Physics Name:_____

Conservation of energy

$KE = \frac{1}{2} mv^2$ $PE_g = mgh$ $PE_k = 1/2\ kx^2$ $\text{Total Energy}_{before} = \text{Total Energy}_{during} = \text{Total Energy}_{after}$

Part I: Conceptual Questions

Read each of the following statements and identify them as having to do with kinetic energy (KE), gravitational potential energy (PE_g), elastic potential energy (PE_k) or all three (A3).

_____ 1) If an object is at rest, it certainly does NOT possess this form of energy.

_____ 2) Energy that depends upon object mass and object height.

_____ 3) Energy an object possesses due to its motion.

_____ 4) Energy whose units are expressed using the unit joule (abbreviated J).

_____ 5) Energy stored in an object due to its position (or height).

_____ 6) Energy that determines how much work the object can do.

_____ 7) Energy that depends on the "stiffness" of a stretchy object.

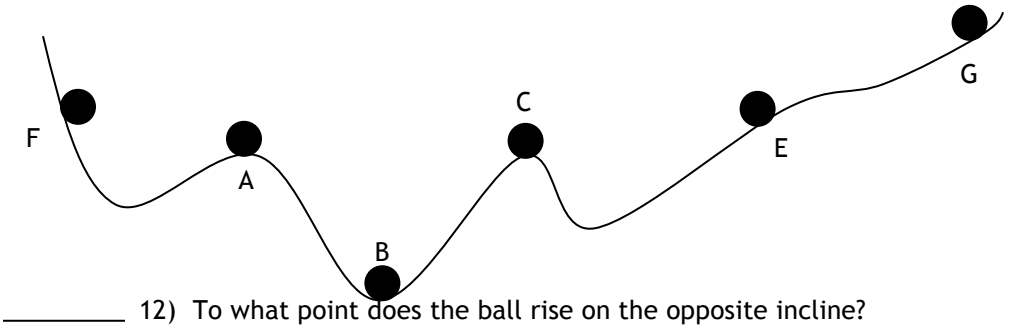
_____ 8) Energy that depends upon the arbitrarily assigned *zero level*.

_____ 9) Energy that depends upon object mass and object speed.

_____ 10) Energy that depends on how far an object is stretched.

_____ 11) If an object is at rest on the ground (zero height), it certainly does NOT possess this form of energy.

A ball slides down the frictionless track shown below. The ball has no velocity at position F. Beware of questions that have no answer or multiple answers!



_____ 12) To what point does the ball rise on the opposite incline?

_____ 13) At what point(s) in the diagram is the speed at a maximum?

_____ 14) At what point(s) is the kinetic energy at a maximum?

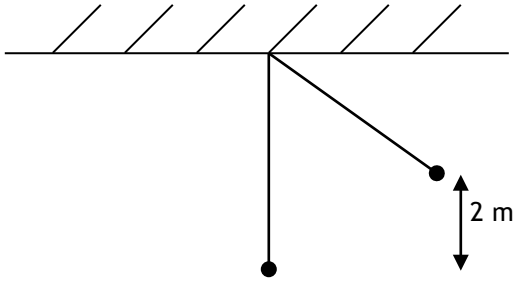
_____ 15) At what point(s) is the speed zero?

_____ 16) At what point(s) is the potential energy at a minimum?

_____ 17) At what point(s) is the potential energy at a maximum?

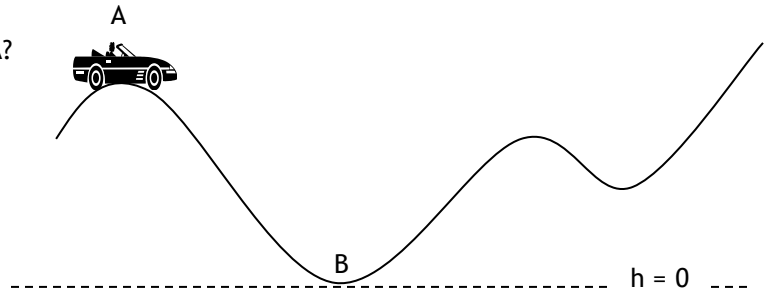
Part II: Problems

18) A pendulum is pulled sideways so that it is raised a vertical distance of 2 m above its resting position. Find the maximum speed the pendulum reaches after being released.



19) A man standing on top of a 30 m tall building drops a brick. Determine the speed of the brick just before it hits the ground.

20) The frictionless car below is moving at 4 m/s at position A (50 m above ground level). It has a mass of 1000 kg and is rolling along the hills in neutral. Point B is at ground level.



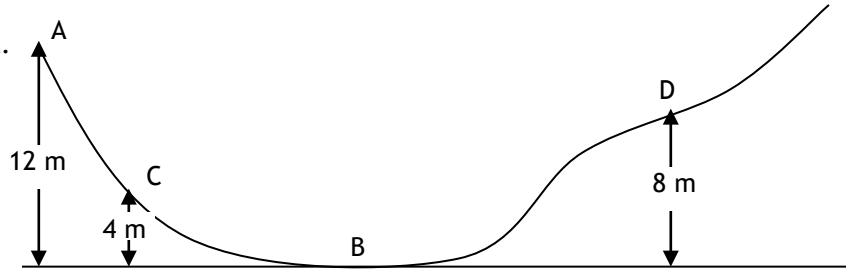
a) What is the total energy of the car at point A?

b) What is the total energy of the car at point B?

c) How fast will the car be moving when it reaches position B (at ground level)?

d) What is the maximum height above the ground that the car can reach on the right side?

21) At point "A" on the hill, there is a skier at rest.



a) Find the skier's maximum speed. Where on the hill does she achieve this speed?

b) How far vertically up the other hill will the skier be able to go?

c) How fast will the skier be moving at point C?

d) How fast will the skier be moving at point D?

22) A water balloon is shot upwards with a velocity of 55 m/s. How high does it travel?

23) A man standing on top of a 30 m tall building throws a brick downwards with a velocity of 12 m/s. Determine the speed of the brick just before it hits the ground.