**ELECTRICITY & ENERGY** **(start:\_\_\_\_\_\_\_\_end: \_\_\_\_\_\_\_\_ )**

| No. | CONTENT |
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|  | **1. Generation of Electricity** |
| 1.1 | I can describe the advantages and disadvantages of different methods of electricity generation and distribution. |
| 1.1.1 | What are some different ways of generating electricity? |
| 1.1.2 | Describe an advantage and disadvantage of each method you have identified.  |
| 1.2 | I can describe & explain the potential role of different methods of electricity generation in future sustainable energy supply. |
| 1.2.1 | How could some of these methods be used in the future of energy supply? |
| 1.3 | I can explain the concept of energy efficiency and energy efficiency issues related to generation, distribution and use of electricity. |
| 1.3.1  | What is energy efficiency? |
| 1.3.1 | Calculate the efficiency of the following: i)​ ​A hairdryer wastes 376J for every 1500J of electrical energy it uses.ii)​If something is 50% efficient, how many joules of wasted energy will there be if 750J of energy is put in? iii))​ ​A wind turbine has an efficiency of 52%. How much kinetic energy from the wind is needed to produce 800J of electrical energy? |
| 1.4 | I can describe energy transformations and can relate these to basic components in power stations. |
| 1.4.1 | what is the energy transformation in:1. A hairdryer ii) a kettle iii) a car
 |
| 1.4.2 | What are the name of the basic components in power stations? |
| 1.4.2 | What are the energy transformations in these components? |
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|  | **2. Ohm’s Law** |
| 2.1 | I can make use of a *V-I* graph to determine resistance. (gradient of V against I graph = resistance) |
| 2.1.1 | Draw a sketch of voltage against current  |
| 2.1.2 | Calculate the resistance of these graphs 1. ii)
 |
| 2.2 | I can make use of an appropriate relationship to calculate potential difference (voltage), current and resistance (V = IR). |
| 2.2.1  | Calculate the voltage if:1. I = 0.2A, R = 20Ω ii) I = 0.33A, R = = 77Ω iii) I = 3.2A, R = 15kΩ

Calculate the current if: 1. V = 4V, R = 20Ω ii) V = 5.3V, R = 19.8Ω iii) V = 2.8V, R = 2mΩ

Calculate the resistance if: 1. I = 0.3A, V = 20kV ii)V = 0.8V, I = 3A iii) I = 7A, V = 8kV
 |
| 2.3 | I can describe the relationship between temperature and resistance of a conductor. |
| 2.3.1 | What is the relationship between temperature and resistance of a conductor? |
|  | **3. Practical Electricity and Electronics** |
| 3.1 | I can make measurement of current, voltage and resistance using appropriate meters in series or parallel circuits. |
| 3.1.1 | How do you insert these components into a circuit?1. An ammeter ii) a voltmeter iii) an ohmmeter
 |
| 3.2 | I can make measurements of current, voltage and resistance, using appropriate meters in complex circuits. |
| 3.2.1  | What is used to measure:1. Current ii) Voltage iii) Resistance
 |
| 3.3 | I can identify and use a range of electrical and electronic components to construct practical electronic circuits and systems. |
| 3.3.1 | Explain the use of three components  |
| 3.4 | I can solve problems involving current voltage and resistance  |
| 3.4.1  | What is the relationship between voltage and current? |
| 3.5 | I can make measurements of I, V and R using appropriate meters in complex circuits. |
| 3.6 | I can describe the symbol, function and application of standard electrical and electronic components including cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, LED, motor, microphone, loudspeaker, solar cell, fuse, LDR, relay and group these as analogue and digital devices, input and output devices |
| 3.6.1 | What is the difference between analogue and digital devices? |
| 3.6.2  | Group the above list of components as analogue and digital devices  |
| 3.6.3 | Group the above list of components as input and output devices |
| 3.7 | I can describe the symbol, function and application of standard electrical and electronic components including cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, LED, motor, microphone, loudspeaker, photovoltaic cell, fuse, diode, capacitor, thermistor, LDR, relay and transistor |
| 3.7.1  | Copy and complete the following table

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| --- | --- | --- | --- |
| **Symbol** | **Component** | **Function** | **Application**  |
| Cell |  |  |  |
| Battery |  |  |  |
| Lamp |  |  |  |
| Switch |  |  |  |
| Resistor |  |  |  |
| Variable Resistor |  |  |  |
| Voltmeter |  |  |  |
| Ammeter |  |  |  |
| LED |  |  |  |
| Motor |  |  |  |
| Microphone |  |  |  |
| Loudspeaker |  |  |  |
| Photovoltaic cell |  |  |  |
| Fuse |  |  |  |
| Diode |  |  |  |
| Capacitor |  |  |  |
| Thermistor |  |  |  |
| LDR |  |  |  |
| Transistor  |  |  |  |

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| 3.8 | I can draw and identify the symbols for an npn transistor, and an n-channel enhancement MOSFET |
| 3.8.1 | Draw the symbols for an npn transistor, and an n-channel enhancement MOSFET |
| 3.9 | I can explain the function of the transistors above as a switch in transistor switching circuits |
| 3.9.1 | What is the function of the transistors above as a switch in transistor switching circuits |
| 3.10 | I can apply the current and voltage relationships in a series circuit. |
| 3.10.1 | What is the relationship for voltage in a series circuit?  |
| 3.10.2 | What is the relationship for current in a series circuit? |
| 3.11 | I can describe and explain practical applications of series and parallel circuits. |
| 3.11.1 | What are some practical applications of series circuits? |
| 3.11.2 | What are some practical applications of parallel circuits? |
| 3.12 | I can use the relationship Rs=R1+ R2+R3 + to solve problems involving total resistance of resistors in a series circuit |
| 3.12.1 | Calculate the resistance in the following circuits  |
| 3.13 | I can use and explain the use of AND/OR/NOT logic gates in electronic circuits |
| 3.13.1 | Explain the use of AND/OR/NOT gates in electronic circuits |
|  | **4. Electrical Power** |
| 4.1 | I am able to explain what electrical power is.  |
| 4.1.1  | What is electrical power? |
| 4.2 | I can give the approximate power consumptions of different appliances, qualitatively (info) and quantitatively (data). |
| 4.2.1. | What is the approximate power consumption of:1. A kettle ii) a hairdryer iii) a microwave iii) an oven
 |
| 4.3 | I am able to use an appropriate relationship between Power, Energy and time to justify energy saving measures (E = Pt). |
| 4.3.1  | Calculate the energy if:i)P = 7W, t = 60s ii) P = 0.2W, t = 700s iii) P = 0.2W, t = 3 minutesCalculate the power if:  i)E = 20J, t = 3s ii) VE = 300J, t = 3600s iii) E = 700J, t = 1 hour Calculate the time if:  i)I P = 50W, E = 89J ii)P = 0.3W, E = 90J iii) P = 802W, E = 11J |
| 4.4 | I can understand that being energy efficient will help us conserve resources, energy and the environment |
| 4.4.1 | What are some ways of being energy efficient? |
| 4.5 | I can explain the concept of energy efficiency as a key factor in energy generation, distribution and use. |
| 4.5.1 | How does energy efficiency relate to energy generation, distribution and use? |
| 4.10 | I can calculate efficiency, given input and output Power / Energy (% efficiency = (useful Eo/Ei) x 100% ). |
|  | **5. Electromagnetism** |
| 5.1 | I am able to describe the relationship between electricity and magnetism.  |
| 5.1.1. | What is the relationship between electricity and magnetism? |
| 5.2 | I can sketch the magnetic field pattern between poles of a magnet |
| 5.2.1 | Sketch a magnetic field pattern between the poles of a magnet and label the poles.  |
| 5.3 | I can give practical applications of magnets and electromagnets. |
| 5.3.1. | What are some practical applications of magnets and electromagnets.  |
| 5.4 | I can explain how transformers are used in high voltage transmissions and can use the formula Ns/Np =Vs/Vp |
| 5.4.1 | How are transformers used in high voltage transmissions? |
| 5.4.2 | A transformer has 20 turns on the primary and 400 on the secondary. What is the output voltage if the input voltage is 500V?  |
| 5.4.3. | A transformer has 30 turns on the primary and 60 on the secondary. If the output voltage is 600V, what is the input voltage? |
|  | **6. Specific Heat Capacity** |
| 6.1 | I understand what is meant by specific heat capacity? |
| 6.1.1 | What is meant by specific heat capacity? |
| 6.2 | I am able to explain temperature in terms of energy of particles.  |
| 6.2.1 | Explain temperature in terms of energy of particles. |
| 6.3 | I can explain the connection between temperature and heat energy. |
| 6.3.1  | What is the connection between temperature and heat energy? |
| 6.4 | I am able to use appropriate relationships to carry out calculations involving: mass, heat energy, temperature change and specific heat capacity (Eh = cm∆T). |
| 6.4.1  | How much energy is needed to increase the temperature of 500 g of lead from 20ºC to 45ºC? The specific heat capacity of lead is 128 J/kg ºC. |
| 6.4.2 | The specific heat capacity of water is Equation: 4180 J kg^{-1^{circ}}C^{-1}.How much heat energy is required to raise the temperature of Equation: 5 kg of water by Equation: 1^{circ}C? |
| 6.5 | I can use the principle of conservation of energy to determine heat transfer. |
| 6.5.1.  | What is the principle of the conservation of energy? |
| 6.5.2  | How does the conservation of energy determine heat transfer? |
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|  | **7. Gas Laws and the kinetic model**  |
| 7.1 | I can describe the kinetic model of a gas. |
| 7.1.1  | Describe the kinetic model of a gas.  |
| 7.2 | I can explain the effects of varying pressure, temperature and volume on a fixed mass of ideal gas. |
| 7.2.1 | Describe the effects of of varying a) pressure, b) temperature and c) volume on a fixed mass of ideal gas. |
| 7.3 | I can give some examples of applications of the kinetic model of a gas using knowledge of pressure, volume and temperature (for a mixed mass of ideal gas.) (e.g. weather balloons, free diving, pressurised aircraft cabin) |
| 7.3.1 | Explain what happens to gas in a) weather balloons, b) free diving, c) pressurised aircraft. |
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