Energy Efficiency

When energy is changed some of it is always wasted. We can measure the amount of useful energy we get by the efficiency.

$$\text{Efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100$$

The examples below show energy changes in engines. The **work** that they do is their useful energy output.

Calculate the efficiency of each engine.

1. A petrol engine takes 1000J of chemical energy and does 250J of work.

   $\frac{250}{1000} \times 100 = 25\%$.

2. A diesel engine uses 6000J of chemical energy and does 2100J of work.

   $\frac{2100}{6000} \times 100 = 35\%$.

3. An electric motor uses 50J of electrical energy and does 40J of work.

   $\frac{40}{50} \times 100 = 80\%$.

4. A cyclist (a human engine) has 200J of energy and does 30J of work.

   $\frac{30}{2000} \times 100 = 15\%$.

For the following questions, you will need to decide what form the useful energy is in.

5. A TV takes in 600J of electrical energy and gives out 300J of light, 240J of sound and 60J of heat energy. useful energy = 300 + 240 = 540

   $\frac{540}{600} \times 100 = 90\%$.

6. A windup toy uses 50J of potential energy and gives out 24J of kinetic energy, 20J of heat energy and 6J of sound energy. useful energy = 24 + 6 = 30

   $\frac{30}{50} \times 100 = 20\%$.

7. 100J of electrical energy is put into a light bulb. 20J of light energy and 90J of heat energy are produced.

   $\frac{20}{100} \times 100 = 20\%$.

8. A hairdryer uses 750J of electrical energy and converts it into 400J of heat energy and 350J of sound energy.

   $\frac{400}{750} \times 100 = 53\%$.

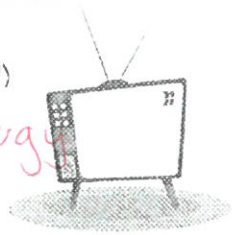
9. 2000J of electrical energy is used by a microwave to produce 100J of sound energy, 400J of light energy and 1500J of heat energy.

   $\frac{1500}{2000} \times 100 = 75\%$.

10. An iPod uses 400J of energy which is transformed into 100J of light energy, sound energy and 75J of heat energy.

    $400 - 100 - 75 = 225$ 225J of sound energy

    $\frac{225}{400} \times 100 = 56\%$.



Efficiency Calculation Worksheet Name: _____

1. Wile E. Coyote sets up a pulley to lift a gigantic boulder over a valley highway in an attempt to squish the Roadrunner. Wile E. Coyote puts 3402 J of energy into the pulley while the pulley does 2938 J of work. Calculate the efficiency of the pulley.

$\frac{2938}{3402} \times 100 = 86\%$

2. Wile E. Coyote's previous attempt of killing the Roadrunner failed so he decided to use an inclined plane to push a boulder down onto the Roadrunner. The output work done by the inclined plane is 875 J and the input work is 1285 J. Calculate the efficiency of the inclined plane.

$\frac{875}{1285} \times 100 = 68\%$

3. After another failed attempt, Wile E. Coyote grabs a stick to create first class lever. He inputs 445 J of work and the output work of the lever is 430 J. Calculate the efficiency.

$\frac{430}{445} \times 100 = 97\%$

4. Wile E. Coyote tries chasing after the Roadrunner with his Acme 200 Cyclone bicycle. The output of bike is 2890 J of work while the input was 4122 J. Calculate the efficiency of the Acme 200 Cyclone.

$\frac{2890}{4122} \times 100 = 70\%$

5. Wile E. Coyote wants to poison the Roadrunner by putting arsenic in some bird feed. The arsenic comes in a can so he must use a can opener. If Wile E. Coyote applies 34 J of work and the can opener does 27 J work then what is the efficiency of the can opener?

$\frac{27}{34} \times 100 = 79\%$

6. In his last attempt Wile E. Coyote creates a catapult to launch a boulder. After construction, Wile E. Coyote sets up the catapult and waits for the Roadrunner. When the Roadrunner appears he puts 793 J of work into the catapult while it does 720 J of work. What is the efficiency this catapult?

$\frac{720}{793} \times 100 = 91\%$