1. D. Speed is required to determine momentum
2. C.
   $K_S = \frac{1}{2}mv^2$
   $K_B = \frac{1}{2}2m(\frac{v}{2})^2 = \frac{1}{2}mv^2 \times \frac{2}{4}$
   $K_B = 0.5K$
3. B.
   $x = x_0 + v_0t + \frac{1}{2}at^2$
   $10 + (-3)(1) + \frac{1}{2}(3)(1)^2 < x < 10 +$
4. A. All voltage is the same, however $I_2 + I_3 = I_1$
5. D. Greatest slope
6. C. $5J - 2J = 3J$
7. C. Must be constant and IJ is an increase
8. B. Since they are in identical tubes, they have the same velocity. If wavelength changes, then frequency must also change
9. N/A
10. C. Solve for frequency using the time spent to go half a wavelength. Then solve for velocity using $v = \lambda f$
11. B. All current is captured using 1-5
12. C. Using $F = ma$, the force applied is 0.3N, and the mass is 0.3kg
13. A. Solve for the system using kinetic energy and momentum. Assume the $m = 1kg$ and $v_0 = 1\frac{m}{s}$
14. D. Assume that $m = 1kg$ and $v_0 = 1\frac{m}{s}$. Solve for velocity, and compare the kinetic energies of each object
15. C. A smaller radius should increase the gravitational acceleration. Centripetal force is always directed towards the center
16. D. Torque must be perpendicular, but centripetal force is parallel to its position vector relative to the center of mass
17. C. Mechanical energy includes rotational kinetic energy.
18. C. The ratio calculated from the force is $\frac{150}{2}$, which is $75N$
19. B. The maximum kinetic energy from the spring is at the equilibrium point
20. A. This is because it has a higher velocity. The final momentum's are the same, which means that the final velocity for the 1kg cart is larger
21. The block must be less than 45 degrees
22. D. The total momentum at the end is $20kg \times ms$, which means that the block at the end is still moving in the positive direction. The block's momentum increases until the 15 second mark, then starts to decrease
23. C. The area becomes equal around 8 seconds. Therefore it must be around 7-10 seconds
24. C. Solve for velocity and substitute
25. A. If $v = \lambda f$, then $\lambda = \frac{v}{f}$, which is the same as $\lambda = v \times \frac{1}{f}$
26. D. Because the object's direction is changing, this means the object is accelerating, which means the velocity is changing. The angular velocity remains constant.
27. D. The normal force caused by centripetal force is $0.2F_G$, therefore it must be $1.2F_G$
28. D. Because $\frac{1}{2}mv^2 + mg2R = \frac{1}{2}m(v^2 + 4gR)$
29. B. The electrons are transferred to the air surrounding the rod
30. D. Resistors in series will share the voltage
31. C. Point Z has a value of $d\sqrt{2}$, which is less than $2d$, therefore point Z is less than point X, and point Y is the greatest

32. A. Horizontal displacement is increasing at a constant rate, while there is initial vertical velocity and the object is accelerating towards the ground
33. B. The total momentum of the system has decreased by $\frac{1}{3}$after $t = 2$
34. D. The new kinetic energy is $\frac{1}{3}K$, which means the change is $\frac{2}{3}K$
35. B. Solve for angular acceleration and then solve for torque using $\tau = I\alpha$
36. C. The force of friction pulls block 3 back, the contact force pushes it forward, and gravity and normal force are up and down (respectively)
37. B. The angle of the inclined plane affects the acceleration of the block. D. The coefficient of kinetic friction will also affect the acceleration of the block.
38. A. The length is required to determine work, as it is displacement. D. If the wheels stop rotating and start to skid, that means it is in kinetic friction and the block no longer maintains a firm grip on the road
39. B and D
40. B and D. The component magnitude opposite of θin F_4 is equal to F_2. Because they are equal and in opposite direction the net torque is 0