

- 14** A metal block has a mass of 750 g. 60% of the mass is magnesium and the remainder is copper.

The density of magnesium is  $1.7 \text{ g cm}^{-3}$ .

The density of copper is  $9.0 \text{ g cm}^{-3}$ .

What is the density of the block?

- A**  $2.5 \text{ g cm}^{-3}$       **B**  $4.6 \text{ g cm}^{-3}$       **C**  $5.4 \text{ g cm}^{-3}$       **D**  $10.7 \text{ g cm}^{-3}$

- 15** A man climbs slowly at a steady speed to the top of a ladder.

What is the **main** energy transfer taking place for the man as he climbs?

- A** chemical potential to gravitational potential  
**B** chemical potential to kinetic  
**C** kinetic to gravitational potential  
**D** thermal (heat) to kinetic

- 16** During an interval of time, fuel supplies energy  $X$  to a car.

Some of this energy is converted into kinetic energy as the car accelerates.

The rest of the energy  $Y$  is lost as thermal energy.

What is the efficiency of the car?

- A**  $\frac{X}{X-Y}$       **B**  $\frac{Y}{X-Y}$       **C**  $\frac{X-Y}{X}$       **D**  $\frac{X-Y}{Y}$

- 17** A railway engine accelerates a train of total mass 800 tonnes (1 tonne = 1000 kg) from rest to a speed of  $50 \text{ m s}^{-1}$ .

How much useful work must be done on the train to reach this speed?

- A**  $1.0 \times 10^6 \text{ J}$       **B**  $2.0 \times 10^6 \text{ J}$       **C**  $1.0 \times 10^9 \text{ J}$       **D**  $2.0 \times 10^9 \text{ J}$

- 18** A mass is raised vertically. In time  $t$ , the increase in its gravitational potential energy is  $E_p$  and the increase in its kinetic energy is  $E_k$ .

What is the average power input to the mass?

- A**  $(E_p - E_k)t$       **B**  $(E_p + E_k)t$       **C**  $\frac{E_p - E_k}{t}$       **D**  $\frac{E_p + E_k}{t}$