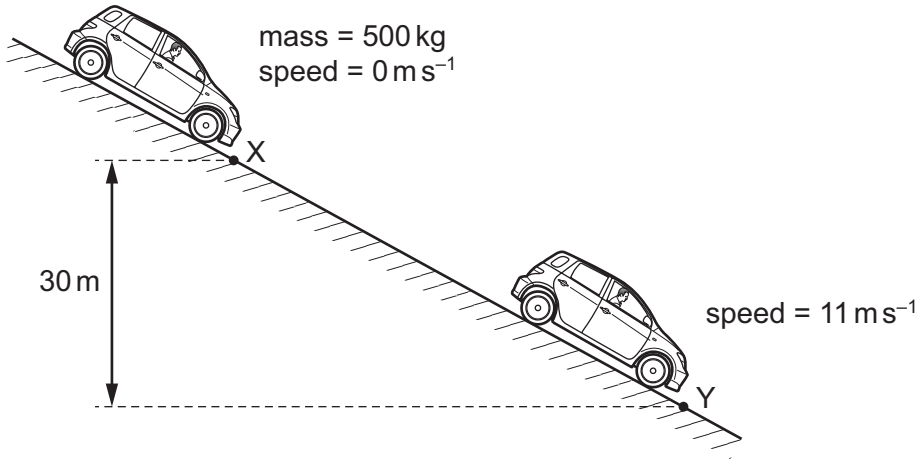
19 A car of mass 500 kg is at rest at point X on a slope, as shown.

The car's brakes are released and the car rolls down the slope with its engine switched off. At point Y the car has moved through a vertical height of 30 m and has a speed of 11 m s^{-1}.



What is the energy dissipated by frictional forces when the car moves from X to Y?

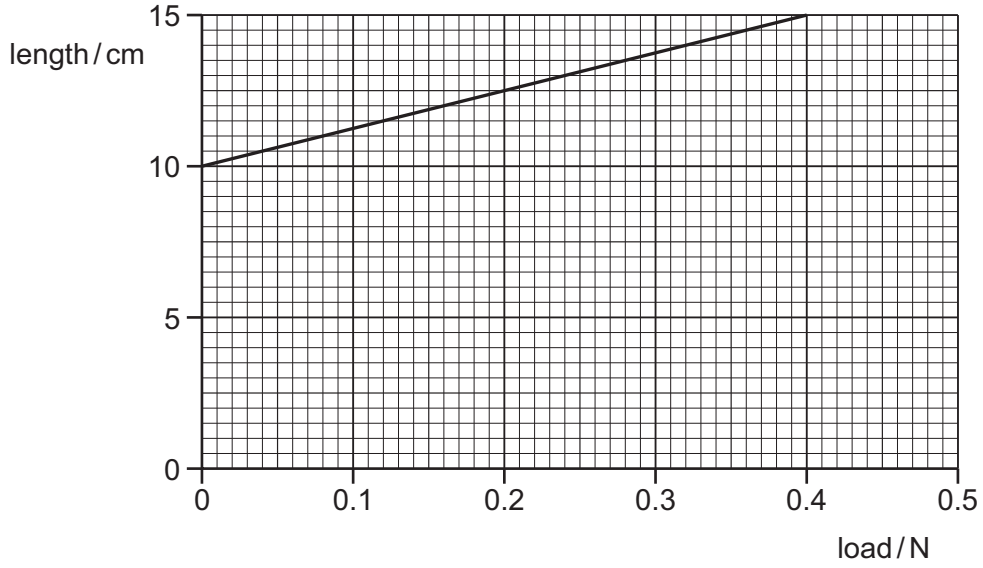
A 3.0×10^4 J **B** 1.2×10^5 J **C** 1.5×10^5 J **D** 1.8×10^5 J

20 An elastic material with Young modulus E is subjected to a tensile stress S. Hooke's law is obeyed.

What is the expression for the elastic energy stored per unit volume of the material?

A $\frac{E}{2S^2}$ **B** $\frac{2E}{S^2}$ **C** $\frac{S^2}{E}$ **D** $\frac{S^2}{2E}$

21 The graph shows the length of a spring as it is stretched by an increasing load.



What is the spring constant of the spring?

A 0.080 N m^{-1} **B** 0.13 N m^{-1} **C** 2.7 N m^{-1} **D** 8.0 N m^{-1}