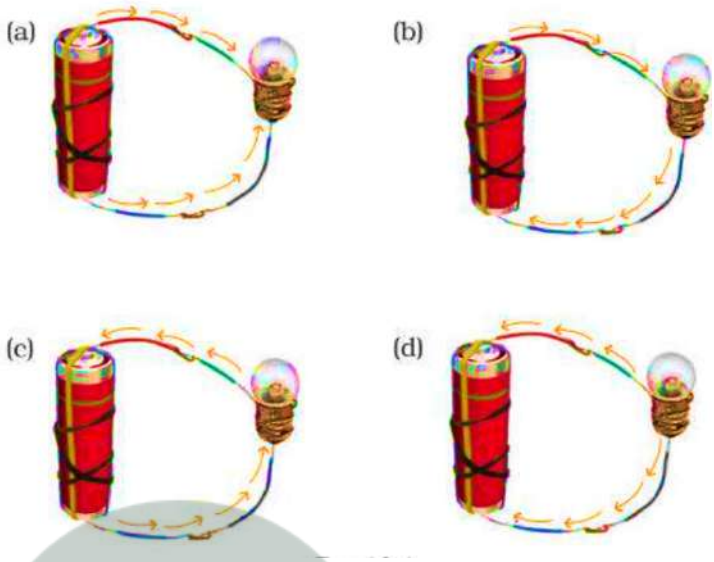
Class 6 Science Chapter 12 - Electricity and Circuits
Complete Solutions

Multiple Choice Questions

1. Choose from the options a, b, c and d given in the figure which shows the correct direction of current.



Solution: (b)

Explanation: In an electric circuit, conventional current flows from the positive terminal to the negative terminal of the electric cell through the external circuit. This is the standard convention used in electrical studies, even though electrons actually move in the opposite direction.

2. Choose the incorrect statement.

(a) A switch is the source of electric current in a circuit. (b) A switch helps to complete or break the circuit. (c) A switch helps us to use electricity as per our requirement. (d) When the switch is open there is an air gap between its terminals.

Solution: (a)

Explanation: A switch is NOT the source of electric current in a circuit. An electric cell or battery is the actual source of electric current. A switch merely controls the flow of current by completing or breaking the circuit path.

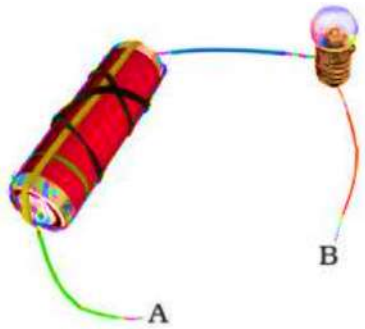
3. In an electric bulb, light is produced due to the glowing of

(a) the glass case of the bulb (b) the thin filament (c) the thick wires supporting the filament (d) gases inside glass case of the bulb

Solution: (b)

Explanation: Light is produced due to the glowing of the thin filament inside the bulb. When electric current passes through the thin filament, it heats up due to resistance and glows, producing light. The filament is usually made of tungsten wire.

4. In the arrangement shown in the figure, the bulb will not glow if the ends A and B are connected with



(a) A steel spoon
(b) A metal clip
(c) A plastic clip
(d) A copper wire
Solution: (c)
Explanation: A plastic clip is an insulator and does not allow electric current to pass through it. Steel spoon, metal clip, and copper wire are all good conductors of electricity and would complete the circuit, allowing the bulb to glow.

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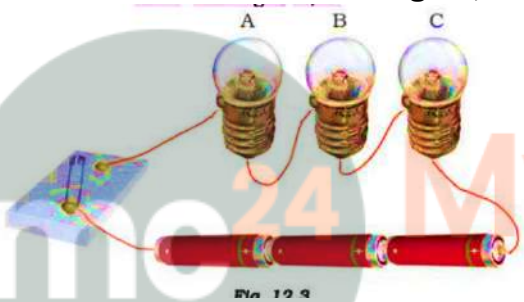
5. In the circuit shown in the figure, when the switch is moved to 'ON' position,



(a) the bulb A will glow first
(b) the bulb B will glow first
(c) the bulb C will glow first
(d) all bulbs will glow together
Solution: (d)
Explanation: All bulbs will glow together simultaneously. When the circuit is completed, electric current reaches all points in the circuit almost instantaneously (at the speed of light), so all bulbs connected in the circuit will glow at the same time.

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6. Filament of a torch bulb is
(a) a metal case (b) metal tip at the centre of the base (c) two thick wires (d) a thin wire
Solution: (d)
Explanation: The filament of a torch bulb is a thin wire, usually made of tungsten. This thin wire has high resistance, which causes it to heat up and glow when electric current passes through it, producing light.

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7. Paheli is running short of connecting wires. To complete an electric circuit, she may use a
(a) glass bangle (b) thick thread (c) rubber pipe (d) steel spoon
Solution: (d)

Explanation: A steel spoon is made of metal and is a good conductor of electricity. It can effectively replace connecting wires to complete an electric circuit. Glass, thread, and rubber are all insulators and cannot conduct electricity.

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8. In which of the following circuits A, B and C, will the cell be used up very rapidly?

Solution: Circuit A
Explanation: In circuit A, the cell is connected directly without any load (like a bulb) to limit the current. This creates a short circuit, causing a very large current to flow, which will drain the cell very quickly and may also damage it.

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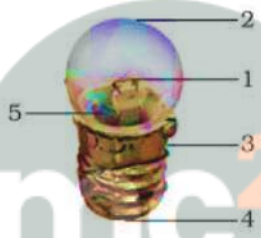
9. The figure shows a bulb with its different parts marked as 1, 2, 3, 4 and 5. Which of them label the terminals of the bulb?



Solution: Labels 3 and 4
Explanation: The terminals of a bulb are the contact points through which electric current enters and exits the bulb. These are typically located at the base of the bulb - one at the bottom center and one on the threaded metal side.

Short Answer Questions
10. You are provided with a bulb, a cell, a switch and some connecting wires. Draw a diagram to show the connections between them to make the bulb glow.

Solution:
To make the bulb glow, connect the components in the following sequence:

- Connect one terminal of the cell to one terminal of the switch using a connecting wire
- Connect the other terminal of the switch to one terminal of the bulb using another connecting wire

- Connect the second terminal of the bulb directly to the other terminal of the cell using a third connecting wire
- When the switch is closed, the circuit becomes complete and the bulb will glow

The circuit should form a complete loop: Cell → Switch → Bulb → back to Cell.

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11. Will the bulb glow in the circuit shown in the figure? Explain.

Solution:

No, the bulb will not glow in this circuit because the switch is in the open position. When a switch is open, there is an air gap between its terminals, which breaks the circuit. Electric current can only flow in a complete, closed circuit. Since the circuit is incomplete due to the open switch, no current will flow and the bulb will not glow.

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12. An electric bulb is connected to a cell through a switch. When the switch is brought to 'ON' position, the bulb does not glow. What could be the possible reasons for it? Mention any two of them.

Solution:

Possible reasons why the bulb does not glow even when the switch is ON:

1. **Loose connections:** The wires may not be properly connected to the terminals, preventing current flow.
2. **Broken connecting wires:** One or more of the connecting wires may be damaged internally, breaking the circuit.
3. **Dead/used up cell:** The cell may have exhausted its chemical energy and can no longer provide electric current.
4. **Fused bulb:** The filament inside the bulb may be broken, preventing current from flowing through it.

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13. A torch requires 3 cells. Show the arrangement of the cells inside the torch so that the bulb glows.

Solution:

The three cells should be arranged in **series** inside the torch:

- The positive terminal of the first cell should be connected to the negative terminal of the second cell
- The positive terminal of the second cell should be connected to the negative terminal of the third cell
- The remaining free terminals (negative of first cell and positive of third cell) are connected to the circuit

This arrangement: Cell1(-) → Cell1(+) | Cell2(-) → Cell2(+) | Cell3(-) → Cell3(+)
This series arrangement adds up the voltage of all three cells, providing sufficient power to make the torch bulb glow brightly.

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14. When the chemicals in the electric cell are used up, the electric cell stops producing electricity. In case of rechargeable batteries, they are used again and again. How?
Solution:
Rechargeable batteries can be used repeatedly because:

1. **Reversible chemical reactions:** The chemical reactions in rechargeable batteries are reversible, unlike in primary cells.
2. **Recharging process:** When connected to an external power source (charger), electric current is passed through the battery in the opposite direction.
3. **Chemical restoration:** This reverse current restores the original chemical composition of the battery, regenerating its ability to produce electricity.
4. **Multiple cycles:** This process can be repeated many times, allowing the same battery to be used for hundreds or thousands of charge-discharge cycles.

Examples include lithium-ion batteries in phones, lead-acid batteries in cars, and nickel-metal hydride batteries in various devices.

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15. Paheli connected two bulbs to a cell. She found that filament of bulb B is broken. Will the bulb A glow in this circuit? Give reason.

Solution:
No, bulb A will not glow in this circuit.
Reason: When the filament of bulb B is broken, it creates a break in the circuit path. Since the bulbs appear to be connected in series (one after the other), the current must pass through both bulbs to complete the circuit. With bulb B's filament broken, no current can flow through the entire circuit, preventing bulb A from glowing as well.
In a series circuit, if any component fails, the entire circuit stops working.

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16. Why do bulbs have two terminals?

Solution:
Bulbs have two terminals because:

1. **Complete circuit requirement:** Electric current needs a complete path to flow. It must enter the bulb through one terminal and exit through the other.
2. **Filament connection:** The two terminals are connected to the ends of the thin filament wire inside the bulb.
3. **Current flow:** Current enters through one terminal, passes through the filament (causing it to glow), and exits through the other terminal.
4. **Circuit integration:** The two terminals allow the bulb to be properly connected in a circuit, maintaining the continuous path for electric current.

Without two terminals, it would be impossible to create a complete circuit through the bulb.

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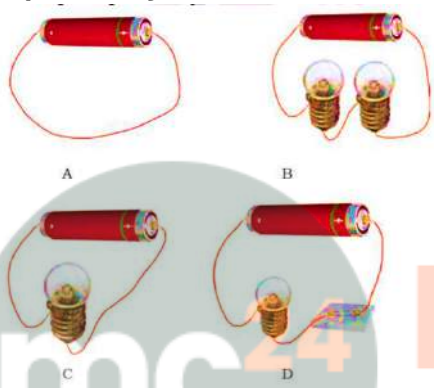
17. Which of the following arrangements A, B, C and D should not be set up? Explain why?



Solution:
Arrangement A should not be set up.
Explanation: In arrangement A, the cell is connected directly without any load (resistor or bulb) to limit the current. This creates a **short circuit** where:

1. Very large current flows through the circuit
2. The cell gets drained very quickly
3. The cell may get damaged due to excessive current
4. Heat is generated, which can be dangerous
5. The cell's lifespan is drastically reduced

Always include a proper load (like a bulb) in the circuit to limit the current flow and prevent short circuits.

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18. A fused bulb does not glow. Why?
Solution:
A fused bulb does not glow because:

1. **Broken filament:** The thin wire (filament) inside the bulb has broken or burned out.
2. **Incomplete circuit:** Since the filament is broken, there is no continuous path for electric current to flow through the bulb.
3. **No current flow:** Without a complete path, electric current cannot pass through the bulb.

4. **No heating effect:** Since no current flows through the filament, it cannot heat up and glow.

The break in the filament essentially creates an open circuit within the bulb, preventing it from functioning.

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19. Paheli wanted to glow a torch bulb using a cell. She could not get connecting wires, instead, she got two strips of aluminium foil. Will she succeed? Explain how?

Solution:

Yes, Paheli will succeed in making the torch bulb glow using aluminium foil strips.

Explanation:

1. **Good conductor:** Aluminium is an excellent conductor of electricity, almost as good as copper wire.
2. **Substitute for wires:** The aluminium foil strips can effectively replace connecting wires in the circuit.
3. **Connection method:** She can:
    - Connect one foil strip from the positive terminal of the cell to one terminal of the bulb
    - Connect another foil strip from the negative terminal of the cell to the other terminal of the bulb
    - Ensure good contact at all connection points
4. **Complete circuit:** This creates a complete circuit: Cell → Aluminium foil → Bulb → Aluminium foil → Cell

The bulb will glow just as it would with regular copper connecting wires.

Long Answer Questions

20. Boojho has a cell and a single piece of connecting wire. Without cutting the wire in two, will he be able to make the bulb glow? Explain with the help of a circuit diagram.

Solution:

Yes, Boojho can make the bulb glow using a single connecting wire without cutting it.

Method:

1. **Direct contact method:** Connect one terminal of the bulb directly to one terminal of the cell (without using wire).
2. **Wire connection:** Use the single connecting wire to connect the other terminal of the bulb to the remaining terminal of the cell.

3. **Complete circuit:** This creates a complete circuit path: Cell terminal → Direct contact → Bulb terminal → Connecting wire → Other bulb terminal → Other cell terminal

Circuit Description:

- One terminal of bulb touches one terminal of cell directly
- The connecting wire completes the circuit by joining the remaining terminals
- Current flows: Cell → Direct contact → Bulb → Wire → Cell

This method works because electricity needs a complete conducting path, which can be achieved through direct metal-to-metal contact as well as through wires.

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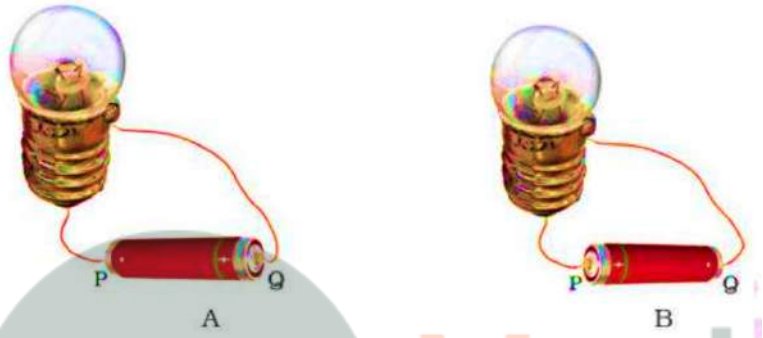
21. The figure shows a bulb connected to a cell in two different ways.
(i) What will be the direction of the current through the bulb in both the cases (Q to P or P to Q)?



Solution:

- **Case A (Q to P):** Current flows from the positive terminal to the negative terminal of the cell through the external circuit (bulb).
- **Case B (P to Q):** Current flows from the positive terminal to the negative terminal of the cell through the external circuit (bulb).

Note: The direction depends on which terminal of the cell is positive in each case.

(ii) Will the bulb glow in both the cases?

Solution: Yes, the bulb will glow in both cases as long as there is a complete circuit and current flows through the filament.

(iii) Does the brightness of the glowing bulb depend on the direction of current through it?

Solution: No, the brightness of the bulb does not depend on the direction of current flow. The brightness depends on:

- The amount of current flowing through the filament
- The voltage of the cell
- The resistance of the filament

The direction of current does not affect how much heat is generated in the filament, so the brightness remains the same regardless of current direction.

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22. Think of six activities which use electric current. Also name the devices used to perform the activity.
Solution:

Activity	Device Used
Getting light	Torch, Electric bulb, LED lamp
Making toast	Toaster, Electric grill
Heating water	Electric geyser, Kettle, Immersion heater
Listening to music	Radio, CD player, MP3 player, Speakers
Watching movies	Television, Laptop, Projector, Tablet
Cooking food	Microwave oven, Electric stove, Induction cooker

Additional examples:

- **Cooling:** Electric fan, Air conditioner, Refrigerator
- **Communication:** Mobile phone, Computer, Telephone
- **Transportation:** Electric car, Electric train, Electric scooter
- **Cleaning:** Vacuum cleaner, Washing machine

All these devices convert electrical energy into other forms of energy (light, heat, sound, motion) to perform useful work.

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23. A torch is not functioning, though contact points in the torch are in working condition. What can be the possible reasons for this? Mention any three.

Solution:

Possible reasons why a torch is not functioning despite good contact points:

1. **Faulty switch:** The switch mechanism may be damaged internally, preventing it from completing the circuit even when pressed.
2. **Incorrect cell placement:** The cells may not be inserted in the correct orientation. If positive and negative terminals are not aligned properly, the circuit won't be complete.
3. **Exhausted cells:** The cells may have been completely used up and no longer have enough chemical energy to produce electric current.
4. **Fused bulb:** The filament inside the torch bulb may be broken, preventing current from flowing through it.
5. **Loose internal connections:** Wires inside the torch may have become loose or disconnected from the switch or bulb holder.
6. **Damaged bulb holder:** The metal contacts in the bulb holder may be corroded or damaged, preventing proper connection with the bulb.

Troubleshooting tips:

- Try replacing the cells with new ones
- Check if the bulb glows when tested in another working torch
- Ensure cells are inserted in correct orientation
- Clean the metal contacts if they appear corroded