

Subject: Science

Level: Standard 4

Strand: Form and Function

Properties of Materials: Conduction of electricity

1

Key Points

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- There are many different types of materials.
- Some examples of everyday materials are plastics, wood, glass and metals.
- Each material has properties or features that can be observed or measured.

Key Points

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- Some of the properties of an uncoated metal wire are:
 - hard
 - shiny
 - bendable
 - able to conduct heat
 - able to conduct electricity
- A material which allows electricity to flow through it, is a good conductor of electricity.
- Insulators are poor conductors of electricity.

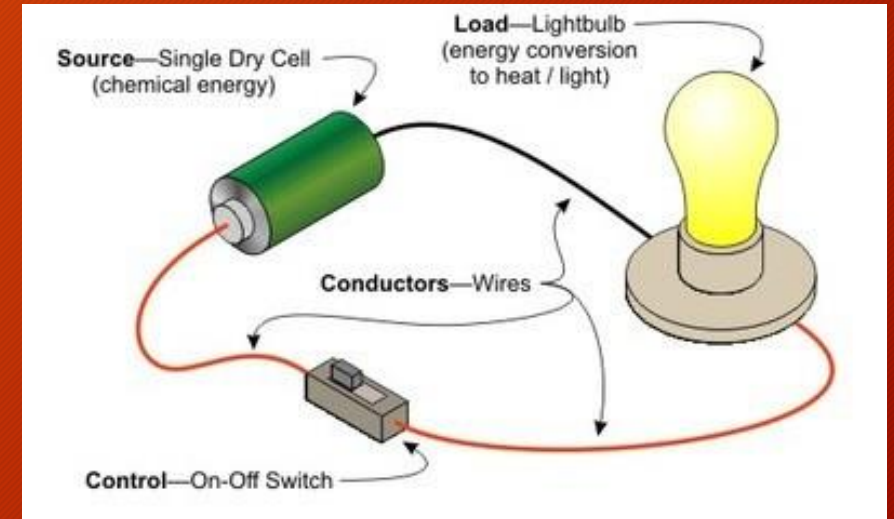


Key Points

4

- An circuit is a closed path for electricity to flow from a source to a load

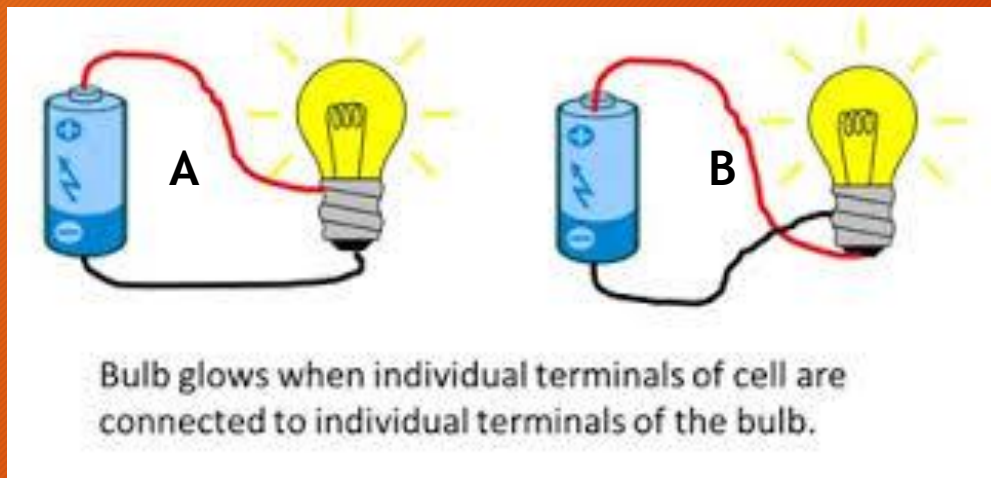
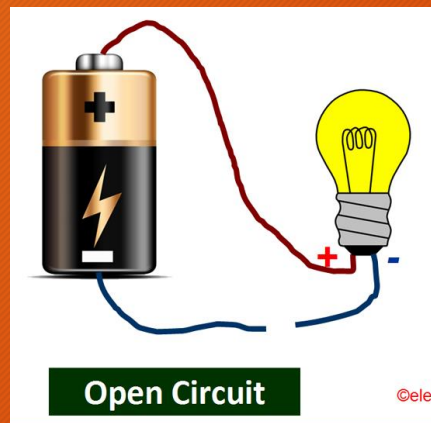
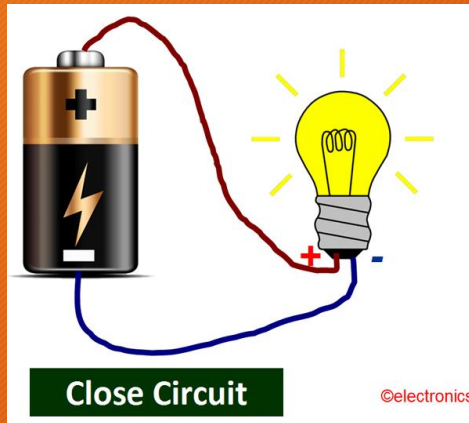
- A circuit has
 - a cell (source of energy),
 - a load (device that works with electricity: bulb)
 - and connecting wires



- Sometimes a switch may be added to allow for completing or breaking the circuit

Activity #1: Simple Circuit tester

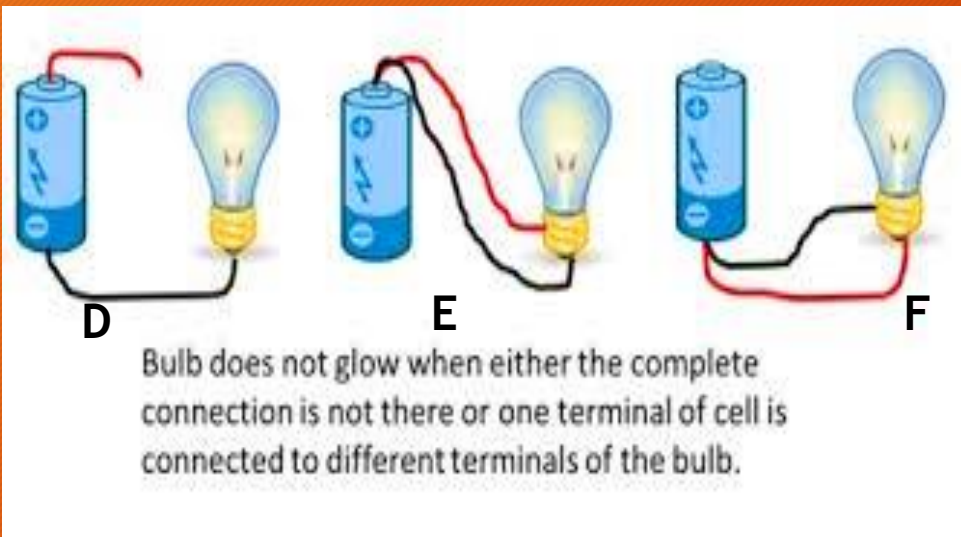
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1. A simple circuit tester can be made using: a cell, a bulb and copper wire
2. One end of the copper wire is attached to one pole of the cell (see black/blue line in picture)
3. The other end is attached to the base of the bulb.
4. Another piece of copper wire is attached to the next pole and the base of the bulb.
5. The bulb lights when the circuit is completed, drawings A and B

Activity #1: Simple Circuit tester

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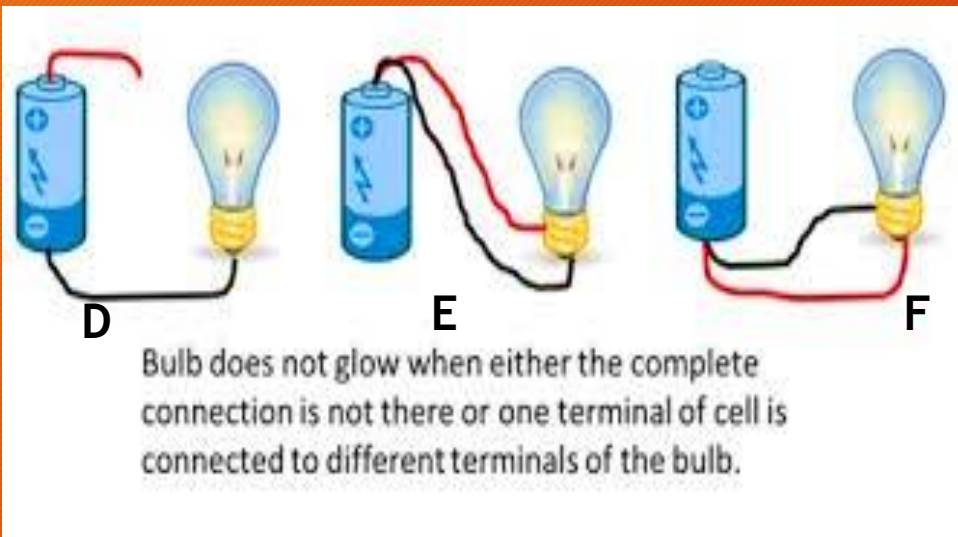


Bulbs D, E and F do not light. Complete the table to give the reason in each case

Bulb	Reason for not lighting
D	
E	Both wires are connected to positive pole of cell. No complete path for electricity to flow
F	

ANSWER: Activity #1: Simple Circuit tester

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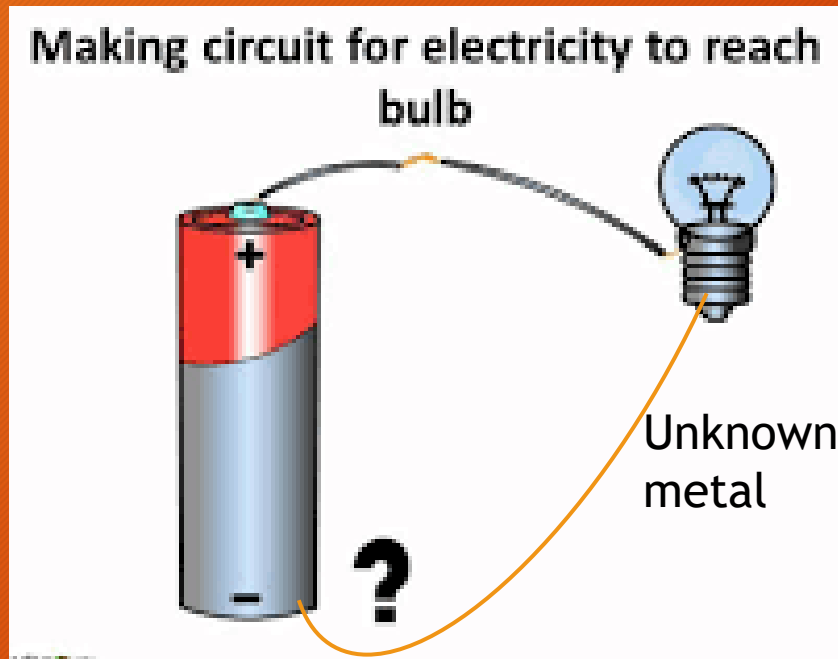
Bulbs D, E and F do not light. Complete the table to give the reason in each case

Bulb	Reason for not lighting
D	One wire from the cell is not connected to the bulb. The circuit is open so electricity will flow
E	Both wires are connected to positive pole of cell. No complete path for electricity to flow
F	Both wires are connected to the negative pole of cell. No complete path for electricity to flow

Testing for electrical conductors and insulators

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- One piece of wire of the tester is replaced by other types of materials.
- Complete the tables to identify the insulators and conductors

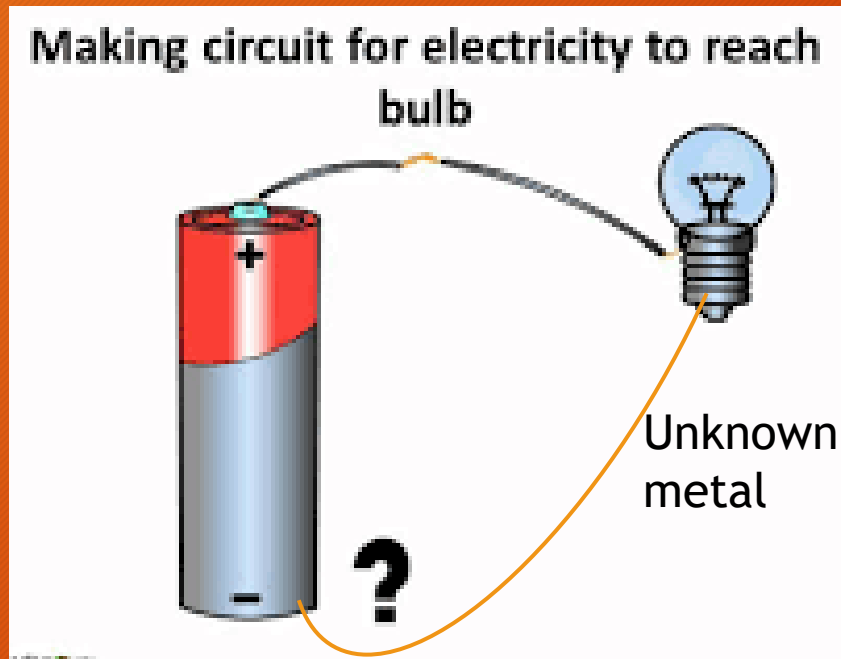


Material	Bulb lights (Yes/No)	Insulator or Conductor
Plastic coated wire		
Copper wire		
Lead		
Iron wire		
Aluminum wire		
Stainless steel wire		
Gold, silver		

Testing for electrical conductors and insulators

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- One piece of wire of the tester is replaced by other types of materials.
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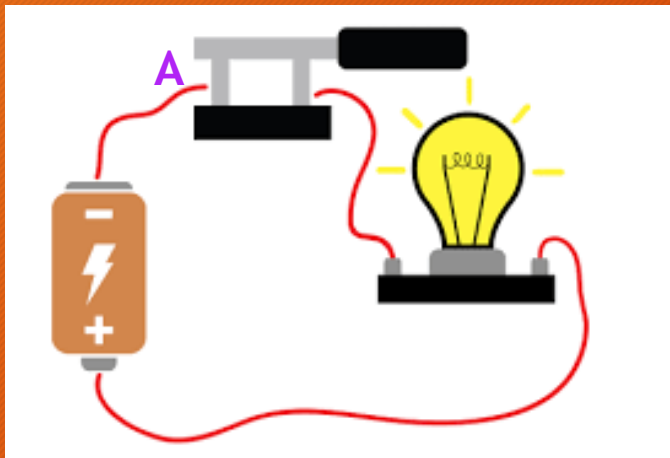


Material	Bulb lights (Yes/No)	Insulator or Conductor
Plastic coated wire	No	Insulator
Copper	Yes	Conductor
Lead	Little	Poor conductor
Iron	Yes	Conductor
Aluminum	Little	Poor conductor
Stainless steel	Little	Poor conductor
Gold, silver	Yes	Conductor

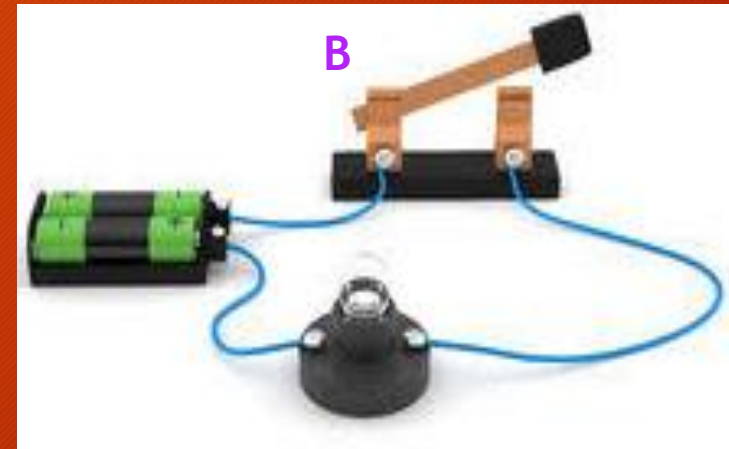
Activity #2: Using a switch to open and close a circuit

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A switch is added to a circuit to let electricity flow (bulb lights) or not



If the switch is closed as in “A” the bulb lights



If the switch is opened as in “B” the bulb will not light

Activity#2: Application of electrical conduction: Morse Code

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- Long ago smoke signals, lanterns and morse code were used to send messages over long distances.
- Electrical signals, like a flashing bulb, were used to represent the alphabet using MORSE CODE
- Short and long electrical signals were used to represent DOTS and DASHES

International Morse Code

1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

Activity#2: Morse Code project

12

A ● —
B — ● ● ●
C — ● — ●
D — ● ●
E ●
F ● ● — ●
G — — ●
H ● ● ● ●
I ● ●
J ● — — —
K — ● —
L ● — ● ●
M — —
N — ●
O — — —
P ● — — ●
Q — — ● —
R ● — ●
S ● ● ●
T —

U ● ● —
V ● ● ● —
W ● — —
X — ● ● —
Y — ● — —
Z — — ● ●

1 ● — — — —
2 ● ● — — —
3 ● ● ● — —
4 ● ● ● ● —
5 ● ● ● ● ●
6 — ● ● ● ●
7 — — ● ● ●
8 — — — ● ●
9 — — — — ●
0 — — — — —

Coding words into MORSE:

- Use the morse code for each letter of the alphabet.
- Record the code for each letter of the word in terms of dots and dashes.

Word	Morse Code
SOS	three dots, three dashes, and three dots
Hi	
Your Initials	

Activity#2: Morse Code project

13

A • —
B — • • •
C — • — •
D — • •
E •
F • • — •
G — — •
H • • • •
I • •
J • — — —
K — • —
L • — • •
M — —
N — •
O — — —
P • — — •
Q — — • —
R • — •
S • • •
T —

U • • —
V • • • —
W • — —
X — • • —
Y — • — —
Z — — • •

1 • — — — —
2 • • — — —
3 • • • — —
4 • • • • —
5 • • • • •
6 — • • • •
7 — — • • •
8 — — — • •
9 — — — — •
0 — — — — —

Word	Morse Code
SOS	three dots, three dashes, and three dots
Hi	4 dots, 2 dots
Your Initials	

Assessment:

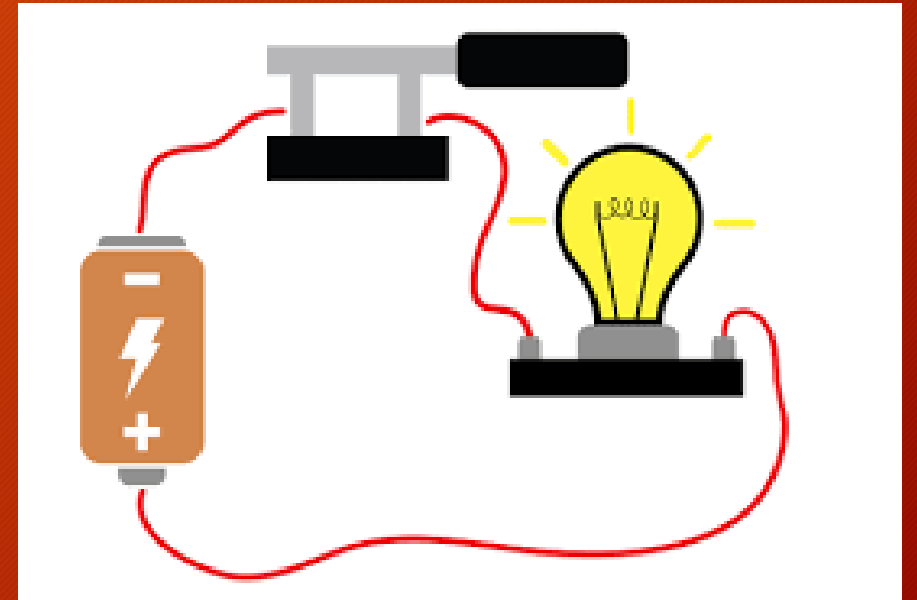
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1. What TWO changes can be made to the circuit in the picture to make morse coding easier:

a) _____

b) _____

2. Why are the connecting wires coated in plastic?

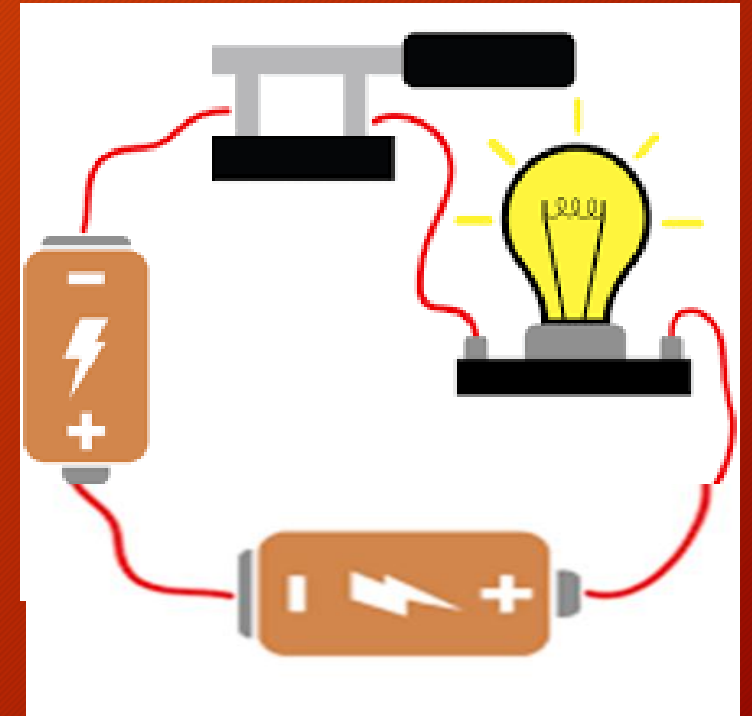


Assessment:

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Q #1. Any two changes:

- more cells so bulbs light brightly and signal is easily seen
- use connecting wires that are a good conductor so bulb receives more energy and shines brightly
- use spring switch to make tapping out the code easier

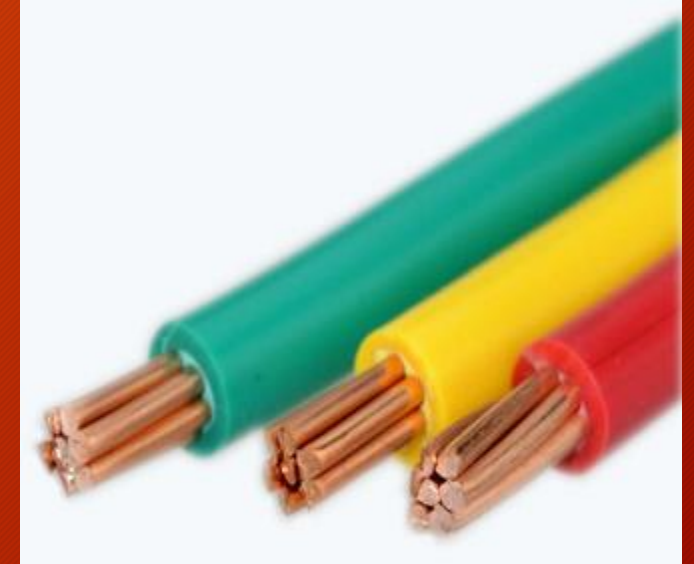


Assessment:

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Question #2

- The plastic coating is an insulator and does not allow electricity to flow
- The coating prevents leakage of electrical energy if wires touch each other
- Also it prevents shock if the wires are held



References

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