**SCIENCE 1206** **UNIT 3: MOTION**
**WORKSHEET #14: ACCELERATION**

Acceleration can be found using the following formula:

**Equation #1**: $$acceleration = \frac{change in velocity}{time}$$


**Equation #2**: $$\vec{a} = \frac{\Delta v}{t}$$

**Equation #3**: $$\vec{a} = \frac{v_2 - v_1}{t}$$

$\vec{a}$ = acceleration (m/s/s or m/s$^2$)

$\vec{v}_1$ = Initial velocity (m/s)

$\vec{v}_2$ = Final velocity (m/s)

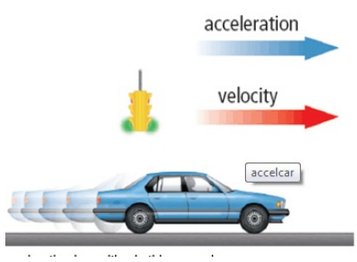
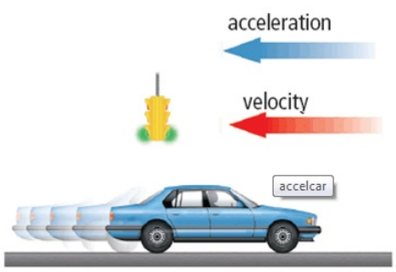
t = change in time (s)

Equation# 3 can be rearranged to give **equation #4**

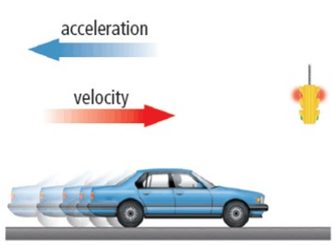
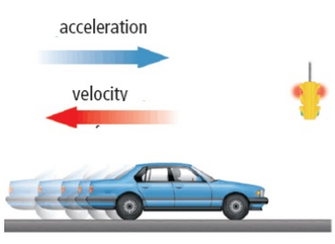
$$v_2 = \vec{v}_1 + \vec{a}t$$

Note: The direction of velocity and acceleration will determine the size of the velocity (ie. If an object is speeding up or slowing down)

If they are in the same direction (both are positive or both are negative) then the object is speeding up

| Car going forward and speeding up | Car going in reverse and speeding up |
|---|---|
|   |   |

If they are in opposite directions (one is positive and the other is negative), the object is slowing down

| Car going forward and slowing down | Car going in reverse and slowing down |
|---|---|
|   |   |

**PART A: MULTIPLE CHOICE**

1. Which of the following refers to the rate at which velocity changes?

   (A) Acceleration
   (B) Gravity
   (C) Speed
   (D) Force

2. What does the term " acceleration of 5 $m/s^2$ " mean?

   (A) An object travels 5 m each second
   (B) An object travels 5m farther each second than in the second before
   (C) An object travels 5 m in 5 seconds
   (D) An object travels 5m/s faster each second

3. If the velocity vector is directed to the right and the acceleration vector is directed to the left, then the object is:

   (A) Moving to the left and increasing speed
   (B) Moving to the right and slowing down
   (C) Moving to the right and increasing speed
   (D) Moving to the left and slowing down.

4. A truck travels east with an increasing velocity. Which of the following is the correct direction of the car's acceleration


| | |
|---|---|
| (A)  | (B)  |
| (C)  | (D)  |

5. A motorbike travels east and begins to slow down before a traffic light. Which of the following is the correct direction of the motorbike's acceleration?


| | |
|---|---|
| (A)  | (B)  |
| (C)  | (D)  |

6. Which of the following quantities could specify an acceleration vector?

(A) 2.5 m/s
(B) 2.5 $m/s^2$
(C) 2.5 $m/s^2$ [E]
(D) 2.5 $m^2/s$ [E]

7. When is an object accelerating?

(A) Only when its speed changes.
(B) Only when its direction changes.
(C) When its speed or direction changes.
(D) Only if its velocity is large

8. If a car has a constant acceleration of 4.0 $m/s^2$, starting from rest, how fast is it traveling after 5.0 s?

(A) 20 m/s
(B) 24 m/s
(C) 30 m/s
(D) 40 m/s

9. An object travels with uniform motion at 20 m/s for 10 s. What is the acceleration?

(A) 0 $m/s^2$
(B) 0.5 $m/s^2$
(C) 2 $m/s^2$
(D) 20 $m/s^2$

10. A running football player has a change in velocity of 9.80 m/s [N] in 1.4 s. What is his average acceleration?

(A) 7.0 $m/s^2$ [N]
(B) 7.0 $m/s^2$ [S]
(C) 3.5 $m/s^2$ [S]
(D) 3.5 $m/s^2$ [N]

11. If an object accelerates at 1.2 $m/s^2$ [N], how long will it take to reach a velocity of 5.0 m/s [N] if starting from rest?

(A) 4.0 s
(B) 4.2 s
(C) 4.25 s
(D) 6.0 s

12. If a car accelerates from 3.0 m/s to 12 m/s in 3.0 s, what is the car's average acceleration?

(A) 1.0 $m/s^2$
(B) 2.0 $m/s^2$
(C) 3.0 $m/s^2$
(D) 4.0 $m/s^2$

13. A baseball is travelling at +65 km/h and is caught by a player. The ball is brought to rest in 0.50 s. What is the acceleration of the ball?

(A) -130 $m/s^2$
(B) -36 $m/s^2$
(C) +36 $m/s^2$
(D) +130 $m/s^2$

14. Dexter is travelling on his bike 4.0 m/s [S]. If he accelerates at a rate of 1.5 $m/s^2$ [S] for 2.0 s, what is his final velocity?

(A) 7.0 m/s [S]
(B) 5.5 m/s [S]
(C) 3.0 m/s [N]
(D) 1.5 m/s [N]

15 A car increases its speed from 9.6 m/s to 11.2 m/s in 4.0 s. What is the average acceleration of the car during this 4.0 s interval?

(A) 0.40 $m/s^2$
(B) 2.4 $m/s^2$
(C) 2.8 $m/s^2$
(D) 5.2 $m/s^2$

16. An object accelerates at 2.2 $m/s^2$ for 3.0 s. If the final velocity of the object is 15 m/s, what was the initial velocity?

(A) 2.3 m/s
(B) 8.4 m/s
(C) 16 m/s
(D) 22 m/s

17. A motorcycle traveling on a straight stretch of highway accelerates at 4.7 $m/s^2$ from a speed of 6.0 m/s. How fast would it be traveling after 5.5 s? [2]

18. Calculate the acceleration of a car that after gently applying the brake, changes speed from 110 km/h to 30 km/h after 12 s. [2]

19. A motorcycle while traveling on a straight stretch of highway accelerates at 6.2 $m/s^2$ to a speed of 48 m/s after 6.0 s. What must have been the initial speed of the motorcycle? [2]

20. A shark traveling at 2.0 m/s accelerates at 4.3 $m/s^2$ to a final speed of 15.0 m/s. What is the elapsed time during the acceleration? [2]