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Electricity and Energy

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3.1 Generation of Energy

At the end of the section you should be able to :

- ❑ 1 State that electricity can be generated by different means.
- ❑ 2 Decide whether sources of energy are renewable or non-renewable.
- ❑ 3 State that fossil fuels are at present the main sources of energy.
- ❑ 4 State that the reserves of fossil fuels are finite.
- ❑ 5 State that the burning of fossil fuels produces greenhouse gases.
- ❑ 6 State the advantages and disadvantages of using nuclear power for the generation of electricity.
- ❑ 7 Explain the advantages and disadvantages of at least three renewable energy sources.
- ❑ 8 State that energy efficiency must be considered if energy is to be conserved.
- ❑ 9 Describe energy efficiency issues in
  - ❑ generation ❑ distribution ❑ appliances
- ❑ 10 State that a transformer reduces power losses in electricity distribution.
- ❑ 11 State the main parts of a transformer; iron core, primary coil and secondary coil.

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3.2 Electrical Power

At the end of the section you should be able to :

- ❑ 1 State the relationship between energy and power.
- ❑ 2 Carry out calculations using E = Pt.
- ❑ 3 Investigate and compare the power ratings of various electrical appliances.
- ❑ 4 Describe energy savings (efficiency) in the home.
- ❑ 5 Carry out calculations involving the relationship between efficiency, energy output and energy input..
- ❑ 6 Carry out calculations involving the relationship between efficiency, power output and power input.

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3.3 Electromagnetism

At the end of the section you should be able to :

- ❑ 1 State that a magnetic field exists around a current-carrying wire.
- ❑ 2 Give examples of practical applications of magnets and electromagnets.
- ❑ 3 Describe the parts of a basic electromagnet.
- ❑ 4 State that a current carrying wire experiences a force when the wire is in a magnetic field.
- ❑ 5 Identify on a simple diagram of an electric motor, the **rotating** coil, the **field** coil (magnet), the **brushes** and the **commutator**.
- ❑ 6 State that a voltage may be induced when a coil of wire is moved within a magnetic field.
- ❑ 7 State that the size of an induced voltage depends on; the strength of the magnetic field, the number of coils of wire and the speed of movement.

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3.4 Electrical & Electronic Circuits

At the end of the section you should be able to :

- ❑ 1 State that electrons are free to move in a conductor.
- ❑ 2 Describe an electric current in terms of movement of charge around a circuit.
- ❑ 3 State that the voltage of a supply is a measure of the energy given to the charges in a circuit.
- ❑ 4 Use the units ampere (amps) and volts correctly.
- ❑ 5 State that an ammeter is used to measure current and a voltmeter is used to measure voltage.
- ❑ 6 Draw and identify the circuit symbols for each of the following :-cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, thermistor, LDR.
- ❑ 7 Draw circuit diagrams to show the correct positions of an ammeter and voltmeter in a circuit.
- ❑ 8 Describe a series circuit.
- ❑ 9 State that in a series circuit the current is the same at all positions.
- ❑ 10 State that the sum of the voltages across the components in series is equal to the voltage of the supply.
- ❑ 11 Describe a parallel circuit.
- ❑ 12 State that the sum of currents in two parallel branches is equal to the current drawn from the supply.
- ❑ 13 State that the voltages across components in parallel is the same for each component.
- ❑ 14 State that resistors convert electrical energy into heat energy.

- ❑ 15 State that an ohmmeter is used to measure resistance.
- ❑ 16 Use the unit of resistance, the ohm (Ω), correctly.
- ❑ 17 State that an increase in resistance of a circuit leads to a decrease in the current in the circuit.
- ❑ 18 Carry out calculations involving the relationship V = IR.
- ❑ 19 Give two uses of variable resistors
- ❑ 20 State that the microphone, thermistor, LDR and switch are examples of input devices.
- ❑ 21 State that a microphone changes sound energy to electrical energy.
- ❑ 22 State that the resistance of a thermistor changes with temperature.
- ❑ 23 State that the resistance of an LDR decreases as the light gets brighter.
- ❑ 24 Identify from a list an appropriate input device for a given application.
- ❑ 25 State that an output device changes electrical energy into another form of energy.
- ❑ 26 State that the loudspeaker, buzzer, lamp, LED and electric motor are examples of output devices.
- ❑ 27 State the energy transformations involved for a given output device.
- ❑ 28 Identify from a list an appropriate output device for a given application.
- ❑ 29 Draw and identify the symbols for an AND gate, an OR gate and a NOT gate.
- ❑ 30 State that: high voltage = logic 1; and low voltage = logic 0.
- ❑ 31 State that for a NOT gate the output is the opposite of the input.
- ❑ 32 State that for an AND gate both inputs must be high for the output to be high.
- ❑ 33 State that for an OR gate either input must be high for the output to be high.
- ❑ 34 Explain how to use combinations of logic gates in simple control circuits.

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3.5 Kinetic Theory

At the end of the section you should be able to :

- ❑ 1 State that pressure is the force per unit area exerted on a surface.
- ❑ 2 Carry out calculations involving pressure, force and area.
- ❑ 3 Describe how the kinetic model accounts for the pressure of a gas.
- ❑ 4 Discuss applications in which the pressure of a gas must be considered.