

Beverly Hills High School -- Physics -- Exam #5 -- 100 points

Write TRUE if the statement is true OR write the word(s) that substitute for the underlined word(s) that would make it true. Writing false only earns partial credit. Three points each.

- _____ 1) Acceleration is the product of mass and velocity.
- _____ 2) When we say a quantity is conserved, it means that what we start with is what we end up with.
- _____ 3) The point about which a lever, like a crowbar, rotates is called the pivot point.
- _____ 4) A resistance arm is a device used to multiply forces and make work easier.
- _____ 5) Another way of understanding a change in momentum is average impulse times the change in time.
- _____ 6) Energy times time equals power.
- _____ 7) The amount of useful work you get out of a machine divided by how much work you put in to the machine is called its efficiency.
- _____ 8) Kinetic energy depends on an object's motion. If you were to cut the speed of an object in half, then the kinetic energy of the object goes up by a factor of two.
- _____ 9) The reason we use tools, such as simple machines, is because it multiplies our energy.
- _____ 10) Mechanical energy is the sum of kinetic and potential energies.

For two points each, give five different machines AND the two energies they transform from and to. You cannot repeat any energies in the "before" or "after" positions in any of the examples you give.

- 11) _____ changes _____ into _____ energy.
- 12) _____ changes _____ into _____ energy.
- 13) _____ changes _____ into _____ energy.
- 14) _____ changes _____ into _____ energy.
- 15) _____ changes _____ into _____ energy.

For two points apiece, list the five simple machines (except the screw) and a common example of each:

- 16) _____
- 17) _____
- 18) _____
- 19) _____
- 20) _____

Multiple Choice. Write the letter that corresponds to the best choice for each example. Three points.

- _____ 21) If a woman pushes an object with three times the force for twice the distance, she does
a) the same work. b) 1 1/2 times the work. c) six times the work. d) 2/3 the work.
- _____ 22) How much work is required to do push a 300 N force a distance of 0.5 m?
a) 60 J b) 60 W c) 150 J d) 250 W e) 600 J
- _____ 23) The amount of potential energy possessed by an elevated object is equal to
a) the force needed to lift it. b) the distance it is lifted.
c) the acceleration due to gravity. d) the work done in lifting it.
e) the power used to lift it.
- _____ 24) When total energy is changed from one form into another there is no net loss or gain.
a) Always true b) Sometimes true c) Always false
- _____ 25) Bullets are fired from the machine gun of a US combat jet into an enemy jet. The collision is
a) inelastic b) elastic c) friction-less d) conserved
- _____ 26) A job is done slowly, and an identical job is done quickly. Both jobs require the same amount of work but different amounts of
a) energy b) power c) both a and b d) none of the above
- _____ 27) It takes 200 J to push a large box 5 m across a floor. Assuming the push is in the same direction as the move, what is the magnitude of the force on the box?
a) 1000 N b) 100 N c) 400 N d) 40 N e) 1/40 N
- _____ 28) What is the kinetic energy of a car of mass 100 kg traveling at 30 m/s?
a) 45000 J b) 90000 J c) 300 kJ d) 450 kJ e) none of these
- _____ 29) A heavy object and a light object are released from rest at the same height and time in a vacuum. As they fall, they have equal
a) energies. b) momenta. c) weights. d) all of these e) none of these
- _____ 30) A man pushes a refrigerator up an inclined plane of length 24 feet. When he gets to the top, he finds he has raised the refrigerator 4 feet. The mechanical advantage of the inclined plane is
a) 96 b) 20 c) 12 d) 6 e) 1/6 f) none of these

Calculations Section. You must show all your work for full credit including any equations used. 5 points each.
Use $g = 10 \text{ m/s}^2$. (You may only check your work by using equations of motion learned earlier.)

- 31) A man climbs a tower and is prepared to jump off. If he has 12,000 J of potential energy at the very top, how much kinetic energy does he have after he has fallen $\frac{1}{4}$ of the way down?
- 32) A 2000 kg car accelerates from 5 m/s to 20 m/s. Using energy considerations, find the amount of work the engine did on the car.
- 33) A 400 kg rocket is shot straight up into the air at an initial speed of 200 m/s. How fast will it be moving when it is $\frac{3}{4}$ the way to the top of its travel? Use only energy considerations.
- 34) You use 40000 J of work to push a 50 kg boulder from the ground to the top of a hill. You push the boulder off the cliff at the top of the hill. At what speed will it hit the ground? (Neglect air resistance.)