Acceleration Worksheet #1 → Concepts

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The Concept of Acceleration

1. Accelerating objects are objects that are changing their velocity. Name the three controls on an automobile that cause it to accelerate.

2. An object is accelerating if it is moving _____. Circle all that apply.
   a. with changing speed b. extremely fast c. with constant velocity
   d. in a circle e. downward f. none of these

3. If an object is NOT accelerating, then one knows for sure that it is _____.
   a. at rest b. moving with a constant speed
   c. slowing down d. maintaining a constant velocity

Acceleration as a Rate Quantity

Acceleration is the rate at which an object's velocity changes. The velocity of an object refers to how fast it moves and in what direction. The acceleration of an object refers to how fast an object changes its speed or its direction. Objects with a high acceleration are rapidly changing their speed or their direction. As a rate quantity, acceleration is expressed by the equation:

$$\text{acceleration} = \frac{\Delta\ \text{Velocity}}{\text{time}} = \frac{v_{final} - v_{original}}{\text{time}}$$

4. An object with an acceleration of 10 m/s^2 will ____. Circle all that apply.
   a. move 10 meters in 1 second b. change its velocity by 10 m/s in 1 s
   c. move 100 meters in 10 seconds d. have a velocity of 100 m/s after 10 s

5. Ima Speedin puts the pedal to the metal and increases her speed as follows: 0 mi/hr at 0 seconds; 10 mi/hr at 1 second; 20 mi/hr at 2 seconds; 30 mi/hr at 3 seconds; and 40 mi/hr at 4 seconds. What is the acceleration of Ima's car?

Acceleration as a Vector Quantity

Acceleration, like velocity, is a vector quantity. To fully describe the acceleration of an object, one must describe the direction of the acceleration vector. A **general rule of thumb** is that if an object is moving in a straight line and slowing down, then the direction of the acceleration is opposite the direction the object is moving. If the object is speeding up, the acceleration direction is the same as the direction of motion.

6 Read the following statements and indicate the direction (up, down, east, west, north or south) of the acceleration vector.

	Description of Motion	Dir'n of Acceleration
a.	A car is moving eastward along Lake Avenue and increasing its speed from 25 mph to 45 mph.	
b.	A northbound car skids to a stop to avoid a reckless driver.	
c.	An Olympic diver slows down after splashing into the water.	
d.	A southward-bound free kick delivered by the opposing team is slowed down and stopped by the goalie.	
e.	A downward falling parachutist pulls the chord and rapidly slows down.	
f.	A rightward-moving Hot Wheels car slows to a stop.	
g.	A falling bungee-jumper slows down as she nears the concrete sidewalk below.	

3. Based on the oil drop pattern for Car A and Car B, which of the following statements are true? Circle all that apply.

Car A 

Car B 

a. Both cars have a constant velocity.
b. Both cars have an accelerated motion.
c. Car A is accelerating; Car B is not.
d. Car B is accelerating; Car A is not.
e. Car A has a greater acceleration than Car B.
f. Car B has a greater acceleration than Car A.

4. An object is moving from right to left. It's motion is represented by the oil drop diagram below. This object has a _____ velocity and a _____ acceleration.

a. rightward, rightward
b. rightward, leftward
c. leftward, rightward
d. leftward, leftward
e. rightward, zero
f. leftward, zero

5. Renatta Oyle's car has an oil leak and leaves a trace of oil drops on the streets as she drives through Glenview. A study of Glenview's streets reveals the following traces. Match the trace with the verbal descriptions given below. For each match, verify your reasoning.

Diagram A: 

Diagram B: 

Diagram C: 

	Verbal Description	Diagram
i.	Renatta was driving with a slow constant speed, decelerated to rest, remained at rest for 30 s, and then drove very slowly at a constant speed. Reasoning: _____	
ii.	Renatta rapidly decelerated from a high speed to a rest position, and then slowly accelerated to a moderate speed. Reasoning: _____	
iii.	Renatta was driving at a moderate speed and slowly accelerated. Reasoning: _____	