

### 4.8.3 Efficiency

Efficiency is a measure of what fraction of total input energy is transferred to useful output energy:

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



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Efficiency can be expressed as a fraction or as a percentage.

(1) *A ball is dropped from a height of 1m and rebounds to 0.6m. What is the efficiency of the bounce?*

(2) *What has happened to the 'missing' energy?*

Efficiency can also be calculated from power:

$$\text{Efficiency} = \frac{\text{useful power output}}{\text{total power input}}$$

*An electric light bulb is supplied at mains voltage (230V) with a current of 2.6A.*

(3) *What is the electrical power supplied?*

(4) *The light bulb, above, produces 100W of light energy. How efficient is it?*

*An electric motor is used to lift a 0.2kg mass by 1.2m. It is supplied at 12V with a current of 0.08A. The motor is 80% efficient.*

(5) *What energy transfer is occurring in this case?*

(6) *What is the useful power output from the motor?*

(7) *What is the total energy gained by the 0.2kg mass?*

(8) *How quickly will it be lifted?*