Chapter 9 Energy, work and power

Chapter test answers Total marks 45

Section A

Question 1

B. W = F × d = ΔEp = mgΔh = 4.7 × 9.8 × 1.8 = 83 J (2 marks)

Question 2

B. (2 marks)

Question 3

A.She has maximal gravitational potential energy and minimal kinetic energy since total energy is conserved.



v = 0 at the top of the jump, therefore Ek = 0 (2 marks)

Question 4

D. (2 marks)

Question 5

C. W = F × d = 9.0 × 8.0 = 72 J (2 marks)

Question 6

A. P =  =  = 1.8 W (2 marks)

Answer is consequential = .

Section B

Question 7

a Ek = mv2 = × 0.50 × 252 = 156 J (1 mark)

b Assuming mechanical energy is conserved, at its maximum height, the ball’s kinetic   
energy has converted to gravitational potential energy; i.e. *E*p = 156 J (1 mark)

*E*p *= mg*Δ*h* (1 mark)

156 = 0.500 × 9.80 × Δ*h*



= 31.8 m (1 mark)

Question 8

At the top, *E*p = mgh = 70 × 9.80 × 110 = 7.54 x 104 J (1 mark)

At the bottom, Ek = mv2 =  × 70 × 252 = 21.9 x 104 J

*E*p *= mgh* = 70 x 9.80 x 30 = 20.6 x 104 J (1 mark)

Energy converted to heat = *Ei* – Ef

= 7.54 x 104 – (21.9 x 104 + 20.6 x 104) = 32.9 x 104 J (1 mark)

 (1 mark)

Question 9

An elastic collision is one in which no kinetic energy is lost. (1 mark)

Ek (before collision) = Ek (after collision)

Question 10

a The spring is elastic. (1 mark)

The force–displacement graph is linear, indicating the spring obeys Hooke’s law. (1 mark)

b i W = area under graph (1 mark)

W =  × 4 × 0.1 (1 mark)

= 0.2 J (1 mark)

ii W = area under graph from x = 0.1 to x = 0.2 (1 mark)

W =  × (4 + 16) × (0.4 − 0.1) (1 mark)

= 3 J (1 mark)

Question 11

70 km h–1 = 19.4 m s–1 (1 mark)

W = ΔEk =  mv2 −  mu2 (1 mark)

= 0 −  × 1250 × 19.42 (1 mark)

= (−)2.4 × 105 J

Question 12

a *E*p = mgh = 350 × 9.8 × 10.0 = 34300 J = 34.3 kJ (1 mark)

b Ek =  mv2 = 0 since v = 0 (1 mark)

c ΔEk = –Δ*E*p = 34.3 kJ (1 mark)

d Ek =  mv2 (1 mark)

34 300 =  × 350 × v2

v2 =  = 196

v =  = 14.0 m s–1 (1 mark)

e Gain in *E*p = loss in Ek = 350 × 9.8 × 8 = 27 440 J

Ek at T = 34 300 – 27 440 = 6860 J (1 mark)

6860 = mv2 =  × 350 × v2 (1 mark)



v2 =  = 39.2

v =  = 6.26 m s–1 (1 mark)

f At Q the total energy must equal the total energy at R.

Etotal at Q = *E*p + Ek = Etotal at R = *E*p = 34.3 kJ

350 × 9.8 × 6.0 + Ek = 34 300 (1 mark)

Ek = 34 300 – 20 580 = 13 720 J

13 720 = mv2 =  × 350 × v2 (1 mark)

v2 =  = 78.4

v =  = 8.85 m s–1 (1 mark)

Question 13

**a** The collision was inelastic because kinetic energy was lost in the collision. (1 mark)

**b** It has been converted to heat and sound produced during the collision. (1 mark)