10.4 Work

9. For each situation described below:
   - Draw a before-and-after diagram, similar to Figures 10.8 and 10.11 in the textbook.
   - Identify *all* forces acting on the particle.
   - Determine if the work done by each of these forces is positive (+), negative (–), or zero (0). Make a little table beside the figure showing *every* force and the sign of its work.

   a. An elevator moves upward.

   b. An elevator moves downward.

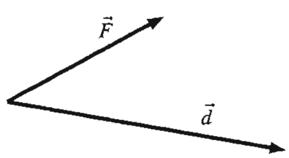
   c. You push a box across a rough floor.

d. You slide down a steep hill.

e. A ball is thrown straight up. Consider the ball from one microsecond after it leaves your hand until the highest point of its trajectory.

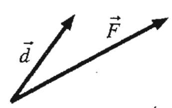
11. An object experiences a force while undergoing the displacement shown. Is the work done positive (+), negative (−), or zero (0)?

a.



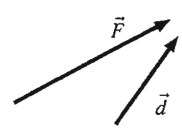
Sign = ________

b.



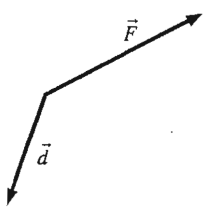
Sign = ________

c.



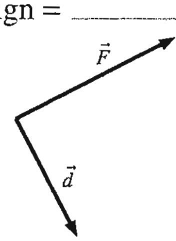
Sign = ________

d.



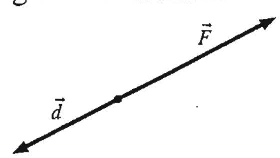
Sign = ________

e.



Sign = ________

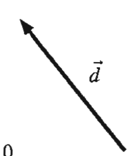
f.



Sign = ________

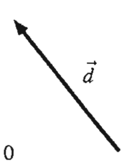
12. Each of the diagrams below shows a displacement vector for an object. Draw and label a force vector that will do work on the object with the sign indicated.

a.



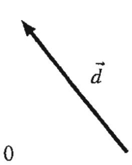
$W > 0$

b.



$W < 0$

c.



$W = 0$

10.5 Kinetic Energy

14. Can kinetic energy ever be negative? ________

Give a plausible *reason* for your answer without making use of any formulas.

15. a. If a particle's speed increases by a factor of three, by what factor does its kinetic energy change?

b. Particle A has half the mass and eight times the kinetic energy of particle B. What is the speed ratio v_A/v_B?

c. If a rotating skater triples her rate of rotation by decreasing her moment of inertia by 1/3, by what factor does her rotational kinetic energy change?

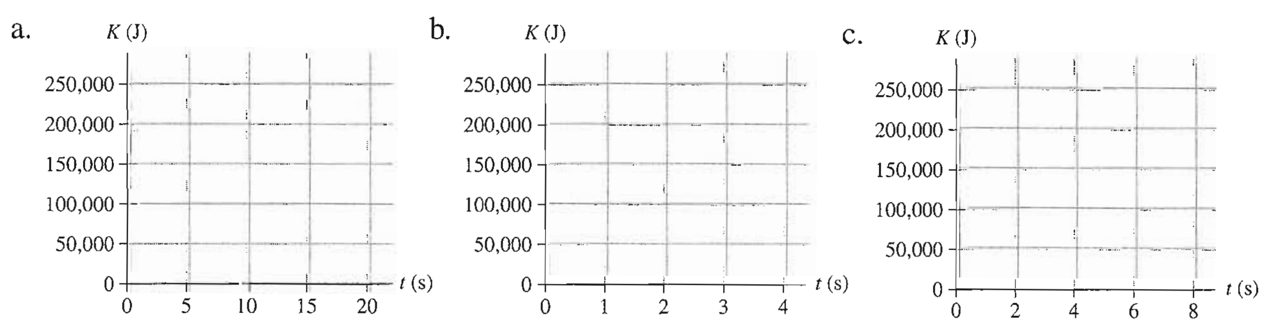
16. On the axes below, draw graphs of the kinetic energy of

a. A 1000 kg car that uniformly accelerates from 0 to 20 m/s in 20 s.

b. A 1000 kg car moving at 20 m/s that brakes to a halt with uniform deceleration in 4 s.

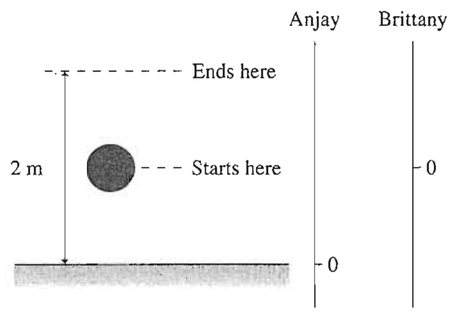
c. A 1000 kg car that drives once around a 40-m-diameter circle at a speed of 20 m/s.

Calculate K at several times, plot the points, and draw a smooth curve between them.



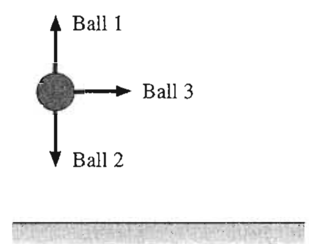
10.6 Potential Energy

17. Below we see a 1 kg object that is initially 1 m above the ground and rises to a height of 2 m. Anjay and Brittany each measure its position but use a different coordinate system to do so. Fill in the table to show the initial and final gravitational potential energies and ΔU as measured by Anjay and Brittany.



	U_i	U_f	ΔU
Anjay			
Brittany			

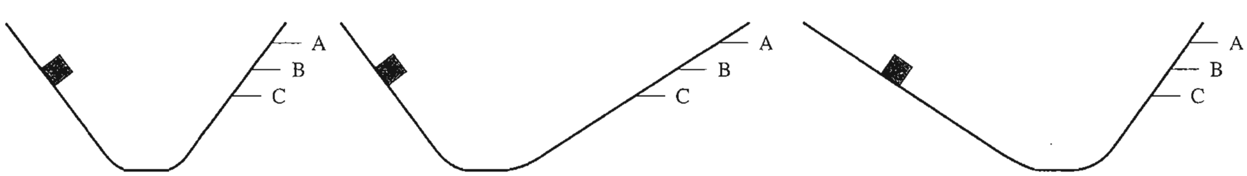
18. Three balls of equal mass are fired simultaneously with *equal* speeds from the same height above the ground. Ball 1 is fired straight up, ball 2 is fired straight down, and ball 3 is fired horizontally. Rank in order, from largest to smallest, their speeds v_1, v_2, and v_3 as they hit the ground.



Order:

Explanation:

19. Below are shown three frictionless tracks. A block is released from rest at the position shown on the left. To which point does the block make it on the right before reversing direction and sliding back? Point B is the same height as the starting position.



Makes it to ______ Makes it to ______ Makes it to ______