Electricity: Magnetic and Heating Effects

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. A compass needle placed near a wire moves when current flows because:
(a) the needle gets hot **(b)** the wire is heavy
(c) the wire gets wet **(d)** the current produces a magnetic field

2. An electromagnet is made with a plastic tube instead of an iron core. Compared with before, it becomes:
(a) weaker **(b)** only hot, not magnetic
(c) non-magnetic even when on **(d)** a permanent magnet

3. Which of these works mainly on the HEATING effect of current?
(a) a ceiling fan's motor **(b)** an electric bell
(c) a kettle **(d)** a compass needle near a wire

4. Which of these works mainly on the MAGNETIC effect of current?
(a) an electric bell **(b)** a toaster
(c) a room heater **(d)** a hair dryer

5. In a dry cell, the carbon rod with a metal cap is the:
(a) negative terminal **(b)** insulator
(c) positive terminal **(d)** electrolyte

6. Each turn of wire around a paper tube uses 4 cm of wire. How much wire is needed for 100 turns?
(a) 400 cm **(b)** 100 cm **(c)** 404 cm **(d)** 104 cm

7. About 6 lemon cells joined together light one LED. How many lemons are needed to light 2 LEDs one at a time from separate sets?
(a) 12 lemons **(b)** 6 lemons **(c)** 8 lemons **(d)** 18 lemons

8. A heater coil stays on for 47 seconds in each test. How many seconds is that for 2 tests?
(a) 94 s **(b)** 49 s **(c)** 141 s **(d)** 47 s

Section B — Short answer — 8 × 2 = 16 marks

9. What did Oersted discover?

10. Does the electromagnet become "stronger" or "weaker" with (a) more cells (b) the iron nail removed from inside the coil?

11. Does each work mainly on the "heating" or the "magnetic" effect of current? (a) a loudspeaker (b) a toaster

12. Is each a positive terminal, negative terminal, electrode or electrolyte? (a) the lemon juice in a lemon cell (b) the copper strip in a lemon cell

13. Where is each used in electrical things, and why? (a) zinc (b) lithium

14. A coil of 100 turns uses 145 cm of wire. About how much wire does each turn use? (Give the answer to 1 decimal place if needed.)

15. A family throws away 11 used single-use cells every month. If they switch to rechargeable cells, how many single-use cells do they avoid in 1 year?

16. An electromagnet with 1 cell picked up 8 paper clips and with 2 cells picked up 15. How many more did it pick up with 2 cells? What does this show?

Section C — Word problems — 4 × 4 = 16 marks

17. Describe how to make an electromagnet and test its strength.

18. A coil of 20 turns around an iron nail picked up 3 clips; a coil of 40 turns picked up 12. (a) How many more clips with more turns? (b) What else could make it stronger? (c) What happens to its poles if the cell is turned round?

19. Sort into heating effect and magnetic effect: a compass needle near a wire, an electric iron, an immersion rod, a ceiling fan's motor. Why is nichrome, not copper, used in heater coils?

20. A class makes a cell with 6 lemons, each with a copper strip and an iron nail, joined in a chain. (a) What is the electrolyte? (b) What are the electrodes? (c) Which LED lead goes to the copper end, and why? (d) Why might one lemon not light the LED?

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Answer key

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Q	Answer	Working
1	**(d) the current produces a magnetic field**	Oersted, 1820
2	**(a) weaker**	—
3	**(c) a kettle**	—
4	**(a) an electric bell**	—
5	**(c) positive terminal**	—
6	**(a) 400 cm**	4 × 100 = 400
7	**(a) 12 lemons**	2 × 6 = 12
8	**(a) 94 s**	47 × 2
9	**An electric current produces a magnetic field (a compass needle moves near a current-carrying wire).**	—
10	**(a) stronger (b) weaker**	—
11	**(a) magnetic (b) heating**	—
12	**(a) electrolyte (b) electrode**	—
13	**(a) dry cell case: negative terminal (b) rechargeable batteries in phones**	—
14	**1.4 cm**	145 ÷ 100
15	**132 cells**	11 × 12 × 1
16	**7; a larger current makes the electromagnet stronger**	15 − 8
17	**Wind about 50 turns of insulated wire around an iron nail, connect the ends to a cell through a switch, and close the switch. Count how many paper clips it picks up. Try more turns or more cells and count again: more turns or current pick up more clips.**	—
18	**(a) 9 (b) More cells (more current) or a thicker iron core. (c) The north and south poles swap.**	—
19	**Heating: an electric iron, an immersion rod. Magnetic: a compass needle near a wire, a ceiling fan's motor. Nichrome has a much higher resistance, so it gets very hot.**	—

Q	Answer	Working
20	**(a) The lemon juice (b) The copper strip and the iron nail (c) The longer (positive) lead, because the LED glows only one way round (d) One lemon gives too little; several are needed together.**	—