# Practice Midterm Exam -- Physics 121
# (taken from exam #1 in 2009)

An electron moves in one dimension according the graph shown below.

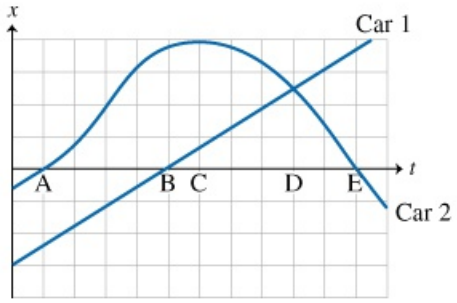


1. (5 pts) What is magnitude of the instantaneous velocity at time t=3 s?
A. 4.5 m/s
B. 1.5 m/s
C. 1.0 m/s
D. 0.0 m/s
E. -1.0 m/s

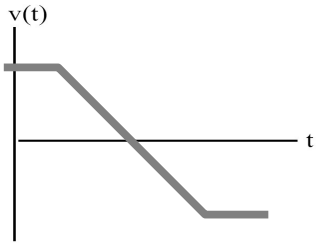
2. (5 pts) What is the direction of the instantaneous acceleration at time t=3 s?
A. the acceleration is zero at t=3 s
B the acceleration is in the positive x direction at t=3 s
C. the acceleration is in the negative x direction at t=3 s
D. the acceleration cannot be determined from the graph

3. (5 pts) Two cars travel down parallel lanes of a two-lane road. The graph below shows their displacement versus time, where the x axis is alligned along the length of the road. At which time do the cars pass each other, and what is their relative direction of motion?

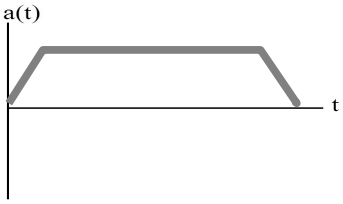
A. time=D, opposite direction
B. time=D, same direction
C. time=B, same direction
D. time=C, same direction



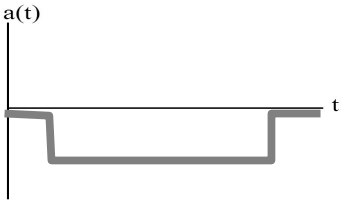
4. (5 pts) A particle moves in one dimension along the x axis and its speed varies with time according to the figure shown below. Which of the graphs **A**, **B**, or **C** best describes the acceleration of the particle?



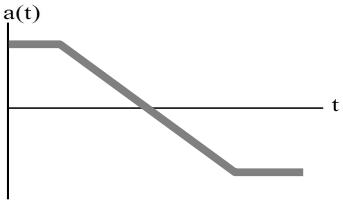

A



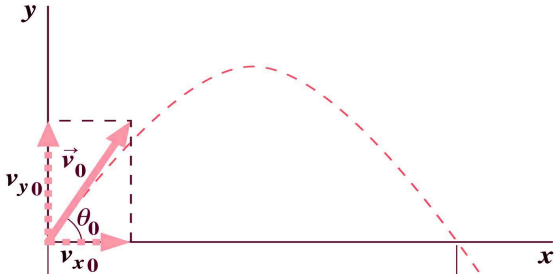

B




C




A soccer ball is kicked and the trajectory of the ball is shown in the figure below. Air drag and lift can be neglected. The initial velocity is $v_o = 20.0$ m/s, and the launch angle is $\theta_o = 50^o$.




5. (5 pts) What is the acceleration of the golf ball just after it leaves the ground, in vector component form?

A. $\vec{a} = 0$

B. $\vec{a} = (12.9\,m/s^2)\hat{i} + (15.3\,m/s^2)\hat{j}$

C. $\vec{a} = (20.0\,m/s^2)\hat{i} - (9.8\,m/s^2)\hat{j}$

D. $\vec{a} = 0\hat{i} - (9.8\,m/s^2)\hat{j}$

6. (5 pts) Referring to the soccer ball in problem 5, what is the acceleration of the ball when it reaches its maximum height?

A. $\vec{a} = 0$

B. $\vec{a} = (12.9\,m/s^2)\hat{i} + (15.3\,m/s^2)\hat{j}$

C. $\vec{a} = (20.0\,m/s^2)\hat{i} - (9.8\,m/s^2)\hat{j}$

D. $\vec{a} = 0\hat{i} - (9.8\,m/s^2)\hat{j}$

7. (5 pts) Referring again to the soccer ball above, what is the x-component of velocity when the ball hits the ground?

A. $v_x = 0$

B. $v_x = 12.9\,m/s$

C. $v_x = 15.3\,m/s$

D. $v_x = 20.0\,m/s$

E. $v_x = -9.8\,m/s$

8. (5 pts) A large truck breaks down on the road and receives a push back into town by a small compact car. While the car, still pushing the truck, is speeding up to get up to cruising speed:

A. the car's engine is running so the car pushes against the truck, but the truck's engine is not running so the truck **cannot push** back against the car. The truck is pushed forward because it is in the way of the car.

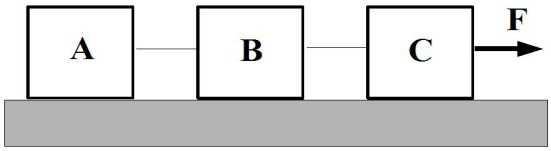
B. the amount of force with which the car pushes on the truck is **smaller than** that with which the truck pushes back on the car.

C. since both objects are accelerating, the amount of force with which the car pushes on the truck is **greater than** that with which the truck pushes back on the car.

D. the amount of force with which the car pushes on the truck is **equal to** that with which the truck pushes back on the car.

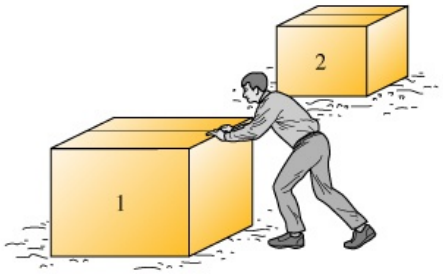
9. (5 pts) Three blocks (A, B, C), each having mass *M*, are connected by strings as shown. Block C is pulled to the right be a force **F** that causes the entire system to accelerate. Neglecting friction, the *net* force acting on block C is:

A. zero
B **F**/3
C. **F**/2
D. 2**F**/3
E. **F**




10. (5 pts) A baggage handler applies a constant horizontal force $F_1$ to push a box across a rough horizontal surface with a small constant acceleration *a*. Friction must be considered. The man now pushes a second box, identical to the first, but with an acceleration of 2*a*. The magnitude of the force $F_2$ applied to the second box, as compared to first, is

A. $F_2 = 2F_1$
B. $0 < F_2 < F_1/2$
C. $F_1/2 < F_2 < F_1$
D. $F_1 < F_2 < 2F_1$
E. $F_2 > 2F_1$




11. (5 pts) A car with a mass of 1000 kg and a motorcycle with mass 100 kg are both moving with constant speeds around a circular track. The car's speed is 10 m/s and the motorcycle's speed is 100 m/s. The magnitudes of their accelerations are
A. in the ratio of 1:1
B. in the ratio of 2:1
C. in the ratio of 1:10
D. they are both zero
E. in the ratio of 1:100

12. (5 pts) A sled of mass 100 kg is pulled over a flat snowy surface a team of dogs. The coefficient of kinetic friction between the sled and snow is 0.05. The work done by the dogs in pulling the sled a horizontal distance of 1 km at constant velocity is

A. $4.9 \times 10^4$ J
B. 49 J
C. $9.8 \times 10^4$ J
D. $2.9 \times 10^6$ J
E. $9.8 \times 10^6$ J

13. (5 pts) Suppose that the velocity of the sled in problem 11 is 1.0 m/s. When the dogs stop pulling on the rope, the sled gradually slows to a stop. What is the magnitude of the work done on the sled by friction during the time that the sled is brought to rest?

A. 0 J
B. 50 J
C. 500 J
D. -50 J
E. -500 J

14. (5 pts) A car is heading eastward on College Ave. at a speed of 24 m/s. A little dog runs into the road and the car skids to a stop. The time interval between when the brakes were first applied and when the car stopped was 3 seconds. Assuming a constant acceleration, what was the distance covered by the car during the braking time of 3 s?