

Answer Key

1. $v = at$

$$a = \frac{v}{t}$$

2. $P = \frac{F}{A}$

$$PA = F$$

$$A = \frac{F}{P}$$

3. $\lambda = \frac{h}{p}$

$$h = \lambda p$$

4. $F \Delta t = m \Delta v$

$$\Delta t = \frac{m \Delta v}{F}$$

5. $U = -\frac{Gm_1m_2}{r}$

$$Ur = -Gm_1m_2$$

$$m_1 = -\frac{Ur}{Gm_2}$$

6. $C = \frac{5}{9}(F - 32)$

$$\frac{9}{5}C = F - 32$$

$$F = \frac{9}{5}C + 32$$

7. $v^2 = v_0^2 + 2a\Delta x$

$$v^2 - v_0^2 = 2a\Delta x$$

$$a = \frac{v^2 - v_0^2}{2\Delta x}$$

8. $K_{avg} = \frac{3}{2}k_B T$

$$\frac{2}{3}K_{avg} = k_B T$$

$$T = \frac{2K_{avg}}{3k_B}$$

Answer Key (continued)

$$9. K = \frac{1}{2}mv^2$$

$$2K = mv^2$$

$$\frac{2K}{m} = v^2$$

$$v = \sqrt{\frac{2K}{m}}$$

$$10. v_{rms} = \sqrt{\frac{3RT}{M}}$$

$$v_{rms}^2 = \frac{3RT}{M}$$

$$Mv_{rms}^2 = 3RT$$

$$M = \frac{3RT}{v_{rms}^2}$$

$$11. v_{rms} = \sqrt{\frac{3k_B T}{\mu}}$$

$$v_{rms}^2 = \frac{3k_B T}{\mu}$$

$$\mu v_{rms}^2 = 3k_B T$$

$$k_B = \frac{\mu v_{rms}^2}{3T}$$

$$12. F = \frac{1}{4\pi\epsilon_0} \frac{q_1 q_2}{r^2}$$

$$4\pi\epsilon_0 r^2 F = q_1 q_2$$

$$r^2 = \frac{q_1 q_2}{4\pi\epsilon_0 F}$$

$$r = \sqrt{\frac{q_1 q_2}{4\pi\epsilon_0 F}}$$

$$13. \frac{1}{s_i} + \frac{1}{s_o} = \frac{1}{f}$$

$$\frac{s_o}{s_i s_o} + \frac{s_i}{s_i s_o} = \frac{1}{f}$$

$$\frac{s_o + s_i}{s_i s_o} = \frac{1}{f}$$

$$f = \frac{s_i s_o}{s_i + s_o}$$

$$14. \frac{1}{C_{EQ}} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$\frac{1}{C_{EQ}} - \frac{1}{C_2} = \frac{1}{C_1}$$

$$\frac{C_2}{C_{EQ} C_2} - \frac{C_{EQ}}{C_{EQ} C_2} = \frac{1}{C_1}$$

$$\frac{C_2 - C_{EQ}}{C_{EQ} C_2} = \frac{1}{C_1}$$

$$C_1 = \frac{C_{EQ} C_2}{C_2 - C_{EQ}}$$

Answer Key (continued)

15. $V = \frac{4}{3}\pi r^3$

$$\frac{3}{4}V = \pi r^3$$

$$\frac{3V}{4\pi} = r^3$$

$$r = \sqrt[3]{\frac{3V}{4\pi}}$$

18. $x = x_0 + v_0 t + \frac{1}{2}at^2$

$$x - x_0 - v_0 t = \frac{1}{2}at^2$$

$$2(x - x_0 - v_0 t) = at^2$$

$$a = \frac{2(x - x_0 - v_0 t)}{t^2}$$

16. $P + Dgy + \frac{1}{2}Dv^2 = C$

$$P + D\left(gy + \frac{1}{2}v^2\right) = C$$

$$C - P = D\left(gy + \frac{1}{2}v^2\right)$$

$$D = \frac{C - P}{\left(gy + \frac{1}{2}v^2\right)}$$

19. $n_1 \sin \theta_1 = n_2 \sin \theta_2$

$$\frac{n_1 \sin \theta_1}{n_2} = \sin \theta_2$$

$$\theta_2 = \sin^{-1}\left(\frac{n_1 \sin \theta_1}{n_2}\right)$$

17. $P + Dgy + \frac{1}{2}Dv^2 = C$

$$\frac{1}{2}Dv^2 = C - P - Dgy$$

$$Dv^2 = 2(C - P - Dgy)$$

$$v^2 = \frac{2(C - P - Dgy)}{D}$$

$$v = \sqrt{\frac{2(C - P - Dgy)}{D}}$$

20. $mg \sin \theta = \mu mg (\cos \theta) \left(\frac{M+m}{m}\right)$

$$\frac{mg \sin \theta}{mg \cos \theta} = \mu \left(\frac{M+m}{m}\right)$$

$$\frac{\sin \theta}{\cos \theta} = \mu \left(\frac{M+m}{m}\right)$$

$$\tan \theta = \mu \left(\frac{M+m}{m}\right)$$

$$\theta = \tan^{-1}\left[\mu \left(\frac{M+m}{m}\right)\right]$$