**Science 9 – Voltage (Current Electricity Notes 3)**

|  |
| --- |
| **C:\Documents and Settings\gill_narinder\Local Settings\Temporary Internet Files\Content.IE5\D6CEZ9YH\MC900434731[1].pngEnergy is Required to do Work**   * In science, energy is measured in **“Joules” (J)** * Your phone battery holds ~ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of energy‼! * Fun fact: a food “Calorie” is equal to 4184 J, so an egg holds \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of energy! * Energy is required to do work (e.g. lighting up a bulb, heating up a stove). * Energy sources provide electrons with energy to do \_\_\_\_\_\_\_\_\_\_ (e.g. lighting up a bulb, heating up a stove). |

|  |
| --- |
| **Understanding Potential Energy**  **Voltage Gain**   * Batteries give electrons a certain amount of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, also known as \_\_\_\_\_\_\_\_\_\_\_\_\_ (V). * E.g. an AA or AAA battery has a potential energy difference of 1.5 V between its two terminals, so we call it a 1.5 V battery.   **Voltage Drop**   * When electrons go through a \_\_\_\_\_\_\_\_\_\_\_\_ (e.g. resistor, light bulb), they \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Some loads may use more energy than others. * On its journey around the circuit, an electron must use \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ before it returns to the positive terminal of the battery. |

|  |  |
| --- | --- |
| **Measuring Changes in Potential Energy** | |
| The voltage difference between two points on a circuit can be measured using a voltmeter.   * Voltmeter symbol in circuit diagrams: * A voltmeter is always connected across the device, in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. | *Add a voltmeter to this circuit diagram to show how you would measure the voltage of the battery.* |

|  |  |  |  |
| --- | --- | --- | --- |
| **https://images.squarespace-cdn.com/content/v1/5c5aed8434c4e20e953d6011/1603295342267-574BA5R64X49DJ3ERJBX/energy+charge+voltage+triangle.jpgVoltage Calculations**   * Voltage is measured in volts (V). * The voltage of a battery is the amount of Energy (J) carried by 1 Coulomb of electrons in a circuit.  |  |  | | --- | --- | |  | V = voltage in Volts (V)  E = energy in Joules (J)  Q = charge in Coulombs (C) | | |
| **Example 1)**  A light bulb is powered by 3 AA batteries. How much energy is delivered to the bulb if 20 C of charge is used? | **Example 2)**  A car battery is 12 V and sends out 28 kJ of energy. How much electric charge does the battery hold? |

|  |  |
| --- | --- |
| **Series and Parallel Combinations of Cells**   * When cells are connected in **series**, we can find the total amount of voltage by just adding them together. * VT = V1 + V2 + … | https://www.schoolphysics.co.uk/age14-16/Electricity%20and%20magnetism/Current%20electricity/text/Series_and_parallel_components/images/4.pngExample: Calculate the total voltage of this battery made of three, 2-volt cells connected in series. Draw the voltmeter set-up that could measure this total voltage change. |
| * When cells are combined in **parallel**, the voltage does not increase but the amount of charge (current) does. * Advantages: greater current or longer battery life * VT = V1 = V2 = V3 | https://www.schoolphysics.co.uk/age14-16/Electricity%20and%20magnetism/Current%20electricity/text/Series_and_parallel_components/images/4.pngExample: Calculate the total voltage of this battery made of three, 2-volt cells connected in parallel. Draw the voltmeter set-up that could measure this total voltage change. |
| **Loads Connected in Series**   * Rule: The total voltage gained from the battery is equal to the total voltage drop from all the loads combined. * VT = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| Example:  What is ? | |

|  |
| --- |
| **Loads Connected in Parallel**  V1  V2  V3  VT   * When electrons go through devices in parallel, they split at junction points. * Each load in parallel will receive the same amount of energy/Voltage. * VT = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Example: If V1=10V, Calculate VT, V2 and V3.  V1  V2  V3  VT |