2016

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| Pupil Progress Document | Lockerbie Academy |

NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| Lockerbie academy | National 4 Outcome Questions |

CLASS: \_\_\_\_

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$$P= \frac{E}{t}$$

$$\% efficiency= \frac{useful E\_{o}}{E\_{i}}x 100\%$$

$$\% efficiency= \frac{useful P\_{o}}{P\_{i}}x 100\%$$

$$\frac{n\_{s}}{n\_{p}}=\frac{v\_{s}}{v\_{p}}$$

$$V=IR $$

Series circuit rules:

$$I\_{s}=I\_{1}=I\_{2}= ..$$

$$V\_{s}=V\_{1}+ V\_{2}+ ..$$

Parallel circuit rules:

$$I\_{p}=I\_{1}+I\_{2}+ ..$$

$$V\_{p}=V\_{1}=V\_{2}= ..$$

$$ R\_{T}=R\_{1}+R\_{2}+ ..$$

$$f= \frac{N}{t}$$

$$v=fλ$$

$$d=vt$$

$$a= \frac{∆v}{t}$$

$$F=ma$$

$$W=mg$$

**ALL UNITS**

| No. | Level | CONTENT |  | Traffic Light |  |
| --- | --- | --- | --- | --- | --- |
| 0.1 | N5 | I know the units for all of the physical quantities used in this course. |  | **☺** | **😐** | ☹ |  |
| 0.2 | N5 | I can use the prefixes: nano (n), micro(μ), milli (m), kilo(k), Mega(M) & Giga (G) |  | **☺** | **😐** | ☹ |  |
| 0.3 | N5 | I can give an appropriate number of significant figures when carrying out calculations (This means that the final answer can have no more significant figures than the value with least number of significant figures used in the calculation). |  | **☺** | **😐** | ☹ |  |
| 0.4 | N5 | I can use scientific notation when large and small numbers are used in calculations. |  | **☺** | **😐** | ☹ |  |

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

| No. | Level | CONTENT |  | Traffic Light |
| --- | --- | --- | --- | --- |
|  |  | **1. Generation of Electricity** |  |  |  |  |
| 1.1 | N4 | I can describe the advantages and disadvantages of different methods of electricity generation and distribution. |   | **☺** | **😐** | ☹ |
| 1.2 | N4 | I can describe & explain the potential role of different methods of electricity generation in future sustainable energy supply. |   | **☺** | **😐** | ☹ |
| 1.3 | N4 | I can explain the concept of energy efficiency and energy efficiency issues related to generation, distribution and use of electricity. |   | **☺** | **😐** | ☹ |
| 1.4 | N4 | I can describe energy transformations and can relate these to basic components in power stations. |   | **☺** | **😐** | ☹ |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  | **2. Ohm’s Law** |  |  |  |  |
| 2.1 | N5 | I can make use of a *V-I* graph to determine resistance. (gradient of V against I graph = resistance) |   | **** | **😐** | ☹ |
| 2.2 | N5 | I can make use of an appropriate relationship to calculate potential difference (voltage), current and resistance (V = IR). |   | **** | **😐** | ☹ |
| 2.3 | N5 | I can describe the relationship between temperature and resistance of a conductor. |   | **** | **😐** | ☹ |
|  |  | **3. Practical Electricity and Electronics** |  |  |  |  |
| 3.1 | N4 | I can make measurement of current, voltage and resistance using appropriate meters in series or parallel circuits. |   | **** | **😐** | ☹ |
| 3.2 | N5 | I can make measurements of current, voltage and resistance, using appropriate meters in complex circuits. |   | **** | **😐** | ☹ |
| 3.3 | N4 | I can identify and use a range of electrical and electronic components to construct practical electronic circuits and systems. |   | **** | **😐** | ☹ |
| 3.4 | N4 | I can solve problems involving current voltage and resistance  |   | **** | **😐** | ☹ |
| 3.5 | N5 | I can make measurements of I, V and R using appropriate meters in complex circuits. |   | **** | **😐** | ☹ |
| 3.6 | N4 | 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 |   | **** | **😐** | ☹ |
| 3.7 | N5 | 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 |   | **** | **😐** | ☹ |
| 3.8 | N5 | I can draw and identify the symbols for an npn transistor, and an n-channel enhancement MOSFET |   | **** | **😐** | ☹ |
| 3.9 | N5 | I can explain the function of the transistors above as a switch in transistor switching circuits |   | **** | **😐** | ☹ |
| 3.10 | N4 | I can apply the current and voltage relationships in a series circuit. |   | **** | **😐** | ☹ |
| 3.11 | N4 | I can describe and explain practical applications of series and parallel circuits. |   | **** | **😐** | ☹ |
| 3.12 | N4 | I can use the relationship Rs=R1+ R2+R3 + to solve problems involving total resistance of resistors in a series circuit |   | **** | **😐** | ☹ |
| 3.13 | N4 | I can use and explain the use of AND/OR/NOT logic gates in electronic circuits |   | **** | **😐** | ☹ |
|  |  | **4. Electrical Power** |  |  |  |  |
| 4.1 | N4 | I am able to state that electrical power is a measure of the energy transferred by an appliance every second. |   | **** | **😐** | ☹ |
| 4.2 | N4 | I can give the approximate power consumptions of different appliances, qualitatively (info) and quantitatively (data). |   | **** | **😐** | ☹ |
| 4.3 | N4 | I am able to use an appropriate relationship between Power, Energy and time to justify energy saving measures (E = Pt). |   | **** | **😐** | ☹ |
| 4.5 | N4 | I can understand that being energy efficient will help us conserve resources, energy and the environment |   | **** | **😐** | ☹ |
| 4.9 | N4 | I can explain the concept of energy efficiency as a key factor in energy generation, distribution and use. |   | **** | **😐** | ☹ |
| 4.10 | N4 | I can calculate efficiency, given input and output Power / Energy (% efficiency = (useful Eo/Ei) x 100% ). |   | **** | **😐** | ☹ |
|  |  | **5. Electromagnetism** |  |  |  |  |
| 5.1 | N4 | I am able to describe the relationship between electricity and magnetism.  |   | **** | **😐** | ☹ |
| 5.2 | N4 | I can sketch the magnetic field pattern between poles of a magnet |   | **** | **😐** | ☹ |
| 5.3 | N4 | I can give practical applications of magnets and electromagnets. |   | **** | **😐** | ☹ |
| 5.4 | N4 | I can explain how transformers are used in high voltage transmissions and can use the formula Ns/Np =Vs/Vp |   | **** | **😐** | ☹ |
|  |  | **6. Specific Heat Capacity** |  |  |  |  |
| 6.1 | N5 | I understand that the same mass of different materials can require different quantities of heat energy to raise their temperature by 1 degree Celsius. |   | **** | **😐** | ☹ |
| 6.2 | N5 | I am able to explain that the temperature of a substance is a measure of the mean kinetic energy of its particles. |   | **** | **😐** | ☹ |
| 6.3 | N5 | I can explain the connection between temperature and heat energy. |   | **** | **😐** | ☹ |
| 6.4 | N5 | I am able to use appropriate relationships to carry out calculations involving: mass, heat energy, temperature change and specific heat capacity (Eh = cm∆T). |   | **** | **😐** | ☹ |
| 6.5 | N5 | I can use the principle of conservation of energy to determine heat transfer. |   | **** | **😐** | ☹ |
|  |  |  |  |  |  |  |
|  |  | **7. Gas Laws and the kinetic model**  |  |  |  |  |
| 7.1 | N4 | I can describe the kinetic model of a gas. |   | **** | **😐** | ☹ |
| 7.2 | N4 | I can explain the effects of varying pressure, temperature and volume on a fixed mass of ideal gas |   | **** | **😐** | ☹ |
| 7.3 | N4 | 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) |   | **** | **😐** | ☹ |
|  |  |  |  |  |  |  |

**WAVES & RADIATION (start:\_\_\_\_\_\_\_\_end: \_\_\_\_\_\_\_\_ )**

| No. | Level | CONTENT |  | Traffic Light |
| --- | --- | --- | --- | --- |
|  |  | **1. Wave Characteristics** |  |  |  |  |
| 1.1 | N4 | I can recognise and compare longitudinal and transverse waves. |  | **** | **** |  |
| 1.2 | N4 | I can explain frequency as the number of waves per second. |  | **** | **** |  |
| 1.3 | N4 | I can describe the wavelength and amplitude of transverse waves. |  | **** | **** |  |
| 1.4 | N4 | I can use appropriate relationships to solve problems involving frequency, no. of waves and time (*f=N/t*) |  | **** | **** |  |
| 1.5 | N4 | I can make use of numerical or graphical data to determine the frequency of a wave. |  | **** | **** |  |
| 1.6 | N4 | I am able to use an appropriate relationship between wave speed, frequency and wavelength (*v = f λ*) |  | **** | **** |  |
| 1.7 | N4 | I can make appropriate use of the relationship between distance, speed and time for waves (*d = vt*). |  | **** | **** |  |
|  |  |  |  |  |  |  |
|  |  | **2. Sound** |  |  |  |  |
| 2.1 | N4 | I can analyse sound waveforms where amplitude and frequency change. |  | **** | **** |  |
| 2.2 | N4 | I can make use of different methods to measure the speed of sound in air. |  | **** | **** |  |
| 2.3 | N4 | I can make sound level measurements (including use of the decibel scale). |  | **** | **** |  |
| 2.4 | N4 | I can identify sources of noise pollution and the risks to human hearing . |  | **** | **** |  |
| 2.5 | N4 | I can suggest methods of protecting hearing, such as absorbing sound using different materials. |  | **** | **** |  |
| 2.6 | N4 | I can describe & explain applications of sonar and ultrasound. |  | **** | **** |  |
| 2.7 | N4 | I can describe sound reproduction technologies. |  | **** | **** |  |
| 2.8 | N4 | I can describe applications of noise cancellation, especially as a way of reducing the risk of damage to hearing. |  | **** | **** |  |
|  |  | **3. Electromagnetic Spectrum** |  |  |  |  |
| 3.1 | N4 | I can describe the applications and hazards associated with electromagnetic radiations. |  | **** | **** |  |
| 3.2 | N4 | I can describe approaches to minimize the risk associated with electromagnetic radiations, e.g use of sunglasses to protect from UV and IR  |  | **** | **** |  |
| 3.3 | N4 | I can describe how the invisible parts of the EM spectrum can be detected. |  | **** | **** |  |
| 3.6 | N4 | I can give a description of refraction in terms of change of direction (where angle of incidence is greater than 0°). |  | **** | **** |  |
|  |  |  |  |  |  |  |
|  |  | **4. Nuclear Radiation** |  |  |  |  |
| 4.1 | N4 | I can identify natural and artificial sources of radiation, and the associated medical and industrial applications. |  | **** | **** |  |
| 4.2 | N4 | I have considered the pros and cons of generating electricity using Nuclear Fuel. |  | **** | **** |  |
| 4.3 | N4 | I can compare the risk due to nuclear radiation and the other environmental hazards (e.g. global warming) and the management of these risks.  |  | **** | **** |  |
|  |  |  |  |  |  |  |

**DYNAMICS & SPACE** **(start:\_\_\_\_\_\_\_\_end: \_\_\_\_\_\_\_\_ )**

| No. | Level | CONTENT |  | Traffic Light |
| --- | --- | --- | --- | --- |
|  |  | **1. Speed and Acceleration** |  |  |  |  |
| 1.1 | N4 | I can perform calculations involving the relationship between speed, distance and time (*d = vt*) |   | **** | **** |  |
| 1.2 | N4 | I can determine average and instantaneous speed. |   | **** | **** |  |
| 1.3 | N4 | I can interpret speed-time graphs to describe motion and can calculate distance travelled from them for objects which are speeding up, slowing down, stationary and moving |   | **** | **** |  |
| 1.4 | N4 | I can use the relationship involving acceleration, change in speed and time (a = ∆v/t). |   | **** | **** |  |
|  |  |  |  |  |  |  |
|  |  | **2. Relationship between forces, motion and energy** |  |  |  |  |
| 2.1 | N4 | I can use Newton’s 1st law and balanced forces to explain constant speed, making reference to frictional forces. |   | **** | **** |  |
| 2.2 | N4 | I can use Newton’s 2nd law to explain the movement of objects in situations where only one force is acting. |   | **** | **** |  |
| 2.3 | N4 | I can carry out calculations using the relationship between force, mass and acceleration in situations where only one force is acting. (F = ma).  |   | **** | **** |  |
|  |  | **3. Satellites** |  |  |  |  |
| 3.1 | N4 | I can describe the range of heights and functions of satellites in orbit around the earth, including geostationary and natural satellites. |   | **** | **** |  |
| 3.2 | N4 | I can describe & explain that the higher the altitude of a satellite (height) the longer the period of orbit. |   | **** | **** |  |
| 3.3 | N4 | I can describe and explain the use of parabolic reflectors to send and receive signals. |   | **** | **** |  |
| 3.4 | N4 | I can use the relationship between distance, speed and time in scenarios related to satellite communication (d = vt). |   | **** | **** |  |
| 3.5 | N4 | I can describe a range of applications of satellites including telecommunications, weather monitoring and environmental monitoring. |   | **** | **** |  |
| 3.6 | N4 | I understand the use of satellites in developing our understanding of the global impact of mankind’s actions. |   | **** | **** |  |
|  |  | **4. Cosmology** |  |  |  |  |
| 4.1 | N4 | I can define: planet, moon, star, solar systems, exo-planet, galaxy and universe. |   | **** | **** |  |
| 4.2 | N4 | I have an understanding of the scale of the solar system and universe measured in light years. |   | **** | **** |  |
| 4.3 | N4 | I have knowledge of space exploration and its impact on our understanding of the universe and planet Earth. |   | **** | **** |  |
| 4.4 | N4 | I understand the conditions required for an exo-planet to sustain life. |   | **** | **** |  |

**Notes**