S3 Physics Practice Paper: Electric Current and Circuits, Resistance and Ohm's Law, Electrical Power and Safety, Magnetism and Electromagnets, Energy Conversion and Sources

S3 | Physics | Time: 60 minutes | Total: 100 marks | 24 questions

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1. Electric current and circuits

Answer all questions. Show your working.

1. In 120 s, 60 C of charge passes through a cross-section of a wire. Find the current. [4]

2. Two lamps are connected in series to a battery. The current in the first lamp is 0.4 A. State the current in the second lamp and explain. [4]

3. In a parallel circuit the main current is 1.2 A and the current in one branch is 0.5 A. Find the current in the other branch. [4]

4. Three 1.5 V cells are connected in series. Find the total electromotive force and state how the e.m.f. values add up in series. [4]

2. Resistance and Ohm's law

Write down the formula and the values substituted.

5. A 12 ohm resistor carries a current of 0.5 A. Find the potential difference across it. [4]

6. Resistors of 6 ohm and 9 ohm are connected in series to a 3 V supply. Find the total resistance and the current. [4]

7. Resistors of 6 ohm and 3 ohm are connected in parallel. Find the total resistance. [5]

8. A wire has a resistance of 12 ohm. Its length is doubled while its cross-sectional area and material stay the same. Find the new resistance and state how resistance depends on length. [5]

3. Electrical power and energy

Use the values given in each question.

9. An appliance is connected to a 12 V supply and carries a current of 2 A. Find its power. [5]

10. A 60 W lamp is used for 5 hours. Find the energy used in kWh, and the cost if electricity costs 1.2 dollars per kWh. [5]

11. A 24 W lamp is switched on for 30 s. Find the energy used in J. [4]

12. A 2000 W kettle is connected to a 220 V supply. Find the operating current and state whether a 5 A or a 13 A fuse should be used. [4]

4. Magnetism and electromagnets

Answer in complete sentences.

13. A current-carrying straight wire produces a magnetic field around it. What happens to the field direction if the current is reversed? [4]

14. The number of turns of an electromagnet coil is increased from 100 to 200 while the current stays the same. How does the field strength change? [4]

15. Give two differences between an electromagnet and a permanent magnet. [4]

16. What is the function of the iron core inside the coil of an electromagnetic crane? [4]

5. Energy conversion and energy sources

Express efficiency as a percentage.

17. A kettle takes in 100 J of electrical energy, of which 35 J becomes internal energy of the water. Find the efficiency. [4]

18. Which two energy conversions occur in a working lamp, and in what form is the unwanted energy lost? [4]

19. A solar panel receives 200 W of light and has an efficiency of 20%. Find the electrical output power. [4]

20. Classify solar energy, coal, wind energy and natural gas as renewable or non-renewable. [4]

6. Integrated problems

Write the formula, the substitution and the unit for each answer.

21. Resistors of 6 ohm and 12 ohm are connected in parallel to a 12 V supply. Find the power of each resistor. [4]

22. For the circuit above, find the current in each branch and the main current. [4]

23. A 1500 W heater runs for 240 s. Find the energy used in J. [4]

24. An appliance of 1.5 kW is used for 4 hours each day. If electricity costs 1.2 dollars per kWh, find the daily cost. [4]