Chapter 10 Past Paper Questions - Answers

1. (a) (i) (use of $E_p = mgh$ gives) $E_p = 70 \times 9.81 \times 150$ **(1)**
$= 1.0(3) \times 10^5$ J **(1)**

(ii) (use of $E_k = ½mv^2$ gives) $E_k = ½ \times 70 \times 45^2$ **(1)**
$= 7.1 \times 10^4$ J **(1)** (7.09×10^4 J) 4

(b) (i) work done ($= 1.03 \times 10^5 – 7.09 \times 10^4$) $= 3.2(1) \times 10^4$ J **(1)**
(allow C.E. for values of E_p and E_k from (a)

(ii) (use of *work done* = *Fs* gives) $3.21 \times 10^4 = F \times 150$ **(1)**
(allow C.E. for value of *work done* from (i)
F = 210 N **(1)** (213 N) 3

[7]

2. (a) resultant force on crate is zero **(1)**
forces must have equal magnitudes or size **(1)**
(but) act in opposite directions **(1)**
correct statement of 1st or 2nd law **(1)** max 3

QWC 1

(b) (i) work done = $F \times d = 640 \times 9.81 \times 8.0$ **(1)**
$= 5.0(2) \times 10^4$J **(1)**

(ii) (use of $P = \frac{W}{t}$ gives) $P = \frac{5.02 \times 10^4}{4.5} = 1.1(2) \times 10^4$W **(1)**
(allow C.E. for value of work done from (i)) 3

[6]

3. (a) (i) ($E_K = ½\ mv^2 =$) $0.5 \times 68 \times 16^2$ **(1)** = **8700** or 8704(J) **(1)**

(ii) ($\Delta E_P = mg\Delta h =$) $68 \times 9.8(1) \times 12$ **(1)** = **8000** or 8005 (J) **(1)**

(iii) any **three** from

gain of kinetic energy > loss of potential energy **(1)**

(because) cyclist does work **(1)** 7

energy is wasted (on the cyclist and cycle) due to air resistance
or friction or transferred to thermal/heat **(1)**

KE = GPE + W – energy ‘loss’ **(1)** (owtte)

energy wasted (= 8000 + 2400 - 8700) = 1700(J) **(1)**

(b) (i) (u = 16 m s^{-1}, s = 160 m, v = 0, rearranging $s = ½ (u + v) t$ gives)

160 = ½ × 16 × t or $t = \frac{2s}{(u+v)}$ or correct alternative

$\frac{2 \times 160}{16}$ (gets 2 marks) **(1)** = 20s **(1)**

(ii) acceleration $a = (\frac{v-u}{t} =) \frac{0-16}{20}$ ecf (b) (i) **(1)** = (–) **0.80** (m s^{-2})

resultant force $F = ma$ = 68 × (–) 0.80 **(1)** = (–) 54 (N) **(1)** or 54.4
or (work done by horizontal force = loss of kinetic energy
work done = force × distance gives)

force = $\frac{\text{(loss of kinetic)energy}}{\text{distance}}$ **(1)** = $\frac{8700 \text{ J}}{160 \text{ m}}$ ecf (a) (i) **(1)** = 54 (N) **(1)** 6

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