



# Edgewood Primary School - Year 3 and 4

## Design and Technology – Knowledge Organiser

### Shell Structures and Electrical Unit: Simple circuit and switch. (Night Lights)



## Prior Knowledge

Cut and joined a variety of construction materials, such as wood, card, plastic, reclaimed materials and glue.

Understand and use electrical system in their products, such as series circuits incorporating switches, bulbs and buzzers.

Have a basic understanding of 2D & 3D shapes in maths and the physical properties and everyday use of materials in science.

Develop and use knowledge of how to construct strong, stiff shell structures.

Develop and use knowledge of nets of cubes and cuboids and, where appropriate, more complex 3D shapes.

## Key Knowledge for this Unit

### Design

Below are some of the main considerations of a design process for a night light.

Consider the 3-D shapes that are most appropriate for this purpose: cubes, cuboids, prisms, are all possibilities. Remember, curved shell structures are effective at spreading weight evenly.

Shell structures can be stiffened through folding, layering, corrugating, ribbing or lamination. Shell Structures may be used to present things.

Whilst the shape needs to be strong & durable, it also needs to be appealing to the users.

Consider what type of input device (e.g. battery/cell), conductor (e.g. wires) and output device (e.g. bulb) are best for your purpose and audience and how you are going to present/store them within your night light.

### Make

In order to ensure that your circuit is closed, it is hugely important that your connections are secure. Connecting blocks and bulb holders are useful pieces of equipment for ensuring this. Twisting strands of wire and taping wire are also useful strategies for creating a secure connection.

Nets can be used to make 3D products. - Scoring is the process of marking a sheet to make it easier to fold. Outer edges of the net can be cut out (apparatus depends on material). Tabs are additional strips on the net that can be scored and folded to make a surface for sticking vertices together.

### Health and Safety

Never use anything with a plug, wire or cord around water.

Do not put fingers or objects in outlets.

Keep metal objects away from electrical heat sources – e.g. knife away from toaster.

Never pull a plug out by its cord.

### Evaluate

How well does your electrical system work? Does it work as planned?

Does it meet its purpose?

What would your audience think about your product? What would they like about it? What would they not like?

What problems did you encounter? How did you fix them?

What could you still improve about your product? How would you do things differently next time?

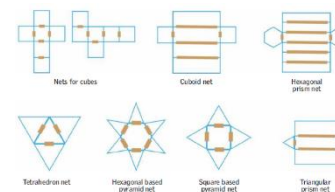
How does your product look? How could it look more appealing?

## Key Vocabulary

shell structure, three-dimensional (3-D) shape, net, cube, cuboid, prism, vertex, edge, face, length, width, breadth, capacity, shaping, tabs, adhesives, stiff, switch, battery, battery holder, light emitting diode (LED), bulb holder, USB cable, wire, insulator, conductor, crocodile clip



**Push-to-make switch**  
When you push, the electricity flows through the circuit, but when you release it the circuit is broken and the switch is off.



## Examples



Examples of  
Edgewood Pupils  
previous work!



## Pop Quiz Questions

Give an example of a shell structure.

How can you make a structure stronger?

What is the strongest shape?

What happens if you break a circuit?

What is the job of a switch in a circuit?