Physical Science

Oklahoma Standards Summary

Atomic Properties and the Periodic Table

The periodic table can be used to identify atomic behaviors/properties and predict the outcome of chemical reactions.

1. Elements are placed on the Periodic Table according to repeating patterns of physical and chemical properties, as well as reactivity patterns. (15)
2. Atomic size decreases going across a period of the table due to increasing nuclear charge. Atomic size increases down a group of elements due to addition of energy levels. (15)
3. All matter is conserved, just broken apart and rearranged to form new molecules/substances. (17)
4. A chemical bond is an attractive force not a physical thing at all. (17)
5. The electron cloud is a “cloud” because of the motion of the electron in orbit around the nucleus, and mostly made up of empty space. (16)
6. Periods on the periodic table are based on the energy levels an atom has. (15)
7. The atomic number of an atom indicates the number of protons an atom has which determines what element and therefore the chemical properties it possesses. (16)
8. Changing the number of electrons an atom has will change its reactivity with atoms around it. (19)

Properties of Chemical Reactions and Conservation of Energy

Chemical reactions always start and end with the same amount of atoms, though they will be arranged differently. Furthermore; how fast the reaction occurs, and if energy is stored or released is all determined by the collisions of the molecules that make up the chemical reaction. The number of collisions of molecules during a chemical reaction can be influenced by temperature as well as the amount of particles present during a reaction.

1. Although the substance changes forms, the atoms are still there. In a closed system you will see no change in mass. (17)
2. A chemical reaction will only happen if a collision occurs, however more requirements, such as orientation and available kinetic energy, must also be met. (17)
3. All matter is conserved, just broken apart and rearranged to form new molecules/substances. (17)

Acceleration and Things That Cause Acceleration

Applying a force to an object will cause acceleration. The size of this acceleration is determined by the mass of the object and the size of force applied. An applied force will cause a change in the types of energy in the system, therefore the energy found in waves and the interaction of waves and their environment will cause accelerations.

1. If a force acts on an object in the same direction as the direction of its motion, the object's speed will continue to increase while the force is acting. (22)
2. Energy can be transferred from one system to another (or from a system to its environment) in different ways: by conduction, mechanically, electrically, or by radiation (electromagnetic waves). (24)
3. Energy can be transferred within a system. Regardless of what happens within a system, the total amount of energy in the system remains the same unless energy is added to or released from the system. (25)
4. Energy can be transformed (converted) within a system. (25)

Momentum

Momentum is determined by the speed of an object and the direction it is traveling (velocity) of an object and the object's mass. This momentum is conserved as long as there are no new objects added to the system. If a new object is added then the momentum will change in order to maintain a balance in the overall system. Devices can be designed and tested, that will use this balance of forces to minimize the effects of a change in momentum on an object.

1. Momentum is a vector quantity. (23)
2. Momentum is mass in motion, whereas forces are pushes or pulls applied to an object or mass. (23)
3. Momentum is conserved in a collision. (23)

Defining and Calculating Energy

The energy of a system depends on the motion of the system, as well as the interactions that occur within the system. Energy is always changing from one kind to another, but the total energy of the system is always the same. Energy can take many forms such as motion, sound, light, and heat. The amount of energy available is mathematically calculable, and determines what the system is capable of doing.

1. Energy can be transformed (converted) within a system. (25)
2. Energy can be transferred from one system to another (or from a system to its environment) in different ways: by conduction, mechanically, electrically, or by radiation (electromagnetic waves). (25)
3. Regardless of what happens within a system, the total amount of energy in the system remains the same unless energy is added to or released from the system. (25)
4. Motion energy (kinetic energy) is associated with the speed and the mass of an object. (22)

The Use of Energy, Its Conservation, and Equilibrium

Energy can be seen in multiple ways and be used to accomplish goals by building machines that capture and use that energy. These machines will transfer one type of energy to another form until a balance between the amounts of the different forms of energy is reached. Show this by building a machine to accomplish a task.

1. Thermal energy of an object is associated with the disordered motions of its atoms or molecules and the number and types of atoms or molecules of which the object is made. (26)
2. Energy can be transformed (converted) within a system. (34)
3. Energy can be transferred from one system to another (or from a system to its environment) in different ways: by conduction, mechanically, electrically, or by radiation (electromagnetic waves). (34)

The Use of Electromagnetism and Its Effect on the Bioshpere

Electromagnetic radiation when absorbed can be converted to thermal energy, cause damage to living cells, or even cause materials to release electrons therefore being converted into electrical energy. In addition, the use of electromagnetic waves can be used to send information worldwide and has become an integral part of our society. It is important to determine the full impact of the advantages and disadvantages of our current use of and exposure to electromagnetism.

1. Energy can be transferred from one system to another (or from a system to its environment) in different ways: by conduction, mechanically, electrically, or by radiation (electromagnetic waves). (34)
2. Only energy is transferred with the wave, the particles always return to their original position. (27)