Transistor Question

1 Figure 1 shows a circuit which can be used as an automatic switch.

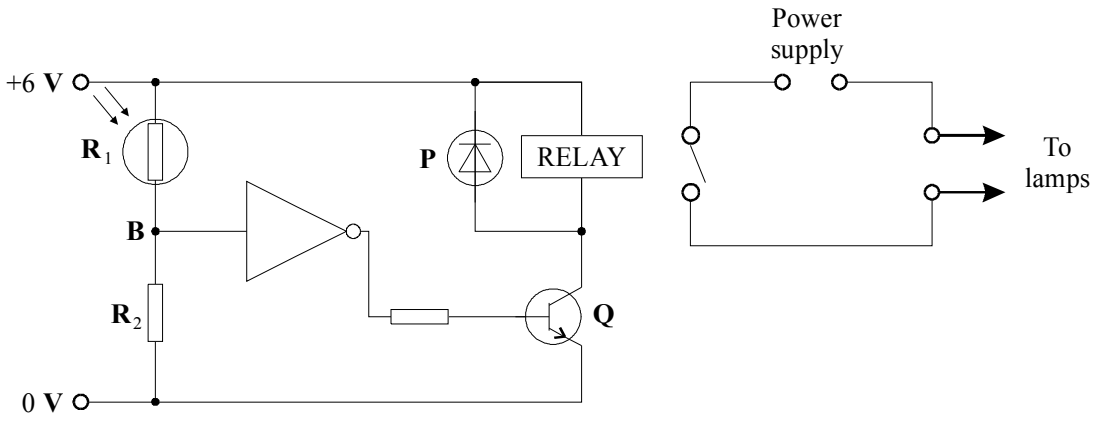

Figure 1

(a) (i) Name component **P**.

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(ii) Why is component P included in the circuit?

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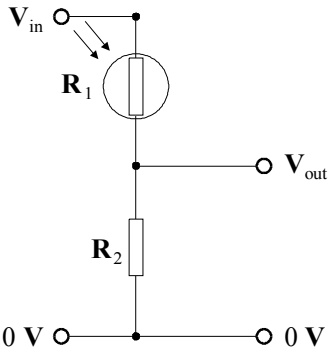
Use the following information for part (b).



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

(b) The resistance of R_2 = 2000 Ω.
V_{in} is 6V.

(i) In daylight the resistance of R_1 = 5000 Ω.
Calculate the voltage across R_2.

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Voltage V

(ii) In daylight the lamps will be OFF. Explain why.

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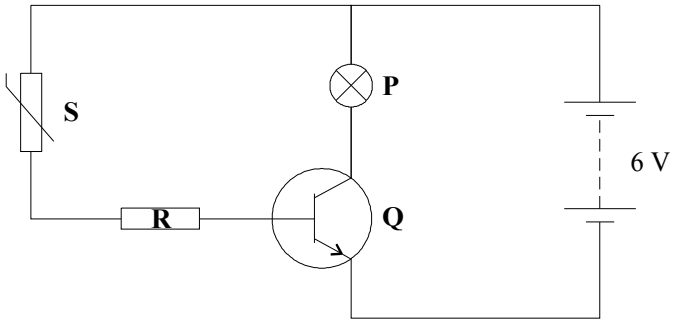
2 (a) The diagram shows a switching circuit. The lamp **P** switches on when the temperature reaches 5 °C.



(i) Which **one** of the following is the name of the component labelled **Q?** Underline your answer.

diode transformer transistor

(ii) In the following sentence, cross out the two lines in the box that are wrong.

The resistor **R** | increases
does not affect
reduces | the current going to component **Q**.

(iii) Suggest **one** practical use for this circuit.

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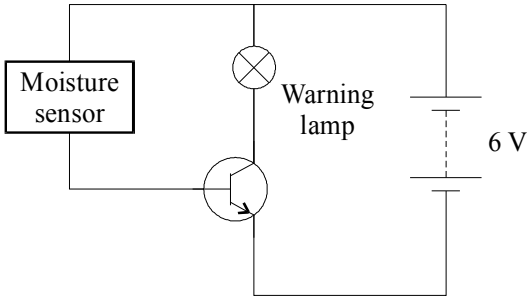
3 (a) The diagram shows a simple moisture detector. The warning lamp lights when a current of 60 mA passes through it.



Someone with wet hands touches the moisture sensor. Explain why the warning lamp lights.

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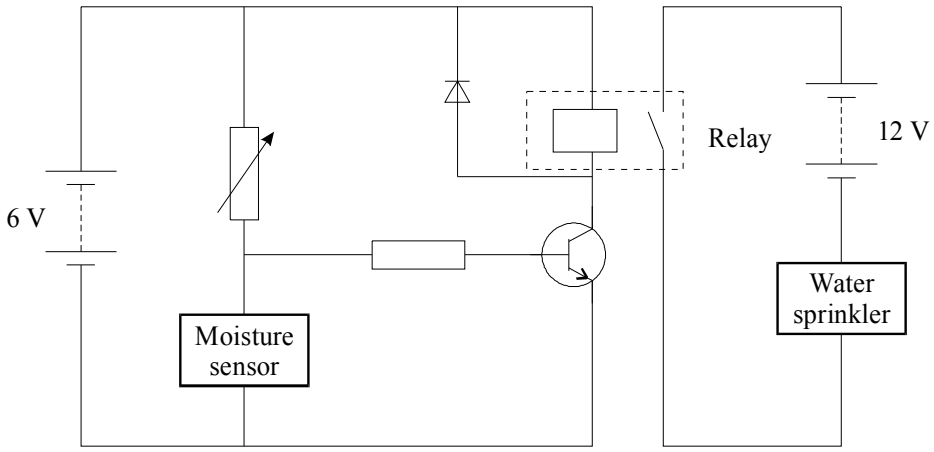
(b) The diagram shows a circuit designed to switch on a water sprinkler when the sensor detects very little moisture.



(i) Why is a relay used to switch on the water sprinkler?

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(ii) How does changing the value of the variable resistor affect the circuit?

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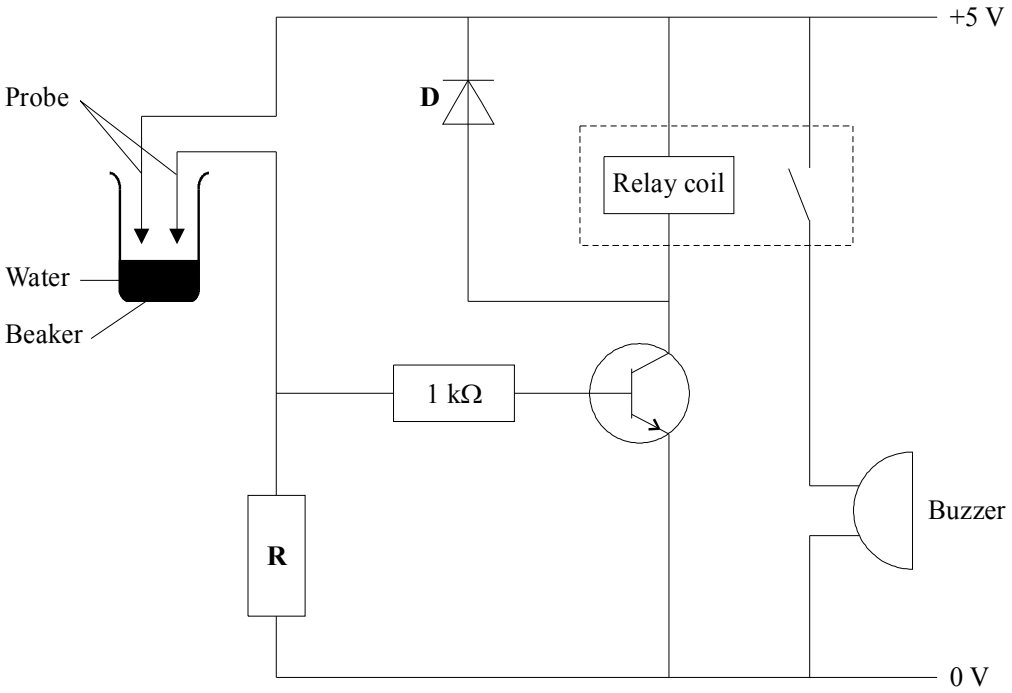
4 (a) The circuit diagram shows one design for a moisture detector.



(i) In this circuit, what is the purpose of each of the 1 kΩ resistor;

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(ii) When the water level in the beaker reaches the two metal probes the transistor switches and the buzzer sounds.

[A] Explain what happens to the circuit to cause the transistor to switch.

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[B] Explain why, when the transistor switches, the buzzer sounds.

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(iii) Suggest **one** practical use for this moisture detector.