16 A hydroelectric power station uses the gravitational potential energy of water to generate electrical energy.

In one particular power station, the mass of water flowing per unit time is $1.5 \times 10^5 \, \text{kg s}^{-1}$. The water falls through a vertical height of 120 m.

The electrical power generated is 100 MW.

What is the efficiency of the power station?

A   5.6%   B   43%   C   57%   D   77%


17 Which amount of energy is **not** 2400 J?

A   the decrease in gravitational potential energy of a mass of 60 kg when it moves vertically downwards through 40 m near the Earth's surface

B   the energy transferred in 15 s by a machine of power 160 W

C   the kinetic energy of a mass of 12 kg moving at a speed of $20 \, \text{m s}^{-1}$

D   the work done by a gas expanding against a constant external pressure of 120 kPa when its volume increases by $0.020 \, \text{m}^3$

18 A train of mass 300 000 kg is accelerating at $0.80 \, \text{m s}^{-2}$. At one instant, the speed of the train is $5.0 \, \text{m s}^{-1}$ and the resistive force to its motion is 15 kN.

At this instant, what is the rate of increase of kinetic energy of the train?

A   0.075 MW   B   1.2 MW   C   1.3 MW   D   3.8 MW

19 A wire of circular cross-section, which obeys Hooke's law, is used to suspend a basket as shown.
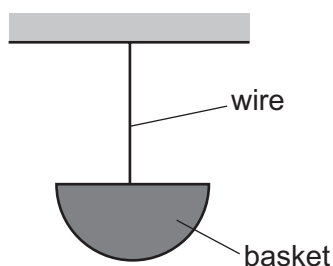
The Young modulus for the material of the wire is $2.5 \times 10^{11} \, \text{Pa}$.

When a weight of 34 N is added to the basket, the strain in the wire increases by 6.0×10^{-5}.

What is the radius of the wire?

A $7.2 \times 10^{-7} \, \text{m}$ B $2.3 \times 10^{-6} \, \text{m}$ C $8.5 \times 10^{-4} \, \text{m}$ D $1.7 \times 10^{-3} \, \text{m}$