Phys 151 Fall 1112 Midterm Exam   Name: _____ Signature: _____ ID:
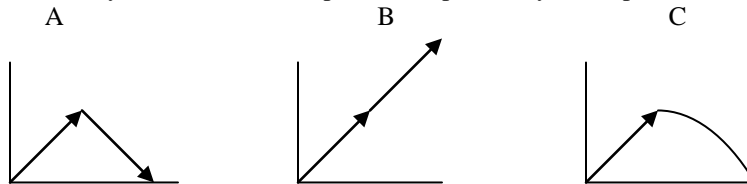
Except for the extra-credit questions where you must give two- or three-sentence answers or work out your answer, you should choose the <u>single-best</u> answer for each of the multiple-choice questions. Then <u>enter it in</u> **capital-form** <u>in the space before</u> the question. **These are the <u>only</u> answers that count.**
Wherever needed, g = 10 m/s^2 or   32 ft/s^2.

[   ] 1. You walk at a constant pace in a straight line between your desk and the nearest window, and back again. At the end of your motion, which plot best represents your <u>displacement</u> versus time plot?
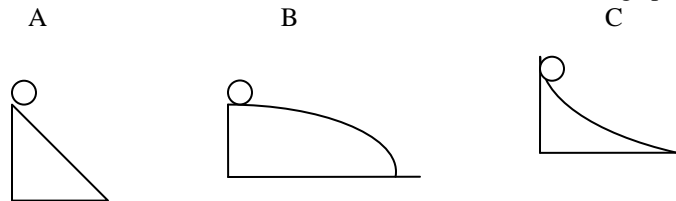

A. A   B. B   C. C   D. A or B   E. A or C   F. B or C   G. none of the previous

[   ] 2. A reconnaissance plane flies in a straight line to a point 600 km away from its base at 200 km/h, then back at 300 km/h. What is its average speed for the whole trip?
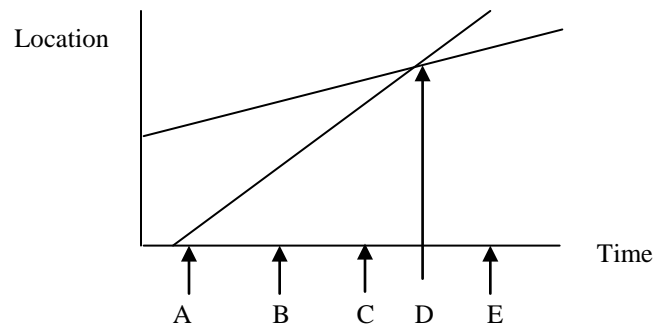
 A. 120 km/h   B. 200 km/h   C. 240 km/h   D. 250 km/h   E. 300 km/h

[   ] 3. On which of these hills does the ball roll down with increasing speed and decreasing acceleration?

A. A   B. B   C. C

[   ] 4. The graph below shows the motion of two objects X and Y. Do the two objects ever have the same speed? If so, when?

A. Yes, at A   B. Yes, at B   C. Yes, at C   D. Yes, at D   E. Yes, at E   F. No, never

[   ] 5. A toilet malfunction occurs in an airplane that is cruising at a fixed height and an "object" falls (not thrown!) from it and is observed to take 15 s to reach the ground. If air resistance can be neglected, at about what height was the plane traveling?

A. 150 m   B. 225 m   C. 1125 m   D. 1500 m   E. 15000 m

[   ] 6. A ball is thrown straight up. One second before it reaches its maximum height, what is its speed? Ignore air resistance. (Hint: All balls, no matter what the speed they are launched with upwards, have the same speed one second before they reach their maximum height!)

    A. 1 m/s   B. 5 m/s   C. 10 m/s   D. 15 m/s   E. 20 m/s   F. none of the previous

[   ] 7. For the ball in the previous question, how far below its maximum height is it at that time?
    A. 1 m   B. 5 m   C. 10 m   D. 15 m   E. 20 m   F. none of the previous

[   ] 8. The rear left door of your car is not properly shut as you are driving along a straight expressway road. As you turn your car abruptly to the right to make an exit what will happen to that door?
A. Obeying Newton's First Law, the door will fly open.
B. Obeying Newton's First Law, the door will bang shut.
C. Obeying Newton's Third Law, the door will fly open.
D. Obeying Newton's Third Law, the door will bang shut.

[   ] 9. A 400-kg bear grasps a vertical tree trunk and slides down it. At one stage it is seen to be moving at constant velocity. What is the friction force that is acting on the bear during this stage?
    A. 0 N   B. 400 N   C. 4000 N   D. 5000 N   E. indeterminate

[   ] 10. You are standing on a skateboard next to a wall. You push off with a force of 40 N. If your mass is 80 kg and the floor is frictionless, how far will you travel in 2 seconds?
    A. 0.25 m   B. 0.5 m   C. 1.0 m   D. 2.0 m   E. 4.0 m

[   ] 11. A 70-kg baseball player is running to second base at 6 m/s when he decides to slide. If he is 5 m from the plate and the ground exerts a constant friction force of 140 N, how soon will it take him to reach the base?
    A. 1 s   B. 2s   C. 2.5 s   D. 5 s   E. 5/8 s   F. 0.8 s

[   ] 12. Two tennis balls, one regular and the other filled with iron pellets, fall from the top of a very tall building. The air resistance just before they hit the ground is greater for
  A. the regular ball   B. the iron-filled ball   C. neither; they are the same

[   ] 13. You are riding an elevator from the parking garage in the basement up to your 12th floor apartment. As it approaches your floor, the elevator begins to slow. What is the direction of the net force acting on you at that time?
A. The net force is up.   B. The net force is down.   C. The net force is zero.

[   ] 14. A waterslide at the edge of a hotel pool is shaped so that its lower end (1.25 m above the water level of the pool) launches a swimmer horizontally. If it is desired to have the swimmer reach the middle of the pool 8 m away from the end of the slide, what speed in m/s must the swimmer have at launch? Hint: This is a projectile problem!

A) 1.25   B) 8   C) 10   D) 16   E) 32   F) none of the previous

[   ] 15. You are driving on a 4-lane highway when you see an <u>unbanked</u> <u>circular</u> curve ahead. If the inner lane has an effective radius there of 50 m while that of the outer lane is 60 m, which lane would you take so as to be able to go faster and by how much? (Assume that the tires will behave in the <u>same</u> manner in providing friction. Recall the two weights on the same turntable demo!)

A) inner lane, 1.25 times faster   B) inner lane, 1.12 times faster   C) inner lane, 1.1 times faster
D) outer lane, 1.25 times faster   E) outer lane, 1.12 times faster   F) outer lane, 1.1 times faster
G) makes no difference

<u>Extra Credit Questions</u>

1. If a ball is thrown vertically upwards in the presence of air resistance, what is the difference between the time for it to rise to its maximum height compared to that for its fall back to the launch level?
     A. no difference   B. takes longer to rise   C. takes longer to fall
Explain your choice of answer for full credit.

2. You tie a bucket of water to a rope and whirl it in a <u>vertical</u> circle with a constant radius. Everywhere, i.e. at the bottom of the circular loop, at the top as well as the sides, you keep the speed of the bucket at a constant 6.0 m/s. Where (at the four sites mentioned) do you have to tug harder on the rope to keep it taut throughout its motion? You must explain your answer in detail.

3. When you get up from a squatting position on the floor until you are standing still upright, your feet will be pushing down all the time. Describe what happens to the force that your feet will be exerting all during that time. Does it change and if so in what way?