

# SCIENCE

## INTERACTIVE ASSESSMENT QUESTIONS BASED ON STANDARD PRACTICAL EXERCISES FOR REVISION AND EXAMINATION PRACTICE

### Physics Part 3

1 of 15

#### LEARNING VERSION

IN THIS LEARNING VERSION ANSWERS ARE IMMEDIATELY AND VISIBLY MARKED, CORRECT ANSWERS ARE INDICATED ON REQUEST, AND END OF SUB-SECTION TOTALS AND PERCENTAGES SHOWN ON SCREEN.

SOME OF THE MORE DIFFICULT QUESTIONS HAVE DROP DOWN HELP BOXES WHICH REVEAL INFORMATION WHEN THE CURSOR IS PASSED OVER THE QUESTION MARK.

WHEN PRINTED OUT ONLY THE QUESTIONS SHOW, THEREFORE THIS CAN BE USED AS A PAPER VERSION FOR TESTS IF REQUIRED.

The questions are of the Multiple Choice style, where the phrase “Which ONE of the following ...” is implied, but is not always stated. So that students are reminded of the type of question that requires short written answers, which unfortunately cannot be automatically marked, each topic has one short passage with missing words, which must be identified in their correct sequence.

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**NB** The practical work presented should be familiar to students, either as a demonstration or as an experiment they might have carried out themselves in the lab. The illustrated material is NOT presented as a practical guide, and while the procedures were carried out according to recommended safety guidelines, specific safety issues are NOT dealt with.

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## CONTENTS

The following practical topics have been selected according to exam question frequency to form the basis of revision and examination practice.

Each section is completely self-contained and they may be attempted in any order.

### Part 1

Refraction

Total Internal Reflection

Sound Waves

### Part 2

Transfer of Thermal Energy

Transfer of Electrical Energy

### Part 3

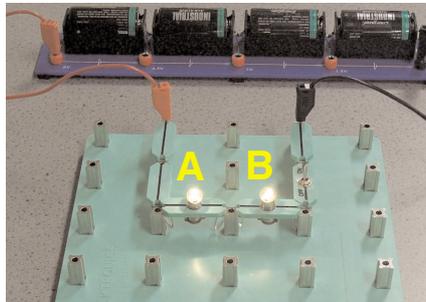
Series and Parallel Circuits

Voltage and Current Characteristics

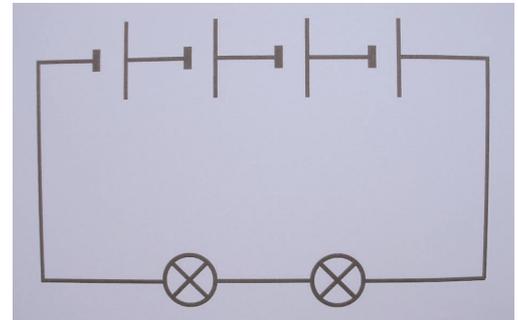
Potential Divider Circuits

● Series and Parallel Circuits

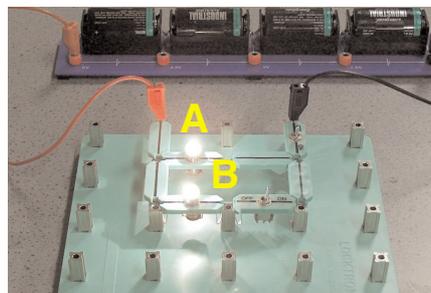
**Practical** - Two circuits were connected as shown in the photographs and drawings. Each circuit contains a battery (which is made up of 4 identical cells) and 2 identical bulbs.



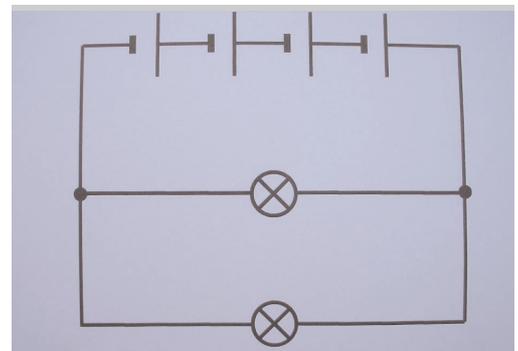
Circuit 1



Circuit 1



Circuit 2



Circuit 2

1. Which pair of words below best completes the following sentence to correctly describe both circuits?

*Circuit 1 is a \_\_\_ circuit and circuit 2 is a \_\_\_ circuit.*

- A - parallel - full
- B - series - parallel
- C - full - series
- D - parallel - series

2. Choose the best sentence below to compare the resistance and brightness of the bulbs in each circuit.

- A - Circuit 1 has a higher resistance because the bulbs are dimmer than in circuit 2.
- B - Circuit 2 has a higher resistance because the bulbs are dimmer than in circuit 1.
- C - Circuit 1 has a lower resistance because the bulbs are dimmer than in circuit 2.
- D - Circuit 2 has a higher resistance because the bulbs are brighter than in circuit 1.

● Series and Parallel Circuits

3. What would happen if bulb A in circuit 1 was unscrewed?

- A - The battery would overheat.
- B - Bulb B would stay on, but be much dimmer.
- C - Bulb B would stay bright.
- D - Bulb B would go out.

4. What would happen if bulb A in circuit 2 was unscrewed?

- A - The battery would overheat.
- B - Bulb B would stay on, but be much dimmer.
- C - Bulb B would go out.
- D - Bulb B would stay bright.

**HELP BOX**

PASS CURSOR OVER  
QUESTION MARK  
FOR HELP WITH  
QUESTION  
NUMBERS **5**  
& **6**



5. The current is the same everywhere in a series circuit.

6. The current is shared between the branches of a parallel circuit according to the resistance of the branches. The bulbs in circuit 2 are identical.

5. In circuit 1, the current through bulb A is 2 Amps. What would the current be through bulb B?

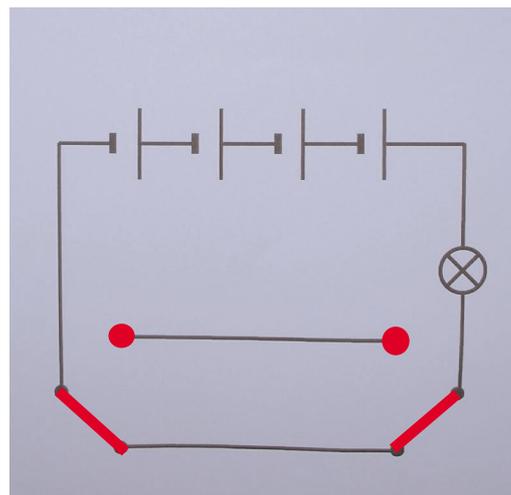
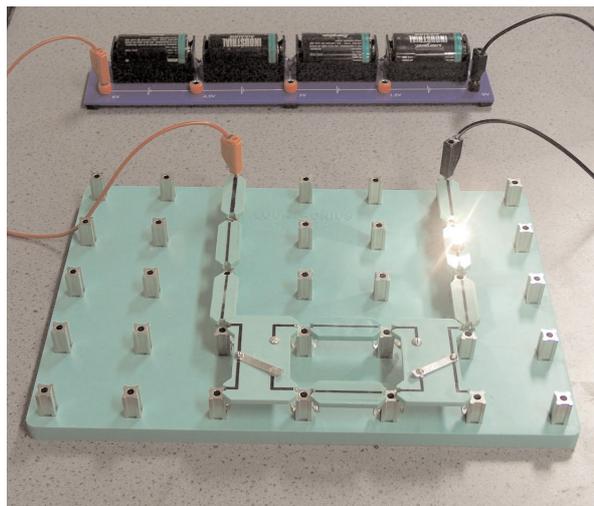
- A - Impossible to say
- B - 1 Amp
- C - 2 Amps
- D - 3 Amps

6. In circuit 2, the current from the battery is 4 Amps. What current would be passing through each bulb?

- A - 4 Amps through each bulb.
- B - 3 Amps through bulb A and 1 Amp through bulb B.
- C - Impossible to say without knowing the voltage of the battery.
- D - 2 Amps through each bulb.

● Series and Parallel Circuits

**Practical** - The circuit shown below is connected using two 2-way switches, linked to a single bulb.



**HELP BOX**

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QUESTION  
NUMBER **7**



Either switch can be used to switch the bulb on or off.

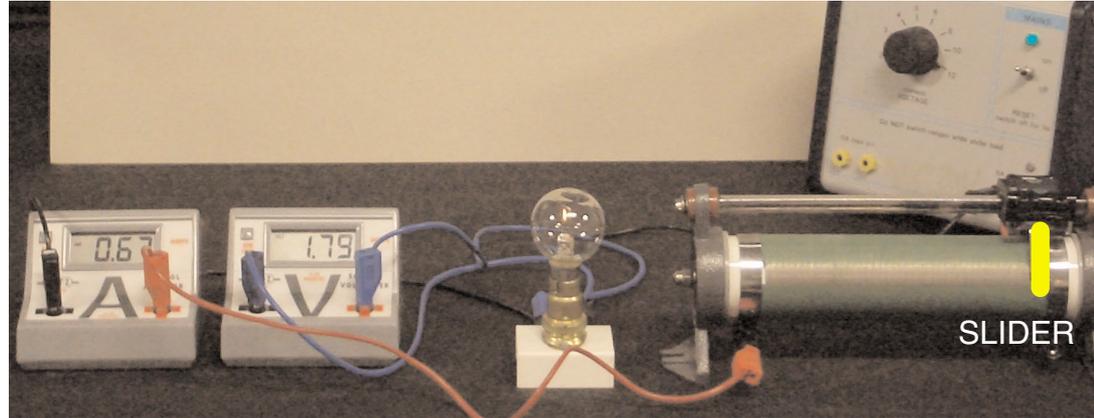
**7.** Where might you find a circuit like the one above?

- A** - Operating lights over a set of stairs.
- B** - In a bathroom.
- C** - In the circuit to operate car headlights.
- D** - In a garage or other outbuilding.



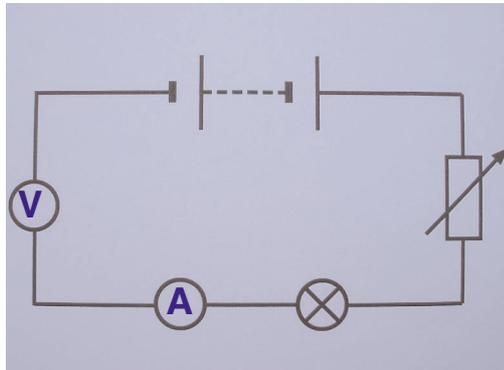
● Voltage and Current Characteristics

**Practical** - A circuit has been set up as shown in the photo. A power pack operates a bulb. The current is varied using a rheostat. The voltage (V) across the bulb and the current (A) through it are being measured. The slider on the rheostat has been enhanced in yellow in the following photographs.

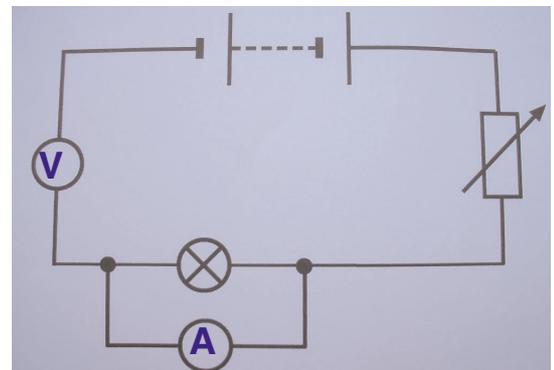


8. Which of the circuit diagrams below represents the circuit in the above photograph?

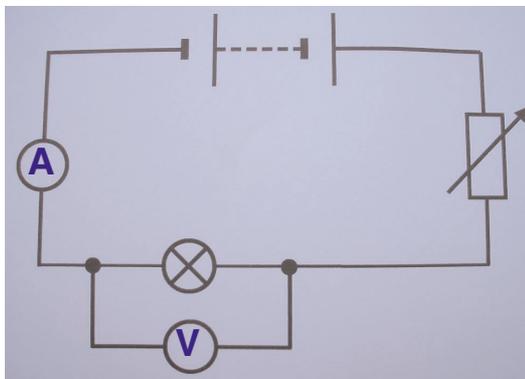
Circuit 4



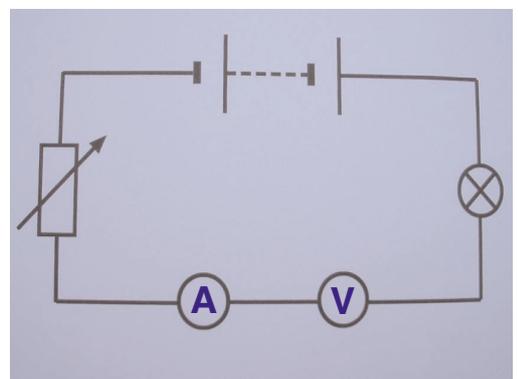
Circuit 5



Circuit 6



Circuit 7



**HELP BOX**

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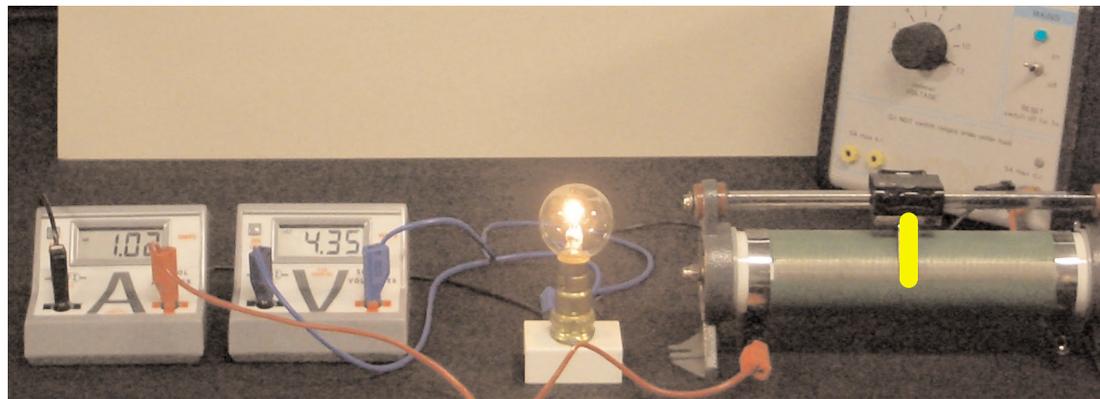
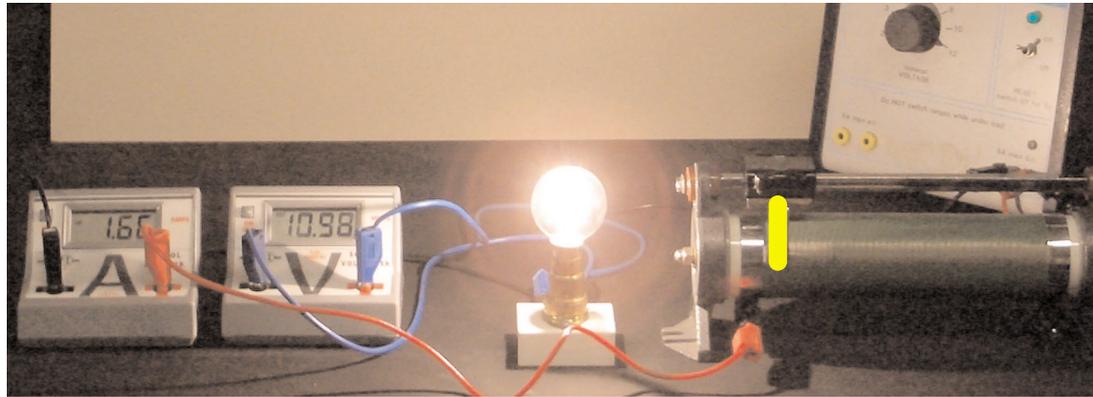
Ammeters should be connected in series and voltmeters in parallel with the component they are measuring.



- A - Circuit 7
- B - Circuit 4
- C - Circuit 5
- D - Circuit 6

● Voltage and Current Characteristics

**Practical** - Starting at the left, the slider on the rheostat is pushed to the right, as shown in the photos below. As the slider moves, the bulb gets dimmer.



9. Which sentence best explains why the bulb gets dimmer?
- A** - The rheostat has a larger resistance and so the current is lower.
- B** - The rheostat has a larger resistance and so the voltage is higher.
- C** - The rheostat has a smaller resistance and so the current is higher.
- D** - The rheostat has a larger resistance and so the voltage is higher.

$$\text{Resistance} = \frac{\text{Voltage}}{\text{Current}}$$

10. If the voltmeter reads 10 Volts and the ammeter reads 0.5 Amps, what is the resistance of the bulb?

- A** - 50 Ohms
- B** - 5 Ohms
- C** - 10.5 Ohms
- D** - 20 Ohms



### HELP BOX

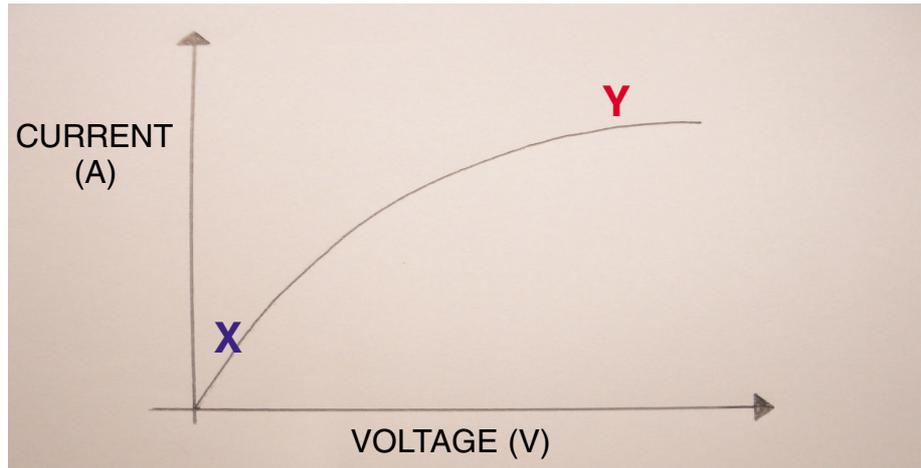
PASS CURSOR OVER  
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FOR HELP WITH  
QUESTION  
NUMBER 10



Voltage and Current Characteristics

**Practical** - The rheostat slider was moved to several different positions. At each new position, the voltage and current through the bulb were recorded. The results were plotted onto a graph as shown below.

Graph of Voltage against Current for a Filament Bulb



**HELP BOX**

PASS CURSOR OVER QUESTION MARK FOR HELP WITH QUESTION NUMBERS **11** & **12**

**11.** The steeper the graph, the lower the resistance.

**12.** At high voltages, the filament wire inside the bulb gets hot.

**11.** Choose the correct pair of words to complete the following analysis of the above graph:

*At point X on the graph, representing a low voltage, the resistance of the bulb is \_\_. At point Y on the graph, representing a high voltage, the resistance of the bulb is \_\_.*

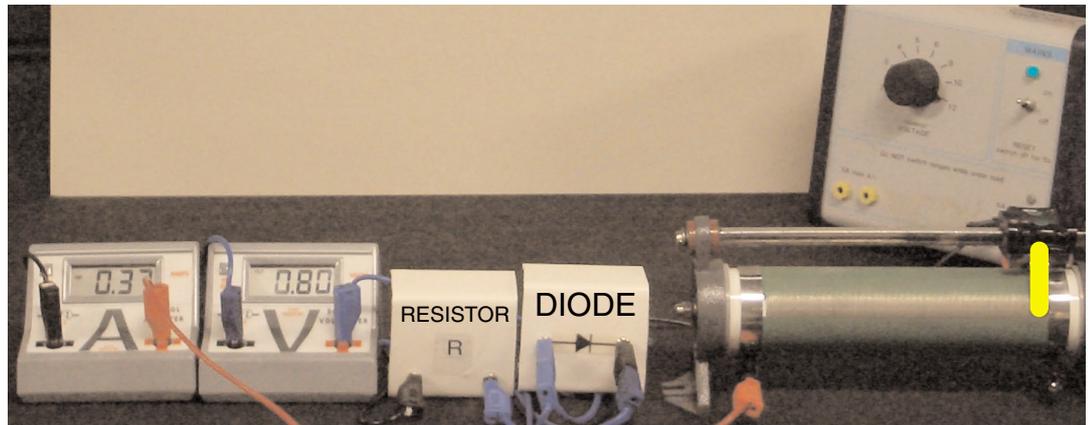
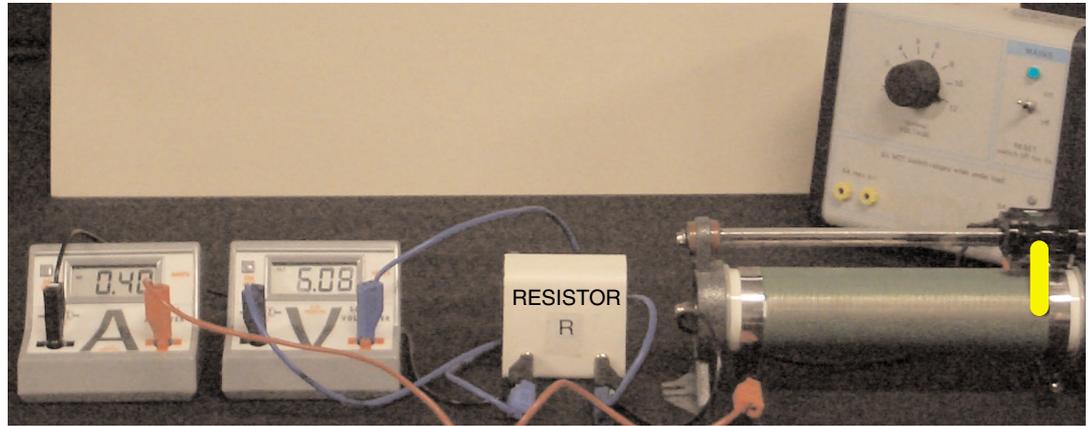
- A** - high - low
- B** - high - high
- C** - low - high
- D** - low - low

**12.** Why does the resistance of the bulb change relative to the voltage?

- A** - The resistance decreases at higher voltages because it is easier to push a current through a hot filament wire than a cool one.
- B** - The resistance increases at higher voltages because it is harder to push the current through a hot filament wire than a cool one.
- C** - The resistance decreases at higher voltages because there is more energy to push a current around the circuit.
- D** - The resistance increases at higher voltages because there is less energy to heat up the filament inside the bulb.

● Voltage and Current Characteristics

**Practical** - The previous experiment was repeated twice more. The bulb was replaced in the circuit, first by a fixed value resistor, then by a resistor and diode in series.



### HELP BOX

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FOR HELP WITH  
QUESTION  
NUMBER **13**



The diode has a maximum current rating of 0.1 Amps.

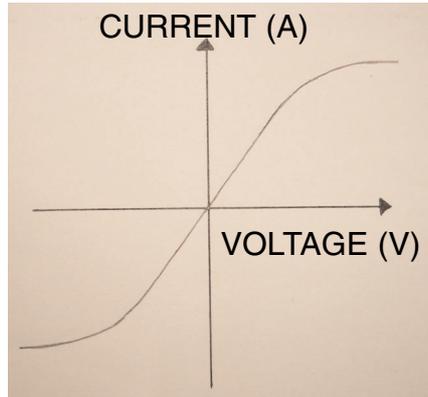
**13.** Why was a resistor placed in series with the diode, rather than putting the diode in the circuit on its own?

- A** - Because the diode can take much higher currents than the resistor.
- B** - To smooth out the current flowing from the power pack.
- C** - To reduce the current flowing through the diode and prevent it overheating.
- D** - Because the diode can only let current flow in one direction.

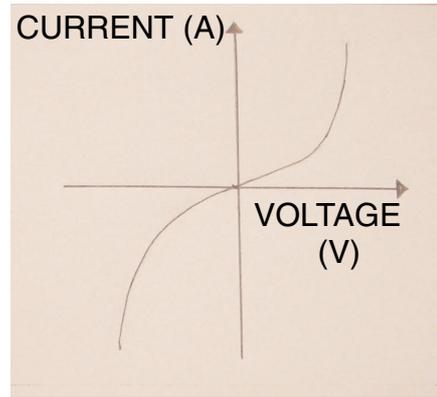


● Voltage and Current Characteristics

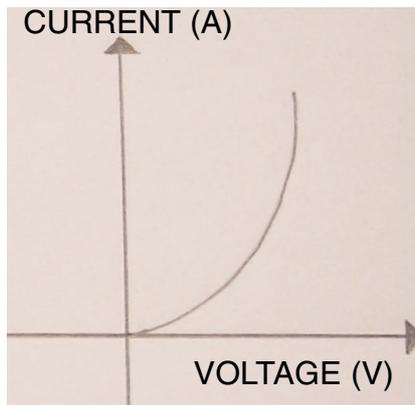
14. Four graphs of voltage against current are set out below.



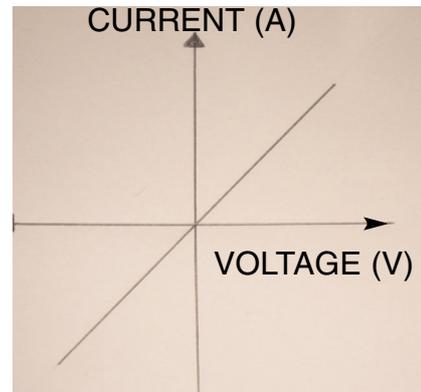
**Graph 1**



**Graph 2**



**Graph 3**



**Graph 4**

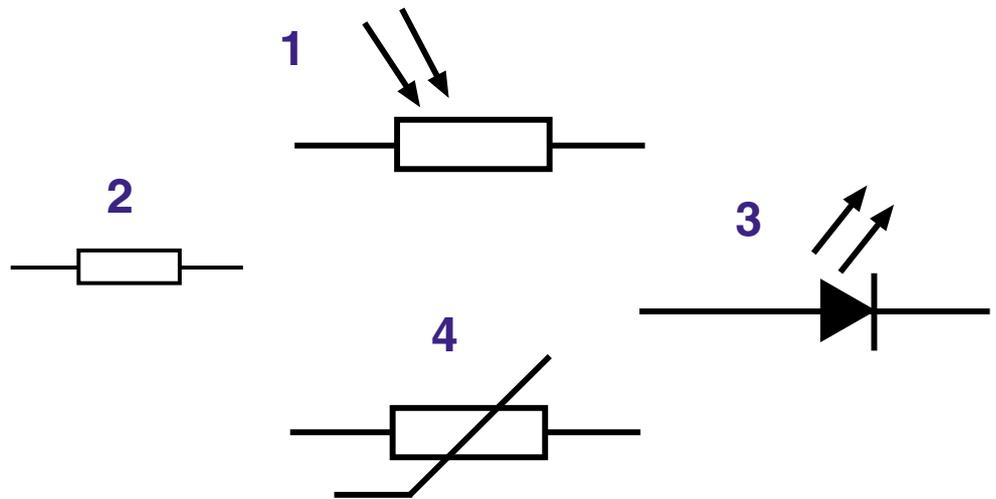
Complete the following sentence by matching the correct graph to the two blank spaces:

*Graph \_\_\_ was produced from the resistor circuit. Graph \_\_\_ was produced from the resistor and diode circuit.*

- A** - 1 - 2
- B** - 4 - 3
- C** - 1 - 3
- D** - 2 - 4

● Potential Divider Circuits

**Practical** - Potential Divider Circuits, so called because they use two resistors (one fixed and one variable) to divide the supply voltage into two parts, are used in sense and control systems. A variable resistor, such as a light dependent resistor (LDR), or temperature dependent thermistor, is used to sense a change in conditions (such as light level or temperature). This causes a change in the resistance of the circuit, which allows a device to operate (such as a light or heater).



**15.** Which pair of numbers in the list below matches the correct circuit symbol to each type of variable resistor in the following sentence:

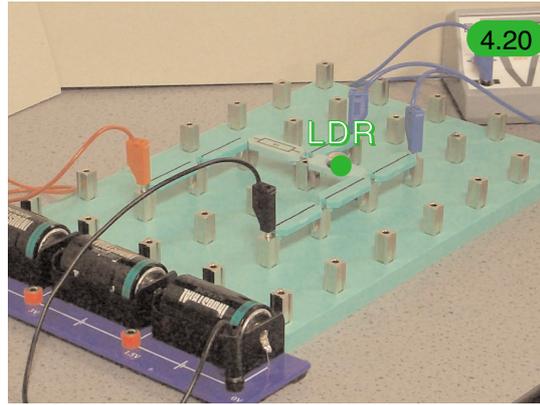
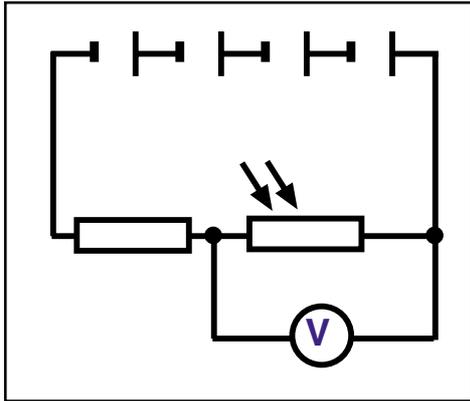
*Symbol \_\_\_ represents a thermistor and symbol \_\_\_ represents an LDR.*



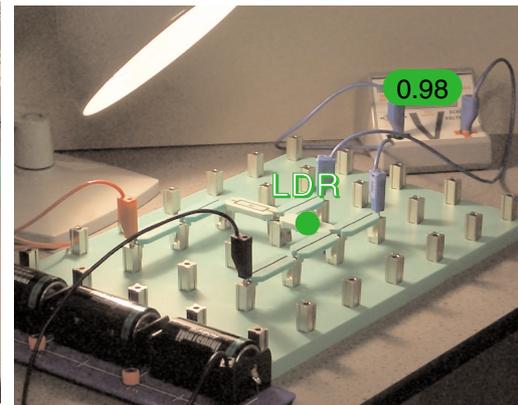
- A** - 4 - 1
- B** - 2 - 3
- C** - 3 - 1
- D** - 4 - 2

● Potential Divider Circuits

**Practical** - The circuit shown in the diagram and photos below uses an LDR to sense the light level. The LDR is connected in series with a fixed value resistor to make a Potential Divider Circuit. The voltage across the LDR is measured by the voltmeter (the screen of which has been enhanced in the photographs).



**Photograph 1** Normal daylight



**Photograph 2** Bright light

**HELP BOX**

PASS CURSOR OVER  
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FOR HELP WITH  
QUESTION  
NUMBER **16**



The higher the voltage,  
the higher the  
resistance of the LDR.

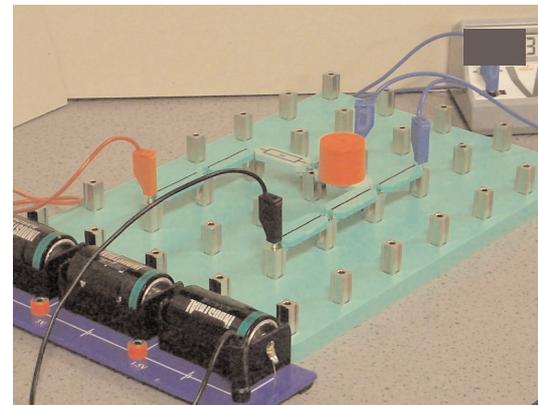
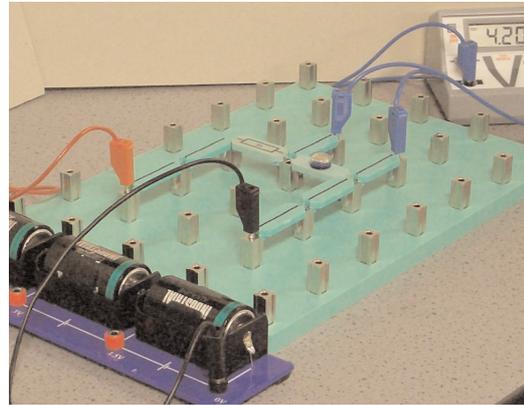
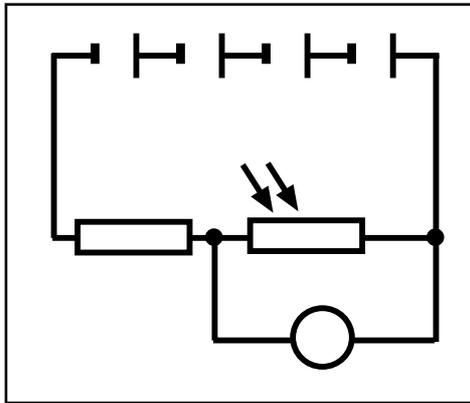
**16.** Which sentence below best explains the voltage reading shown in Photograph 2?

- A** - The light level is low, so the LDR has a high resistance.
- B** - The light level is low, so the LDR has a low resistance.
- C** - The light level is high, so the LDR has a high resistance.
- D** - The light level is high, so the LDR has a low resistance.



Potential Divider Circuits

**Practical** - In the left hand photo below, the LDR is exposed to normal daylight, and the voltmeter reads 4.20 Volts. In the right hand photo, the LDR is covered, so only a very low level of light will reach it.



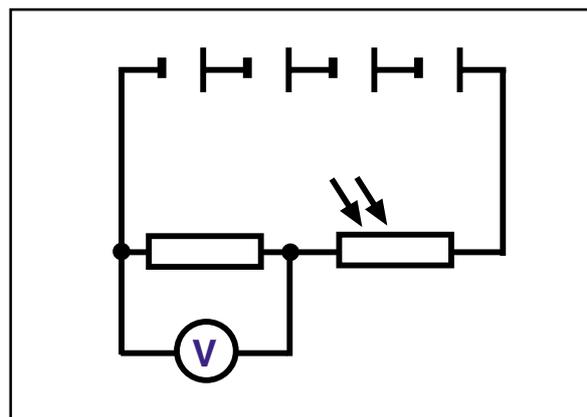
17. Which one of the readings given below would you expect to be shown by the voltmeter in the right hand photo?

- A - 5.39 Volts
- B - 4.20 Volts
- C - 2.52 Volts
- D - zero Volts

**Practical** - The voltmeter is now connected so that the voltage across the fixed resistor can be measured.

**HELP BOX**

PASS CURSOR OVER QUESTION MARK FOR HELP WITH QUESTION NUMBER 18



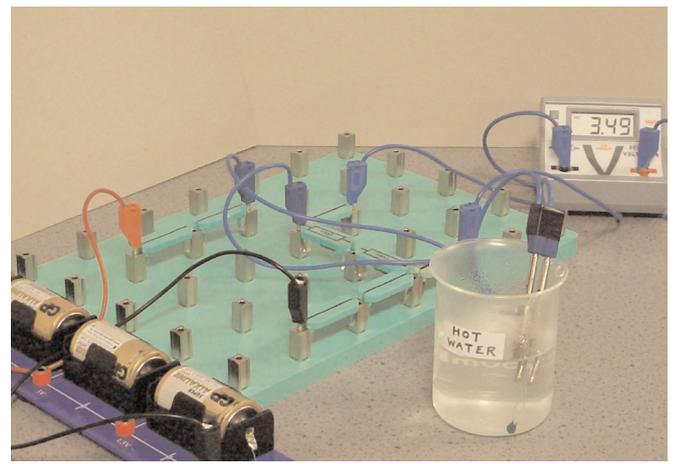
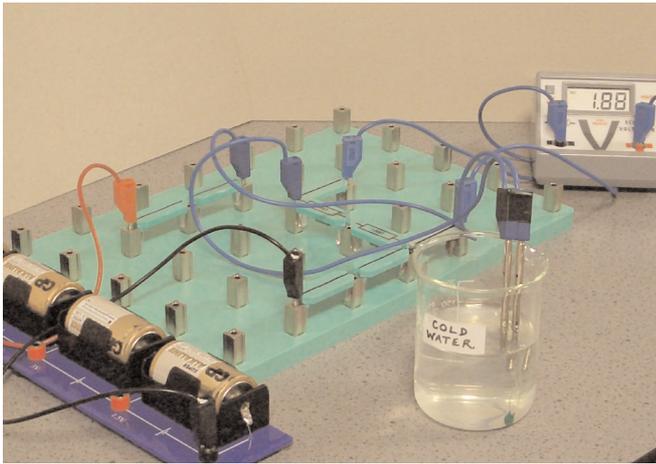
18. What will happen to the voltmeter reading as the light level increases?

- A - The voltmeter reading will stay constant.
- B - The voltmeter reading will go up.
- C - The voltmeter reading will go down.
- D - It is impossible to say what the voltmeter reading will do.

Voltage is shared between the fixed value resistor and the LDR. If the voltage across the LDR goes up, the voltage across the fixed value resistor will go down.

● Potential Divider Circuits

**Practical** - The LDR is now replaced in the circuit with a thermistor. The voltmeter is still connected across the fixed value resistor. In the left hand photo below, the thermistor is standing in cold water. In the right hand photo, it stands in a beaker of hot water.



**HELP BOX**

PASS CURSOR OVER  
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FOR HELP WITH  
QUESTION  
NUMBER 19



The voltage readings are 1.88 in the photo on the left, and 3.49 in the other. If the fixed value resistor has a high voltage across it, the thermistor will have a low voltage across it. The higher the voltage, the higher the resistance.

**19.** What is the relationship between temperature and the resistance of the thermistor?

- A** - There is no relationship between temperature and resistance.
- B** - The higher the temperature, the higher the resistance.
- C** - The higher the temperature, the lower the resistance.
- D** - The higher the temperature the higher the voltage.



- Series and Parallel Circuits
- Voltage and Current Characteristics
- Potential Divider Circuits

**SECTION TOTAL**

**SECTION PERCENTAGE**