IB1 physics (NOM)
More work/energy problems

Questions

1 A horizontal force of 24 N pulls a body a distance of 5.0 m along its direction. Calculate the work done by the force.

2 A block slides along a rough table and is brought to rest after travelling a distance of 2.4 m. The frictional force is assumed constant at 3.2 N. Calculate the work done by the frictional force.

3 A block is pulled as shown in Figure 7.23 by a force making an angle of 20° to the horizontal. Find the work done by the pulling force when its point of application has moved 15 m.

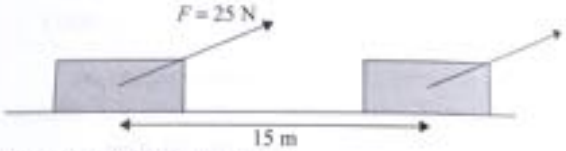

Figure 7.23 For question 3.

4 A block of mass 4.0 kg is pushed to the right by a force $F = 20.0$ N. A frictional force of 14.0 N is acting on the block while it is moved a distance of 12.0 m along a horizontal floor. The forces acting on the mass are shown in Figure 7.24.

(a) Calculate the work done by each of the four forces acting on the mass.

(b) Hence find the net work done.

(c) By how much does the kinetic energy of the mass change?

Figure 7.24 For question 4

5 A weight lifter slowly lifts a 100 kg mass from the floor up a vertical distance of 1.90 m and then slowly lets it down to the floor again.

(a) Find the work done by the weight of the mass on the way up.

(b) Find the work done by the force exerted by the weight lifter when lifting the weight up.

(c) What is the total work done by the weight on the way up and the way down?

6 A block of mass 2.0 kg and an initial speed of 3.4 m s^{-1} slides on a rough horizontal surface and is eventually brought to rest after travelling a distance of 4.0 m. Calculate the frictional force between the block and the surface.

7 A spring of spring constant $k = 200$ N m^{-1} is slowly extended from an extension of 3.0 cm to an extension of 5.0 cm. How much work is done by the extending force?

8 A spring of spring constant $k = 150$ N m^{-1} is compressed by 4.0 cm. The spring is horizontal and a mass of 1.0 kg is held to the right end of the spring. If the mass is released, with what speed will it move away?

9 Look at Figure 7.25.

(a) What is the minimum speed v the mass must have in order to make it to position B? What speed will the mass have at B?

(b) If $v = 12.0$ m s^{-1}, what will the speed be at A and B?

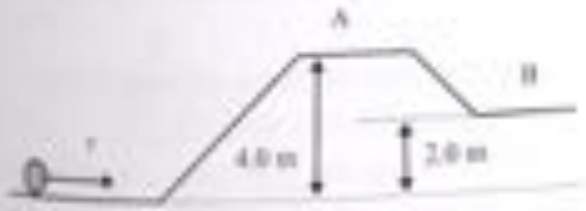

Figure 7.25 For question 9.

10 A mass is released from rest from the position shown in Figure 7.26. What will its speed be as it goes past positions A and B?

Figure 7.26 For question 10.

11 The speed of the 8.0 kg mass in position A in Figure 7.27 is 6.0 m s^{-1}. By the time it gets to B the speed is measured to be 12.0 m s^{-1}.

Figure 7.27 For question 11.

What is the frictional force opposing the motion? (The frictional force is acting along the plane.)

12 A toy gun shoots a 20.0 g ball when a spring of spring constant 12.0 N m^{-1} decompresses. The amount of compression is 10.0 cm (see Figure 7.28). With what speed does the ball exit the gun, assuming that there is no friction between the ball and the gun? If, instead, there is a frictional force of 0.05 N opposing the motion of the ball, what will the exit speed be in this case?

10 cm

Figure 7.28 For question 12.

13 A variable force F acts on a body of mass $m = 2.0$ kg initially at rest, moving it along a straight horizontal surface. For the first 2.0 m the force is constant at 4.0 N. In the next 2.0 m it is constant at 8.0 N. In the next 2.0 m it drops from 8.0 N to 2.0 N uniformly. It then increases uniformly from 2.0 N to 6.0 N in the

Chapter 2.7

1 1.2×10^2 J.
2 −7.7 J.
3 3.5×10^2 J.
4 (a) Work done by weight and reaction force is zero. Work done by F is 240 J and by friction is −168 J.
(c) The kinetic energy increases by 72.0 J.
5 (a) −1900 J; (b) +1900 J; (c) zero.
6 7.3 N.
7 0.16 J.
8 0.49 m s^{-1}.
9 (a) 8.9 m s^{-1}; 6.3 m s^{-1}; (b) 8.0 m s^{-1}; 10.2 m s^{-1}.
10 7.75 m s^{-1}; 11.8 m s^{-1}.
11 22 N.
12 2.45 m s^{-1}; 2.35 m s^{-1}.