Physical Science SOL Review Packet

1. Standards are what people agree to use for comparison.
2. Length is the distance between two points and is measured in meters using a meter stick.
3. Mass is the amount of matter in an object and is measured in grams using a triple beam balance.
4. Weight is a measure of the pull of gravity on an object.
5. Volume is the amount of space an object occupies and is measured in cubic centimeters. It is a derived unit of measure (mathematical computation). For fluids (liquids and gases), a special unit called the liter is used (1000 cubic centimeters = 1 liter). Fluids are measured using the graduated cylinder.
6. Temperature is thew measure of molecular activity. It5 is measured in degrees Celsius using a thermometer.
7. Force is a push or pull on an object that is measured in Newtons and is a derived unit.
8. The independent variable is the thing we change in an experiment.
9. The dependent variable is what changes as a result of the change in the independent variable. It is usually the thing we are observing or measuring.
10. Constants are the things that do not change in an experiment.
11. Controls are what a scientist uses for comparison during an experiment.
12. The Particle Theory of Matter states that all matter is made of tiny particles in constant motion.
13. Matter exists in one of four states, solid, liquid, gas, or plasma.
14. Solids have a definite shape and a definite volume. The molecules or atoms have very little molecular activity and are held or strongly influenced by the other molecules nearby.
15. Liquids have a definite volume but no definite shape. The molecules or atoms have more molecular activity than solids do. The molecules are further apart and are still influenced by the other molecules nearby. They are able to flow around each other.
16. Gases have no definite volume or shape. The molecules or atoms have lots of molecular activity. They are so far apart that they have little or no influenced on the other molecules nearby. They will fill all space available.
17. Plasma is a gas like mixture of charged particles. The heat energy is so great that the atoms break into subatomic particles that move about wildly.
18. Physical properties are those that can be observed using the five human senses. This includes changes in the states of matter.
19. An element is made up of only one type of atoms that have unique chemical and physical properties.
20. Chemical properties are those that describe how matter will react with other matter (i.e., acidity, basicity, combustibility, and reactivity).
21. A compound is made up of two or more different elements that are chemically bonded together to form molecules that have properties different from the original elements.
22. Mixtures are elements and/or compounds combined together but not bonded. They can be separated by physical means and maintain their original chemical properties.
23. Organic compounds are most compounds that contain the element carbon.
24. Density is a measure of the amount of matter there is in a specific amount of space.
25. The pH is a measure of the H^+ ions in a solution. It is used to determine acidity, basicity, and neutrality of the solution. A pH less than 7 is acidic, pH of 7 is neutral, and pH greater than 7 is basic.
26. Acids and bases combine to form a salt and water in a neutralization reaction.
27. Atoms are the basic building blocks of all matter.
28. The Greek, Democritus, first proposed the concept of an indivisible particle and called it an atom. He said that atoms were:

Infinite in numbers,
Different shapes and sizes
Always moving
Capable of joining together

29. Dalton is known as the father of the modern atomic theory. In 1803 he proposed:
    All elements are composed of atoms
    Atoms are indivisible and indestructible
    Atoms of an element are exactly alike
    Atoms of different elements are different
    Compounds are formed by joining two or more different elements
30. Thompson discovered the electron in 1897 and predicted the existence of positively charged particles. His work showed the atom was divisible.
31. Rutherford discovered the nucleus in 1908 and proved that the atom was mostly empty space.
32. In 1913, Bohr hypothesized that electrons move around the nucleus in definite orbits just like the planets.
33. The current model is known as the Wave Model. It states that there is a nucleus made up of protons and neutrons and that the electrons move about in energy levels in an electron cloud that surrounds the nucleus.
34. The proton is a positively charged particle in the nucleus that has the mass of 1 atomic mass unit (amu).
35. The number of protons in the nucleus determines what the element is. It is known as the atomic number.
36. The neutron is a neutral particle in the nucleus with a mass of 1 amu.
37. The sum of the number of protons plus the number of neutrons is known as the mass number.
38. Atoms with the same number of protons but a different number of neutrons are called isotopes.
39. Electrons have a negative charge and move in energy level in the electron cloud around the nucleus. Electrons have a mass of about 1/2000 amu.
40. The electrons in the outermost level of the atom determine it's chemical properties.
41. Atomic mass is the average of the masses of all the naturally occurring isotopes of the element.
42. Protons and neutrons are made up of smaller particles called quarks.
43. All the known elements are arranged on a table known as the periodic table.
44. The periodic table provides valuable information including the element symbol, atomic number, atomic mass, state of matter at room temperature, and the valence number.
45. The periodic table is organized by atomic number. As you move left to right or top to bottom, the atomic numbers of the elements increase.
46. The columns are called groups or families and all the elements listed have similar chemical properties. They can replace each other in reactions.
47. The rows are called periods and have properties that change as you move from left to right. When you move from top to bottom, you add an electron level and the properties repeat again.
48. Metals are to the left side of the stair step line, nonmetals are to the right side of the line, and metalloids are touching the line.
49. The most active elements (never found in a pure form in nature) are on the left side of the periodic table and on the right side are the noble gases (never combine with other elements).
50. Compounds are two or more elements chemically joined together by the combining of their outer layers of electrons. They form a molecule. They are represented by a chemical formula, which lists what elements (symbols) and how many of each (subscripts) is present.
51. Elements that share electrons equally when they form a compound form a covalent bond (usually two nonmetals).

52. Elements that gain or lose electrons when they form a compound form an ionic bond (usually a metal and nonmetal).
53. Matter is classified as an element, compound, or mixture.
54. In physical changes, substances maintain their original chemical properties.
55. In chemical changes, substances lose their original chemical properties and form totally new substances.
56. The Law of Conservation of Matter says that matter is not created or destroyed in a chemical reaction or by simple means.
57. Chemical reactions are explained by chemical equations that list the reactants (start with) and products (end with).
58. Chemical equations are balanced. The law of conservation of matter requires the same numbers and types of atoms on both the reactant and produce sides.
59. Chemical reactions that require less energy in their bonds release heat (exothermic) and those that require more energy take in heat (endothermic).
60. Nuclear changes usually release large amounts of energy. They either join atoms' nuclei (fusion) or split an atom's nucleus (fission).
61. Nuclear reactions have both good and bad effects. Good include medicine and nuclear energy and bad include nuclear waste and radiation.
62. Energy is the ability to do work.
63. Potential energy is the energy of position or stored energy.
64. Kinetic energy is the energy of motion.
65. Most common forms of energy include heat, light, chemical, mechanical, electrical, and nuclear.
66. Sound is a form of mechanical energy.
67. The law of conservation of energy states that energy can not be created or destroyed only changed from one form to another (transformation).
68. Heat, a form of energy, is often the by-product of an energy transformation.
69. The kinetic theory of matter states that all matter is made of tiny particles in constant motion. The measure of this motion is called heat.
70. As the heat energy increases, the kinetic energy increases. Thus, the particles move apart or expand. The converse is true. As the heat energy decreases, there is less kinetic energy, and the particles move together or contract. This is the law of thermal expansion.
71. Absolute zero is -273^0 Celsius or 0 Kelvin and is when all molecular activity stops.
72. The three common temperature scales are Fahrenheit (F), Celsius (C), and Kelvin (K). Water freezes at 32^0 F, 0^0 C, or 273 K and boils at 212^0 F, 100^0 C, or 373 K.
73. Adding heat energy doesn't always change the temperature. Sometimes heat energy is needed for a phase change of matter (freezing, melting, boiling, condensing, and vaporizing).
74. Conduction is the transfer of heat energy through the direct contact of two surfaces.
75. Convection is the transfer of heat energy through the movement of air currents.
76. Radiation is the transfer of heat energy through a vacuum or empty space.
77. Refrigerators work by removing heat energy from the air inside the box.
78. Thermostats work by using two metals with different expansion rates and a mercury switch.
79. Heat engines convert heat energy into mechanical energy. They are also known as combustion engines.
80. Sound is a compression wave. It requires a medium (or matter – solid, liquid, or gas) to transfer the energy through. The matter vibrates or moves in the same direction that the wave travel.
81. The speed of sound depends upon the type of medium it travels through and the temperature of the medium.
82. Ultrasound waves are used in sonar and medical diagnoses.
83. Compression waves travel much slower than transverse waves.

84. Light is a transverse wave. The wave moves at right angles to the direction the energy travels.
85. Light travels in straight lines until refracted, reflected, or absorbed.
86. As light moves from one medium to another, its speed usually changes and the light appears to bend. This is called refraction.
87. The speed of light is 300,000 km/s through a vacuum.
88. As wavelength decreases, frequency increases.
89. Electromagnetic radiation is classified and arranged into the electromagnetic spectrum by wavelength. Beginning with the longer wavelengths/lower frequencies of radio waves moving to infrared, visible light, ultraviolet, X-ray, and ending with gamma ray waves (short wavelength/high frequency).
90. Force, a push or pull, can cause objects to change their motion.
91. Balance forces are equal in size and opposite in direction. They never change motion.
92. Unbalanced forces (net forces) are not equal in size or opposite in direction. They always cause a change in motion.
93. Motion is a change in position relative to a frame of reference.
94. Friction is the force that opposes motion.
95. There are three types of friction, sliding, rolling, and fluid.
96. Speed is the rate of change in position per unit of time. Speed = Distance / Time
97. Velocity is the combination of speed and direction.
98. Velocity can have a positive or negative value depending on the direction of the change in position.
99. Newton's first law is that an object in motion (or at rest) stays in motion (or rest) until acted upon by a net force. This is also known as inertia.
100. Inertia varies directly with the mass of the object. The greater the mass, the greater the inertia.
101. Momentum is a measure of the mass and the speed of the object.
102. Newton's second law tells how much force is needed to move a certain amount of matter.
Force = mass x acceleration
103. Newton's third law explains the concept of action/reaction. It states that for every action there is an equal and opposite reaction. This explains why boats move backwards as we step off and how a rocket flies.
104. Gravity, the force of attraction between two objects, causes free-falling objects to accelerate.
105. Air resistance acts in the opposite direction of a moving object. When it equals the force acting on the object, terminal velocity has been reached. The object has reached its maximum speed and will not accelerate.
106. The combination of a horizontal force and gravity causes projectile motion.
107. Circular motion is caused by centripetal force that moves an object towards the center of a curve. It could be a string on an object being swung in the air or the lip of a plate with a marble moving around the edge.
108. Work is defined as the transfer of energy through motion. Work is done when a force is applied to and object and the object moves in the same direction as the applied force.
109. Simple machines make work easier by using a smaller force through a greater distance, trading effort for distance.
110. Simple machines change the direction of the applied force, change the effort needed (mechanical advantage), change the distance which the force is applied, change the speed of the resistance movement, or a combination of these.
111. Work input is always greater than work output. The ratio of work output to work input is called efficiency.
112. Power is the rate at which work is done. Its unit of measure is the watt.

Power = Work / Time

113. Static electricity is the net accumulation of electric charges on an object. This accumulation is normally a result of friction or the rubbing of two objects together.
114. The discharge of these accumulated electrons can be slow or rapid.
115. Opposite electric charges attract and like charges repel.
116. An electric charge exerts a force around itself that influences other electric charges. This is known as an electric field.
117. Materials that allow electrons to flow through them are called conductors. Materials that don't allow electrons to flow through them are called insulators.
118. The electroscope is a tool used to detect electric charges.
119. When one material has a larger number of electrons that another material, a potential difference exists. This difference is measured in units called volts.
120. Electrons move through a conductor from higher potential to lower potential. This flow is called current and measured in amperes.
121. A device that generates a potential difference using chemicals is the battery. Batteries are either wet cells or dry cells. Both have certain advantages.
122. Resistance is the tendency for a material to resist the flow of electrons. They type of material, the length, and the diameter all effect resistance.
123. Ohm's law explains the relationship between resistance, current, and potential difference.

Potential difference = current X resistance

124. A complete path that electrons can travel is called a circuit. When there is only one path for the electrons it is known as a series circuit. When there is more that one path it is a parallel circuit.
125. Fuzzes and circuit breakers prevent too many electrons from flowing through a circuit.
126. Electrical power is the rate at which electrical energy is converted into another form of energy.

Power = current X resistance

127. Magnetism is a property of matter in which there is a force of attraction or repulsion between like or unlike poles.
128. Electricity is related to magnetism.
129. Magnets exert a force in the region around them that is similar to the electric filed. It is called a magnetic field.
130. Moving magnets past a wire cause electrons to flow in the wire.
131. Current flowing in a wire causes a magnetic field around the wire. Thus, a temporary magnet is formed. This is called an electromagnet.
132. Magnets moving through a wire coil are called generators and electric current flowing thorough a coil that cause a magnet to move are called motors.
133. Current flowing in only one direction is called direct current. Current that moves in back and forth is called alternating current.
134. Two coils of wire wrapped around a soft iron core is called a transformer. When the voltage is increased, it is a step up transformer. When the voltage is decreased, it is a step down transformer.