1 **(a)** A truck of mass 12 kg is rolling down a very slight incline as shown in Fig. 1.1.

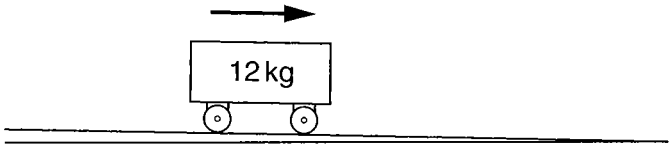

Fig. 1.1

The truck travels at constant speed.

Explain why, although the truck is on an incline, it nevertheless does not accelerate.

force down slope = friction force

(b) The slope of the incline is increased. As a result of this, the truck now accelerates.

(i) Explain why there is now acceleration.

force down slope > friction force

(ii) Write down an equation linking the resultant force on the truck and the acceleration of the truck.

$F = ma$

[1]

(iii) The truck's acceleration is 2.0 m/s^2.

Calculate the resultant force on the truck.

$F=ma$
$=12 \times 2$
$=24N$

(c) The friction force up the slope in **(b)(iii)** was 14.0 N.

By suitable lubrication, the friction force is now almost totally removed.

(i) Calculate the new acceleration of the truck.

$F = 24N + 14N$

$= 38N$

$F = ma$

$38 = 12a$

$a = 38/12 = 3.16 m/s^2$

(ii) The lubricated truck travels down the incline, starting from rest at the top of the incline. It takes 2.5 s to reach the bottom of the incline.

Calculate its speed as it reaches the bottom of the incline.

$v = at$

$= 3.2 \times 2.5$

$= 8 m/s$

(d) The incline is reduced to the original value and the lubricated truck is placed on it.

Describe the motion of the truck when it is released.

the truck will accelerate