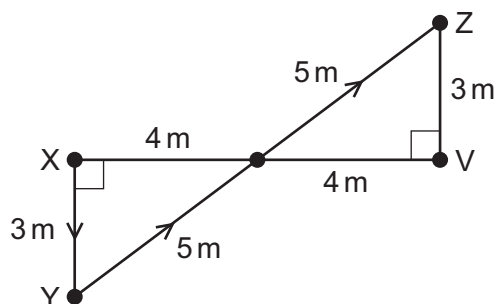17 An object is moved in a vertical plane from X to Y, and then from Y to Z, as shown in the diagram.

The distances between various points are indicated on the diagram.

Lines XY and VZ are vertical.

The object weighs 20 N.

How much gravitational potential energy does the object gain by moving from X to Z?

A   60 J   B   120 J   C   140 J   D   260 J

18 A car travels at a constant speed of $25\,\text{m s}^{-1}$ up a slope. The wheels driven by the engine exert a forward force of 3000 N. The total force due to air resistance and friction is 2100 N. The weight of the car has a component down the slope of 900 N.

What is the rate at which thermal energy is dissipated?

A   zero   B $2.3 \times 10^4\,\text{W}$ C $5.3 \times 10^4\,\text{W}$ D $7.5 \times 10^4\,\text{W}$

19 A composite rod is made by attaching a glass-reinforced plastic rod and a nylon rod end to end, as shown.
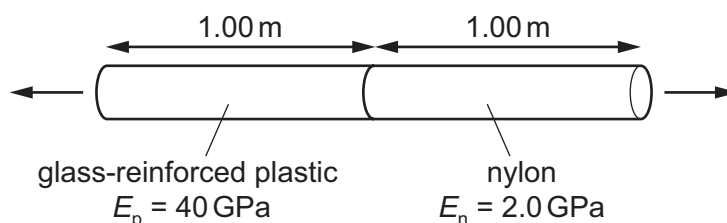
The rods have the same cross-sectional area and each rod is 1.00 m in length. The Young modulus E_p of the plastic is 40 GPa and the Young modulus E_n of the nylon is 2.0 GPa.

The composite rod will break when its total extension reaches 3.0 mm.

What is the greatest tensile stress that can be applied to the composite rod before it breaks?

A $2.9 \times 10^6\,\text{Pa}$

B $5.7 \times 10^6\,\text{Pa}$

C $2.9 \times 10^9\,\text{Pa}$

D $5.7 \times 10^9\,\text{Pa}$