

Students are responsible for all notes and activities handwritten in class for all quizzes and tests as well as for a notebook grade at the conclusion of each chapter. The information below is taken from the SC Department of Education Science Support Documents which can be found at https://www.ed.sc.gov/apps/cso/standards/supdocs_k8.cfm?#area_5. All classroom activities and topics of study for this chapter are based on the standards listed below.

5-5.1 Illustrate the effects of force (including magnetism, gravity, and friction) on motion.

It is essential for students to know that a *force* is a push or pull. Forces can make things move faster, slower, stop, or change direction. Different forces (including magnetism, gravity, and friction) can affect motion.

Magnetism

- A force that acts at a distance and cannot be seen.
- Materials that create this force are said to be magnetic and are called *magnets*.
- The needle of a compass moves because of Earth's *magnetism*.
- When like poles (S-S or N-N) of magnets are near each other, the magnetic force causes the poles to repel, and the magnets push away from each other.
- When opposite poles (N-S or S-N) of magnets are near each other, the magnetic force causes the poles to attract, and the magnets pull toward each other.
- The closer the objects, the greater the magnetic force.
- The magnetic force is greatest at the poles of magnets.

Gravity

- A pull that attracts objects to each other.
- This attraction is not noticeable unless one of the objects is very large, for example a planet, a moon, or the Sun.
- The force of gravity between Earth and anything on it is extremely noticeable because the mass of Earth is so large. The pull of Earth's gravity makes any object fall to the ground.
- As the Moon goes around Earth, its gravity pulls on Earth causing water in the oceans to move toward the Moon.
- Earth's gravity also pulls on the Moon. This force of gravity keeps the Moon moving around Earth.
- Similarly, the pull of the Sun's gravity keeps Earth moving around the Sun.

Friction

- The force that opposes motion between two surfaces that are touching.
- The effect of friction can be observed as an object slides across a surface and slows down.
- The rougher the surfaces are, and the harder the surfaces press together, the more friction there will be.
- Friction can be reduced by using *lubricants*, for example motor oil, wax, or grease, by making surfaces smoother, or by using rollers.
- Friction occurs in liquids and gases as well as between solids.
- Without friction, it would be very hard to slow or stop the motion of objects.

5-5.2 Summarize the motion of an object in terms of position, direction, and speed.

It is essential for students to know that motion is described in terms of position, direction, and speed as follows:

Position

- The *position* of an object is its location relative to another object (the reference point) for example “above”, “below”, “beside”, “behind”, “ahead of” plus the distance from the other object.
- The distance (length) from the reference point changes when the object moves.

Direction

- *Direction* of motion is the course or path that an object is moving and can be determined by reading a compass using the terms “north”, “south”, “east”, or “west.”
- Direction can also be described using the terms “right”, or “left,” “forward,” or “toward” relative to another object, or “up”, or “down” relative to Earth.

Speed

- A measure of how fast an object is moving.

Students should be able to measure the distance specific objects move in a given time. They can compare the relative speeds of different moving objects determining which is moving faster or slower.

5-5.3 Explain how unbalanced forces affect the rate and direction of motion in objects.

is essential for students to know that unbalanced forces change the rate and direction of the motion of objects.

- Several forces can act on an object at the same time.
- Sometimes forces are balanced which means that they are equal in strength but opposite in direction.
- Balanced forces do not change the motion of objects only unbalanced forces cause changes in motion.
- An unbalanced force is one that does not have another force of equal magnitude and opposite direction off-setting it.
- *Rate of motion* is the speed of the object or how fast or slow the object is moving.
- Unbalanced forces can change the rate or direction of motion of an object in different ways:

Object at rest

- If an unbalanced force acts on an object at rest the object will move in the direction of the force.
- A stronger force (push or pull) will make it move faster.

Object in motion

- If an object is moving, an unbalanced force will change the motion of the object in different ways depending on how the force is applied. The unbalanced force may speed the object up, slow it down, or make it change directions.
 - If the force is applied in the same direction as the object is moving, the object will speed it up.
 - If the force is applied in the opposite direction as the object is moving, the object will slow it down or stop it.

- If the force is applied to the side of the moving object, the object will turn.

5-5.4 Explain ways to change the effect that friction has on the motion of objects (including changing the texture of the surface, changing the amount of surface area involved, and adding lubrication).

It is essential for students to know that friction is a force produced when objects are in contact with each other. Friction is a force that acts against motion. The following variables influence the affect of friction:

Texture of the surface

- *Rough surfaces* tend to create more friction.
- *Smooth surfaces* tend to create less friction.

Amount of surface area

- The amount of surface area affects the friction between objects in liquids and gases.
- The amount of surface area affects the friction on a moving object under the following circumstances: air resistance (such as the size of a parachute) or the resistance of an object as it glides through water (such as a boat).
- The amount of surface area in contact usually does not affect friction between two solids.

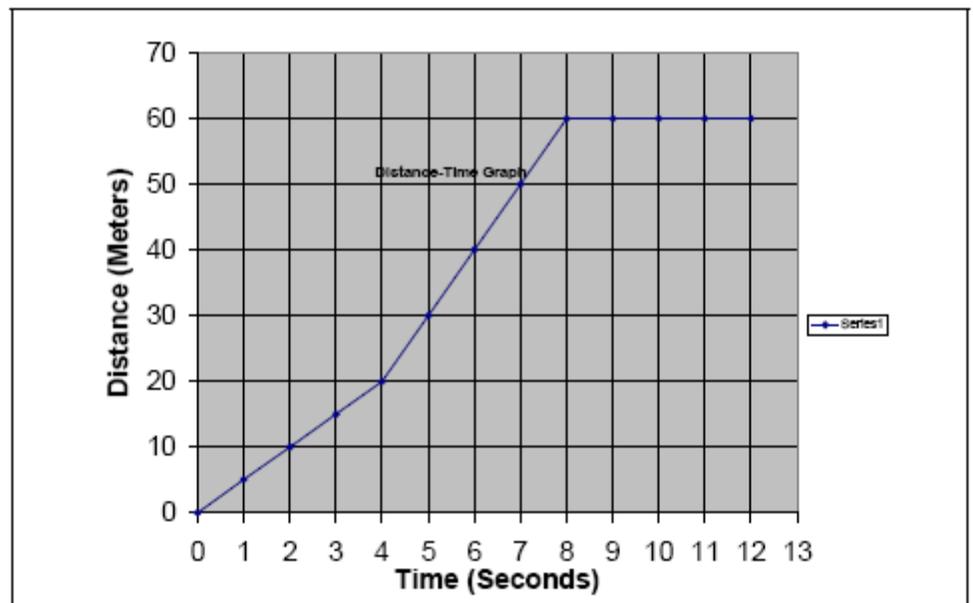
Lubrication

- *Lubrication*, for example oil or grease, reduces the effects of friction.
- Without lubrication, moving parts of machines would slow down or stop very quickly.

5-5.5 Use a graph to illustrate the motion of an object.

It is essential for students to construct a distance-time graph to illustrate the motion of an object. For example, given the following data collected from a moving object:

Time (Sec)	Distance (meters)
0	0
1	5
2	10
3	15
4	20
5	30
6	40
7	50
8	60
9	60
10	60
11	60



Distance-Time Graph

To construct a distance-time graph, follow the correct procedures for producing a graph:

- Correct placement of dependent and independent variables (DRY-MIX)
- Correct labeling of the axes
- Title the graph
- Correct placement of intervals

It is essential for students to interpret the motion of an object from studying a distance time graph, including:

- The total distance that the object has traveled after a certain amount of time
- The distance that the object travels during a particular time interval
- Determine if the object is moving or stationary during a particular time interval
- Compare the motion of the object during two time intervals (Based on the shape of the graph, is the object moving faster or slower?)

5-5.6 Explain how a change of force or a change in mass affects the motion of an object.

It is essential for students to know that the motion of an object can be affected by a change in force or a change in mass

Force

- If there are two objects with the same mass and one is acted on by a greater force than the other, the one acted on by the greater force will have the greatest change in speed.
- It will speed up the most or slow down the most in a given amount of time.

Mass

- If there are two objects, one with a greater mass than the other, and the same amount of force is applied to each object, the object with the lesser mass will have the greater change in speed.
- It will speed up or slow down more in a given amount of time.
- It is harder to change the speed of the object with the greater mass than the object with the lesser mass.