PHYS 2311 Ch. 1 HW

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MisConcQ 1.

1. d
3. b
5. a
7. b
9. d
11. a

Problem 1.

$$\vec{F} = m\vec{a}$$

$$\vec{F} = (45)(1.4) = \boxed{63\,\text{N}}$$

Problem 2.

$$W = mg$$

(a)

$$W = (74)(9.8) = \boxed{725.2\,\text{N}}$$

(b)

$$W = (74)(1.7) = \boxed{125.8\,\text{N}}$$

(c)

$$W = (74)(3.7) = \boxed{273.8\,\text{N}}$$

(d)

$$W = (74)(0) = \boxed{0\,\text{N}}$$

Problem 3.

$$\vec{F} = (1210)(1.35) = \boxed{1630\,\text{N}}$$

Problem 4.

$$215 = m(2.30)$$
$$m = \boxed{93.5\,\text{kg}}$$

Problem 5.

$$-\frac{95\,\text{km}}{1\,\text{h}} \times \frac{1000\,\text{m}}{1\,\text{km}} \times \frac{1\,\text{h}}{3600\,\text{s}} = -26.39\,\text{m/s}$$
$$\vec{a} = \frac{\Delta\vec{v}}{\Delta t} = \frac{-26.39}{8.0} = -3.30\,\text{m/s}^2$$
$$\vec{F} = (950)(-3.30) = \boxed{-3134\,\text{N}}$$

Problem 7.

$$\frac{120\,\text{km}}{1\,\text{h}} \times \frac{1000\,\text{m}}{1\,\text{km}} \times \frac{1\,\text{h}}{3600\,\text{s}} = 33.3\,\text{m/s}$$
$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$
$$0 = (33.3)^+ 2a(150)$$
$$-1108.89 = 300a$$
$$a = -3.70\,\text{m/s}^2$$
$$\vec{F} = m\vec{a} = (3.6 \times 10^5)(-3.70) = \boxed{-1.3 \times 10^6\,\text{N}}$$
$$W_T = (3.6 \times 10^5)(9.80) = 3.53 \times 10^6\,\text{N}$$
$$\frac{1.3 \times 10^6}{3.53 \times 10^6} = \boxed{39\,\%}$$
$$-1.3 \times 10^6 + F = 0$$
$$F = \boxed{1.3 \times 10^6\,\text{N}}$$

Problem 12.

$$\vec{F}_g = m\vec{a}_g = (1400)(9.80) = 13\,720\,\text{N}$$
$$\vec{F}_a = (1400)(0.70) = 980\,\text{N}$$
$$13720 + 980 = \boxed{14\,700\,\text{N}}$$

Problem 13.

(a)

$$W = (20.0)(9.80) = \boxed{196\,\text{N}}$$
$$\vec{F}_N - 196 = 0$$
$$\vec{F}_N = \boxed{196\,\text{N}}$$

(b)

$$\vec{F}_{N1} = (10.0)(9.80) = \boxed{98\,\text{N}}$$
$$\vec{F}_{N2} = (30.0)(9.80) = \boxed{294\,\text{N}}$$

Problem 14.

$$\vec{x}(t) = \vec{x}_0 + \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$$
$$402\hat{i} = \frac{1}{2}\vec{a}(6.40)^2$$
$$402\hat{i} = 20.48\vec{a}$$
$$\vec{a} = 19.63\,\text{m/s}^2\hat{i}$$
$$\vec{F}_c = (535)(19.63) = \boxed{10\,501\,\text{N}}$$

Problem 28.

(a)

$$\vec{F}_N = 66.0 - 30.0 = \boxed{36.0\,\text{N}}$$

(b)

$$\vec{F}_N = 66.0 - 60.0 = \boxed{6.00\,\text{N}}$$

(c)

$$\vec{F}_N = 66.0 - 90.0 = -24 \implies \boxed{0\,\text{N}}$$

Problem 33.

(a)

$$\vec{F}_g = mg$$
$$\vec{F}_{net} = ma = 0$$
$$T_{\hat{i}} + T_{\hat{j}} - mg\hat{j} = 0$$
$$2T - mg = 0$$
$$2T = mg$$
$$T = \frac{mg}{2} = \frac{78(9.8)}{2} = \boxed{382\,\text{N}}$$

(b)

$$T' = 382(1.15) = 439\,\text{N}$$
$$\vec{F}_{net} = 2T' - mg$$
$$a = \frac{F_{net}}{m} = \frac{2T' - mg}{m}$$
$$a = \frac{2(439) - (78)(9.80)}{78} = \boxed{1.46\,\text{m/s}^2}$$

Problem 42.

$$\vec{F}_{net} = 6\hat{i} + 34\hat{j})\text{N}$$
$$a = \frac{F_{net}}{m} = \frac{(6\hat{i} + 34\hat{j})}{3.0} = 2.0\hat{i} + 11.33\hat{j}\text{m/s}^2$$
$$\vec{v} = \vec{v}_i + \vec{a}t = (2.0\hat{i} + 11.33\hat{j})(4.0) = \boxed{8.0\hat{i} + 45.32\hat{j}\text{m/s}}$$

Problem 45.

(a)

$$\vec{F}_x = ma_x$$
$$mg\sin\theta = ma$$
$$a = g\sin\theta = (9.80)\sin(22.0) = \boxed{3.67\,\text{m/s}^2}$$

(b)

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$
$$v_f^2 = 2(3.68)(12.0)$$
$$v_f = \sqrt{2(3.68)(12.0)} = \boxed{9.39\,\text{m/s}}$$

Problem 47.

$$\vec{a} = \frac{28}{5.0} = 5.6\,\text{m/s}^2\hat{i}$$
$$T\cos\theta = mg$$
$$T\sin\theta = ma$$
$$\frac{T\sin\theta}{T\cos\theta} = \frac{ma}{mg}$$

$$\tan\theta = \frac{a}{g}$$

$$\theta = \arctan\left(\frac{a}{g}\right) = \arctan\left(\frac{5.6}{9.80}\right) = \boxed{29.7^\circ}$$

Problem 48.

$$\vec{F}_{net} = \vec{F}_g + \vec{F}_D$$

$$\vec{F}_g = (2.0)(9.80) = 19.6\,\text{N}$$

$$v_f^2 = v_i^2 + 2a(x_f - x_i)$$

$$(-27)^2 = 2a(55)$$

$$\vec{a} = 6.63\,\text{m/s}^2$$

$$\vec{F}_{net} = (2.0)(6.63) = 13.2N$$

$$13.2 = 19.6 + \vec{F}_D$$

$$\vec{F}_D = \boxed{6.35\,\text{N}}$$