TestGenie

AI-Powered Question Paper Generator

Science — Class 7

Chapter(s): Electricity: Circuits and their Components

Maximum Marks: 39 **Time Allowed: 1 Hour 10 Minutes**

Section A — MCQ & Assertion-Reason (1 mark each)

Q1. A student connects a torch bulb to a single cell using two wires. The bulb still does not glow. On checking, the filament is found intact and wires are conducting. Which situation MOST likely explains the non-glowing bulb? [1 mark]

A) The two wires are connected to the same terminal of the cell.

B) The bulb terminals are interchanged at the cell terminals.

C) The bulb is connected in a closed circuit so it should glow.

D) The current direction taken is from negative to positive so bulb will not glow.

Q2. A student uses an LED (long lead = positive) with two cells in series. The LED does not glow. Which connection will definitely make the LED glow (assuming the LED is not damaged)? [1 mark]

A) Long lead of LED to negative terminal of battery and short lead to positive terminal of battery

B) Long lead of LED to positive terminal of battery and short lead to negative terminal of battery

C) Both leads of LED to positive terminal of battery using two wires

D) Any connection works for an LED as long as the circuit is closed

Q3. A battery is made by connecting 4 identical 1.5 V cells in series (positive of one to negative of next). What is the total potential difference provided by the battery? [1 mark]

A) 6.0 V

B) 3.0 V

C) 1.5 V

D) 0 V

Q4. A switch is inserted in the circuit between the cell and the lamp. When the switch is moved from OFF to ON, the lamp glows. Which statement best describes what changed in the circuit? [1 mark]

A) The switch increased the cell's voltage.

B) The switch completed the conducting path, changing an open circuit into a closed circuit.

C) The switch changed the direction of current inside the cell.

D) The switch supplied extra electrical energy like an additional cell.

Q5. A student wants a device to run for a longer time without changing cells, but does NOT want to increase the voltage. Which cell arrangement best matches this requirement (within Class 7 understanding)? [1 mark]

A) Use more cells in series to increase voltage

B) Use only one cell to keep voltage fixed

C) Use two or more cells but connect positive-to-positive and negative-to-negative (parallel)

D) Reverse the terminals of one cell in a series battery

Q6. Assertion (A): An LED may not glow even when connected in a closed circuit.
Reason (R): An LED allows current to pass through it only when it is connected with correct polarity. [1 mark]

A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

Q7. Assertion (A): A torch lamp glows only when there is a complete path from one terminal of the cell to the other terminal through the lamp.
Reason (R): Electric current can flow only in a closed circuit, not in an open circuit. [1 mark]

A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

Q8. Assertion (A): Connecting the positive terminal of one cell to the negative terminal of the next cell forms a battery with higher voltage than a single cell.
Reason (R): In such a series connection of identical cells, the voltages of the cells add up. [1 mark]

A) Both A and R are true and R is the correct explanation of A.

B) Both A and R are true but R is not the correct explanation of A.

C) A is true but R is false.

D) A is false but R is true.

Q9. Assertion (A): An incandescent bulb can glow even if its two terminals are interchanged at the cell terminals.
Reason (R): The filament in an incandescent bulb glows due to heating effect of current, which does not depend on current direction. [1 mark]

A) Both A and R are true and R is the correct explanation of A.
B) Both A and R are true but R is not the correct explanation of A.
C) A is true but R is false.
D) A is false but R is true.

Q10. Assertion (A): A switch must always be placed only next to the cell in a circuit to work correctly.
Reason (R): A switch works by either completing the circuit (ON) or breaking the circuit (OFF). [1 mark]

A) Both A and R are true and R is the correct explanation of A.
B) Both A and R are true but R is not the correct explanation of A.
C) A is true but R is false.
D) A is false but R is true.

Section B — Very Short Answer (2 marks each)

Q11. A student has two identical 1.5 V cells.
(i) Calculate the total potential difference when they are connected in series.
(ii) State one verification step by describing how the terminals are connected in series.
Answer in exactly 2 sentences. [2 marks]

Q12. An LED has a longer lead and a shorter lead.
State which lead should be connected to the positive terminal of the cell and give one principle-based reason.
Answer in exactly 2 sentences. [2 marks]

Q13. In a simple circuit with a cell, a switch and a lamp, the lamp does not glow when the switch is OFF.
Write two sentences: one stating the type of circuit (open/closed) and the second citing the principle that explains the observation.
Answer in exactly 2 sentences. [2 marks]

Section C — Short Answer (3 marks each)

Q14. Experimental reasoning: A student makes a circuit with a cell, an LED, and a switch. The LED does not glow.
Write exactly 3 numbered points:
1) Identify one likely connection mistake.

2) State one test the student can do without changing components.

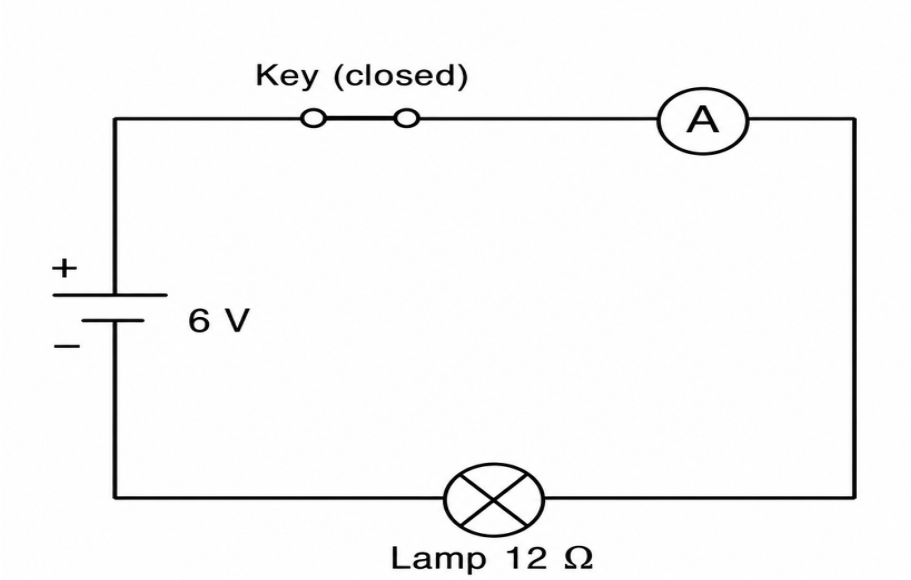
3) State the corrected connection with proper polarity (use words: longer lead/shorter lead). [3 marks]

Q15. A torch has two 1.5 V cells and a filament bulb.
Write exactly 3 numbered points to explain:
1) How the two cells should be arranged to form a battery in the torch.
2) What total potential difference is obtained.
3) One verification step using the + and - symbols in the battery compartment. [3 marks]

Q16. A circuit has a cell, a lamp and a switch. The lamp does not glow.
Write exactly 3 numbered points (each with a heading) that explain three different possible faults AND the specific check for each fault. [3 marks]

Section D — Long Answer (5 marks each)

Q17. The given figure shows a simple series circuit made using a battery, a key (switch), an incandescent lamp and an ammeter. Answer the following in one connected solution:
(a) When the key is closed, calculate the current shown by the ammeter.
(b) Calculate the voltage drop across the lamp.
(c) If the lamp is replaced by an LED, will it glow in this same circuit? Use the diagram to justify the correct connection needed for the LED.
(d) State one reason (in terms of circuit condition) why the lamp would not glow even if the cell is new. Write the answer using: one-sentence introduction + 5 numbered points with headings + one-sentence conclusion. [5 marks]



Q18. A group of students notices that some torches in the lab use two cells placed end-to-end, while one old device uses two cells placed side-by-side with both positive terminals facing the same direction. They want to decide which arrangement is better for making a lamp glow brightly and for longer duration. Using ideas of terminals (+/-), battery formation, closed/open circuit, and lamp/LED behaviour, answer:
(a) What is the correct way to combine two cells to form a battery for a torch, and why?
(b) Predict what happens if the two cells are wrongly placed with + connected to + in a torch compartment.
(c) Explain, with cause-effect reasoning, two different faults that can stop an incandescent torch bulb from glowing even if the cells are correctly placed.
(d) Explain why an LED torch may not glow even when the circuit is closed, and how to fix it. Write the answer in the required 5-mark format. [5 marks]

Section E — Case Study (4 marks each)

Q19. Read the following passage and answer the questions that follow: [4 marks]

In a school science club, students are making a low-cost "study lamp" usinga3Vbattery pack (two 1.5 V cells), a small switch, and either an incandescent bulb or a single LED. In Trial 1, they connect the two cells as a battery by placing them end-to-end so that the + terminal of one touches the - terminal of the other. The incandescent bulb glows.

In Trial 2, they keep the same wiring and replace the bulb with an LED. The LED does not glow, even though the switch is ON and all wires look connected.

In Trial 3, they reverse only the LED in its holder (swap its two leads), keeping the rest of the circuit the same. Now the LED glows.

A student notes: "So, a closed circuit was present in Trial 2 as well. The only difference was the direction of the LED." The teacher asks the group to explain the observations and to compute the current in Trial 1 if the bulb's resistance is 6 Ω (assume negligible wire resistance).

(i) What evidence from the trials shows that the cells were combined correctly as a battery in Trial 1? (1 mark)

(ii) Why did the LED not glow in Trial 2 even though the switch was ON? (1 mark)

(iii) Calculate the current in Trial 1 whena3Vbattery is connected to a 6 Ω bulb. Show steps and include SI unit. (2 marks)

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Science — Class 7

Chapter(s): Electricity: Circuits and their Components

Section A — MCQ & Assertion-Reason (1 mark each)

A1.

Answer:

Correct option: (A)

The two wires are connected to the same terminal of the cell.

Explanation:

For the bulb to glow, its two terminals must be connected to the two different terminals of the cell to make a complete path. If both wires touch the same cell terminal, the circuit is incomplete through the filament, so no current passes through it. Hence, option (A) is correct.

A2.

Answer:

Correct option: (B)

Long lead of LED to positive terminal of battery and short lead to negative terminal of battery

Explanation:

An LED allows current only in one direction and glows only when connected with correct polarity. Connecting the long lead (positive) to the battery's positive terminal and the short lead (negative) to the battery's negative terminal completes the circuit in the allowed direction. Hence, option (B) is correct.

A3.

Answer:

Correct option: (A)

6.0 V

Explanation:

In series combination, voltages add: total V = 1.5 V + 1.5 V + 1.5 V + 1.5 V = 6.0 V. Therefore the battery provides 6.0 V. Hence, option (A) is correct.

A4.

Answer:

Correct option: (B)

The switch completed the conducting path, changing an open circuit into a closed circuit.

Explanation:

In OFF position the circuit is open because there is a gap, so current cannot flow. In ON position the gap is removed, the circuit becomes closed, and current flows through the lamp making it glow. Hence, option (B) is correct.

A5.

Answer:

Correct option: (C)

Use two or more cells but connect positive-to-positive and negative-to-negative (parallel)

Explanation:

In a parallel combination of identical cells, the voltage remains the same as one cell, but the available energy for a longer duration increases because the cells share the supply. Series would increase voltage, and reversing a cell in series is incorrect. Hence, option (C) is correct.

A6.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

A is true because LEDs are directional devices and may not conduct in reverse connection even if the path is closed. R is true and explains A: if polarity is wrong, current cannot pass through the LED, so it will not glow.

A7.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

A is true because the lamp needs current to pass through it, which requires a complete path between the cell's terminals. R is true and directly explains A: current flows only when the circuit is closed; an open circuit stops current so the lamp cannot glow.

A8.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

A is true because this is the standard series way to make a battery from cells, increasing the overall potential difference. R is true and explains A: in series, the potential differences add, giving a higher voltage than one cell.

A9.

Answer:

Correct option: (A)

Both A and R are true and R is the correct explanation of A.

Explanation:

A is true: in an incandescent lamp, reversing connections still allows current through the filament. R is true and explains A because filament heating (and glow) depends on current magnitude, not the direction of current through the filament.

A10.

Answer:

Correct option: (D)

A is false but R is true.

Explanation:

A is false because a switch can be placed anywhere in the circuit and still control the current by opening or closing the path. R is true: the principle of a switch is to complete or break the circuit, independent of its position.

Section B — Very Short Answer (2 marks each)

A11.

Answer:

(i) Total potential difference = 1.5 V + 1.5 V = 3.0 V. (ii) In series connection, the positive (+) terminal of one cell is connected to the negative (-) terminal of the other cell, so the voltages add.

A12.

Answer:

The longer lead of the LED should be connected to the positive terminal of the cell, and

the shorter lead to the negative terminal. This works because an LED conducts current (and glows) only when connected in the correct direction (correct polarity).

A13.

Answer:

When the switch is OFF, the circuit is an open circuit because there is a gap in the conducting path. Electric current flows only in a closed circuit, so the lamp cannot glow in an open circuit.

The switch in OFF position breaks the path, preventing current from reaching and passing through the filament. Citing the closed-circuit principle is the verification step that links circuit state to lamp glow.

Section C — Short Answer (3 marks each)

A14.

Answer:

1) Likely mistake: The LED is connected with reversed polarity, so it blocks current even though the circuit may be closed. The longer lead might be connected to the negative terminal of the cell.

2) Test: Without changing any component, reverse only the LED connections (swap its two leads at the cell terminals) and then turn the switch ON. If it glows after swapping, the original issue was wrong polarity.

3) Correct connection: Connect the longer lead (positive) of the LED to the positive terminal of the cell and the shorter lead (negative) to the negative terminal, ensuring the switch is ON to complete the circuit.

A15.

Answer:

1) Arrangement (series): Place the cells so that the positive (+) terminal of one cell touches the negative (-) terminal of the next cell using the metal strip/spring contact. This end-to-end connection forms a battery for the torch circuit.

2) Total potential difference: Vtotal = 1.5 V + 1.5 V = 3.0 V, because in series the voltages add. This higher voltage helps the bulb glow properly.

3) Verification step: Match the printed '+' and '-' signs in the compartment with the metal cap (+) and metal disc (-) of each cell. If a + is printed at one end, the cell's metal cap must face that end, confirming correct polarity in the series chain.

A16.

Answer:

1) Switch/Open gap: The switch may be in OFF position or not making contact, leaving the

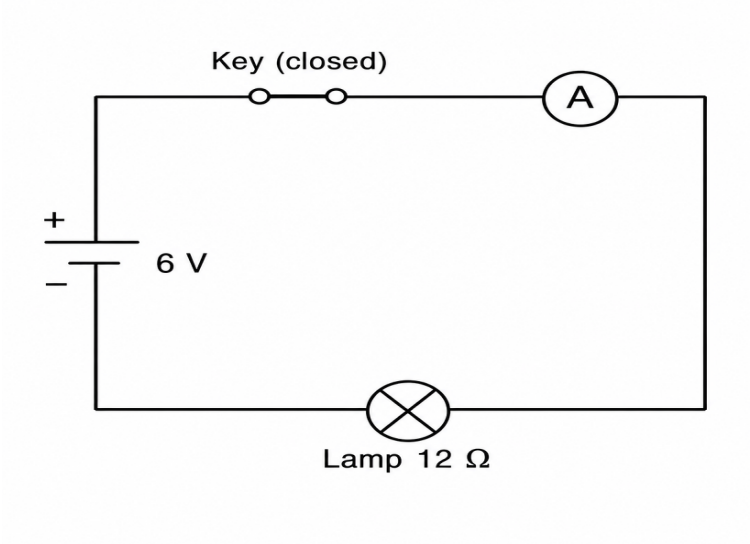
circuit open. Check by turning it ON and ensuring the contacts touch so the path is complete.

2) Broken filament: The filament inside the incandescent lamp may be broken, which breaks the circuit inside the bulb itself. Check by observing the filament (if visible) or replacing the lamp with a known working lamp.

3) Wrong/loose terminal connections: A wire may be connected to the same terminal of the cell twice, or a wire may be loosely attached so current cannot pass. Check by ensuring one lamp terminal goes to the positive terminal of the cell and the other lamp terminal goes to the negative terminal, with tight connections.

Section D — Long Answer (5 marks each)

A17.



Answer:

Electric current flows only when there is a closed conducting path from the positive terminal of the battery to the negative terminal through the components.

1)

Given: & Circuit Type: The circuit is a series circuit witha6Vbattery and one lamp of resistance 12 Ω, with an ideal ammeter in series and the key closed. In series circuits, the same current flows through every component.

2) Current through the circuit (numerical):

Given: V = 6 V, R = 12 Ω.

Formula: I = [V] / [R].

Substitution: I = 6/12 A = 0.5 A, so the ammeter reads 0.5 A.

3) Voltage drop across the lamp (numerical): In this circuit, the lamp is the only

significant resistor, so the entire battery voltage appears across it when the key is closed. Therefore, Vlamp = 6 V (SI unit: volt, V).

4) Replacing lamp with LED (polarity reasoning): An LED allows current only in one direction, so it glows only when connected with correct polarity. The LED's longer lead (positive) must be connected to the + terminal of the 6 V battery and the shorter lead (negative) to the - terminal; if reversed, it will not glow.

5) One cause for 'no glow' even with a new cell: If the circuit is open anywhere (e.g., key left open, a loose/broken wire, or poor contact at a terminal), current cannot complete the path. With no current in an open circuit, the lamp cannot glow.; Thus, with the key closed and proper connections, the current is 0.5 A and the lamp gets 6 V across it; an LED needs correct polarity to glow.

A18.

Answer:

In a torch, correct cell orientation and an unbroken closed circuit are necessary so that current can pass through the lamp/LED and produce light.

1) Correct battery formation (series connection): Two cells should be connected in series by joining the positive terminal of one cell to the negative terminal of the next cell. This increases the total potential difference available to the circuit, helping the lamp glow properly.

2) Effect of wrong placement (+ to +): If the cells are placed with + connected to + (or - to -), they do not add their voltages in the required way for the torch circuit. The effective potential difference available across the lamp may become very small, so current is insufficient and the lamp may glow dimly or not at all.

3) Fault 1-Open circuit due to switch/wire contact: Even with correct cells, if the switch is OFF, or a wire is loose, the circuit remains open. In an open circuit there is a gap, so current cannot flow and the bulb cannot glow.

4) Fault 2-Broken filament in incandescent lamp: Incandescent bulbs have a filament that must be continuous for current to pass. If the filament breaks, the bulb becomes like an open circuit at that point, stopping current and preventing glow.

5) LED special condition (polarity): An LED conducts only in one direction, so it glows only when its positive terminal (longer lead) is connected to the battery's positive terminal and its negative terminal (shorter lead) to the battery's negative terminal. If reversed, the LED will not glow even though the circuit is closed; fixing it requires reversing LED polarity (or reversing the cell orientation) to make current flow through the LED.; Therefore, a torch works best when cells are in series with correct polarity and all parts make a closed, continuous circuit suited to the lamp type.

Section E — Case Study (4 marks each)

A19.

(i) What evidence from the trials shows that the cells were combined correctly as a battery in Trial 1?

Answer:

In Trial 1, the incandescent bulb glowed when the two cells were placed end-to-end with + of one touching - of the other, showing a proper battery (series combination) supplying enough potential difference for current to flow.

(ii) Why did the LED not glow in Trial 2 even though the switch was ON?

Answer:

An LED allows current only in one direction, so if its positive and negative leads are connected in reverse, current cannot pass through it and it will not glow even in a closed circuit.

(iii) Calculate the current in Trial 1 whena3Vbattery is connected to a 6 Ω bulb. Show steps and include SI unit.

Answer:

Given: V = 3 V, R = 6 Ω.

Formula: I = [V] / [R].

Substitution: I = 3/6 A = 0.5 A.

Current = 0.5 A.