1. **D** Mega (M) is 10^6
2. **B** Leaves are again neutral and return to equilibrium
3. **D** All others have magnitude and direction
4. **A** $v^2 = {v_o}^2 + 2a\Delta x$
5. **E** Displacement is a vector
6. **A** K temperature = ^{0}C + 273
7. **B** (0.16/2.54) x 100 = 6.3
8. **D** $\tan\theta = v^2/rg$
9. **B** $r = d/2$; $A=4\pi r^2$
10. **C** $L=\lambda/2$ for open pipe
11. **C** Pressure is evenly distributed
12. **C** $1/R_p = 1/20\Omega + 1/20\Omega = 10\ \Omega$; $R_{eq}=10\ \Omega +10\ \Omega + 30\ \Omega = 50\ \Omega$
13. **D** Both momentum and energy are always conserved
14. **C** Block 1 will experience no friction and will therefore travel the distance in the least amount of time. Blocks 2 & 3 will experience equivalent amounts of friction and will take equal amounts of time to travel.
15. **B** $PV = nRT = nk_BT$
16. **D** $\Delta v = a\Delta t$
17. **D** $A_{Total} = A_{inside} + A_{outside} + A_{ends}$
18. **A** $V_{Total} = \varepsilon + V_r = IR + Ir$
19. **A** Yes, if $f < d_o < R$
20. **A** $\tau = I\alpha$; $\tau = Fr$; $I\alpha = Fr$; $I = \frac{1}{2} mr^2$
21. **B** $v = v_o + a\Delta t$
22. **D** $\Delta x = v_o\Delta t + \frac{1}{2} a\Delta t^2$
23. **B** Faraday explained it well…
24. **B** $v_o = (\sin\theta)v$; $v^2 = {v_o}^2 + 2a\Delta x$
25. **D** $I = Q/t = ne^-/t$; $n=It/e^-$
26. **C** $f = 1/t$; $t_{pendulum} = 2\pi\sqrt{\frac{l}{g}}$
27. **B** Right hand rule #1

28. A Rock: $\Delta x = v_o\Delta t + \frac{1}{2} a\Delta t^2$; Ball: $\Delta x = v_o\Delta t + \frac{1}{2} a\Delta t^2$; Both: $v = v_o + a\Delta t$; After 2.1 s, rock is traveling 21.0 m/s and the ball at 36.0 m/s. From that point on, they are both in an accelerating reference frame and the difference in speeds will always be 15.0 m/s

29. A $h_o/h_i = -d_o/d_i$ $1/f = 1/d_o + 1/d_i$

30. B $\omega=\Delta\theta/\Delta t$; Angular displacement measured in radians and time in seconds

31. B Adjacent nodes are separated by $\lambda/2$ and adjacent antinodes are separated by $\lambda/2$. Therefore, a node is separated from an adjacent antinode by $\lambda/4$.

32. B Electric field vectors point from positive to negative

33. B $P = W/t = Fr/t = \tau\omega$

34. A Lowest energy transitions are Lyman series

35. D $\varepsilon = Blv = N(BA)/t$

36. B $F = mg$; $F = -kx$; $t_{mass/spring} = 2\pi\sqrt{\frac{m}{k}}$

37. A $F = qvB\sin\theta$

38. D

39. D $t = 2\pi/\pi/2 = 4$

40. C $hf = KE_e + W_o$ $c = \lambda f$

41. C $p_{before} = p_{after}$; $p = \frac{mv}{\sqrt{1-\frac{v^2}{c^2}}}$

42. A $PV = n RT$

43. A

44. E

45. D

46. B

47. C

48. D $\tau = RC$; $1/\tau = 1/RC$

49. C $E = \frac{mc^2}{\sqrt{1-\frac{v^2}{c^2}}}$ $p = \frac{mv}{\sqrt{1-\frac{v^2}{c^2}}}$

50. C $Q/t = e\sigma T^4 A$; $P'/P = d^2/(d^2/4)$