

The University of Jordan
 Physics Department
 Solutions for Chapter 6 / Giancoli
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11

Q9] $a = 2.0 \text{ m/s}^2$,

$$v_f = v_i + at \Rightarrow v_f = 0 + (2)(7) = 14 \text{ m/s}.$$

$$W = \Delta K = \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2 = \frac{1}{2} (4)(14)^2 - 0 = 392 \text{ J}$$

10] $m = 380 \text{ kg}$, slides 2.9 m down the incline.

$$\Delta + mg \sin 25 - F = ma = 0$$

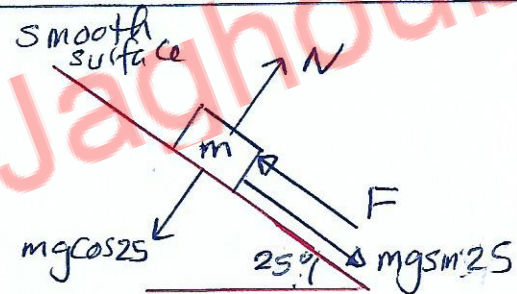
(a) $\therefore F = mg \sin 25 = 1573.8 \text{ Newtons}.$

(b) $W_F = (F)(2.9) \cos 180^\circ = -4564 \text{ J}$

(c) $W_{mg} = (mg \sin 25)(2.9) \cos(0) = +4564 \text{ J}.$

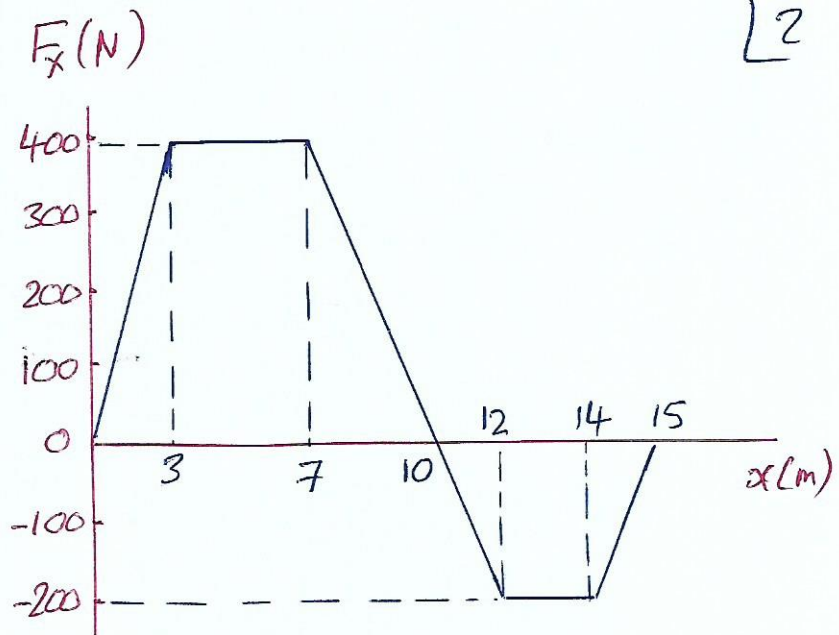
(d) $W_{\text{total}} = W_F + W_{mg} = 0$

Since $W_{\text{total}} = 0$ the piano does NOT accelerate and moves at constant velocity down the plane.



13]

In an F_x versus x graph, the area under the curve represents the work done.



$$(a) W_{0 \rightarrow 10m} = \frac{1}{2}(10+4)(400) = 2800 \text{ J}$$

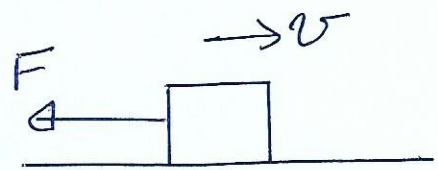
$$W_{10 \rightarrow 15m} = \frac{1}{2}(5+2)(-200) = -700 \text{ J}$$

$$(b) W_{0 \rightarrow 15m} = W_{0 \rightarrow 10} + W_{10 \rightarrow 15} = 2800 - 700 = 2100 \text{ J}$$

$$18] W = \Delta K = \frac{1}{2}(925)(0 - (26.4)^2) = -322344 \text{ J}$$

the work is negative since this is a stopping force that decelerates the car.

∴ Required work to stop the car is 322344 J.



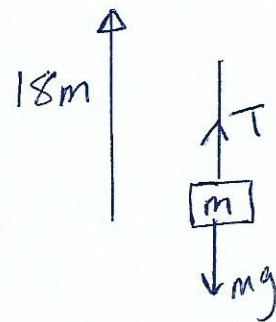
\vec{F} and displacement are in opposite directions.

23] $m = 265 \text{ kg}$
 $a = 0.16g$

(a) $\uparrow T - mg = ma$

$$T = m(g+a) = 265(g+0.16g)$$

$$= 265g(1.16) \approx 3012.5 \text{ N}$$



(b) $\uparrow F_{\text{net}} = T - mg = ma = 415.5 \text{ N}$ upwards.

$$\therefore W_{\text{net}} = (F_{\text{net}})(18) \cos(0) = 7479 \text{ J.}$$

Note $W_{\text{net}} > 0 \Rightarrow$ load accelerates.

(c) $W_T = (T)(18) \cos(0) = 54225 \text{ J.}$

(d) $W_{mg} = (mg)(18) \cos(180^\circ) = -mg(18) = -46746 \text{ J}$

$$W_{\text{net}} = W_T + W_{mg} = 7479 \text{ as in part (b) above.}$$

(e) $v_i = 0, v_f = ?$

$$W_{\text{net}} = \Delta K$$

$$7479 = \frac{1}{2}(265)(v_f^2 - 0) \Rightarrow v_f \approx 7.5 \text{ m/s.}$$

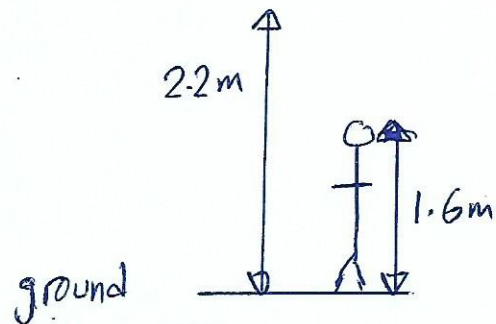
28] $m = 1.65 \text{ kg}$

(a) $U_{\text{ground}} = mg(2.2) = 35.6 \text{ J}$

(b) $U_{\text{person head}} = mg(2.2 - 1.6) = 9.7 \text{ J}$

(c) $W_{mg} = -\Delta U$

$$W_{\text{person}} \equiv W_{\text{external}} = -W_{mg} = \Delta U.$$



$$36] \text{ No friction } \Rightarrow W_{\text{friction}} = 0$$

L4

N is perpendicular to displacement $\Rightarrow W_N = 0$

\Rightarrow only force doing work is the weight mg which is a conservative force \Rightarrow

$$\Delta K + \Delta U = 0$$

$$\frac{1}{2} m (v_2^2 - v_1^2) - m/g(32) = 0$$

$$v_2 = \sqrt{64g} \approx 25 \text{ m/s.}$$

To find v_3 it is best to take points 1 and 3, since $v_1 = 0 \Rightarrow$

$$\frac{1}{2} m (v_3^2 - 0) - m/g(32 - 26) = 0 \Rightarrow v_3 = \sqrt{2g(6)} \approx 10.8 \text{ m/s}$$

Alternatively, take points 2 and 3.

$$\frac{1}{2} m (v_3^2 - v_2^2) + m/g(26) = 0$$

$$\therefore v_3^2 = v_2^2 - 2g(26) = (64g) - 52g = 12g$$

$$v_3 \approx 10.8 \text{ m/s as before.}$$

$$\Delta K + \Delta U = 0$$

$$\frac{1}{2} m (v_4^2 - v_1^2) - m/g(32 - 14) = 0$$

$$v_4 = \sqrt{2g \times 18} = \sqrt{36g}$$

$$v_4 \approx 18.9 \text{ m/s.}$$

One can also take point (4) with any of points 1, 2 or 3.

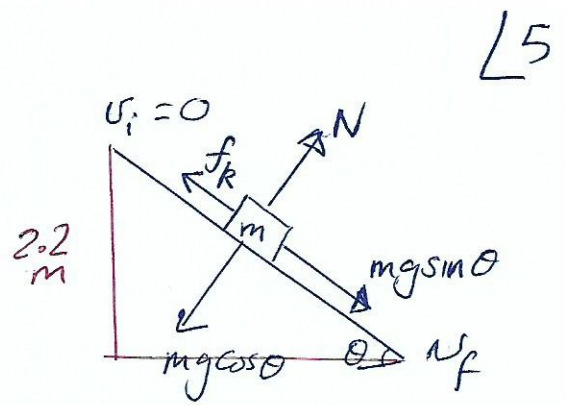
41] 2.2 m slide.
 $m = 16 \text{ kg}$
 $v_f = 1.25 \text{ m/s}$

$$\Delta K + \Delta U = W_{nc}$$

work done by the non-conservative force

$$\begin{aligned} \therefore W_{nc} &= \frac{1}{2}(1.6)((1.25)^2 - 0) - (16)g(2.2) \\ &= -332.5 \text{ J} \end{aligned}$$

generated thermal energy is 332.5 J.



Note $W_N = 0$
 $W_{mg \cos \theta} = 0$

f_k is a non-conservative force.

44] Skier starts with $v_i = 11 \text{ m/s}$ and moves 15 m up the incline before coming to rest.

f_k is a non-conservative force \Rightarrow

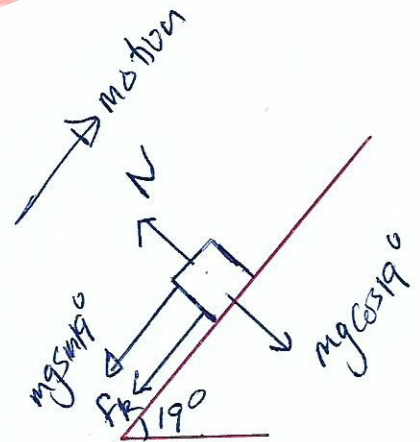
$$\Delta K + \Delta U = W_{nc}$$

$$\frac{1}{2}m(0 - (11)^2) + mg(d \sin 19^\circ) = f_k(15) \cos 180^\circ$$

$$f_k = \mu_k N = \mu_k (mg \cos 19^\circ)$$

$$\Rightarrow -\frac{1}{2}m(11)^2 + mg(15 \sin 19^\circ) = -\mu_k (mg \cos 19^\circ)(15)$$

$$\therefore \mu_k = \frac{\frac{1}{2}(11)^2 - 15g \sin 19^\circ}{15g \cos 19^\circ} \approx 0.09$$



$$55] P = \frac{W}{t} \Rightarrow W = P t$$

LG

$$W = (2)(746)(1 \times 60 \times 60)$$

$$= 5371200 \text{ J}$$

$$= 5.3712 \text{ MJ}$$

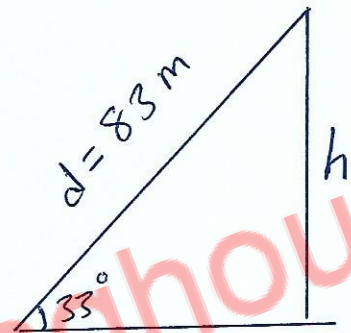
$$(M = 10^6)$$

$$57] h = d \sin 33^\circ = 83 \sin 33^\circ$$

$$\bar{p} = \frac{\text{work done by athlete}}{\text{time}}$$

$$= \frac{(mg)(h)}{75} = \frac{(829)(83 \sin 33^\circ)}{75}$$

$$\approx 484.4 \text{ Watt.}$$



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