W1.07

Velocity & Acceleration Problems-KEY

1) What is the acceleration of a car that travels in a straight line at a constant speed of 100 km/h?

a=?v/t ?v=0 so a=0

2) By how much does the speed of a vehicle moving in a straight line change each second when it is acceleration at (i) 2 meters per second per second? (ii) 9.8 meters per second per second? (iii) 10 kilometers per hour per second?

"Every second the speed (velocity) changes by +2 m/s."
"Every second the speed (velocity) changes by +9.8 m/s."
"Every second the speed (velocity) changes by +10 km/h."

3) Is it possible for an object to have a negative acceleration while having a positive velocity? Explain.

If velocity & accel. have different signs, just means opposite direction i.e. obj. slows down

4) Starting from rest, one car accelerates to a speed of 50 km/hr, and another car accelerates to a speed of 60 km/hr. Can you say which car underwent the greatest acceleration? Explain.

No, not enough information -need to know time.

5) i) Can an object be moving when its acceleration is zero? If so, give an example. ii) Can an object be accelerating when its speed is zero? If so, give an example.

Yes-at a constant velocity (maintaining the same speed & direction)
Yes (an instantaneous speed of 0) when obj. changes direction.
Example: A ball at its peak after being thrown up in the air.

6) Cite an example of something that undergoes acceleration while moving at constant speed. Can you also give an example of something that accelerates while traveling at a constant velocity? Explain.

An object moving in a circular path must accelerate because direction changes so ? v?0.
NO!

7) The Concord jetliner achieves a lift-off speed of 112 m/s in 20.0 seconds, starting from rest and traveling due east. What is the magnitude and direction of the average acceleration?

a=?v/t so a= 112m/s divided by 20 sec thus a= 5.6 m/s every second (**5.6 m/s²**).

8) A train, traveling at 26.4 meters per second brakes with an acceleration of 1.50 meters per second per second. How much time is required for the train to slow down to 9.72 meters per second?

t=?v/a since ?v =9.72 m/s- 26.4 m/s = -16.68 m/s
so t= -16.68 m/s divided by –1.5 m/s² (braking so neg) t=**11.12 seconds**

9) If a treadmill starts at a velocity of -2.7 meters per second and has a velocity of -1.3 meters per second after 5.0 minutes, what is the average acceleration of the treadmill?

a=?v/t since ?v= -1.3 m/s – (-2.7 m/s) = +1.4 m/s so a=+1.4 m/s divided by 300 s = .00467 m/s².

10) With an average acceleration of -0.50 m/s², how long will it take a cyclist to bring a bicycle with an initial velocity of +13.5 m/s to a complete stop?

t=?v/a t= -13.5 m/s divided -0.50 m/s² so t= 27 seconds

11) (i)What does the slope of a position versus time graph represent? (ii) What does the slope of a velocity versus time graph represent?

Instantaneous velocity Instantaneous acceleration

12) What does the area between the curve and the time-axis represent on an acceleration versus time graph? What does the area between the curve and the x-axis represent on a velocity versus time graph?

?v Note: area ABOVE time axis-pos. change, area BELOW time axis-neg. change