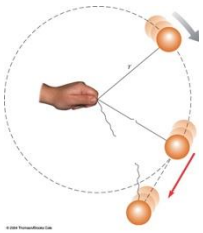
1 A ball of mass 0.5 kg is attached to the end of a cord whose length is 2 m. The ball is whirled in a horizontal circle. If the cord can withstand a maximum tension of 50 N, the maximum speed the ball can have before the cord breaks is:



a) 14.1 m/s **b)** 12.2 m/s **c)** 23.4 m/s **d)** 28.5 m/s **e)** 18.3 m/s

2 A curve in a road forms part of a horizontal circle. As a car goes around it at constant speed 12 m/s, the total force on the driver has magnitude 130 N. The vector total force on the driver if the speed is 17 m/s instead is:

a) 142 N **b)** 83 N **c)** 261 N **d)** 215 N **e)** 311 N

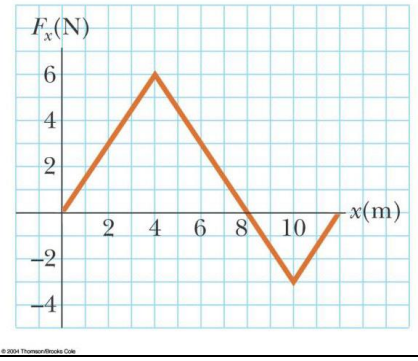
3 A 4 kg block of mass 1.6 kg initially at rest is pulled to the right along a horizontal, frictionless surface by a constant horizontal force of 12 N, the speed of the block after it has moved 3 m is:

a) 1.3 m/s **b)** 2.4 m/s **c)** 5.3 m/s **d)** 4.2 m/s **e)** 3.5 m/s

4 If it takes 4 J of work to stretch a Hooke's-law spring 10 cm from its unstressed length, the extra work required to stretch it an additional 15 cm is:

a) 10 J **b)** 21 J **c)** 12 J **d)** 24 J **e)** 16 J

5 The force acting on a particle varies as shown in the Figure. The work done by the force on the particle as it moves from $x = 0$ to $x = 10$ m is:



a) 21 J **b)** 3 J **c)** 24 J

d) 27 J **d)** 34 J

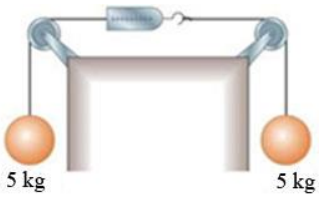
6 Ali jumps vertically upward with a vertical velocity component 4 m/s. How far does his center of mass move up as he makes the jump?

a) 2.14 m **b)** 0.92 m **c)** 1.11 m **d)** 0.82 m **e)** 1.84 m

7 A 400 N child is in a swing that is attached to rope 2 m long The gravitational potential energy of the child-earth system if the child if the child is at the bottom of the circular arc is:

a) 800 J **b)** 100 J **c)** 0 J **d)** 200 J **e)** 500 J

8 The system shown in the Figure is in equilibrium. If the spring scale is calibrated in newton, what does it read? (Neglect the masses of the pulleys and strings)

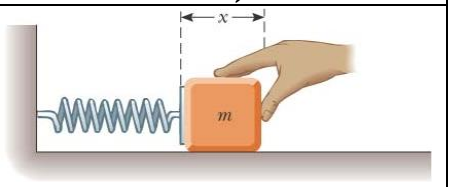
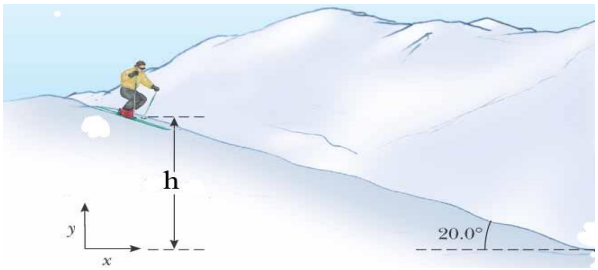
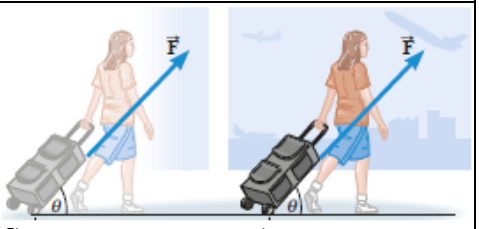
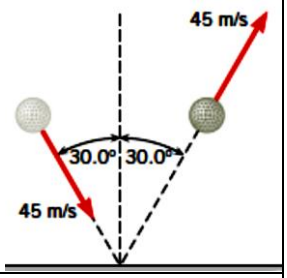
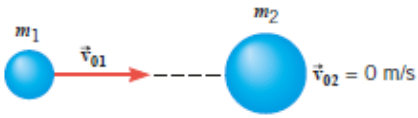


a) 0 N **b)** 5 N **c)** 20 N **d)** 15 N **e)** 10 N

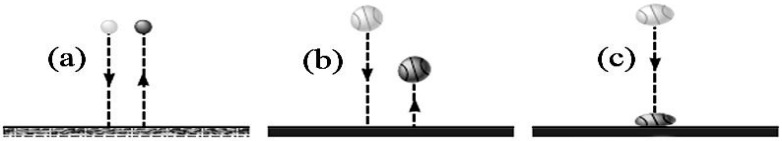
9 A dart is loaded into a spring-loaded toy dart gun (حمل سهم علي نابض بندقية لعبة قاذفة للاسهم) by pushing the spring a distance d. For the second loading, the spring is compressed a distance 2d. How much faster does the second dart leave the gun compared to the first?

a) 4 times as fast **b)** 3 times as fast **c)** the same **d)** half as fast **e)** 2 times as fast

10	Choose of the correct answer. The gravitational potential energy of a system **a)** is always positive **b)** can be positive or negative or zero **c)** is always zero **d)** is always negative **e)** None of those

11	If a person lifts a 20 kg bucket from a well and does a 6 kJ of work, the depth of the well is: (assume the speed of the bucket is constant) **a)** 7.8 m **b)** 30.6 m **c)** 15.5 m **d)** 42.2 m **e)** 22.3 m
12	If you push a 40 kg box at a constant speed of 1.4 m/s across a horizontal floor of $\mu_k = 0.25$, the rate of energy dissipation by the frictional force is: **a)** 210 W **b)** 98 W **c)** 173 W **d)** 137 W **e)** 34 W
13	A block of mass 2 kg is kept at rest as it compresses a horizontal spring (k=100 N/m) a distance x =10 cm. As the block is released, it travels 0.25 m on a rough horizontal surface before stopping. The coefficient of kinetic friction between surface and block is:  **a)** 0.1 **b)** 0.2 **c)** 0.3 **d)** 0.4 **e)** 0.25
14	A skier starts from rest at the top of a frictionless incline ($\theta = 20°$) of height h = 30 m (as in the figure). The speed of the skier at the bottom of the incline is:  **a)** 32.3 m/s **b)** 7.6 m/s **c)** 24.2 m/s **d)** 17.1 m/s **e)** 19.8 m/s
15	In the figure, find the work done by a force F = 45 N to pull the suitcase at an angle $\theta = 50°$ for a distance s = 75 m  **a)** 0.92 kJ **b)** 2.17 kJ **c)** 3.52 kJ **d)** 4.11 kJ **e)** 1.71 kJ
16	A golf ball strikes a hard, smooth floor at an angle of 30° and rebounds at the same angle (as in the figure). The mass of the ball is 0.047 kg, and its speed is 45 m/s just before and after striking the floor. The magnitude of the impulse applied to the golf ball by the floor is:  **a)** 4.5 N.s **b)** 2.8 N.s **c)** 1.2 N.s **d)** 3.7 N.s **e)** 5.6 N.s
17	A ball of mass m_1 = 5 kg, moving to the right at a velocity of 2 m/s on a frictionless table, collides head-on with a stationary ball of mass m_2 = 7.5kg. If the collision is perfect inelastic, the final velocity of the two balls after collision is:  **a)** 0.8 m/s **b)** 1.6 m/s **c)** 0.4 m/s **d)** 2.3 m/s **e)** 0.5 m/s
18	If a fly (object 1) collides with the windshield of a fast moving bus (object 2), which object experiences an impact force with a larger magnitude **a)** the fly **b)** the bus **c)** the same force is experienced by both **d)** None of those **e)** both of them will not experience any impact force

19 The figures show dropping different balls onto different surfaces. In figure (a), a hard steel ball will completely rebound to its original height after striking a hard surface. In figure(b), a basketball will partially rebound after striking a soft surface. In Figure (c), a basketball will not rebound at all. In which of these figures the collision is elastic?



a) Figure (c) **b)** Figure (b) **c)** Figures (b & c) **d)** Figure (a) **e)** Figures (a & b)

20 If we know the potential energy function *U(x)* for a conservative system in which a one-dimensional force *F(x)* acts on a particle, we can find the force as:

a) $F(x) = -\frac{du(x)}{dx} + u(x)$ **b)** $F(x) = -du(x)$ **c)** $F(x) = \frac{du(x)}{dx}$ **d)** None of those **e)** $F(x) = -\frac{du(x)}{dx}$

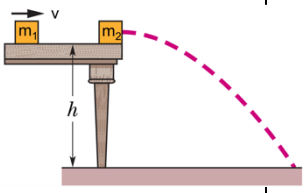
21 If a particle of mass m moves with momentum P, the kinetic energy of the particle (k) is:

a) P/2m **b)** $P^2/2m$ **c)** P^2/m **d)** $m^2/2p$ **e)** $2m^2/p$

22 A car and a large truck traveling at the same speed make a head-on collision and stick together. Which vehicle experiences the larger change in the magnitude of momentum?

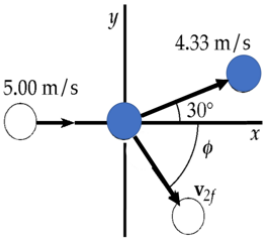
a) the car **b)** the truck **c)** The change in the magnitude of momentum is the same for both. **d)** impossible to determine

23 In the figure, a box (m1= 3.2 kg) slides on a horizontal frictionless table and collides with a another box (m2= 2.0 kg) initially at rest on the edge of the table, at height h= 0.40 m. The speed of the box m1 is 3.0 m/s just before the collision. If the two boxes stick together because of packing tape on their sides, what is their kinetic energy just before they strike the floor?



a) 12 J **b)** 20 J **c)** 29 J **d)** 37 J **e)** 55 J

24 A billiard ball moving at 5.00 m/s strikes a stationary ball of the same mass. After the collision, the first ball moves, at 4.33 m/s, at an angle of 30.0° with respect to the original line of motion. Assuming an elastic collision (and ignoring friction and rotational motion), find the struck ball's velocity (v_{2f}) after the collision.



a) 2.5 m/s **b)** 1.5 m/s **c)** 4.8 m/s **d)** 3.7 m/s **e)** 0.5 m/s

25 A 3.00-kg particle has a velocity of (3.00i - 4.00j) m/s. Find the magnitude and direction of its momentum.

a) 15 kg.m/s, 307° **b)** 10 kg.m/s, 260° **c)** 19 kg.m/s, 200° **d)** 22 kg.m/s, 170° **e)** 5 kg.m/s, 60°