

- 20** A railway engine accelerates a train of total mass 800 tonnes (1 tonne = 1000 kg) from rest to a speed of 50 ms^{-1} .

How much 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** $2.0 \times 10^9 \text{ J}$

- 21** Water from a reservoir is fed to the turbine of a hydroelectric system at a rate of 500 kg s^{-1} . The reservoir is 300 m above the level of the turbine.

The electrical output from the generator driven by the turbine is 200 A at a potential difference of 6000 V.

What is the efficiency of the system?

- A** 8.0 % **B** 8.2 % **C** 80 % **D** 82 %

- 22** Which row correctly describes the spacing, ordering and motion of the molecules in water and in ice when both are at a temperature of 0°C ?

| | spacing | ordering | motion |
|----------|--|--|---|
| A | molecules in ice are closer together than molecules in water | a regular pattern of molecules in both ice and water | molecules in both ice and water have the same average speed |
| B | molecules in ice are closer together than molecules in water | a regular pattern of molecules in ice but not in water | molecules in ice travel more slowly than those in water |
| C | molecules in ice are further apart than molecules in water | a regular pattern of molecules in both ice and water | molecules in ice travel more slowly than those in water |
| D | molecules in ice are further apart than molecules in water | a regular pattern of molecules in ice but not in water | molecules in both ice and water have the same average speed |

Space for working