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**M/J Physical Science Adv. 2nd Semester Exam Study Guide**

**SC.6.P.1.1 - Explore the Law of Conservation of Energy by differentiating between potential and kinetic energy. Identify situations where kinetic energy is transformed into potential energy and vice versa.**

1. What role do kinetic and potential energy play in mechanical energy?
2. Identify and compare the different kinds of potential energy?
3. How do you calculate kinetic energy and potential energy? What is the metric unit of energy? Which variables have the greatest impact on an object’s kinetic and potential energy?
4. Describe the changes in kinetic and potential energy: (*Where is the kinetic/potential energy greatest/least?*)
   * as a ball drops to the ground and bounces back up.
   * as a pendulum swings back and forth.
   * as a roller coaster goes up and down a hill.

**SC.6.P.12.1 - Measure and graph distance versus time for an object moving at a constant speed. Interpret this relationship.**

1. Compare the concepts of speed and velocity (*including their calculation and metric units*).
2. How can you use the line on a d vs. t graph to analyze the motion of an object?
3. Describe the concept of acceleration (*including its calculation and metric units*). Identify all of the ways that an object can accelerate.

**SC.6.P.13.1 - Investigate and describe types of forces including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.**

1. Categorize the following as “contact forces” and “non-contact forces”:
   * gravity, applied force, normal force, friction, magnetic force
2. Describe the “normal force” (*relate to Newton’s Laws*).
3. Discuss friction and how it affects the motion of an object?
4. How does a force diagram describe the forces acting on an object?

**SC.6.P.13.2 - Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.**

1. Describe the force of gravity and how it affects all objects.
2. What factors affect the strength of a gravitational force?
3. How do we calculate the force due to gravity on Earth?
4. How do objects accelerate as a result of Earth’s gravity?

**SC.6.P.13.3 - Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.**

1. Compare balanced and unbalanced forces (*How do they relate to the net force? How do they influence motion?*).
2. Explain Newton’s first law of motion. How does “momentum” relate to “inertia”?
3. Explain Newton’s second law of motion. How do you calculate the net force on an object? What are the metric units of Force? How does the acceleration of an object relate to the net force?
4. Explain Newton’s third law of motion. How can you draw a diagram to describe Newton’s 3rd law of motion? How will a 3rd-law diagram be different from a force diagram?

**SC.7.P.10.1- Illustrate that the sun's energy arrives as radiation with a wide range of wavelengths, including infrared, visible, and ultraviolet, and that white light is made up of a spectrum of many different colors.**

1. Identify types of energy present in the Sun and which of them are transferred from the Sun to the Earth?
2. How are different kinds of radiant energy classified within the electromagnetic spectrum? List the types in order and relate the energy of electromagnetic waves related to their wavelengths.
3. Explain the term “white light” and how it relates to the concepts of “visible light” and “color”.

**SC.7.P.10.2 - Observe and explain that light can be reflected, refracted, and/or absorbed.**

1. What is reflection? Explain the law of reflection. Give an example where light is reflected.
2. What is refraction? Give an example where light is refracted.
3. Explain how the absorption of certain wavelengths and the reflection of others allow us to see objects in color.

**SC.7.P.10.3 - Recognize that light waves, sound waves, and other waves move at different speeds in different materials.**

1. Discuss the cause and effect of the refraction of light.

**SC.7.P.11.1 - Recognize that adding heat to or removing heat from a system may result in a temperature change and possibly a change of state.**

1. Relate the concepts of “thermal energy”, “temperature”, and “heat”.
2. Describe how the molecules of a substance react as it changes temperature and/or state (*between solid, liquid, or gas*). How is this shown on a phase change graph (temperature vs. energy)?

**SC.7.P.11.2 - Investigate and describe the transformation of energy from one form to another.**

1. List the types of energy and give a definition for each.
2. Describe examples of energy being converted between different forms and/or transferred between objects.

**SC.7.P.11.3 - Cite evidence to explain that energy cannot be created nor destroyed, only changed from one form to another.**

1. Describe the changes in energy (*all types involved*) as a ball drops to the ground and bounces back up. Why doesn’t it bounce back to the original drop height? How does this relate to the law of conservation of energy?
2. Describe the changes in energy (*all types*) as a pendulum swings back and forth. Why does the pendulum eventually stop swinging? What happened to the original potential energy in the pendulum?
3. Explain why, despite appearances, thermal energy is NOT being *created* during an exothermic chemical reaction (*a reaction that gives off heat*).

**SC.7.P.11.4 - Observe and describe that heat flows in predictable ways, moving from warmer objects to cooler ones until they reach the same temperature.**

1. Describe the 3 different types of heat. Give an example of each.
2. How does heat flow between substances (*which “direction”*) and when does it stop flowing?
3. What does the statement, “*There is no such thing as ‘cold’*,” mean? Explain our perception of “hot” and “cold” (*why your hand would feel “cold” when you touch an ice cube or “hot” when you touch steam*).

**SC.8.P.8.5 – Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.**

1. Differentiate between an element and a compound. What do all molecules have in common?
2. What causes atoms to form compounds/molecules (*discuss the octet rule*)?

**SC.8.P.8.8 – Identify basic examples of and compare and classify the properties of compounds, including acids, bases, and salts.**

1. Compare the common properties of acids and bases (*including how the different ions they produce in solution affect pH strips and litmus paper*).
2. Discuss how salts are related to acids and bases.

**SC.8.P.9.1 – Explore the Law of Conservation of Mass by demonstrating and concluding that mass is conserved when substances undergo physical and chemical changes.**

1. Identify the reactants and products in a chemical reaction. How are they shown in a chemical equation?
2. How do the atoms present in the reactants compare to those present in the products? Why is this important?
3. How is the law of conservation of mass observed during an actual chemical reaction?

**SC.8.P.9.2 – Differentiate between physical changes and chemical changes.**

1. Describe physical signs that a chemical reaction has occurred.

**SC.8.P.9.3 – Investigate and describe how temperature influences chemical changes.**

1. Describe and explain the effect of temperature on the rate of a chemical reaction.