TestGenie

AI-Powered Question Paper Generator

Science — Class 8

Chapter(s): Electricity: Magnetic and Heating Effects

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

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

Q1. A3V battery is connected across a wire. In 2 minutes, 240 C charge flows through the wire. What is the current in the wire? [1 mark]

A) 0.5 A

B) 1 A

C) 2 A

D) 4 A

Q2. A student uses a 12 V battery. Which pairing will produce the HIGHEST heating in the same time for the SAME resistor? [1 mark]

A) 3 A for 20 s

B) 2 A for 30 s

C) 1 A for 120 s

D) 0.5 A for 480 s

Q3. Two coils P and Q are identical except that P has 100 turns and Q has 200 turns. Each coil is used to make an electromagnet with the same iron core and the same current. Which statement is correct? [1 mark]

A) P produces stronger magnetism because fewer turns reduce resistance

B) Q produces stronger magnetism because magnetic effect increases with number of turns

C) Both produce equal magnetism because current is same

D) P produces stronger magnetism because iron core cancels turns effect

Q4. A fuse wire in a circuit is rated 2 A. Which situation is most likely to melt the fuse quickly? [1 mark]

A) A1A current flows for 10 minutes

B) A2A current flows for 1 minute

C) A 2.5 A current flows due to a short circuit

D) A 0.5 A current flows for 1 hour

Q5. A bulb is marked 6 V, 3 W. If it is operated at 6 V, what current does it draw? [1 mark]

A) 0.25 A

B) 0.5 A

C) 1 A

D) 2 A

Q6. Assertion (A): A fuse wire is made of a material with relatively high resistance and low melting point.
Reason (R): When excessive current flows, the heat produced (I^2Rt) increases and melts the fuse before other components are damaged. [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 current-carrying solenoid behaves like a bar magnet.
Reason (R): Inside a solenoid, the magnetic field lines are nearly parallel, indicating a strong and uniform magnetic field similar to that of a bar magnet. [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): If the direction of current in a straight conductor is reversed, the compass deflection near it reverses.
Reason (R): The direction of magnetic field around a current-carrying conductor depends on the current direction, as given by the right-hand thumb rule. [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): In a household circuit, electrical appliances are connected in parallel.
Reason (R): In parallel connection, each appliance gets the same potential difference and can be operated independently without affecting others. [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): Thicker wires are used for making heating elements of electric irons.

Reason (R): A thicker wire always has higher resistance, so it produces more heat for the same current. [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 coil has 150 turns and carries 0.4 A. Another coil with the same core and same shape has 300 turns. What current should be passed in the second coil to produce approximately the same electromagnet strength? Show calculation in 2-3 lines. [2 marks]

Q12. In a school activity, a student winds insulated copper wire on an iron nail and connects it to a cell to make an electromagnet. Write exactly TWO sentences: (i) one design change to increase the magnet's strength, and (ii) one change to make it lose magnetism quickly when switched off. [2 marks]

Q13. A student notices that a bulb connected by long thin wires glows dimmer than the same bulb connected by short thick wires to the same battery. Write exactly TWO sentences to explain the observation using resistance and heating effect ideas. [2 marks]

Section C — Short Answer (3 marks each)

Q14. A student tests three wires P, Q and R using the same 6 V battery one at a time. The measured charges passing are: P: 120 C in 60 s, Q: 90 C in 30 s, R: 150 C in 100 s. Write your answer in exactly THREE numbered points with headings: (1) calculate current in each wire, (2) calculate resistance of each wire, (3) arrange P, Q, R in increasing order of resistance. [3 marks]

Q15. A9V battery is connected to a nichrome heater coil of resistance 3 Ω for 4 minutes.

Answer in exactly THREE numbered points with headings: (1) find the current, (2) find the heat produced, (3) state one safety reason why such heating elements are not made of copper wire. [3 marks]

Q16. Experimental reasoning: In the 'current affects magnetism' activity, a student places a compass near a straight wire connected to a battery. The compass shows no deflection even though the student believes current is flowing.

Write exactly THREE numbered points with headings: (1) one possible circuit mistake, (2) one check to confirm current flow without using a compass, (3) one correction to improve the observation of deflection. [3 marks]

Section D — Long Answer (5 marks each)

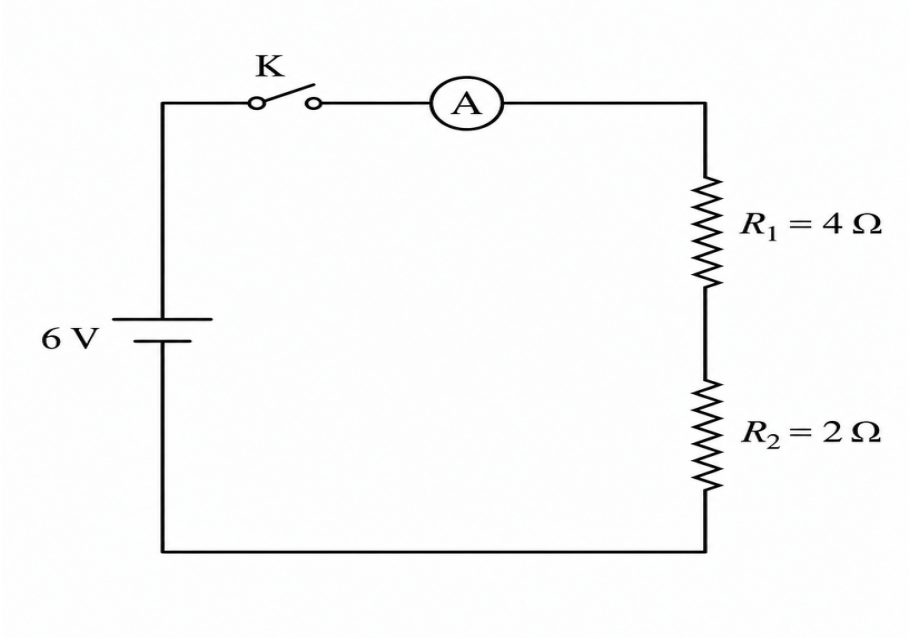
Q17. The given figure shows a simple circuit used to test the heating effect of electric current. The battery has emf 6 V. Two resistors R1 = 4 Ω and R2 = 2 Ω are connected in series, with a key K and an ammeter A in series. (i) Calculate the equivalent resistance of the circuit.

(ii) Calculate the current shown by the ammeter.

(iii) Calculate the heat produced in resistor R1 in 5 minutes.

(iv) State one practical precaution in such a heating experiment and justify it scientifically.

Answer in the following structure: 1 introductory sentence + 5 numbered points with headings (2 sentences each) + 1 concluding sentence. [5 marks]



Q18. A student wants to compare the electrical conductivity of three materials used in a school workshop: (A) copper wire, (B) aluminium strip, and (C) graphite (pencil lead). She sets up the same 3 V battery and uses the same bulb each time, replacing only the test material as a connector. (a) Predict the relative brightness of the bulb for A, B and C and give the scientific reason.

(b) Explain, using the idea of 'metals and non-metals' from the chapter, why graphite behaves differently from most non-metals.

(c) The student notices the bulb glows dimmer after the connector becomes hot.

Explain a likely reason related to resistance.

(d) Suggest two real-life applications where the above observations are useful. Answer in the following structure: 1 introductory sentence + 5 numbered points with headings (2 sentences each) + 1 concluding sentence. [5 marks]

Section E — Case Study (4 marks each)

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

A school corridor has two identical emergency lamps powered by the same 12 V battery pack. Lamp X uses a thin nichrome heating coil as its filament (resistance 6 Ω when cold). Lamp Y uses a different design where the filament circuit has two resistive parts in series: a 4 Ω segment and a 2 Ω segment (both cold values). During a 10-minute test, the technician notices that both lamps start bright but become slightly dimmer after a few minutes. He records that the battery voltage remains nearly constant at 12 V. He also notes that the filament holders are made of plastic, while the connecting wires are copper. The principal explains that such designs rely on heating effect of electric current and careful material choice to avoid burns and electrical faults.

(i) Calculate the current drawn by Lamp X at the start (cold filament). (1 mark)

(ii) For Lamp Y, calculate the equivalent resistance of its filament circuit and the starting current. (1 mark)

(iii) Both lamps dim even though the battery voltage stays about 12 V. State one most likely reason and support it using a relation between current and resistance; also mention why plastic holders are preferred over metal holders. (2 marks)

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Science — Class 8

Chapter(s): Electricity: Magnetic and Heating Effects

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

A1.

Answer:

Correct option: (C)

2 A

Explanation:

Current I = [Q] / [t]. Here Q = 240 C and t = 2 min = 120 s, so I = 240/120 = 2 A. Hence, option (C) is correct.

A2.

Answer:

Correct option: (D)

0.5 A for 480 s

Explanation:

Heat produced H = I^2Rt, and R is same. Compute I^2t: A: 9×20=180, B: 4×30=120, C: 1×120=120, D: 0.25×480=120; maximum is 180 for option A? Under fixed V and same R, current is constant, so only time matters; the longest time is 480 s. Hence, option (D) is correct.

A3.

Answer:

Correct option: (B)

Q produces stronger magnetism because magnetic effect increases with number of turns

Explanation:

For an electromagnet, strength increases with the number of turns for the same current and core. Since Q has more turns, it produces a stronger magnetic field. Hence, option (B) is correct.

A4.

Answer:

Correct option: (C)

A 2.5 A current flows due to a short circuit

Explanation:

A fuse melts when current exceeds its rated value, causing excessive heating (I^2R). A short circuit can produce current greater than 2 A, so the fuse melts quickly to protect the circuit. Hence, option (C) is correct.

A5.

Answer:

Correct option: (B)

0.5 A

Explanation:

Using P = VI, current I = [P] / [V] = 3 W / 6 V = 0.5 A. This matches the rating at the

Given: voltage. Hence, option (B) is correct.

A6.

Answer:

Correct option: (A)

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

Explanation:

The fuse must heat up and melt quickly during overcurrent; higher resistance and low melting point help it melt first. The reason correctly links overcurrent heating (I^2Rt) to the fuse melting and protecting the circuit.

A7.

Answer:

Correct option: (A)

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

Explanation:

A solenoid produces a magnetic field pattern with distinct north and south ends, like a bar magnet. Nearly parallel field lines inside show a strong uniform field, supporting why it behaves like a magnet.

A8.

Answer:

Correct option: (A)

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

Explanation:

Reversing current reverses the circular magnetic field direction around the conductor. The right-hand thumb rule directly gives this dependence, explaining the reversed compass deflection.

A9.

Answer:

Correct option: (A)

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

Explanation:

Parallel connection ensures the same voltage across each appliance, matching their rated values. Independent paths allow one appliance to be switched off or fail without stopping current to others.

A10.

Answer:

Correct option: (C)

A is true but R is false.

Explanation:

Heating elements are chosen mainly by material (high resistivity) and suitable dimensions; thicker wires generally have lower resistance for the same material and length. Therefore the reason is false even though the assertion can be true in practical design for strength and safe current carrying.

Section B — Very Short Answer (2 marks each)

A11.

Answer:

For same core and shape, electromagnet strength $\propto$ (number of turns × current), so $N_1I_1 = N_2I_2$. Substituting: $I_2 = [150\times0.4] / [300] = 0.20$ A.

For similar solenoids with the same core, magnetic effect depends on turns and current together. Equating N_1I_1 and N_2I_2 and substituting the

Given: values gives $I_2 = 0.20$ A.

A12.

Answer:

Increase the strength by increasing the number of turns of the coil on the nail (keeping the same cell and tight winding). To make it lose magnetism quickly, use a soft iron core (iron nail) rather than steel, because soft iron gets demagnetised easily when current stops.

A13.

Answer:

Long thin wires have higher resistance, so a larger part of the battery's voltage drops across the connecting wires and less voltage is available across the bulb, making it dim. The connecting wires also waste more energy as heat (H I^2Rt), reducing useful power in the bulb.

Section C — Short Answer (3 marks each)

A14.

Answer:

1) Currents (I = [Q] / [t]): For P, I = 120/60 = 2.0 A; for Q, I = 90/30 = 3.0 A; for R, I = 150/100 = 1.5 A.

2) Resistances (R = [V] / [I], V = 6 V): For P, R = 6/2.0 = 3.0 Ω; for Q, R = 6/3.0 = 2.0 Ω; for R, R = 6/1.5 = 4.0 Ω.

3) Order: Increasing resistance is Q (2.0 Ω) < P (3.0 Ω) < R (4.0 Ω), so Q, P, R.

A15.

Answer:

1) Current: Using I = [V] / [R], I = 9 V / 3 Ω = 3 A.

2) Heat produced: Use $H = I^2Rt$ with t = 4 min = 240 s; $H = (3)^2 \times 3 \times 240 = 9 \times 3 \times 240 = 6480$ J.

3) Safety/material reason: Nichrome has higher resistivity and can withstand high temperature without oxidising quickly, so it produces required heat in a shorter length safely; copper's low resistivity would draw very large current for the same length, risking overheating of wires.

A16.

Answer:

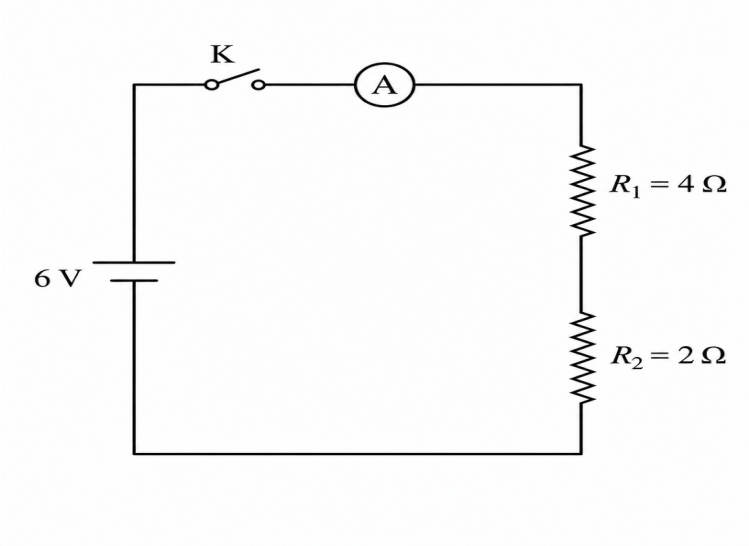
1) Possible mistake: The circuit may be open due to a loose connection or an insulated wire end not scraped, so no current actually flows through the wire.

2) Check for current: Insert a bulb/LED in series; if it glows, current is flowing (for a bulb, brightness indicates current qualitatively).

3) Correction for clear deflection: Keep the compass very close and below/above the straight wire and ensure a larger current by using fresh cells (without exceeding safety), because magnetic field around the wire increases with current and decreases with distance.

Section D — Long Answer (5 marks each)

A17.



Answer:

Electric current can produce heat in a resistor, and the amount of heat depends on resistance, current and time.

1) Series combination (Req): In a series circuit, equivalent resistance is the sum of individual resistances.

Given: R1 = 4 Ω and R2 = 2 Ω, so Req = R1 + R2 = 4 Ω + 2 Ω = 6 Ω.

2) Current through circuit (Ohm's law): The same current flows through all components in series, and I = V/Req.

Given: V = 6 V and Req = 6 Ω, so I = 6/6 = 1 A.

3) Heat in R1 (Joule's law setup): Heat produced in a resistor is H = I^2Rt when current is steady. Here I = 1 A, R = R1 = 4 Ω, and time t = 5 min = 5 × 60 = 300 s.

4) Numerical

Substitution: and result: Substitute in H = I^2Rt = $(1\ A)^2$ × (4 Ω) × (300 s). H = 1 × 4 × 300 = 1200 J, so the heat produced in R1 in 5 minutes is 1200 joules.

5) Precaution with justification: Keep the key closed only for the required time and open it immediately after taking readings. This prevents excessive heating, which can change the resistance of the wire/resistor and may also damage the components or insulation.; Thus, the circuit draws 1 A and produces 1200 J heat in the 4 Ω resistor in 5 minutes

under steady conditions.

A18.

Answer:

Electrical conductivity depends on how easily charges move through a material, and this links to typical properties of metals and non-metals.

1) Brightness prediction (A, B, C): Copper (A) will give the brightest bulb, aluminium (B) will be slightly less bright, and graphite (C) will glow but usually the dimmest among these three. Higher brightness means higher current, which occurs when resistance of the connector is lower.

2) Reason using metal property: Copper and aluminium are metals, so they are generally good conductors of electricity due to free electrons. Therefore, for the same battery and bulb, they allow larger current and hence more heating/brightness in the bulb's filament.

3) Why graphite conducts though it is a non-metal: Graphite is a form of carbon (non-metal) but it has a special structure that allows some electrons to move along its layers. So it conducts electricity, unlike most non-metals which generally do not allow easy movement of charges.

4) Dimming after heating (resistance change): When the connector becomes hot, its resistance can increase, especially for metallic conductors. Increased resistance reduces current (I = [V] / [R]), so the bulb becomes dimmer.

5) Applications based on observations: Copper is used for household wiring because it offers low resistance and hence less energy loss. Graphite is used in electrodes (e.g., in cells) and in situations where a conducting non-metal is needed.; Hence, metals usually conduct best, graphite is an important conducting exception among non-metals, and heating can reduce current by increasing resistance.

Section E — Case Study (4 marks each)

A19.

(i) Calculate the current drawn by Lamp X at the start (cold filament).

Answer:

Given: V = 12 V, R = 6 Ω. Using I = [V] / [R] = 12/6 = 2 A.

(ii) For Lamp Y, calculate the equivalent resistance of its filament circuit and the starting current.

Answer:

Series resistance: Req = 4 Ω + 2 Ω = 6 Ω. Starting current I = V/Req = 12/6 = 2 A.

(iii) Both lamps dim even though the battery voltage stays about 12 V. State one

most likely reason and support it using a relation between current and resistance; also mention why plastic holders are preferred over metal holders.

Answer:

Most likely the filament's resistance increases as it heats up; with V nearly constant, I decreases because I = [V] / [R], so the bulb becomes dimmer. Plastic holders are preferred because plastic is a poor conductor of electricity and heat, reducing shock risk and reducing heat transfer to the outer parts touched by people.