

### Ravenell Science Study Guide February 2016

**Friction:** A force that opposes the motion of objects that touch as they move past each other

4 types (in order of severity)

- **Static friction:** acts on unmoving objects to keep them stationary (prevents them from slipping)
  - **Traction:** A type of static friction that creates motion by allowing objects such as car tires and people to move
- **Sliding (kinetic) friction:** opposes the direction of motion of an object as it slides over a surface; opposes the continuation of motion; either slows the motion of the object or makes it more difficult for other forces to keep the object moving
- **Rolling friction:** Friction that acts on a rolling object
- **Fluid friction:** Opposes the motion of an object in a liquid or gaseous environment; liquid fluid friction is dependent on viscosity and shape
  - **Air resistance:** A special type of fluid friction; opposes gravity and reduces acceleration; dependent on speed and shape

Friction does **work** by transforming an object's kinetic energy into thermal energy. **Lubricants** can be used to decrease the force of friction, and therefore decrease the amount of KE being transferred away.

#### **Simple vs. Complex Relationships:**

- **Simple:** The data points form a straight line, also called a **linear** relationship (ex. KE vs. mass)
- **Complex:** The data points form a curve; the variables could have a **quadratic** relationship (ex. KE vs. speed)

#### **Equations for Kinetic Energy:**

- $KE = \frac{1}{2}mv^2$  (velocity and KE have a complex, or quadratic relationship)
  - The squared term is what makes the two variables have a quadratic relationship. Without the square, it would still be a linear relationship.
- $KE = \text{force} \times \text{stopping distance}$  (KE and stopping distance are **directly proportional** to velocity squared)

Example: A 40 kg girl and her 80 kg father are skating, and they are both moving at the same speed. Who has more kinetic energy?

- The father has twice as much kinetic energy, because he has twice as much mass (KE and velocity squared are directly proportional)

**Law of Conservation of Energy:** Energy can be neither created nor destroyed; it can only be transformed from one form to another or transferred between objects. The total amount of energy never changes.