Linear Motion and Freefall
Physics First Honors 2012/13

Name KEY

Linear Motion Review

A 1. On a distance vs. time graph, a straight horizontal line indicates ___ motion.

a. no b. increasing c. decreasing d. acceleration

d 2. On a velocity vs. time graph, a straight diagonal line with an upward slope indicates _____.

a. no motion b. increasing motion c. decreasing motion d. acceleration

b 3. On a velocity vs. time graph, the motion of a car traveling along a straight road with a uniform acceleration of 2 m/s^2 would appear as a _____.

a. horizontal straight-line
b. straight line sloping up to the right
c. straight line sloping up to the left
d. curved line whose upward slope increases with time

C 4. A bicycle travels 12 km for 40 minutes its average speed is _____km/hr. $s = \frac{\Delta d}{\Delta t} = \frac{12}{2/3}$

a. 0.30 b. 8.0 c. 18.0 d. 48

C 5. A car travels 40 km/hr for 2.0 hr and 50 km/hr for 1.0 hr and 20 km/hr for 0.5 hr. The cars average speed is _____km/hr.

a. 31 b. 45 c. 40 d. 55 $s = \frac{\Delta d}{\Delta t} = \frac{80+50+10}{2+1+.5}$

A 6. How long does a car with an acceleration of 2.0 m/s^2 take to go from 10 m/s to 30 m/s?

a. 10 s b. 20 s c. 40 s d. 400 s Equation #1

A 7. A car undergoes a constant acceleration of 6.0 m/s^2, starting from rest. In the first second it travels _____m

Equation 3

a. 3 b. 6 c. 18 d. 36 m

C 8. An airplane requires 20 s and 400. m of runway to become airborne, starting from rest. Its velocity when it leaves the ground is _____ m/s.

Equation 2

a. 20 b. 32 c. 40 d. 80

d 9. A car has an initial velocity of 15 m/s and an acceleration of 1.0 m/s^2. In the first 10 s after the acceleration begins, the car travels _____m.

Equation 3

a. 50 b. 150 c. 155 d. 200

C 10. A car has an initial velocity of 15 m/s and an acceleration of -1.0 m/s^2. In the first 10 s after the acceleration begins, the car travels _____m.

Equation 3

a. 25 b. 50 c. 100 d. 145

A 11. A ball thrown vertically upward at 25 m/s continues to rise for approximately ___s.

a. 2.5 b. 5.0 c. 7.5 d. 10

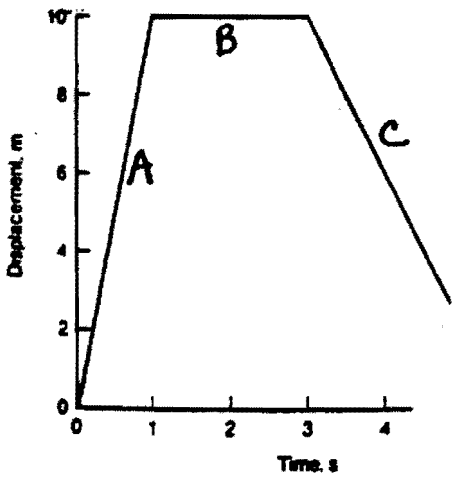
Linear Motion and Freefall Name _____

Physics First Honors 2012/13

b 12. In question #11, how much time will pass before the ball strikes the ground.

a. 2.5 s b. 5.0 s c. 7.5 s d. 10 s

Use the graph to the right to answer questions 14 - 17



B 13. Which section indicates the object is not moving?

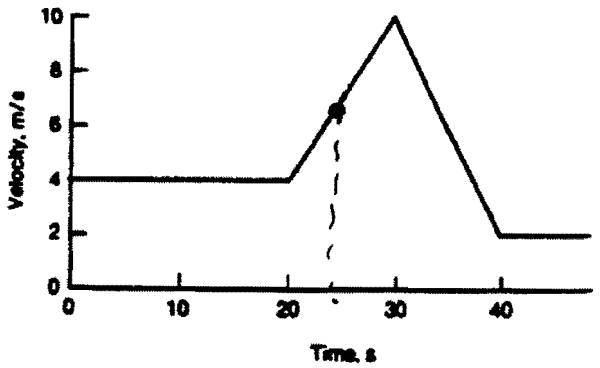
C 14. Which section indicates the object is moving back toward the original position?

A 15. Which section indicates the object is moving forward?

___ 16. What is the velocity of segment "A"?

$\frac{10}{1} = 10\ m/s$

Use the graph to the right to answer questions 18–19



___ 17. What is the acceleration of the object at 25.0 s?

___ 18. When does the object turn around and head back?

17) $V_f - V_i = 10 - 4 = 6\ m/s$

$a = \frac{\Delta V}{\Delta t} = \frac{6}{10} = 0.6\ m/s^2$

18) Never Velocity is > 0 Everywhere

Graphical Analysis and Motion Name _____
Physics 2007/08

Use a blank sheet of paper to answer the following questions.
Remember for full credit show, Givens – Drawing – Formula – Substitution - Answer

1. a. Explain the difference between instantaneous and average speed.

Average speed is the speed over a specific range of time while instantaneous speed as a speed at a specific time. Average speed is calculated as total distance traveled divided by the total time. Instantaneous speed is the slope of a line at a specific point.

b. What is velocity?

Velocity is a vector quantity representing the change in distance in a specified amount of time. $V = \Delta d / \Delta t$

c. What is acceleration?

Acceleration is a vector quantity representing the change in velocity in a specified amount of time. $a = \Delta v / \Delta t$

d. What equation would be used to find the acceleration of something that changes its velocity in some uniform way over a given time interval?

$a = \Delta v / \Delta t$

e. Why would a piece of paper and a tennis ball fall at different rates if dropped in the classroom? How could you get them to fall at the same rate?

They fall at different rates because air resistance affects the paper more than the ball. You can get them to fall at the same rate by placing them in a vacuum.

2. a. What is the difference between speed and velocity?

Speed is a scalar quantity which just means how fast is something going. Velocity is a vector which means it has both size (how fast) and direction. 10 m's is a scalar, 10 m/s up is a vector. Vectors are used when direction is an important thing to know.

b. If you move at a constant speed can you be accelerating? Explain and give an example.

You can be accelerating if you are moving at a constant speed because your direction could be changing. By changing your direction, you are changing your velocity and acceleration is $\Delta v / \Delta t$

Linear Motion and Freefall Name _____

Physics First Honors 2012/13

3. a. What is the average speed of a driver who accelerates from 10 mph to 82 mph in 4.2 seconds?

$V_{avg} = \frac{V_f + V_i}{2} = \frac{10+82}{2} = 46$ mph

b. What is his acceleration?

$a = \frac{\Delta V}{\Delta t} = \frac{82-10}{4.2} = \frac{17 mph}{sec}$

c. What is the driver's instantaneous speed after 4.2 second? $V_f = 82$ mph

4. a. Ignoring air resistance, if a rock is dropped from a cliff that is 50 m tall, how long would it take to hit the ground?

$V_i = 0$, V_f *, $d = 50$, $a = -9.8$, t t

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

$50 = \frac{1}{2}(9.8) t^2$

$50 = 4.9 t^2$

$t^2 = \frac{50}{4.9} = 10.2$

$t = \sqrt{10.2} = 3.19$ sec

b. How fast would that rock hit the ground?

$V_f = V_i + at = 9.8(3.19) = 31.3$ m/s

c. What acceleration would the rock experience? $-9.8 m/s^2$

5. Ignoring air resistance, if Keith "The Pop-Up King" Moreland hits a baseball straight up at a speed of 45 m/s.

a. What will be the ball's velocity at the peak of the hit? $V = 0$

b What will be the ball's acceleration at the peak of the hit? $a = -9.8 m/s^2$

c. What will be the ball's velocity as it hits the ground? -45 m/s

d. how long will the ball be in the air?

$V_i = 45$, $V_f = 0$, $d = *$, $a = -9.8$, $t = ?$

$V_f = V_i + at$

$0 = 45 - 9.8t$

$9.8t = 45$

$t = \frac{45}{9.8} = 4.59$ sec

e. How high will the ball go?

$d = \frac{1}{2} a t^2 = \frac{1}{2}(9.8)(4.59)^2 = 103$ m