

Physics 1114
Midterm #1 – Spring 2014
Version A

Multiple choice (6 points each for questions 2-19)

1) Which exam version do you have?

- A) A
- B) B
- C) C
- D) D

2) What discussion section are you in?

- A) Section 11: 8:30-9:20 AM Physical Science Center 359 (Tang)
- B) Section 12: 10:30-11:20 AM Nielsen Hall Room 251 (Tang)
- C) Section 13: 11:30-12:20 PM Adams Hall Room 101 (Savoy)
- D) Section 14: 12:30-1:20 PM Physical Science Center 359 (Savoy)

3) A rock is thrown upward from the surface of the earth. The rock rises to some maximum height and falls back toward the surface of the earth. Which statement concerning this situation is true? Neglect air resistance.

- a. As the ball rises, its acceleration vector points upward
- b. The ball's acceleration is a constant for the duration of its flight
- c. The acceleration of the ball is 0 when the ball is at its highest point
- d. The speed of the ball is negative while the ball falls back toward the earth
- e. The velocity and acceleration of the ball always point in the same direction

acceleration
always 9.8 m/s^2
downward

4) Which one of the following situations is not possible

- a. A body has zero velocity and non-zero acceleration
- b. A body travels with a northward velocity and a northward acceleration
- c. A body travels with a northward velocity and a southward acceleration
- d. A body travels with a constant velocity and a time-varying acceleration
- e. A body travels with a constant acceleration and a time-varying velocity

acceleration is
change in velocity
so if velocity constant
 \ddot{a} must be zero

5) A car travels a total distance of 80 km. For the first 30 minutes, it is driven at a constant speed of 80 km/hr. The driver then slows down and drives at 40 km/hr for the rest of the trip.

The average speed for the entire trip is:

- a. 40.0 km/hr
- b. 47.5 km/hr
- c. 50.0 km/hr
- d. 53.3 km/hr
- e. 60.0 km/hr

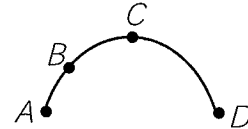
1st 30 minutes car traveled $d = st = (80 \text{ km/hr})(0.5 \text{ hr}) = 40 \text{ km}$

time for slower drive $t = \frac{80 \text{ km} - 40 \text{ km}}{40 \text{ km/hr}} = 1 \text{ hr}$

Total distance = 80 km
Total time = 0.5 hr + 1 hr = 1.5 hr
speed = $\frac{80 \text{ km}}{1.5 \text{ hr}} = 53.3 \text{ km/hr}$

- 6) If your car is accelerating, then
- Its velocity cannot be zero
 - Its speed cannot be constant
 - Its velocity must be increasing
 - Its position cannot be zero
 - None of the above

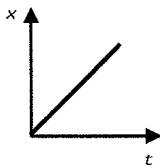
- 7) You hit a golf ball into the air and notice that the ball follows the parabolic path shown in the figure to the right. At which point on the path is the velocity zero?



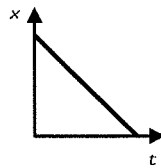
- A
- B
- C
- D
- None of the above

always has velocity in horizontal direction

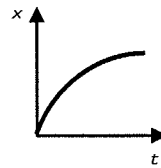
- 8) Which of the following graphs represents the motion of an object whose speed is increasing?



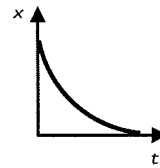
A)



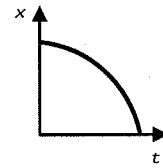
B)



C)



D)



E)

- 9) You throw a ball from a tower that is 9.0 m high. You want the ball to hit 3.5 m away from the tower. If you throw the ball horizontally, what speed in m/s must you throw the ball?

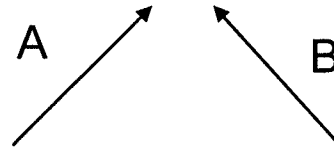
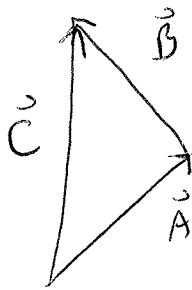
- A) 2.58 B) 2.23 C) 1.91 D) 3.14 E) 4.37

$\uparrow +$ time to fall 9.0 m

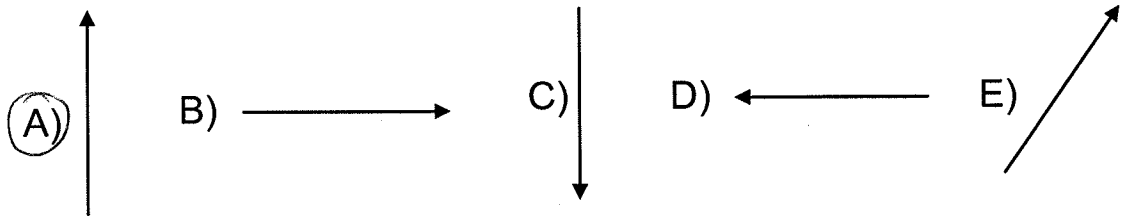
$$d = v_{0y}t + \frac{1}{2}at^2 \quad t^2 = \frac{2d}{a} \quad t = \sqrt{\frac{2d}{a}} = \sqrt{\frac{2(-9\text{m})}{-9.8\text{m/s}^2}} \quad t = 1.355\text{s}$$

have 1.35 s to travel 3.5 m $d = vt$

$$3.5\text{m} = v(1.355\text{s}) \quad \underline{v = 2.58\text{m/s}}$$



10) Two vectors **A** and **B** are shown to the right
If $C=A+B$, which best describes vector **C**?



11) The acceleration of gravity is 9.8 m/s^2 , what is the acceleration of gravity in feet/hour²

(2.54 cm = 1 inch)

$$\frac{9.8 \text{ m}}{\text{s}^2} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{1 \text{ km}}{2.54 \times 10^5 \text{ in}} \times \frac{1 \text{ ft}}{12 \text{ in}} \times \frac{3600 \text{ s}}{1 \text{ hr}} \times \frac{3600 \text{ s}}{1 \text{ hr}} = 416692913 \text{ ft/hr}^2$$

- A) 32.2 B) 9.31×10^8 C) 1.16×10^5 **(D) 4.17×10^8** E) 1.63×10^8

12) A light ball is thrown horizontally from the top of a tower at the same instant that a heavy rock is dropped vertically from rest from the same spot. Ignoring air resistance, which object has a greater total speed when it hits the level ground and which object hits the ground first?

<u>Greater Speed</u>	<u>Hits the Ground First</u>
A) Same speed	Hit at the same time
B) The rock	Hit at the same time
(C) The ball	Hit at the same time
D) The ball	The rock
E) The rock	The rock

13) In everyday language, speed and velocity are synonyms, but in physics,

- A) velocity has only magnitude.
 B) speed has only direction.
(C) velocity has magnitude and direction.
 D) speed has magnitude and direction.
 E) velocity has only direction.

speed only has magnitude

14) Objects A and B both start at rest. They both accelerate at the same rate. However, object A accelerates for half as long as object B. What is the distance traveled by object A compared to that of object B?

- A) the same distance
- B) 1/2 as far
- C) 1/3 as far
- D) 1/4 as far**
- E) 1/5 as far

$$d = v_0 t + \frac{1}{2} a t^2$$

$$d = \frac{1}{2} a t^2$$

$$\frac{1}{2} a \left(\frac{t}{2}\right)^2 = \frac{1}{4} \frac{1}{2} a t^2 = \frac{1}{4} d$$

15) A stone is thrown vertically upward with an initial speed of 19.5 m/s. It will rise to a maximum height of: *1st find time* $v = v_0 + at$ $v = 0$ at top $0 = v_0 + at$ $\uparrow +$

- A) 4.9 m
- B) 9.8 m
- C) 19.4 m**
- D) 38.8 m
- E) 58.2 m

$$t = \frac{-v_0}{a} = \frac{-19.5 \text{ m/s}}{-9.8 \text{ m/s}^2} \quad t = 1.99 \text{ s}$$

$$d = v_0 t + \frac{1}{2} a t^2 = (19.5 \text{ m/s})(1.99 \text{ s}) + \frac{1}{2} (-9.8 \text{ m/s}^2)(1.99 \text{ s})^2$$

$$d = 38.8 \text{ m} - 19.4 \text{ m} = 19.4 \text{ m}$$

16) An object is thrown vertically upward with an initial speed of 35 m/s. The velocity of the object 5 seconds later is: $\uparrow +$

- A) 7.0 m/s up
- B) 14 m/s down**
- C) 14 m/s up
- D) 84 m/s up
- E) 10 m/s down

$$v = v_0 + at$$

$$v = (35 \text{ m/s}) + (-9.8 \text{ m/s}^2)(5 \text{ s}) = \underline{-14 \text{ m/s}}$$

17) The starship Enterprise takes 4.5 minutes to fly from Mars to Earth travelling at the speed of light (3×10^8 m/s). How far away is Mars from Earth?

- A) 8.10×10^{10} km
- B) 1.35×10^9 m
- C) 8.10×10^{10} m**
- D) 1.35×10^9 km
- E) 1.62×10^{11} m

$$d = vt$$

$$\frac{4.5 \text{ min}}{60 \text{ s}} \times \frac{1 \text{ hr}}{1 \text{ min}}$$

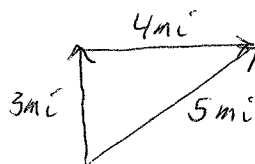
$$t = 270 \text{ s}$$

$$d = (3 \times 10^8 \text{ m/s})(270 \text{ s})$$

$$\underline{8.10 \times 10^{10} \text{ m}}$$

18) You walk 3 miles north and then walk 4 miles east, ending up 5 miles away from where you started. It took 2 hours for the entire trip. What is your average speed and average velocity for the entire trip?

- A) speed = 3.5 mi/hr velocity = 3.5 mi/hr
- B) speed = 2.5 mi/hr velocity = 3.5 mi/hr
- C) speed = 2.5 mi/hr velocity = 2.5 mi/hr
- D) speed = 3.5 mi/hr velocity = 2.5 mi/hr**
- E) speed = 1.5 mi/hr velocity = 2 mi/hr



$$\text{speed} = \frac{3 \text{ mi} + 4 \text{ mi}}{2 \text{ hrs}} = 3.5 \text{ mi/hr}$$

$$\text{velocity} = \frac{5 \text{ mi}}{2 \text{ hrs}} = 2.5 \text{ mi/hr}$$

19) In which of the following situations is the acceleration zero?

A) A boat is slowing down as it nears a dock

B) A car is turning a corner at a constant speed

C) A skier is speeding up as he goes down a hill

D) A train is traveling at a constant speed in a straight line

E) Both (B) and (D)

*If car turning direction
changing so velocity
changing so acceleration
cannot be zero*