

## EPSE Project 1: Sample Diagnostic Questions - Set 1

### **Electric circuits: basic ideas**

These questions all probe pupils' understandings of very basic ideas about electric circuits, in particular the idea of a circuit itself – the need for a closed loop of conducting material from one terminal of the battery, through all the components and back to the other terminal of the battery. We have found that more pupils have difficulty with Q4 than with the others here.

Similarly in Q7, bulb 3 is likely to be the most difficult part – again exploring the same situation. These might be circuits that are worth letting pupils explore practically (ask them to predict what will happen, and then try it out to see what does happen).

Qs8-9 test understanding of the difference between conductors and insulators and basic ideas about a closed circuit loop. There is no point in asking these until pupils are secure with the earlier ones.

Q10 tests a different basic idea – that the order of objects in a series circuit makes no difference to how they work.

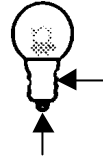
These questions are taken from a larger bank of diagnostic questions and tasks developed by the *Evidence-based Practice in Science Education (EPSE) Research Network*. The EPSE network was funded between 1999 and 2003 by the UK Economic and Social Research Council (ESRC) as part of the *Teaching and Learning Research Programme (TLRP)*.

1

The two contact points on a torch battery are at the ends:



The two contact points on a torch bulb are the tip and the screw thread:



Look at the diagrams below. For each, tick one box (✓) to show if the bulb is lit or not.

a.



lit      not lit



<input type="checkbox"/>	<input type="checkbox"/>
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b.



lit      not lit



<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

c.



lit      not lit



<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------

d.



lit      not lit



<input type="checkbox"/>	<input type="checkbox"/>
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e.



lit      not lit



<input type="checkbox"/>	<input type="checkbox"/>
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f.



lit      not lit



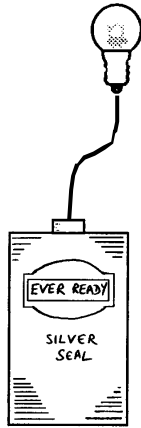
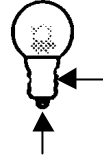
<input type="checkbox"/>	<input type="checkbox"/>
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Some useful information:

The two contact points on a torch battery are at the ends:



The two contact points on a torch bulb are the tip and the screw thread:



- (a) Is this bulb lit?      Yes
- Tick ONE box (✓):*
- No

- (b) If you have ticked 'No', could it be made to light by adding one wire?
- Tick ONE box (✓):*      Yes
- No

(c) If you have said 'Yes', please draw the wire on to the diagram.

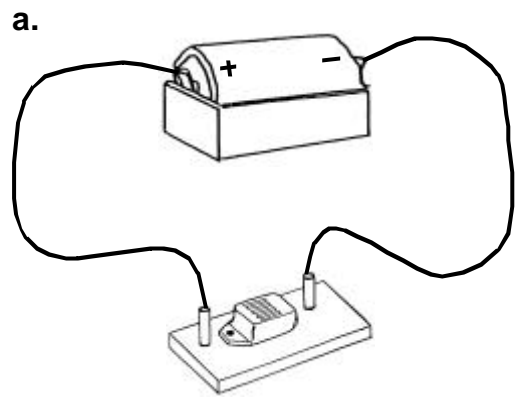


- (d) Is this bulb lit?      Yes
- Tick ONE box (✓):*
- No

- (e) If you have ticked 'No', could it be made to light by adding one wire?
- Tick ONE box (✓):*      Yes
- No

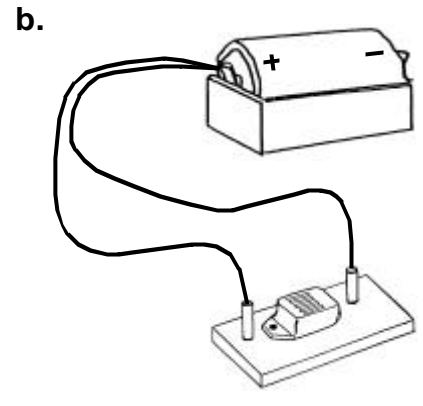
(f) If you have said 'Yes', please draw the wire on to the diagram.

The buzzer in the first circuit is on. For each of the other circuits, tick one box (✓) to show if the buzzer is on or off.



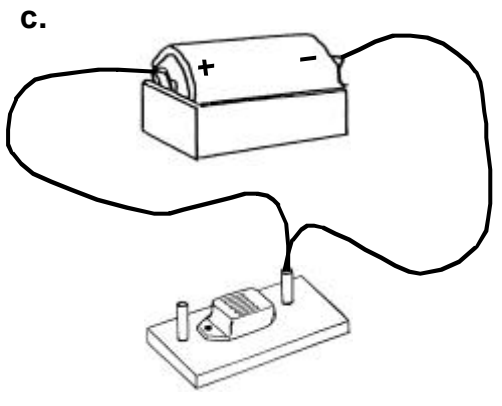
on      off



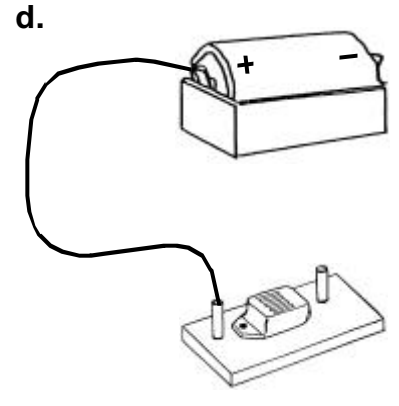
on      off



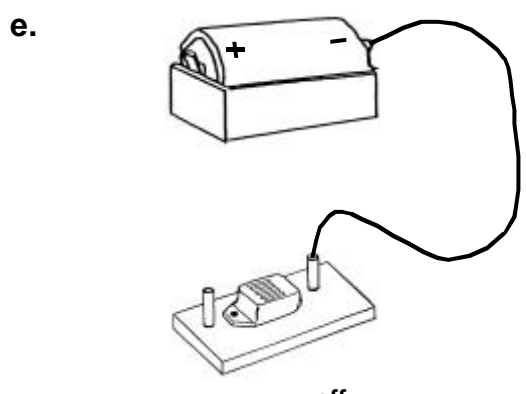
on      off



on      off

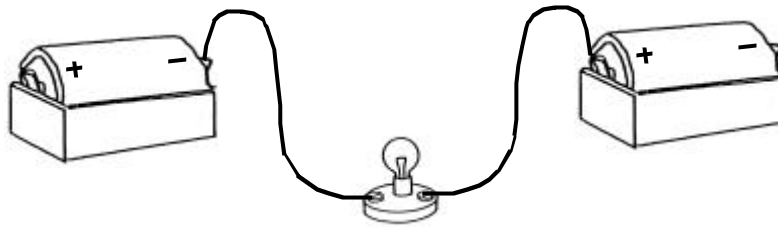
    




on      off

4

Look at the circuit below. tick one box (✓) to show if the bulb is lit or not.



	<b>lit</b>	<b>not lit</b>
	<input type="checkbox"/>	<input type="checkbox"/>

Explain your answer:

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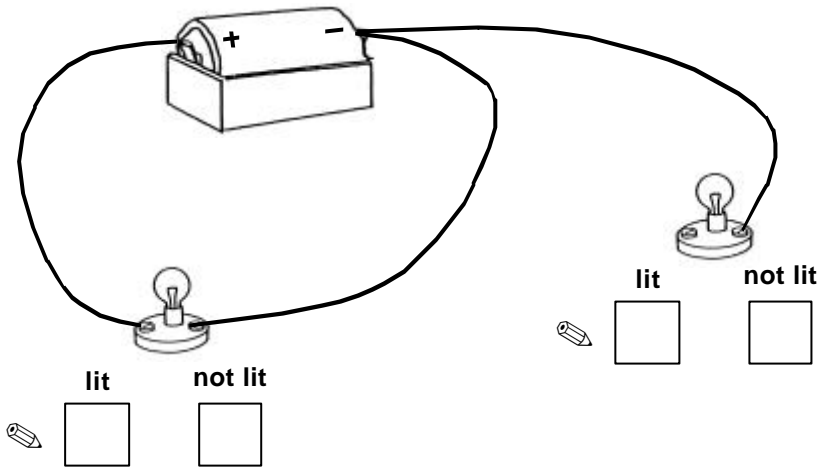
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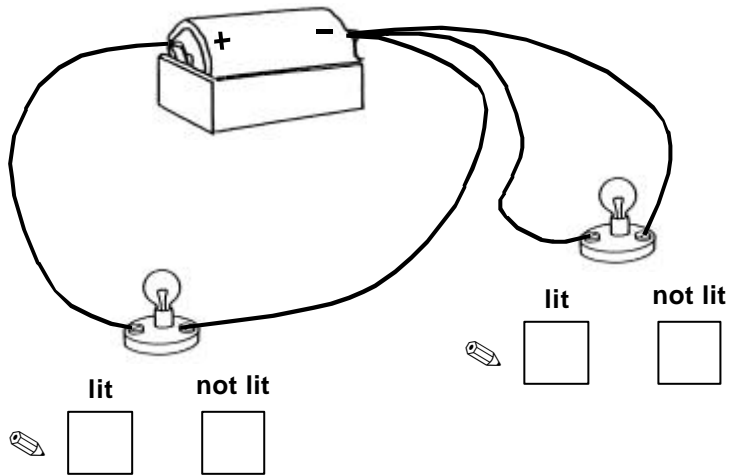
5

Look at each of the circuits below. For each bulb, tick one box to show if the bulb is lit or not.

a.

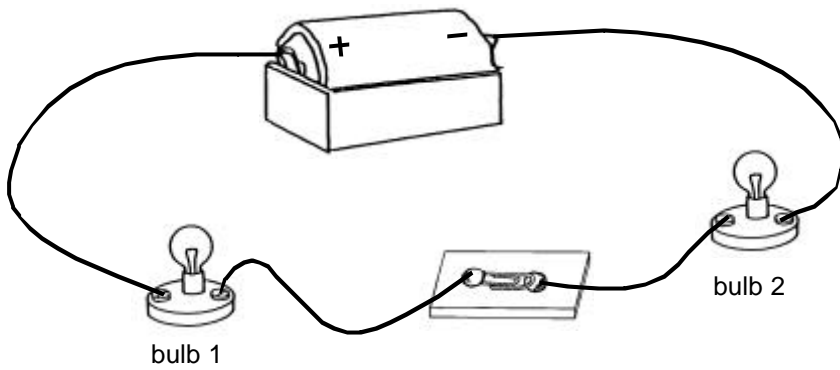


b.

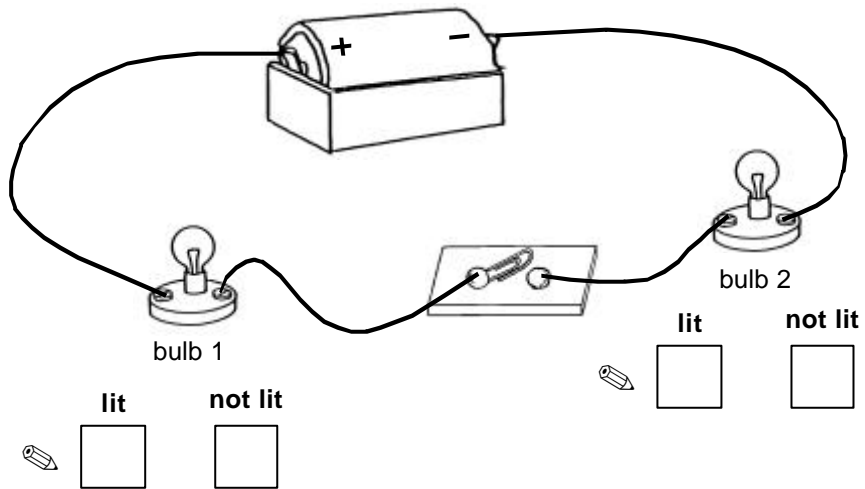


6

In this circuit both bulbs are lit.



The switch is now opened.  
For each bulb, tick one box (✓) to show if it is lit or not.



Explain your answer: \_\_\_\_\_

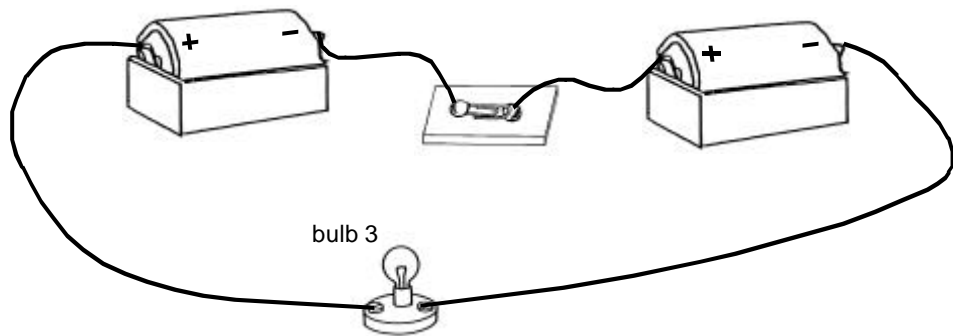
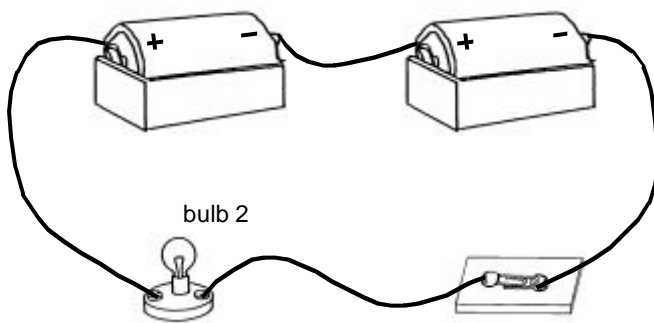
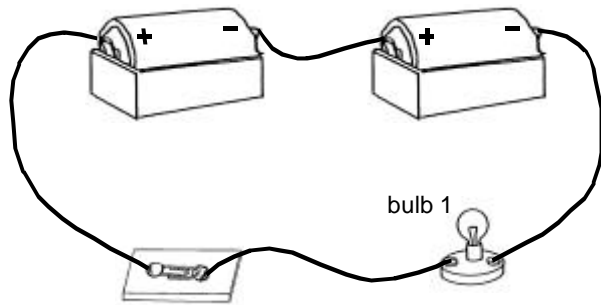
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7

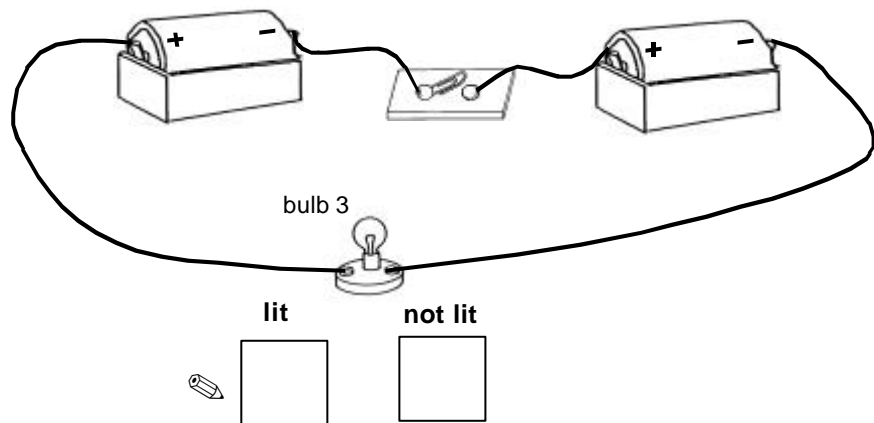
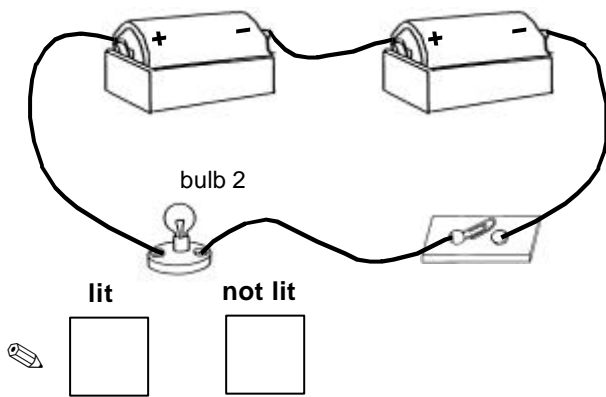
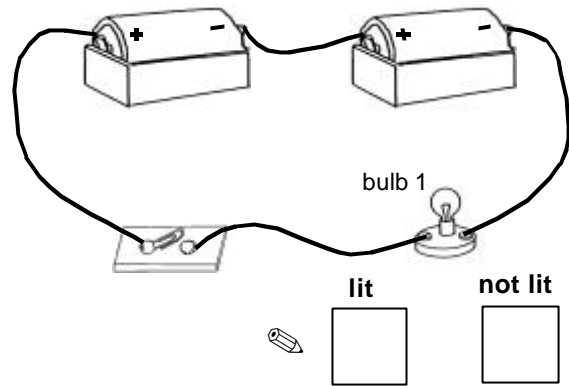
In these three circuits, the switches are closed and all the bulbs are lit.



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All the switches are now opened. For each bulb, tick one box (✓) to show if it is lit or not.



Explain your answer: \_\_\_\_\_

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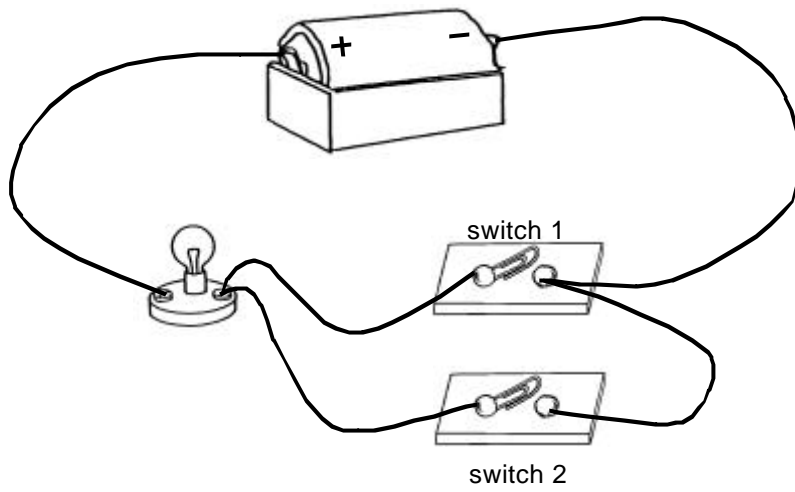
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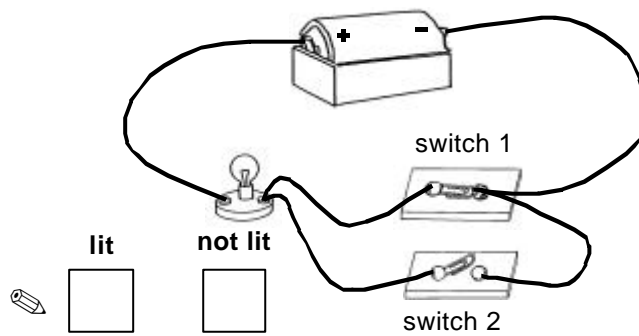
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8

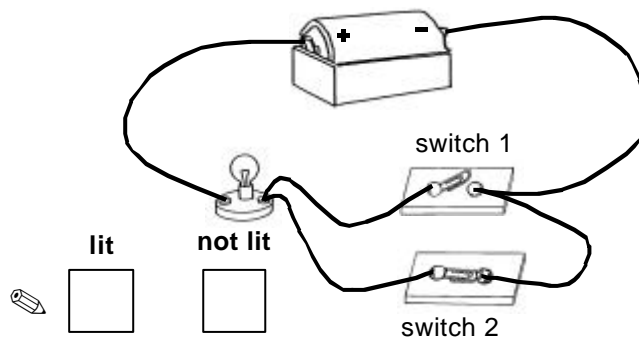
In this circuit the switches are both open. The bulb is not lit.



- (a) Switch 1 is now closed.  
Tick one box (✓) to show if the bulb is lit or not.





- (b) Switch 1 is opened again, and switch 2 is closed.  
Tick one box (✓) to show if the bulb is lit or not now.

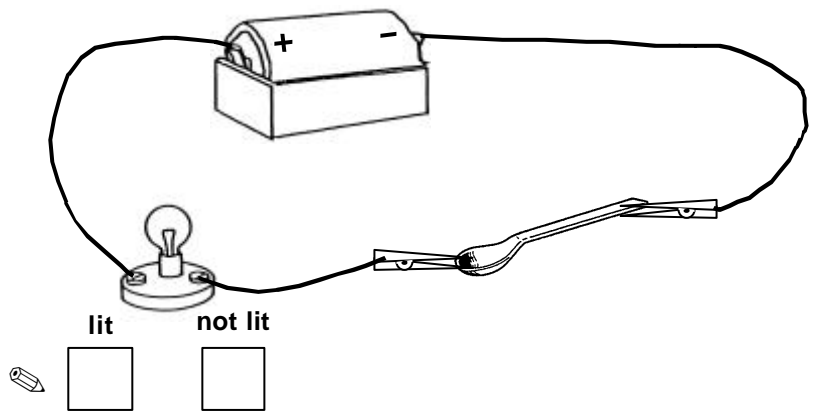
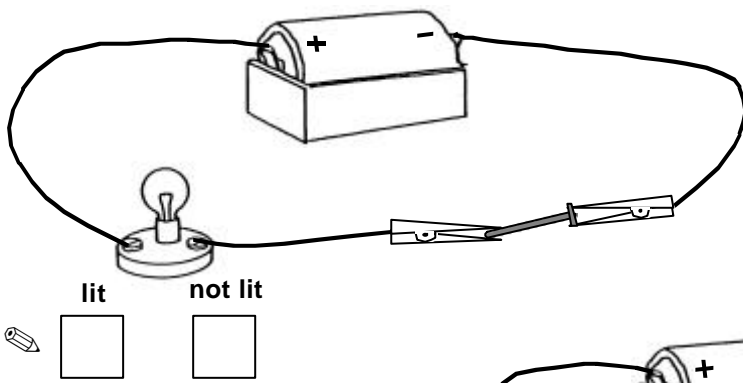
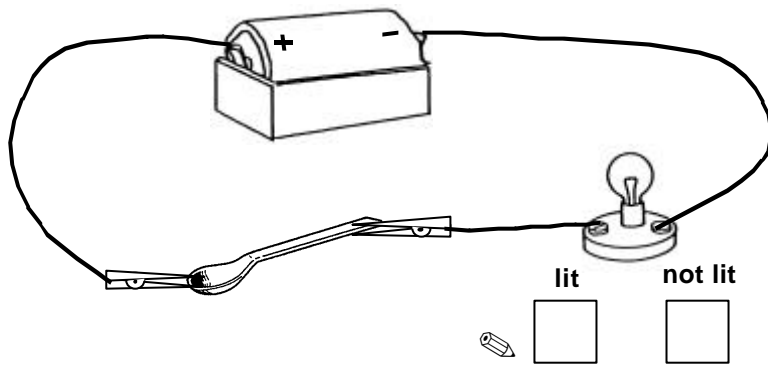


A pupil is doing some experiments with **conductors** and **insulators**.

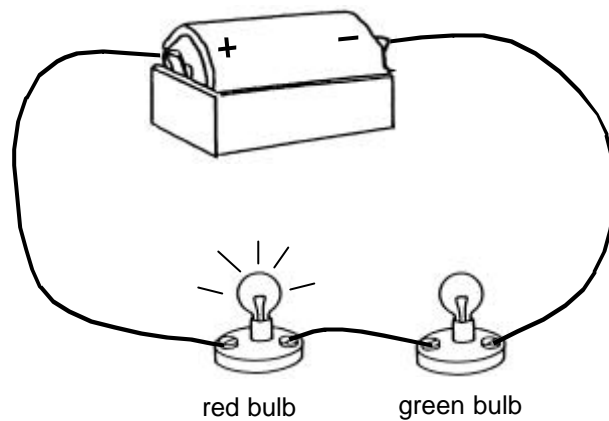
He has two objects:

	a plastic spoon – an <b>insulator</b>
	an iron nail – a <b>conductor</b>

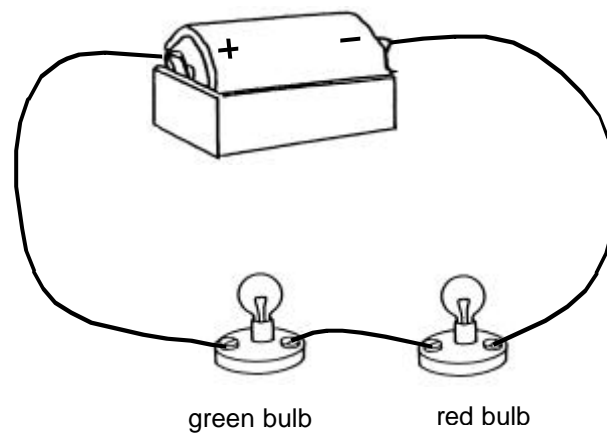
He uses these to make some circuits with a battery and a bulb. For each circuit, tick one box (✓) to show if you think the bulb is lit or not lit.



In this circuit, the red bulb is **bright** and the green bulb is **dim**.



Peter decides to swap the two bulbs over, like this:



How bright will the bulbs be now?

Tick *ONE* box (✓):

- Same as before. The red bulb is bright. The green bulb is dim.
- They change over. The red bulb is now dim. The green bulb is bright.
- Both bulbs are now bright.
- Both bulbs are now dim.

Explain your answer: \_\_\_\_\_

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