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**M/J Physical Science Advanced**

Semester Exam Study Guide

**PRACTICE OF SCIENCE**

**SC.7.N.1.1 – Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.**

**SC.7.N.1.2 – Differentiate replication (by others) from repetition (multiple trials).**

**SC.7.N.1.3 – Distinguish between an experiment (which must involve the identification and control of variables) and other forms of scientific investigation and explain that not all scientific knowledge is derived from experimentation.**

**SC.7.N.1.4 – Identify test variables (independent variables) and outcome variables (dependent variables) in an experiment.**

**SC.7.N.1.5 – Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.**

1. What characterizes a controlled experiment as a scientific investigation?
2. Be able to identify the INDEPENDENT VARIABLE and the DEPENDENT VARIABLE by reading the research question or a brief description of a CONTROLLED EXPERIMENT.
3. Explain why it is important to use CONTROLLED VARIABLES in an EXPERIMENT.
4. How is a HYPOTHESIS related to a PREDICTION?
5. Explain the difference between DATA and EVIDENCE.
6. Explain the role of SCIENTIFIC CONFIRMATION.
7. Be able to identify examples of REPETITION and REPLICATION; describe how they are useful in confirming results.
8. How does an investigator know whether he/she has performed enough TRIALS in their investigation?

**SCIENTIFIC KNOWLEDGE**

**SC.7.N.1.6 – Explain that empirical evidence is the cumulative body of observations of a natural phenomenon on which scientific explanations are based.**

**SC.7.N.1.7 – Explain that scientific knowledge is the result of a great deal of debate and confirmation within the science community.**

**SC.7.N.2.1 – Identify an instance from the history of science in which scientific knowledge has changed when new evidence or new interpretations are encountered.**

**SC.7.N.3.1 – Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.**

**SC.7.N.3.2 – Identify the benefits and limitations of the use of scientific models.**

1. Describe the characteristics of science (CONPTT).
2. How are scientific CLAIMS affected by the concept of scientific CONFIRMATION and debate (ARGUMENTATION)?
3. What is EMPIRICAL EVIDENCE and how does it influence SCIENTIFIC EXPLANATIONS?
4. Discuss the benefits of using SCIENTIFIC MODELS as well as the possible drawbacks, or limitations, of models.
5. Why do we describe SCIENTIFIC KNOWLEDGE as “TENTATIVE”?
6. Describe how a SCIENTIFIC THEORY and a SCIENTIFIC LAW can be related to one another.
7. Explain why a THEORY can never become a LAW.
8. Identify an instance from the history of science in which scientific knowledge changed when new evidence or new interpretations emerged.

**PROPERTIES OF MATTER**

**SC.8.P.8.2 – Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.**

**SC.8.P.8.3 – Explore and describe the densities of various materials through measurement of their masses and volumes.**

**SC.8.P.8.4 – Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.**

**SC.8.P.8.1 – Explore the scientific theory of atoms (also known as atomic theory) by using models to explain the motion of particles in solids, liquids, and gases.**

**SC.8.P.8.9 – Distinguish among mixtures (including solutions) and pure substances.**

1. Distinguish between mixtures and pure substances (*include the three types of matter*).
2. Identify and describe common physical properties of matter.
3. How are the chemical properties of substances observed?
4. Compare the characteristics of shape and volume among solids, liquids, and gasses.
5. How can you use the term, “viscosity,” to describe a liquid?
6. Explain how “weight” and “mass” are different from each other, but also related to one another.
7. Explain how density is calculated (*What measurements do you need?*) and be able to use the formula to calculate the density of a substance.
8. How can density be used to make predictions about a sample (*its identity and its ability to float*)?

**ATOMS**

**SC.8.P.8.7 – Explore the scientific theory of atoms (also known as atomic theory) by recognizing that atoms are the smallest unit of an element and are composed of sub-atomic particles (electrons surrounding a nucleus containing protons and neutrons).**

1. Interpret/describe a model of the atom and its parts (*the modern electron cloud model*).
2. What is the atom mostly made of? Where does basically all of its mass come from?
3. Describe the characteristics of the three sub atomic particles, including size (mass), charge, and location.
4. Discuss the role of sub atomic particles in the formation of different elements (ie: atomic number, atomic mass, isotopes, and ions).

**PERIODIC TABLE**

**SC.8.P.8.6 – Recognize that elements are grouped in the periodic table according to similarities of their properties.**

1. Explain how the modern periodic table is slightly different than the one Mendeleev created. (Why didn’t he use atomic number?)
2. What is “periodic” about the periodic table?
3. Interpret the information included in the boxes of elements on the periodic table.
4. Explain the importance of the atomic number to an element.
5. Differentiate between groups and periods on the periodic table.

**CHEMICAL REACTIONS**

**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.**

**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.**

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

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

1. Differentiate between an element and a compound. How can you interpret a chemical formula to determine the elements that make up a molecule of a substance?
2. What causes atoms to form compounds/molecules (*discuss the octet rule*)?
3. Describe physical signs that a chemical reaction has occurred.
4. Identify the reactants and products in a chemical reaction. How are they shown in a chemical equation?
5. How do the atoms present in the reactants compare to those present in the products? Why is this important?
6. How is the law of conservation of mass observed during an actual chemical reaction?
7. Describe and explain the effect of temperature on the rate of a chemical reaction.