2 **(a)** An object of mass 1.5 kg is released vertically downwards from a stationary hot air balloon. Fig 2.1 shows how the velocity of the object varies with time.

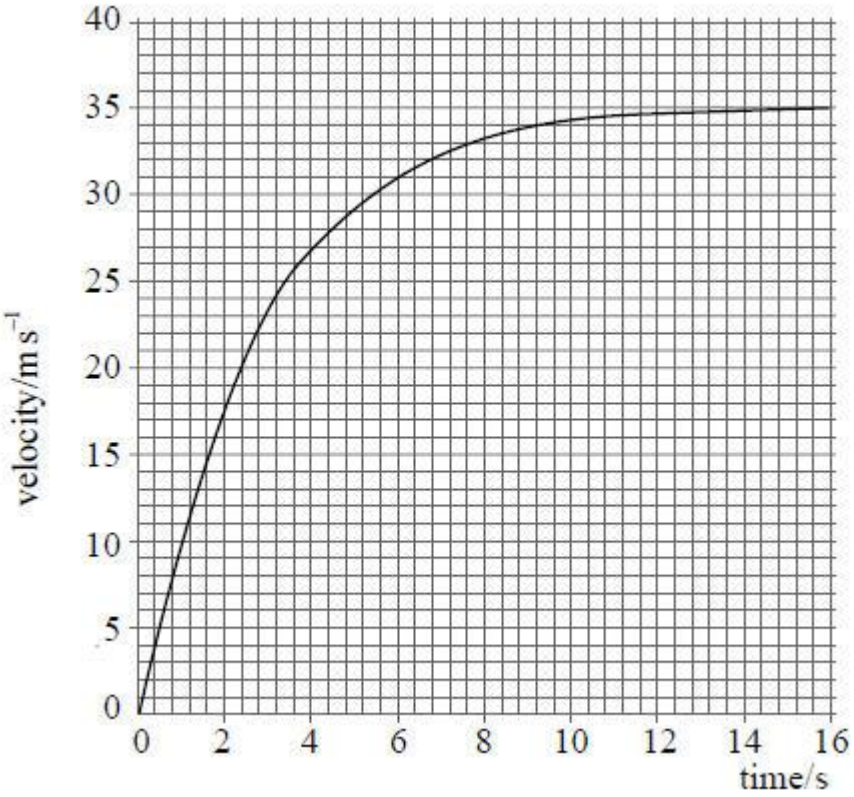

Fig 2.1

(i) Define the term *acceleration*.

……..……...…...

……..... [1]

(ii) Estimate the distance travelled by the object in the first 6.0 s.

distance travelled = …… m [2]

(iii) Using Fig. 2.1, explain how the acceleration of the object changes with time.

……

……

……

…… [2]

(iv) Determine the magnitude of the viscous force acting on the object when time = 5.0 s.

viscous force = …… N [3]

(b) Fig. 2.2 shows two blocks A and B of mass 3.0 kg and 4.0 kg respectively connected by a light inextensible cord passing over a light frictionless pulley. When both blocks are released, block A starts to move from rest along a smooth plane inclined at 40° to the horizontal while block B starts to move from rest along a smooth plane inclined at 20° to the horizontal.

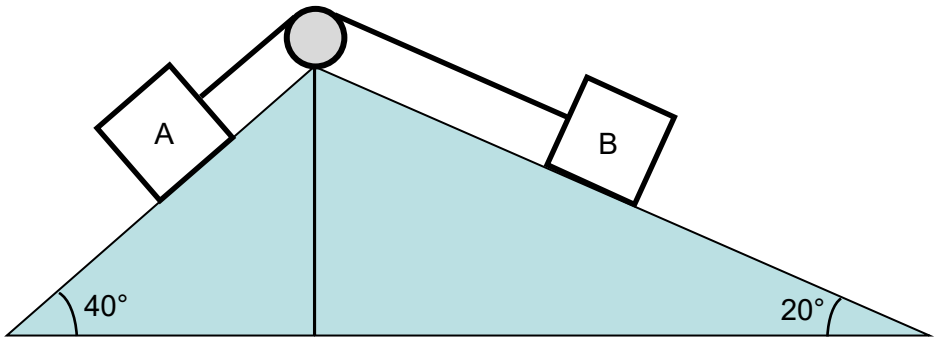

Fig. 2.2 (not to scale)

(i) Calculate the magnitude of the acceleration of the two blocks when the blocks are released and the tension in the cord.

acceleration = …… m s^{-2} [2]

tension = …… N [1]

(ii) If both planes in contact with blocks A and B are rough and the total frictional force between the surfaces in contact is 4.0 N, determine the speed of block A when it has moved 2.0 m along the plane from rest.

speed of block A = …… m s^{-1} [3]