Answer **all** the questions in the spaces provided.

1 **(a)** Define *acceleration*.

.....

.....[1]

(b) A man travels on a toboggan down a slope covered with snow from point A to point B and then to point C. The path is illustrated in Fig. 1.1.

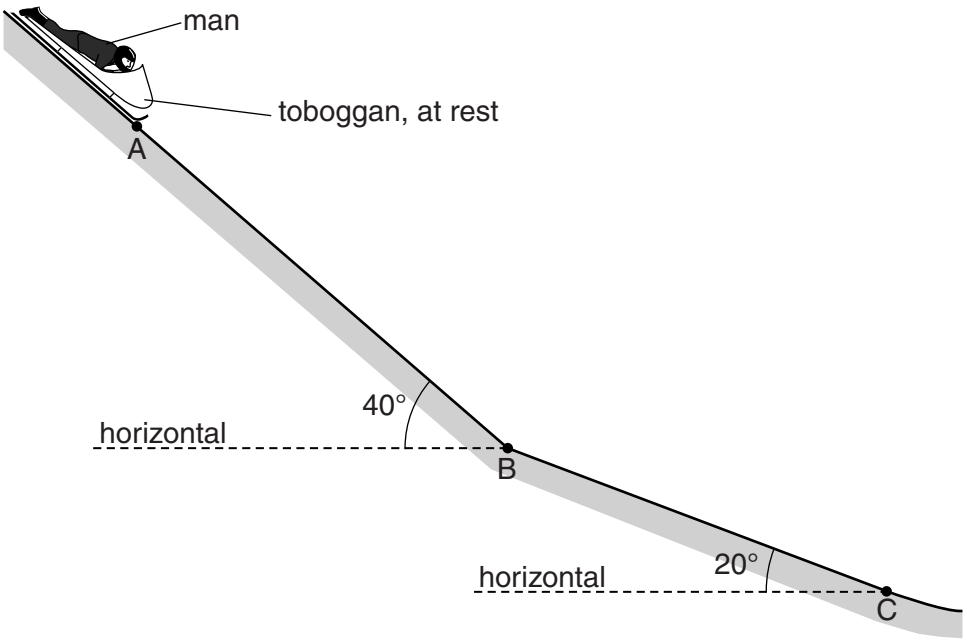

Fig. 1.1 (not to scale)

The slope AB makes an angle of 40° with the horizontal and the slope BC makes an angle of 20° with the horizontal. Friction is not negligible.

The man and toboggan have a combined mass of 95 kg.

The man starts from rest at A and has constant acceleration between A and B. The man takes 19 s to reach B. His speed is 36 m s^{-1} at B.

(i) Calculate the acceleration from A to B.

acceleration = ... m s^{-2} [2]

(ii) Show that the distance moved from A to B is 340 m.

[1]

(iii) For the man and toboggan moving from A to B, calculate

1. the change in kinetic energy,

change in kinetic energy = ... J [2]

2. the change in potential energy.

change in potential energy = ... J [2]

(iv) Use your answers in **(iii)** to determine the average frictional force that acts on the toboggan between A and B.

frictional force = ... N [2]

(v) A parachute opens on the toboggan as it passes point B. There is a constant deceleration of $3.0\,m\,s^{-2}$ from B to C.

Calculate the frictional force that produces this deceleration between B and C.

frictional force = ... N [2]

[Total: 12]

[Turn over