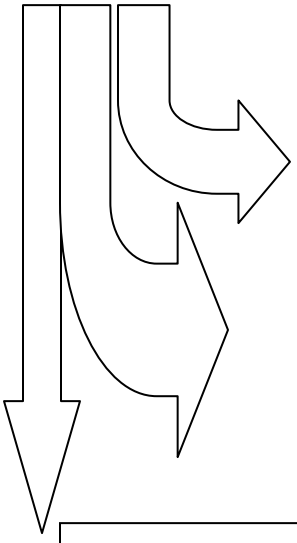
Energy Efficiency

1000 J fuel energy (put IN to car)



700 J energy → wasted in the engine – vapourize fuel, ignites, pistons move, heat energy off engine

150 J → wasted in the transmission - heat lost caused by friction in the wheels/axels

100 J energy actually moving the car! **100 J of <u>useful</u> work.**

So how efficient is the car? _____

How about this? A coal burning plant is 38% efficient. It puts out 2.2 x 10^{14} J of energy a day. How much fossil fuel (coal) must be burned a day to achieve this output?

38% (input E) = output E

0.38 (fossil energy burned) J = 2.2 x 10^{14} J

Fossil energy burned = 2.2 x 10^{14} / 0.38

Fossil energy burned = _____

(you finish off – it should be greater than 2.2 x 10^{14})

<u>% efficiency formulas</u>

Remember the work-energy theorem so we can consider the work instead of energy 

% efficiency = $\frac{Energy\ out\ (J)}{Energy\ in\ (J)}\ x\ 100\%$

% efficiency = $\frac{Useful\ work\ out\ (J)}{Energy\ in\ (J)}\ x\ 100\%$

Machines & Efficiency

Key points

→ Simple machines (lever, ramp, pulley etc.) is a device that enables us to do work more easily.

ie: I can move a heavy rock with a long **lever**.

→ Not so simple machines help too!

ie: a **bulldozer** moves a load of bricks faster than I can.

We have other machines that are not so simple: ie: furnace, heater, engine etc. There is a trade-off though. Energy is 'lost' to non-useful forms (often heat) during the process. Take a look at Table 5.1 on page. 181.