Total 30 points

points:

Homework 1.3 solutions

E.20. Her velocity is constant (constant speed, straight line), thus there is no acceleration, thus there is **no net force.** (The pulling force is cancelled by the drag force). (2)

E.23 Zero net force. (they are not moving → no acceleration → zero net force (2)

E.24. They push on each other with the same force (Newton's third law: For every action (force), there is an equal-magnitude, and oppositely-directed reaction (force). (2)

E.27 Both forces have exactly the same magnitude. (see E.24, Newton's third law). (2)

E.34. You are doing work on the saw in both pulling directions, your pulling force is parallel to the displacement of the saw as you pull the saw toward you and as you push it away from you. (2)

E.35 As it rolls on the surface, it always accelerates downhill. (downhill component of the acceleration due to gravity). (2)

E.39 The kinetic energy becomes gravitational potential energy (and somewhat frictional energy (heat)). (2)

P.8 $v_0 = 0$; $v_f = 10 \frac{m}{s}$; $t = 1s$

$v = \cancel{v_0}^{0} + a \cdot t$, $v_0 = 0$

$\rightarrow a = \frac{v_f}{t}$

$a = \frac{10 \frac{m}{s}}{1s}$

$a = 10 \frac{m}{s^2}$ // (2)

P.9 $m = 60\,kg$, $a = 0.8 \frac{m}{s^2}$

Newton's 2. law: $F = m \cdot a$

$F = 60kg \cdot 0.8 \frac{m}{s^2}$

$F = 48\,N$ // (2)

P.10 weight $F_{weight} = m \cdot g$

$= 60kg \cdot 9.8 \frac{m}{s^2}$

$= 588\,N$ (1)

P. 13 $m = 12{,}000\,kg$, $a = 0.4\,\frac{m}{s^2}$

(2)

Newton's 2. law: $F = m \cdot a$

$F = 12{,}000\,kg \cdot 0.4\,\frac{m}{s^2}$

$F = 4800\,N$ //

P. 14 $v_f = 28\,\frac{m}{s}$, $v_0 = 0$, $a = 0.4\,\frac{m}{s^2}$, $t = ?$

$v_f = v_0 + a \cdot t$ (with $v_0 \to 0$)

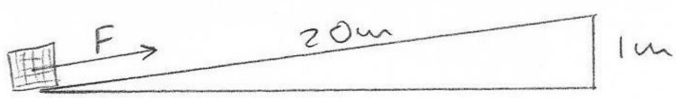
$\rightarrow t = \frac{v_f}{a}$

$t = \frac{28\,\frac{m}{s}}{0.4}$

$t = 70\,s$ //

(2)

P.15



work: $W = m \cdot g \cdot h$

$= 20{,}000\,kg \cdot 9.8\,\frac{m}{s^2} \cdot 1m$

$= 196{,}000\,J$ //

} straight lift

ramp: same amount of work (ignoring friction)

$W = F \cdot d$

$\rightarrow F = \frac{W}{d}$

$F = \frac{196{,}000\,J}{20m}$

$F = 9{,}800\,N$ //

(3)

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* h=50m; mg·(196,000N)(50m) W=9,800,000J

P. 16 (see P.15) $W = m \cdot g \cdot h = 9{,}800{,}000\,J$ //

(2)

P. 22 $W = F \cdot d$

$= 30N \cdot 1000m = 30{,}000\,J$ //

(2)