Year 8 Science - Energy Flow Diagrams

An energy flow diagram is a visual way to show the uses of energy in a system. A simple diagram for the energy flow in a mobile phone is shown below. This shows how energy is converted from one form into another. The usable energy stored in the battery as chemical energy becomes degraded energy when converted to sound, light and heat. Degraded energy is energy that is less usable.

Sankey Diagrams

Sankey diagrams are more useful because they indicate the amount of usable and wasted energy at each stage of the diagram. Shown below are the Sankey diagrams for two types of light globes. Each of these show 100 Joules of energy, added on the left, being converted into light energy and heat energy. Sankey diagrams are named after Captain Matthew Sankey, an Irish engineer, who published the energy flow diagram for a steam engine in 1898.

Answer the following questions

Explain what you would mean by the expression, 'energy efficiency of a light globe'.

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Which of the two light globes is more efficient, using your definition? Explain why?

What is that efficiency, in numbers?

How many filament globes are needed to give out the same light as one LED?

The following Sankey diagram shows the energy flow for an electricity generator. An electrical generator converts kinetic energy into electrical energy.

How efficient is this boiler-condenser-turbine-generator system?

Where is the most energy lost?
Draw a diagram to show the boiler and the condenser replaced by a windmill.

Now redraw the Sankey diagram to show the energy flow for the windmill-turbine-generator system. You can assume efficiency of the windmill is 80%. Think carefully about how much energy reached the generator in the previous diagram, and compare that to how much energy reaches the generator in this diagram.

What is the efficiency of the windmill-turbine-generator system?
Consider the following situation.

A year 8 student lifts a rubber ball to a height where it has 20 Joules of gravitational potential energy. The ball is dropped and bounces repeatedly.

Draw a Sankey diagram showing the energy conversions and energy losses for three bounces of the ball. Assume that 70% of the energy is lost each time the ball bounces. Use a ruler, and measure the width of each branch.