

MCQ4 Solutions

Chapter 4

Question 1

$$W = 176 \text{ lb}$$

in newtons : $W = (176 \text{ lb}) \left(\frac{4.4 \text{ N}}{\text{lb}} \right) = \boxed{774.4 \text{ N}}$

(A)

If you take the conversion as 4.42, then $W = 778 \text{ N}$.

However, the conversion 4.4 N/lb is what we are going to use in this course.

Question 2

$$m = 40 \text{ kg}$$

$$a) W = mg = (40)(9.8) = \boxed{392 \text{ N}}$$

(B)

$$b) W_{\text{in pounds}} = (392) \left(\frac{1}{4.4} \right) = \boxed{89 \text{ lb}}$$

Question 3

$$a) m = 2 \text{ kg} \Rightarrow W_{\text{in air}} = (2)(9.8) = 19.6 \text{ N}$$

$$\text{but } W_{\text{in water}} = 14 \text{ N} \Rightarrow \text{upward force} = 19.6 - 14 = \boxed{5.6 \text{ N}}$$

b) Scale reading

$$= 12 + 5.6 = 17.6 \text{ N}$$

but why? (think of the 3rd law)

Question 4

$$a) F = G \frac{m_E m_m}{r^2} = \dots = 1.98 \times 10^{20} \text{ N}$$

(C) b) 3rd law $\Rightarrow$ forces are the same

Question 5

$$\mu_s = 0.4 \quad \mu_k = 0.15$$

$$m = 5 \text{ kg}$$

(D)



$$(f_s)_{\max} = \mu_s N = (0.4)(5 \times 9.8) = 19.6 \text{ N} \approx 20 \text{ N}$$

Question 6

$$m = 3 \text{ kg}$$

$$F = 12 \text{ N}$$

$$a) f_s = F = 12 \text{ N} \Rightarrow 12 = \mu_s N$$

$$12 = (\mu_s)(3 \times 9.8) \Rightarrow \boxed{\mu_s = 0.41}$$

(D)

b) Now friction force changes:

$$f_s = \mu_s N_{\text{new}} = (0.4)(\overset{10}{3+7}) \times 9.8 = 40 \text{ N}$$

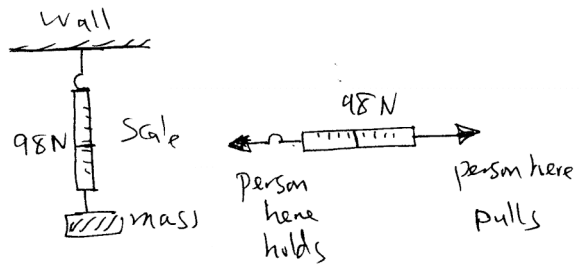
$$\Rightarrow F = f_s = \boxed{40 \text{ N}}$$

Question 7

(B)

Question 8

(D)



Question 9

(A)

$$R = 2R_E \quad M = 4M_E$$

$$g = G \frac{M}{R^2} = G \frac{4M_E}{(2R_E)^2} = \frac{GM_E}{R_E^2} = g_{\text{Earth}}$$