|  |  |  |
| --- | --- | --- |
| **Make a trap to detect Santa** | | |
| Stay |  |  |
| **Stay safe** | | |
| Whether you are a scientist researching a new medicine or an engineer solving climate change, safety always comes first. An adult must always be around and supervising when doing this activity. You are responsible for:    • ensuring that any equipment used for this activity is in good working condition  • behaving sensibly and following any safety instructions so as not to hurt or injure yourself or others    Please note that in the absence of any negligence or other breach of duty by us, this activity is carried out at your own risk. It is important to take extra care at the stages marked with this symbol: ⚠ | | |
| **Age range:** 7-11  **Approx time:** 1 hour |  | **Key words / Topics:**   * KS2 * Electricity * Circuit |
|  |  |  |
| **Equipment** |  |  |
| * A thin piece of sponge – a washing up sponge is great but make sure it is completely dry * Scissors * Masking or sticky tape * Aluminium kitchen foil * 3 crocodile leads (you will need another 2 if you do the extension task) * A 2 x AA battery pack * A 3V buzzer * Solar panel (optional – A3.0V 100mA Polycrystalline solar cell works best) * A 2.5 bulb with holder (optional) | | |
|  |  |  |
| **The challenge** |  |  |
| You really want to stay awake to see Santa delivering your presents on Christmas Eve but you know you are probably going to fall asleep. You need to make an Electronic Santa Detector (or ESD for short!) | | |
|  |  |  |
| **Instructions** |  |  |
| **Step 1**  Cut a square of the thin sponge approximately 10cm x 10cm.  In the centre, cut a hole approximately 4cm diameter.  ⚠**Be careful when using scissors always have an adult on standby in case you need help**  **Step 2**  Cut two pieces of aluminium foil slightly smaller than your piece of sponge.  **Step 3**  Using masking or sticky tape, tape one piece of aluminium foil to the top of the sponge and the other to the bottom. The tin foil pieces **MUST NOT** touch if the sponge is not pressed down but should once it is pressed.  **Step 4**  Attach one crocodile lead to the top piece of foil and one to the bottom piece.  You have now built the pressure pad for your Electronic Santa Detector but you need to put it in a circuit for something to happen. Use your crocodile leads to connect the components like this:  B  Pressure pad  Battery pack  Buzzer  Crocodile leads  When you gently press the centre, the buzzer should sound.  Now all you need to do is leave it somewhere you think Santa will stand when he delivers your presents. Just inside your bedroom door perhaps, or at the end of your bed with your stocking.  When he steps on the pressure pad, the buzzer will sound and alert you to him being in the room.  You might also want to disguise it, so it is not noticeable. Santa is old and wise and if he sees it, he will know not to step on it. | | |
| **Extension** |  |  |
| Use a solar panel to replace the battery pack in your circuit. Does this work as well? Which is better for Electronic Santa Detector – the battery pack or the solar panel?  What if you were deaf? Try replacing the buzzer with the bulb. Does this work?  Can you put both the buzzer and the bulb in the circuit and make it work? You will find a parallel circuit works best. Try this.  B  Pressure pad  Battery pack  Bulb | | |
|  |  |  |
| **Science** |  |  |
| The pressure pad acts just like a switch, making and breaking the circuit. When you press it, the two pieces of aluminium foil connect, the circuit is completed, and the flow of electricity begins. When you let go the circuit is broken and the flow of electricity stops.  Watch this video for information on how electricity moves through materials <https://www.bbc.co.uk/bitesize/clips/zxksb9q>.  This will only work if the materials which touch are good electrical **conductors**. These are materials which allow electricity to pass through them easily, such as many copper, iron and steel.  Materials which do not allow electricity to pass easily through them are called **insulators**. Examples of these are plastic, rubber and wood, and washing up sponges.  Check out our electric dough activity to investigate conductors and insulators further with another hands-on experiment. | | |

|  |
| --- |
| **The Engineering Context** |
| Engineers need to be able to understand how electrical circuits are drawn and communicated. This includes the use of circuit symbols to produce circuit diagrams and schematics. This knowledge could be used when investigating, designing or making electrical and electronic circuits in the future. |

|  |  |  |  |
| --- | --- | --- | --- |
|  | |  |  |
| **Curriculum links** | | | |
| |  |  | | --- | --- | | **England: National Curriculum**  Design and Technology   * KS2: 1b, 2a, 2b, 4c   Science  KS2 Electricity:   * construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers * identify whether or not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery | **Northern Ireland Curriculum**  Science and Technology   * Movement and energy: The causes and effect of energy, forces and movement | | **Scotland: Curriculum for Excellence**  Technologies   * TCH 2-09a, TCH 2-12a,   Sciences   * SCN 1-09a, SCN 2-10a | **Wales: National Curriculum**  Design and Technology   * KS2 Designing: 5 * KS2 Making: 2, 3, 4, 6 * KS2 Systems and control: 14   Science:   * KS2 How things work: 1 | | | | |
|  |  | | |