Science 10 - Acceleration Motion Problems
ANSWER KEY

1. An object that is initially traveling at a velocity of +7.0 m/s accelerates to a velocity of +22.0 m/s in a time of 1.7 s. Calculate the acceleration of the object.

1. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{22-7}{1.7} = \frac{15}{1.7} = 8.82\ m/s^2$

2. An object accelerates from rest to a velocity of +12.0 m/s in 3.40 s. Calculate the acceleration of the object.

2. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{12-0}{3.4} = 3.52\ m/s^2$

3. An object accelerates from rest to a velocity of +15 m/s in 4.7 s. What is the object's average acceleration?

3. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{15-0}{4.7} = 3.19\ m/s^2$

4. An object accelerates at 1.9 m/s^2 for 5.0 s. What is the object's change in velocity?

4. $\Delta \vec{v} = \vec{a}\,\Delta t = 1.9 \times 5 = 9.5\ m/s$

5. Find the acceleration that causes a car's velocity to change from 32 m/s to 96 m/s in an 8.0 s period.

5. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{96-32}{8} = \frac{64}{8} = 8\ m/s^2$

6. A supersonic jet can accelerate at a rate of 23.1 m/s^2. If the jet accelerates for 20.0 s, what will its change in velocity be?

6. $\Delta \vec{v} = \vec{a}\,\Delta t = 23.1 \times 20 = 462\ m/s$

7. A car accelerates for 6.8 s at a rate of 1.6 m/s^2. What is the change in velocity for the car?

7. $\Delta \vec{v} = \vec{a}\,\Delta t = 1.6 \times 6.8 = 10.88\ m/s$

8. From the moment a 40.0 m/s fastball touches the catcher's mitt until it is completely stopped takes 0.012 s. Calculate the average acceleration of the ball as it is being caught.

8. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{0-40}{0.012} = \frac{-40}{0.012} = -3333.33\ m/s^2$

9. Top-fuel drag racers are able to accelerate at 12.5 m/s^2 from rest to 100.0 m/s before crossing the finish line. How much time elapses during the run?

9. $\Delta t = \frac{\Delta \vec{v}}{\vec{a}} = \frac{100}{12.5} = 8\ s$

10. A racecar accelerates from rest at 7.5 m/s^2 for 4.5 s. How fast will it be going at the end of that time?

10. $\Delta \vec{v} = \vec{a}\,\Delta t = 7.5 \times 4.5 = 33.75\ m/s$

Because it is from rest, final velocity = 33.75 m/s.

11. A jet plane traveling at 88 m/s lands on a runway and comes to rest in 11 s. Calculate its average acceleration.

12. A car traveling at 14 m/s encounters a patch of ice and takes 5.0 s to stop. What is the car's average acceleration?

13. A train traveling at 25 m/s slows down with a constant acceleration of –0.60 m/s². How long does it take the train to stop?

14. A motorist traveling at 25.0 m/s applies her brakes and comes to rest in 20.0 s. What was the motorist's acceleration?

15. A car accelerates at a rate of 2.50 m/s² for 60.0 s. What is the change in velocity of the car?

16. A car takes 15.0 s to come to a stop. If the car was traveling at 30.0 m/s initially, what was the car's acceleration?

17. A motorcycle accelerates from +5.0 m/s to +3.0 m/s in 0.25 s. What was the acceleration of the motorcycle?

18. An object accelerates at a rate of 1.00 m/s² for 27.0 s. What was the object's change in velocity?

19. An object is accelerated from 2.0 m/s to 12.0 m/s in 2.50 s. What was the acceleration of the object?

20. A ball accelerates down an incline at 1.4 m/s². If the ball took 5.0 s to roll down the incline, by how much did its velocity increase?

11. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{0-88}{11} = \frac{-88}{11} = -8\ m/s^2$

12. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{0-14}{5} = \frac{-14}{5} = -2.8\ m/s^2$

13. $\Delta t = \frac{\Delta \vec{v}}{\vec{a}} = \frac{0-25}{-0.6} = \frac{-25}{-0.6} = 41.67\ s$

14. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{0-25}{20} = \frac{-25}{20} = -1.25\ m/s^2$

15. $\Delta \vec{v} = \vec{a} \Delta t = 2.5 \times 60 = 150\ m/s$

16. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{0-30}{15} = \frac{-30}{15} = -2\ m/s^2$

17. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{3-5}{0.25} = \frac{-2}{0.25} = -8\ m/s^2$

18. $\Delta \vec{v} = \vec{a} \Delta t = 1 \times 27 = 27\ m/s$

19. $\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = \frac{12-2}{2.5} = \frac{10}{2.5} = 4\ m/s^2$

20. $\Delta \vec{v} = \vec{a} \Delta t = 1.4 \times 5 = 7\ m/s$