**Work, Power, and Energy Review**

**Work**

1. What is the physical definition of work?
2. How do you calculate work?
3. What relationship does work have to force? (direct= W F/indirect= W F)
4. What relationship does work have to distance? (direct/indirect)
5. Explain how force and distance must be related for work to be done.
6. What is the unit for work? What does it mean?
7. What are some examples of doing work on an object?
8. Can carrying an object be said to be doing work on that object? Explain.
9. Is it possible to do work on an object that remains at rest? (yes/no)
10. A box is being pulled across a rough floor at a decreasing speed. What can you say about the work done by friction?
    1. Friction does no work at all
    2. Friction does negative work
    3. Friction does positive work
11. A ball tied to a string is being whirled around in a circle. What can you say about the work done by centripetal force?
    1. Centripetal force does no work at all
    2. Centripetal force does negative work
    3. Centripetal force does positive work
12. A child on a skateboard is moving at a speed of 2 m/s. After a force acts on the child, her speed is 3 m/s. What can you say about the work done by the external force on the child?
    1. Positive work was done
    2. Negative work was done
    3. Zero work was done
13. Mike applied 10 N of force over 3 m in 10s. Joe applied the same force over the same distance in 1 minute. Who did more work?
    1. Mike
    2. Joe
    3. Both did the same amount of work
14. A 6 kg laboratory cart is pushed down a hallway that is 23 m long with an acceleration of 2.3 m/s2. How much work is done on the cart?
15. If a wagon were being pulled with a force of 12N @ 37° for a distance of 5 m, which trigonometry function would you need to solve the problem? (sine/cosine)
16. How much work would be done in the previous problem?
17. Why does a machine (like a ramp) make work easier to do?
18. Why can’t a machine’s efficiency be equal to or higher than 100% in the real world?
19. What is the efficiency of an inclined plane which required 2100 J of work to produce 1750 J of work?

**Power**

1. What is the definition of power?
2. How do you calculate power?
3. What relationship does power have to work? (direct= P W/indirect= P W)
4. What relationship does power have to time? (direct/indirect)
5. What is the unit for power? What does it mean?
6. A 58 N force is used to push a laboratory cart down a hallway that is 23 m long. If it takes 78 seconds to make it down the hall, how much power was demonstrated?
7. Mike performed 5 J of work in 10 s. Joe did 3 J of work in 5 s. Who produced the greater power?
   1. Mike
   2. Joe
   3. They produced the same amount of power
8. A robot uses a force of 234 N to push an 86 kg crate a distance of 15 m. The robot took 32 s to do this. What was the work done by the robot? What was the power used by the robot?
9. If 746 W = 1 horsepower(hp), how much horsepower is shown when 149,200 J of work is done in 10 s?

**Energy**

1. What is kinetic energy? What is the formula? What are the units?
2. What is potential energy? What is the formula? What are the units?
3. What is mechanical energy? What is the formula? What are the units?
4. What does the change in kinetic energy equal? (look at your formula chart)
5. What does the law of conservation of energy state?
6. What happens to the kinetic energy of an object falling towards Earth?
7. What happens to the potential energy of an object falling towards Earth?
8. What happens to the kinetic energy of an object thrown up into the air?
9. What happens to the potential energy of an object thrown up into the air?
10. Is it possible for the kinetic energy of an object to be negative? (yes/no)
11. Is it possible for the potential energy of an object to be negative? (yes/no)
12. When is the gravitational potential energy the greatest on a rollercoaster? When is the kinetic energy the greatest on a rollercoaster?
13. What is the relationship between PE and KE on a rollercoaster? (direct/indirect)
14. What are the three types of potential energy?
15. By what factor does the kinetic energy of a car change when its speed is tripled?
    1. No change at all
    2. Factor of 3
    3. Factor of 6
    4. Factor of 9
    5. Factor or 12
16. Two stones, one twice the mass of the other, are dropped from a cliff. Just before hitting the ground, what is the kinetic energy of the heavy stone compared to the light one?
17. ¼ as much
18. ½ as much
19. The same
20. Twice as much
21. Four times as much
22. In the previous question, just before hitting the ground, what is the final speed of the heavy stone compared to the light one?
23. ¼ as much
24. ½ as much
25. The same
26. Twice as much
27. Four times as much
28. Two paths lead to the top of a big hill. One is steep and direct, while the other is twice as long but less steep. How much more potential energy would you gain if you take the longer path?
    1. The same
    2. Twice as much
    3. Four times as much
    4. ½ as much
    5. You gain no PE in either case
29. Three golf balls of equal mass start from rest and roll down ramps of increasing length. All ramps have the same height. Which ball has the greater speed at the bottom of its ramp?
    1. 1
    2. 2
    3. 3
    4. Same speed for all 3
30. A car starts from rest and accelerates to 30 mph. Later, it gets on a highway and accelerates to 60 mph. Which takes more energy, the 0🡪30 mph, or the 30🡪60 mph?
31. 0🡪30 mph
32. 30🡪60 mph
33. Both are the same
34. If an object has 1250 J of potential energy at the top of a tall building, how much kinetic energy will it have just before it hits the ground if it falls?
35. If you do 156 J of work to lift an object to a shelf at the top of a bookcase, how much gravitational potential energy will the object have?
36. You see a leaf falling to the ground with *constant speed*. When you first notice it, the leaf has initial total energy PEo + KEo. You watch the leaf until just before it hits the ground, at which point it has final total energy PEf + Kef. How do these total energies compare?
    1. PEo + KEo > PEf + KEf
    2. PEo + KEo < PEf + KEf
    3. PEo + KEo = PEf + KEf
    4. Impossible to tell from the information given
37. What is the kinetic energy of a bullet with a mass of 0.015 kg that moves with a velocity of 400.0 m/s?
38. Find the potential energy given to the 50.0 kg hammer of a pile driver when it is raised 4.00 m.
39. A mechanic pushes a 3100 kg car to a certain speed doing 5421 J of work in the process. Find the velocity.
40. A 5 kg cat jumps up from the floor to a countertop 3 m high. Find the gravitational potential energy of the car on the counter. Find the amount of work done by the cat.
41. A mechanical arm lifts a 2500 kg car up in the air 32 m. How much force does the arm use? Using this force, how much work did the arm do?
42. Often in physics, we do not contain all of our energy in a system. Name some forms of energy that kinetic and potential change into on a real rollercoaster?
43. A bowling ball with a mass of 6,000 g is dropped from an airplane at an altitude of 555.5 m. How fast is the bowling ball travelling the split second before it hits the ground?
44. A 500 kg rollercoaster car tops a 28 m hill travelling at 4 m/s. When it reaches the top of the next hill, which is only 9 m high, how fast is the car moving?
45. Why doesn’t mass matter in law of conservation of mass calculations?