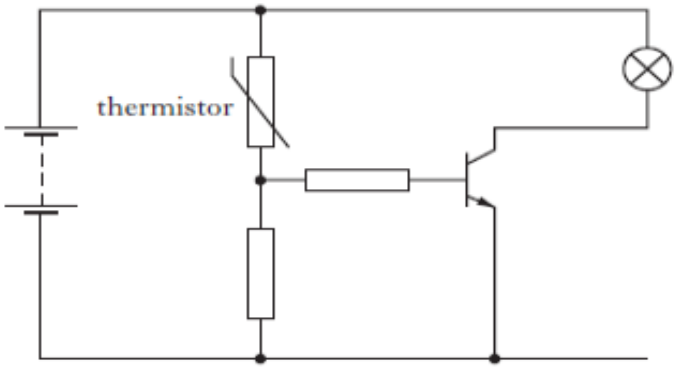
2. An electronic circuit, used to give a warning, is shown below.



(a) (i) What causes the resistance of the thermistor to change? **1**
(ii) State the function of the transistor in this circuit. **1**

(iii) How does the circuit indicate this warning? 2

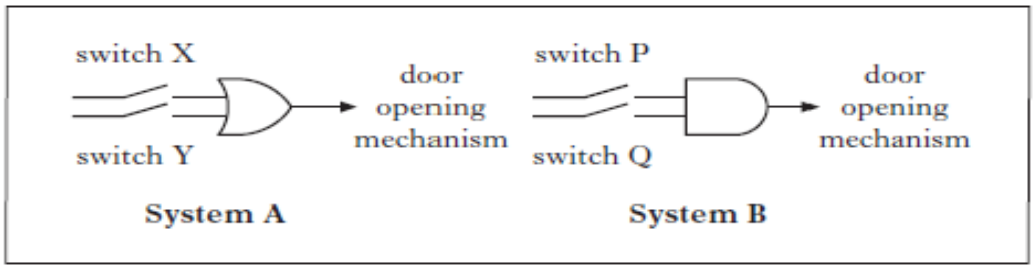
(iv) Suggest where this circuit could be used to give a warning. 1

(b) Some electronic devices are listed below:

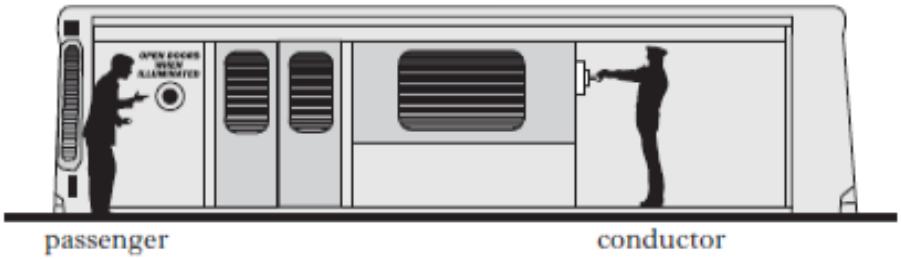
LED Relay Switch Motor Solar Cell LDR Solenoid

From the list ,state two digital input devices. 1

3. Two logic systems, A and B, for controlling door opening mechanisms are shown.

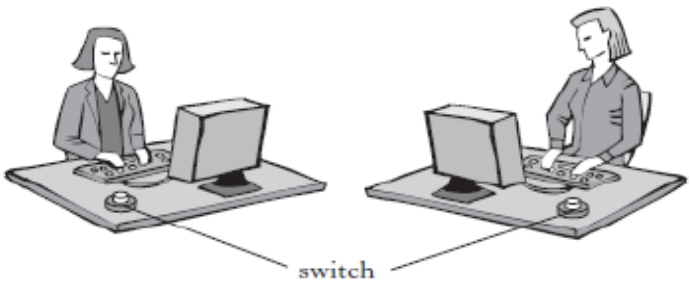


To open the passenger doors on a train, the button marked "Open Doors When Illuminated" must be pressed. To illuminate the button the conductor closes a master switch using a key.



(a) Explain which system, A or B should be used in this situation. 2

(b) The main entrance doors in a school can be opened by either of two office staff using a switch on their desk.

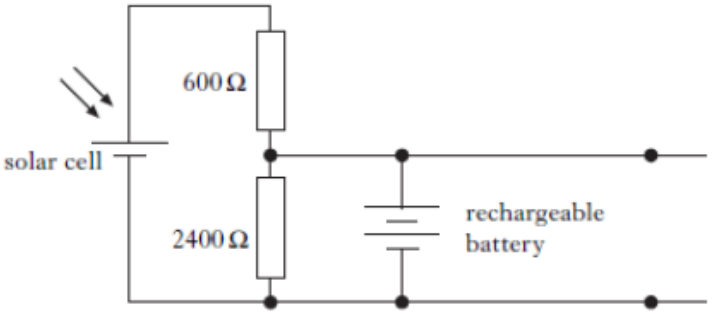


Explain which system, A or B, should be used in this situation. 2

4. A high intensity LED is used as a garden light. The light turns on automatically when it becomes dark.

The light also contains a solar cell which charges a rechargeable battery during daylight hours.

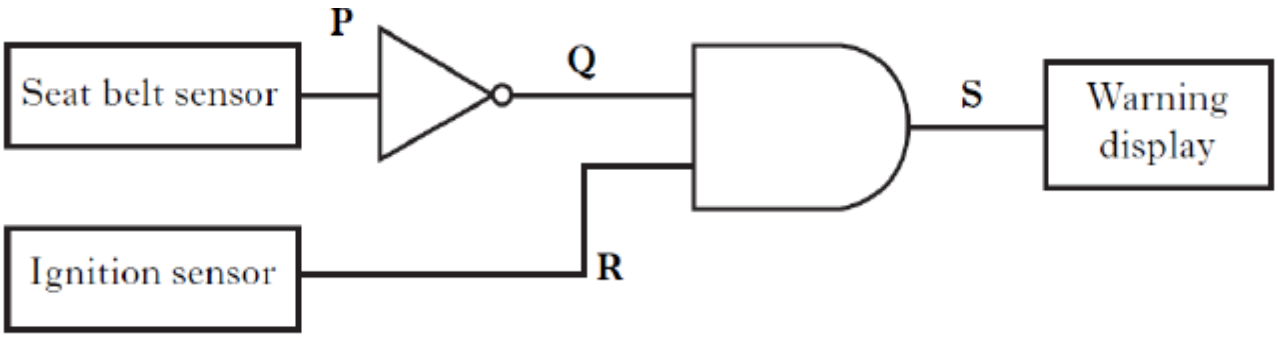
(a) Part of the circuit is shown below.



(i) State the energy transformation in a solar cell. **1**

(ii) At a particular light level, the voltage generated by the solar cell is 1.5 V.
Calculate the voltage across the rechargeable battery at this light level. **3**

5. An electronic device warns a car driver when the seat belt has not been fastened. The device only operates when the ignition is switched on. The device contains the logic circuit shown.



The seat belt sensor produces logic 1 when the seat belt is fastened and logic 0 when the car ignition is off.

(a) (i) Suggest a suitable output device that will illuminate the warning display. **1**

(ii) Complete the truth table for the logic levels **P**,**Q** and **S** in the circuit. **4**

Seat belt	Ignition	**P**	**Q**	**R**	**S**
unfastened	off			**0**	
unfastened	on			**1**	
fastened	off			**0**	
fastened	on			**1**	

(c) The car has another electronic device that also contains a logic gate.
The truth table for this logic gate is shown below.

Input 1	Input 2	Output
0	0	0
0	1	1
1	0	1
1	1	1

(i) Name this logic gate. **1**

(ii) Draw the symbol for this logic gate. **1**

(d) The temperature outside the car is measured with an electronic thermometer and displayed on a screen. What input device could be used in the electronic thermometer. **1**

6. Three circuit symbols X, Y and Z are shown.

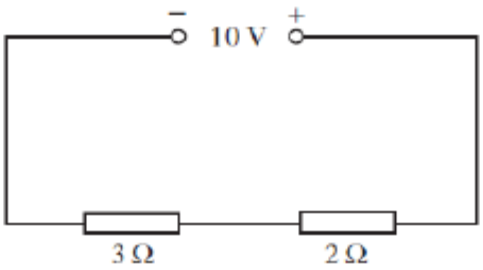
X Y Z

Which row in the table identifies the symbols X, Y and Z?

	X	Y	Z
A	thermistor	transistor	resistor
B	fuse	variable resistor	thermistor
C	transistor	fuse	variable resistor
D	fuse	variable resistor	resistor
E	variable resistor	resistor	fuse

1

7. A circuit is set up as shown.

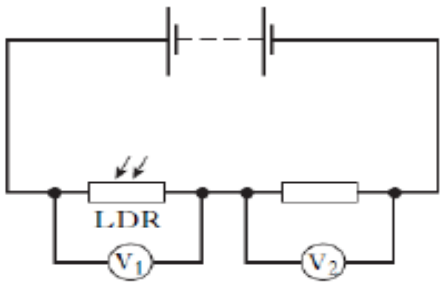


The potential difference across the 2 Ω resistor is

A 4 V
B 5 V
C 6 V
D 10 V
E 20 V.

1

8. A circuit is set up as shown.



The initial reading on both voltmeters V_1 and V_2 is 2·5 V.

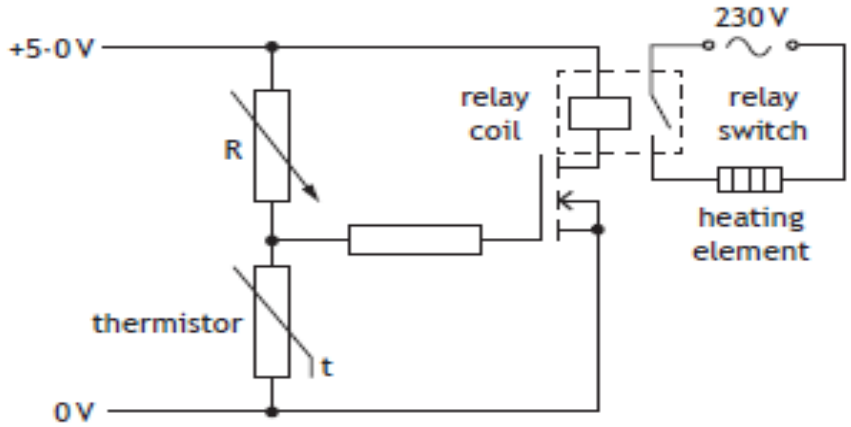
The light shining on the LDR is made brighter.

Which row in the table shows possible new readings on voltmeters V_1 and V_2?

	Reading on V_1 (V)	*Reading on V_2* (V)
A	2·0	3·0
B	2·5	2·0
C	2·5	2·5
D	2·5	3·0
E	3·0	2·0

1

9. The temperature of the water in the washing machine is monitored by a circuit containing a thermistor.

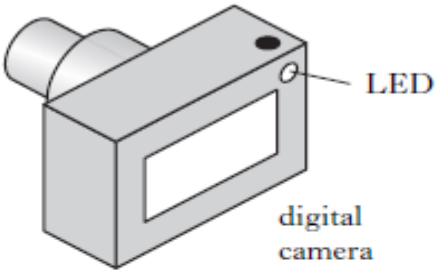


As the temperature of the water increases, the resistance of the thermistor decreases.

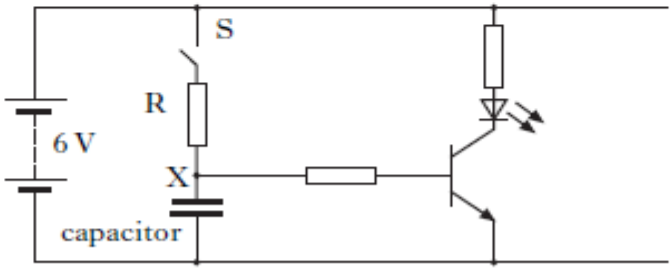
The heating element is switched off when the temperature of the water reaches 40 °C.

Explain how the circuit operates to switch off the heating element. 3

10. A digital camera is used to take pictures. When switched on, the flash on a digital camera requires some time before it is ready to operate. When ready, a green LED is illuminated.



The part of the circuit used to control the LED is shown below. The voltage at point X is initially 0 V.

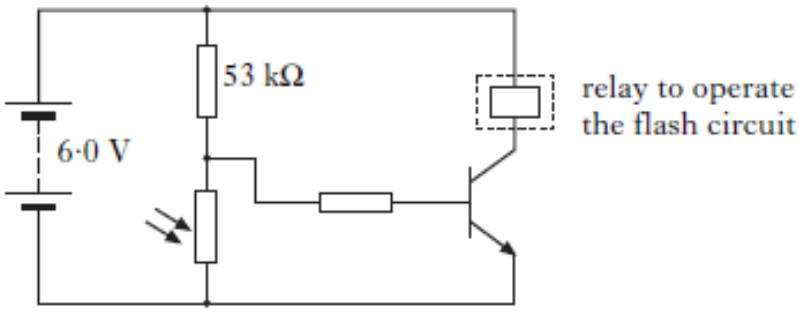


(*a*) Describe what happens to the voltage at point X when switch S is closed. **1**

(*b*) The camera manufacturer wants to change the time taken for the flash to be ready to operate.

State **two** changes which could be made to the above circuit so that the time for the green LED to come on is **reduced**. **2**

(c) The camera flash is designed to operate under dim lighting conditions. Another part of the circuit for the camera flash is shown below. The flash only operates when a minimum voltage of 0·7 V occurs across the LDR.



(i) Calculate the voltage across the 53 kΩ resistor when the voltage across the LDR is 0·7 V.

Space for working and answer

2

(ii) Calculate the **minimum** resistance of the LDR that allows the flash to operate in dim conditions.

Space for working and answer

3

Total Marks available = 37