Dr. Mohammad Hussein **PHY 105** **Recitation Session - First Exam - Chapter 6**

1) A PHY 105 student is holding a book of mass m. He walks a distance d at a constant speed v. The work the student has done on the book is:

zero +mgd – mgd $+1/2mv^2$ $-1/2mv^2$

2) Imagine you push a box of mass m a distance d across a floor with constant speed. The coefficient of kinetic friction between the box and the floor is μ_k. You then pick up the box, raise it to a height h, carry it back to the starting point, and put it back down on the floor. How much work have you done on the box?

$\mu_k mgd$ zero $\mu_k mgd + 2mgh$ $\mu_k mgd - 2mgh$ $2\mu_k mgd + 2mgh$

3) When a ball rises vertically to a height 3h and returns to its original position, the work done on it by the gravitational force is

zero – 6mgh − 3mgh + 3mgh + 6mgh

4) A 20 g particle is moving to the left at a speed of 30 m/s. How much total work (in J) must be done on the particle to make it move to the right at a speed of 30 m/s?

zero +9 – 9 +18 – 18

5) The engine of a truck of mass 940 kg can deliver an average power of 104800 W. If the truck accelerates from rest, the speed (in m/s) after 4.5 s is: (Ignore air resistance)

31.7 11.2 15.1 4.8 36.6

6) A 100 kg box is pushed at a constant speed of 5.0 m/s across a horizontal floor by an applied force F directed 37° above the horizontal. If the rate at which F does work on the box is 0.66 hp, the applied force F (in N) is: Hint: 1 hp = 746 W

123 980 98 164 43

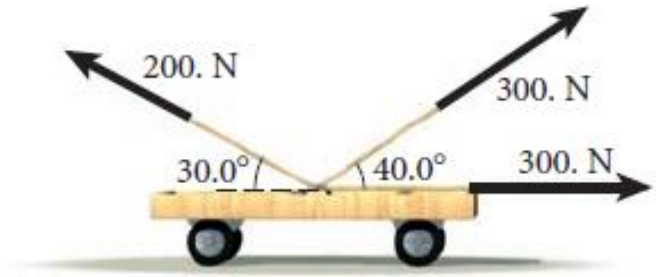
7) A motor lifts a 3000 kg elevator 210 m up during a time interval t at constant speed. If the rate at which the motor does work on the elevator is 362 hp, the time interval t (in s) is: Hint: 1 hp = 746 W

23 1.7 5 14.8 19.9

8) A horse drags a heavy cart (200 kg) horizontally on a rough floor at constant speed. The power delivered by the horse is 1.06 hp. The coefficient of kinetic friction between the cart and the floor is 0.115. The speed (in m/s) with which the cart moves across the floor is:

3.5 0.3 11.7 9.0 2.1

9) A 125 kg cart initially at rest is pulled by three ropes as shown. When the cart moves 100 m horizontally on a frictionless level, it's final speed (in m/s) is:



$F_1 = 300.\ \text{N at } 0°$
$F_2 = 300.\ \text{N at } 40.0°$
$F_3 = 200.\ \text{N at } 150.°$

24 22 19 27 30

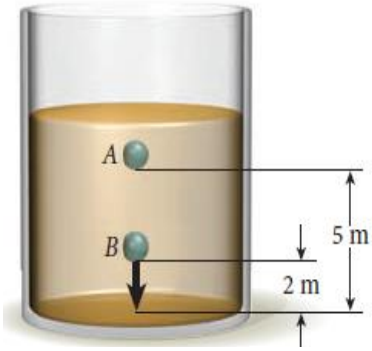
10) A box of mass m at a height h above the floor has a speed v. Its total mechanical energy is E. A second box of mass m at a height 4h above the floor has a speed 2v. The total mechanical energy for the second box is:

4E 2E $(2)^{½}E$ E $(2)^{-½}E$

11) A box of mass m is moving with an initial speed v on a horizontal level, where the coefficient of kinetic friction is μ_k. The box moves a distance d and stops. If the initial speed is doubled, how far will the same box move before it stops?

4d 2d d^2 d $4d^2$

12) As shown, a bead of mass 0.5 kg immersed in a certain liquid is released from rest at point A. At point B, the bead has a speed of 6 m/s. The work done on the bead (in J) by the viscosity (friction force) of the liquid is:



–5.7 +15 +9 –15 –9

13) A 3 kg ball thrown vertically upward has reached a height of 100 m in the presence of air resistance. The air resistance has performed –800 J of work on the ball. Determine the height (in m) the ball would reach if air resistance can be neglected.

127 100 163 196 201

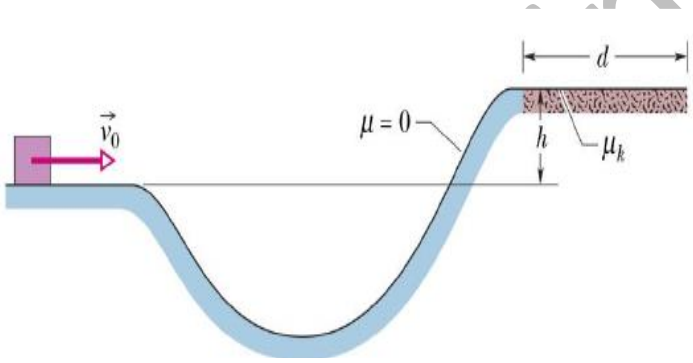
14) A box of mass 18 kg is dropped from rest from a height of 80 m above the floor. The box falls vertically downward and reaches the floor with a speed of 15 m/s. The work (in 10^3 J) exerted by the air resistance force on the box is:

– 12 – 16 + 12 + 16 – 14

15) A 0.5 kg ball thrown vertically upward with an initial speed of 4.00 m/s has reached a maximum height of 0.8 m. What change does air resistance cause in the mechanical energy (in J) of the ball during the upward motion?

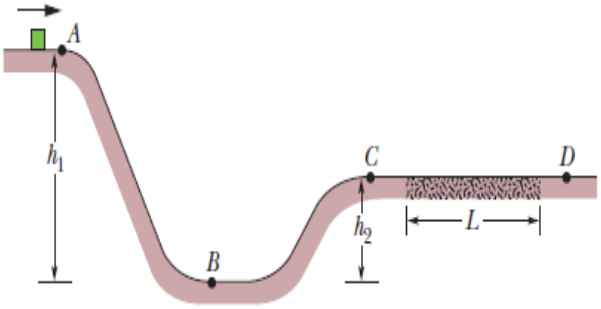
0.08 0 16 3.92 4.9

16) As shown, 2 kg block slides along the track with an initial speed v_o of 6 m/s. The blue section of the track is frictionless (μ=0), while the horizontal brown section is rough (μ_k). On the rough section, a frictional force stops the block in a distance d. If the height difference h is 1.1 m and μ_k is 0.60, what is d (in m)?



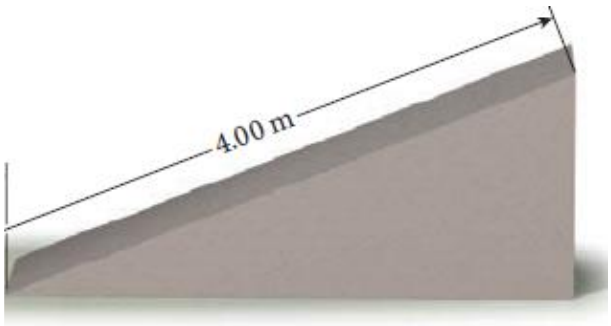
1.2 4.5 2.6 3.4 5.7

17) As shown, a block slides at point A with an initial speed of 7 m/s along the track. All the sections of the track are frictionless until the block reaches the section L (of length 12 m), where the coefficient of kinetic friction is 0.7. If the height differences h_1 and h_2 are 6 m 2 m respectively, how far (in m) through the section of friction does the block travel before it comes to a complete stop?



9.3 6.3 10.3 12 5.7

18) A 1 kg ball is located at the top of a 4 m plane inclined at 45° as shown. The ball begins to slide down the inclined plane from rest. The upper half of the inclined plane is frictionless, while the lower half is rough, with a coefficient of kinetic friction μ_k = 0.3. The speed (in m/s) of the ball at the bottom of the inclined plane is:



6.9 5.3 7.5 0.3 1.1