# Acceleration study guide section 2 physical science

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Understanding Acceleration in Physical Science**

Acceleration is an essential concept in physical science that describes how an object's velocity changes over time. Here's a comprehensive guide to understanding acceleration:

**Definition of Acceleration**

Acceleration is the rate at which an object's velocity changes. It can be either positive or negative. Positive acceleration indicates an increase in velocity, while negative acceleration indicates a decrease in velocity.

**Formula for Acceleration**

The formula for acceleration is:

```
Acceleration (a) = (Change in Velocity) / (Change in Time)
a = ?v / ?t
```

**How to Calculate Acceleration**

To calculate the acceleration of an object, you need to know its initial velocity (v0), final velocity (vf), and the time elapsed (t):

```
Acceleration (a) = (vf - v0) / t
```

**Example of Acceleration**

A car that starts from rest and accelerates to a speed of 60 km/h in 5 seconds has an acceleration of:

```
a = (60 km/h - 0 km/h) / 5 s
= 12 km/h/s
```

### Changing Speed vs. Constant Velocity

It is possible for an object to have a changing speed but a constant velocity. Velocity is a vector quantity that includes both speed and direction. If an object is moving in a circle at a constant speed, its velocity is changing because the direction is changing, even though its speed is constant.

### Uniform Speed vs. Acceleration

An object can have uniform speed but still have acceleration. Acceleration is a change in velocity, not just a change in speed. For example, an object moving in a circle at a constant speed is accelerating towards the center of the circle.

### Finding Acceleration in Physics Forces

Acceleration can be caused by forces acting on an object. The force acting on an object is directly proportional to its acceleration:

```
Force (F) = Mass (m) x Acceleration (a)
F = ma
```

### Measuring Acceleration Physically

Acceleration can be measured physically using various instruments, such as:

- **Accelerometer:** A device that measures the acceleration of an object.
- **Motion sensor:** A device that tracks the motion of an object and calculates its acceleration.

### Total Acceleration in Physics

Total acceleration is the vector sum of all accelerations acting on an object. It can be calculated by adding all the accelerations in the same direction.

### Acceleration in Physical Education

In physical education, acceleration is often used to measure the change in velocity of athletes during various activities, such as running, jumping, and throwing.

### Additional Resources

- Acceleration PDF
- Can a Body Have Zero Velocity and Still Be Accelerating?

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