

## Sci 265 Exam 2 Learning Goals

### Energy

Students will be able to:

- Explain why energy does not contain mass
- Identify the form of energy that an object has depending on its motion or position
- Compare the amount of gravitational potential energy objects have depending on their height and mass.
- Compare the amount of kinetic energy objects have depending on their speed and mass
- Identify the energy form before and after a particular event
- Apply conservation of energy to different events
- Explain what “The lion eats the sun” means in terms of conservation of energy
- Predict the final location of an object (pendulum or skater) based on its initial height
- Explain the behavior of electrically charged objects
- Explain some differences between magnets and electrical charges. For example, electric charges are attracted to all metals but magnets are not attracted to all metals, only those that can be magnetized.
- Explain that a positive charge can exist separately from a negative charge; however a magnetic North pole cannot exist without a magnetic South pole.
- Describe how induction occurs and which variables increase the induction
- Describe how a generator produces electricity from a water wheel
- Describe how a wind turbine produces electricity and trace the energy conversions a step at a time from wind to the motion of electrons
- Describe the difference between a direct current (DC) and an alternating current (AC)
- Describe how an AC or DC current is able to light a light bulb or heat a toaster

### Density, Volume, Mass and Weight

Students will be able to:

- Define density as mass divided by volume
- Identify the relative density of different objects by observing how they float or sink in water
- Define volume
- Define how to measure volume by either using a meter stick or water
- Define mass
- Explain how mass does not change depending on location
- Define weight as how hard gravity pulls on an object (mass x gravity)
- Explain how weight changes on different planets because gravity of each planet is different
- Identify which type of scale will measure mass correctly on other planets and which type will measure weight correctly on different planets.

## Motion and Forces

Students will be able to:

- Given two tracks (with different shapes) identify on which track a ball will take less time to roll to the end. In other words, the ball on which road will win.
- Define speed
- Define acceleration
- Identify the acceleration of an object in free fall
- Identify the acceleration of an object on a ramp compared to when in free fall
- Read a motion diagram. Identifying when an object is moving at a constant speed, speeding up or slowing down.
- Create a motion diagram for any given scenario
- Identify when an object is moving at its fastest speed while in free fall
- Identify when an object has zero velocity when in free fall
- Identify the acceleration of an object at all positions in free fall including at the top of the flight.
- Explain in detail why every object falls at  $-9.8 \text{ m/s}^2$  when in free fall (no air resistance) and how this depends on both weight and inertia.
- Apply Newton's first law the natural state of an object is at rest or in motion at a constant speed in a straight line (constant velocity).
- Define inertia
- Use the idea of inertia to explain how objects speed up, slow down or turn.
- Show the path of an object that was traveling in a straight line but receives a force in a new direction.
- Show the path of an object that was traveling in a circle but suddenly loses the force that is causing it to travel in a circular motion.
- Explain why water stays in a bucket when you swing it in a circle from the floor to above your head.
- Explain why a penny stays on the tip of a hanger when you swing it around.
- Apply Newton's second law to show that the result of a net force acting on an object is for the object to accelerate.
- Identify the forces acting on an object at rest
- Identify the forces acting on an object as it slides across the floor.
- Identify the forces on an object when it is in free fall
- apply Newton's third law to forces (every force has an equal and opposite force)
- Determine the relative acceleration of two objects that receive the same force but have different mass.
- Define friction
- Explain how friction changes the natural motion of an object
- Identify the net force on an object when it's moving at a constant speed