Physics 100 Name: Answers
Kinematics Test Review, Part 2

Formulas that always work:

$v = \frac{\Delta x}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$

Formulas that only work when starting from rest

$a = \frac{2\Delta x}{t^2}$ $\Delta x = \frac{1}{2} a t^2$

10. Write the basic units for each of the following:

a. Position m
b. Speed m/s
b. Acceleration m/s^2
c. Displacement m
d. Velocity m/s
e. Time s

11. Suppose an object is launched directly upward in the absence of air resistance (i.e. it is in free-fall). Between the time it is launched and the time it lands, a time of 6 seconds elapses. The object begins and ends at a height of zero meters.

Fill in all of the missing data below, given that the entire trip takes 6 seconds. [Hint: Start by writing "6s" next to the final time (t).]

$\Delta y_{fall} = \frac{1}{2} a t^2$
$= \frac{1}{2}(-10 m/s^2)(3s)^2$
$= -45m$

h = 45m
a = $-10 m/s^2$
v = 0m/s
t = 3s

$\bar{v}_{ascent}$ = 15m/s
a = $-10 m/s^2$
h_0 = 0m
v_0 = 30m/s
t_0 = 0s

$\bar{v}_{descent}$ = -15m/s
a = $-10 m/s^2$
h = 0m
v = -30m/s
t = 6s

$\bar{v} = \frac{\Delta x}{\Delta t}$
$\bar{v} = \frac{45m}{3s}$
$\Delta \bar{v} = 15 m/s$

Some basic conversions:

1m/s = 2.24mph	1 foot = 0.305m	1km = 0.62miles	1m = 100cm
1 inch = 2.54cm	1km = 1,000m	1gallon = 128 fluid ounces	1 gallon = 4 quarts
1 mile = 5280 feet			

12. If a spool tractor travels 5m, how many feet is this?

$5m \left(\frac{1 ft}{0.305 m}\right) = 16.4 ft$

13. A car is travelling at a speed of 60mph. What is its speed in m/s?

$60 mph = \left(\frac{1 m/s}{2.24 mph}\right) = 26.8 m/s$

14. Identify each of the following as either positive velocity or negative velocity.

Speed to the left (−) Speed to the right (+)

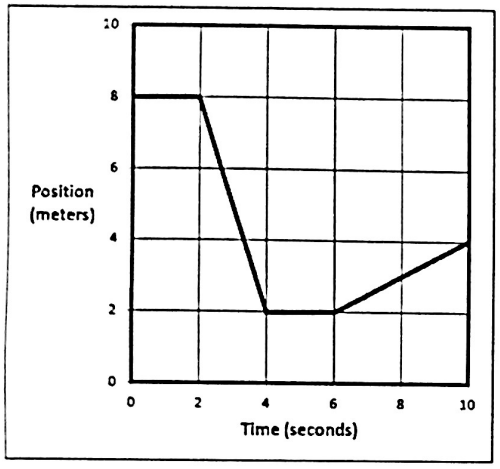
Speed upward (+) Speed downward (−)

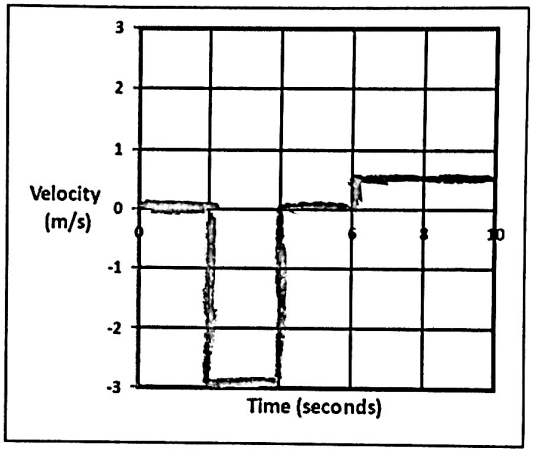
Match the descriptions in the left column to the descriptions in the right column

15. f Negative velocity and positive acceleration
16. d Negative velocity and negative acceleration
17. e Positive velocity and positive acceleration
18. g Positive velocity and negative acceleration
19. c Zero velocity and zero acceleration
20. b Zero velocity and negative acceleration
21. a Zero velocity and positive acceleration

a. No speed, but beginning to move rightward.
b. No speed, but beginning to move to the left.
c. No movement.
d. Moving leftward, speeding up.
e. Moving rightward, speeding up.
f. Moving leftward, slowing down.
g. Moving rightward, slowing dow

22. Use the information from the position vs. time graph, below, to complete the velocity vs. time graph.





23. A helicopter is sitting still on the ground. Suddenly the helicopter takes off and begins to accelerate upward. If the helicopter travels a distance of 4m in 1.5s, what is its acceleration?

$a = \frac{2\Delta x}{t^2} = \frac{2(4m)}{(1.5s)^2} = 3.56\ m/s^2$ (Δx, Δt)

24. A bus can accelerate at a rate of $3m/s^2$ (a). The bus leaves a stoplight (where it was sitting motionless) and accelerates at this rate for 3 seconds (t). At the end of 3 seconds...

a. What is the speed of the bus?

9 m/s

0 m/s → (1st second) 3 m/s → (2nd second) 6 m/s → (3rd second) 9 m/s

b. How far has the bus traveled?

$\Delta x = \frac{1}{2}at^2 = \frac{1}{2}(3m/s^2)(3s)^2 = 13.5\ m$

c. What is the bus' average speed over these three seconds?

$\bar{v} = \frac{\Delta x}{\Delta t} = \frac{13.5m}{3} = 4.5\ m/s$