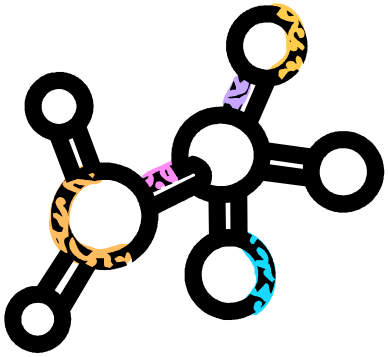
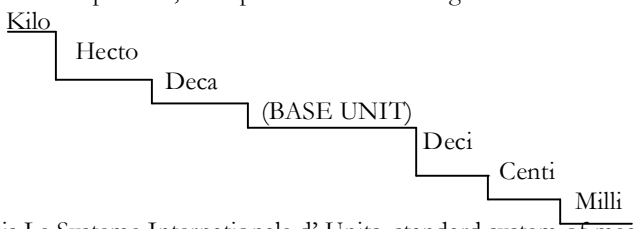
Physical Science Review Packet



Physical Science SOL Review Packet

Please remember that on the SOL test you still have to know material from the past two school years. This packet is only to help you with the material from this school year.

1. Identify the proper usage for different types of science equipment such as; triple beam balance, graduated cylinder, microscope, metric ruler, spring scales, etc.
2. Know how to use different types of science equipment such as; triple beam balance, graduated cylinder, microscope, metric ruler, spring scales, etc.
3. Identify the independent variable on a graph. This is generally found on the x-axis of graph.
4. Identify the dependent variable on a graph. This is generally found on the y-axis of a graph.
5. Create and interpret information from various types of graphs and charts such as; line graphs, pie graphs, and bar graphs, food webs, food chains, and data charts.
6. Identify key components of an experiment; controlled variables, independent variables, dependent variables, hypothesis, constants, repeated trials, and data interpretation.
7. Controlled variables/constants- parts of the experiment that stay the same. Example, in an experiment about the effects of sun light on pea plants, the amount of food will stay the same.
8. Independent variable – the variable that is changed on purpose by the person performing the experiment.
    a. *I* "the scientist" change this variable.
    b. Example: In an experiment about the effects of sunlight on pea plants, the amount of time in the sun is the independent variable.
9. Dependent variable – the variable that changes as a result of the independent variable.
    a. Depends on the experiment to change.
    b. Example: In an experiment about the effects of sunlight on pea plants, the size of the pea plant is the dependent variable.
10. Variable – the part of an experiment that can be changed
11. Hypothesis is a predicted educated outcome of an experiment.
12. Hypothesis shows the cause and effect relationship between the independent variable and the dependent variable.
13. Repeated trials, this is often thought of as the actual experiment. The more times an experiment is repeated with similar results, the more reliable the data.
14. Data is the collected information for the experiment.
15. The metric prefixes, each prefix is 10 times larger than the one to its right, starting with milli



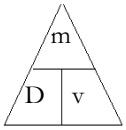
16. SI is Le Systeme Internationale d' Units, standard system of measurement used worldwide, also know as the metric system. The main SI base uses are:
    a. time- seconds
    b. distance-meter
    c. mass/weight-gram
    d. volume-Liter
17. Volume can be found several ways. For liquids we use a liter and for regular shaped objects we use the formula length*width*height. Irregular shaped objects volume can be found by the amount of water it displaces from a container.
18. One Cubic centimeter ($1cm^3$) = One milliliter (1mL)
19. Particle theory of matter – matter is made of particles that are in constant motion. The speed of the molecules is depended about the temperature of the substance.
20. There are 3 states of matter commonly found on Earth, solids, liquids and gases.
21. The 4^{th} state of matter, plasma, is the most common state of matter found in the universe. Plasma is a gas like mixture made of positively and negatively charged particles. Plasma is extremely hot.
22. Matter is anything that has mass and occupies space. All matter is made up of small particles called atoms.

23.  Solids have a definite volume and definite shape. The molecules are packed tightly together. There is little movement and little heat. Items that are in their solid state are said to be frozen, AKA ice.

24.  Liquids have a definite volume but no definite shape. The molecules are close together, but are able to move. The temperature of a liquid is higher than a solid. The molecules in a liquid are able to flow. AKA, water.

25.  Gases have no definite volume or definite shape. The molecules are able to move freely from each other. The temperate of the gas molecules is the highest of the 3 states of matter. AKA, water vapor.

26. Mixtures are substances in which the different parts can be separated by physical means.
    a. Example: Lettuce Salad.
27. Compounds are substances that are made of two or more different elements but are unable to be separated by physical means.
28. Elements are substances made of two or more atoms that are alike
29. There are two types of mixtures; homogeneous and heterogeneous mixtures.
30. Homogeneous mixture have a uniform shape and size and cannot be easily separated into its individual parts
    a. Example: cake mix.
31. Heterogeneous mixture – the individual parts can be easily separated by physical means.
    a. Example: Chef Salad
32. Compounds can be classified in several ways including the following
    a. acids, bases and salts
    b. organic and inorganic compounds
    c. ionic and covalent compounds
33. Physical properties are the characteristics of a substance that can observe or changed without creating a new substance.
    a. size
    b. shape
    c. density
    d. freezing point/boiling point
    e. odor
    f. color
34. Chemical properties indicate whether a substance can be changed into a new substance.
    a. acidic/basicity
    b. Combustibility – ability to burn
    c. Reactivity
    d. color – if changed during a chemical reaction
35. Density is the relationship between mass and volume of an object. Objects of the same size but made of different materials will have different densities.

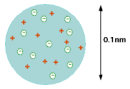


D=m/v

Density = mass / volume

36. With fluids, objects will higher densities will sink to the bottom while those with lower density will float towards the top.
37. The model of the atom has improved through the years. Each model has a critical addition to understanding the atom.
38. The first atomic model is Dalton's. Dalton's model was that the atom was a solid ball. Atoms of the same element are identical. Atoms are capable of combining with others to create compounds. Compounds were made of atoms in a set ratio.

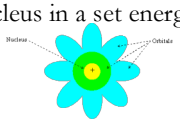
39. Thomson – the second model has positively charged particles with negatively charged particles infused together in a "pudding like" mixture.



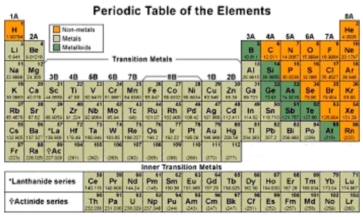
40. Rutherford – has a positively charged center surround by a negatively charged outer ring. "Donut like" structure.

41. Bohr – this model has a positively charged nucleus with protons and neutrons, surrounded by negatively charged electrons that circle the nucleus in a set orbit pattern.

42. Electron Cloud Atomic Model (modern atomic model) – is a 3-D representation of the atom in which the electrons move around the nucleus in a set energy level.



43. Atoms are made of subatomic particles; protons, neutrons and electrons.
44. Protons are located in the nucleus of the atom and have a positive charge. The atomic mass of a proton is 1 amu.
45. Neutrons are located in the nucleus of that atom and have a neutral charge. The atomic mass of a neutron is 1 amu.
46. Electrons orbit the nucleus of the atom. The electron has a negative charge.
47. The number of protons is the same as the atomic number.
48. The number of electrons is the same as the atomic number in a neutral atom.
49. The number of neutrons if found by subtracting the atomic mass by the atomic number.
50. An element is defined by the protons it has. Each element has a different number of protons.
51. Isotope is when an element has a different number of neutrons than its neutral counterpart.
52. Only electron in the outer most energy level are capable of forming chemical bonds
53. Ion is an atom that gains or loses electrons. Ions can have either a positive charge or a negative charge.
54. If an atom has more electrons than protons it has a negative charge.
55. If an atom has more protons than electrons it has a positive charge.
56. The periodic table of elements is an arrangement of elements based on atomic numbers and properties. The periodic table of elements can be divided into 3 main categories; metal, metalloids and non-metals.
57. Metals are located to the left of the stair-steps on the periodic table. These elements tend to lose electron during chemical bonding.
58. Non-metal are located to the right of the stair-steps on the periodic table. These elements tend to gain electrons during chemical bonds. These elements are usual in a gaseous state at room temperature.
59. Metalloids are located along the stair-steps on the periodic table. These elements tend to share characteristics of both metal and non-metal elements. These elements make great semiconductors.

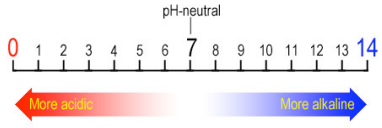


60. There are more than 110 elements located on the periodic table, however 92 of them are found naturally. The remaining elements are man made.
61. The periodic table shows the atomic number, atomic mass, and chemical symbol for every element currently known on Earth.

62. The vertical (up-down) columns on the periodic table are called groups/families. Elements that are in the same group have the same number of electrons in their outer shell (valence electrons.)
63. The horizontal rows (left-right) on the periodic table are called periods. Elements in the same period have the same number of energy levels.
64. As you move down and to the left the periodic table the larger the atom. The largest atom is Francium (Fr) and the smallest is Helium (He).
65. The chemical symbol of an element is represented by one to two letters. The first letter is always Capital, and the second letter is always lowercase.
    a. Example: Sodium --- Na
66. A chemical compound is when two different elements react creating a new substance. Chemical compounds are shown using chemical formulas.
    a. example: NaCl --- sodium chloride (table salt)
67. Chemical compounds form as a result of atoms wanting to become more stable. In order for an atom to be stable it has to have a "perfect eight" in its outer shell.
68. The perfect eight is when the outer shell has 8 electrons in its outer shell, thus making it chemically stable.
69. There are several types of chemical compounds:
    a. organic
    b. inorganic
    c. ionic
    d. covalent
70. Organic compounds contain carbon.
    a. Example CO_2
71. Inorganic compounds are compounds that DO NOT contains carbon.
    a. Example: H_2O
72. Ionic compounds are compounds that have a metal and metalloid or non-metal.
    a. Example: NaCl
73. Covalent compounds are compounds that are made of two non-metals.
    a. Examples: CO_2 and O_2
74. A compound can be ionic and inorganic, or covalent and organic, or visa versa, but a compound can NOT be ionic and covalent or inorganic and organic.
75. Chemical compounds can react with each other and create new compounds. This is shown by a chemical equation.

$$H_2O + CO_2 \rightarrow H_2CO_3$$

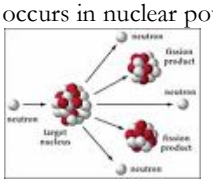
76. The left side of the arrow in a chemical equation is the reactant.
77. The right side of the arrow in a chemical equation is the product.
78. Law of conservation of mass states that matter can be neither created nor destroyed.
79. Based on the Law of conservation of mass, all chemical reactions start and finish with the same amount of matter, thus all chemical equations must have the same number of atoms for each element on the reactant side as on the product side of the chemical equation.
80. To balance equations coefficients are placed in front of the compound. All elements in that compound must increase by that number.
    a. This is an example of a balanced chemical equation.
    b. $4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$
81. Exothermic reaction is a chemical reaction in which heat is released.
    a. example: fireworks, heat from a fire, heat packs
82. Endothermic reaction is a chemical reaction in which heat is absorbed into the reaction, leaving a cold feeling.
    a. example: making ice cream, ice packs
83. pH scale is a measure of the acidity or alkalinity of a solution.



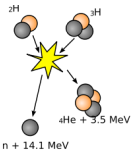
84. Acid – a chemical property that has a pH range of 0-6. Releases H+ (hydrogen ions) in solution.

a. properties of acids include; conduct electricity, produce a sour taste and corrosive
b. Everyday example: battery acid, lemon juice, and stomach acid

85. Bases- chemical property that has a pH range of 8-14. Release OH- (hydroxide ions) in solution.
    a. Properties of bases include; conduct electricity, corrosive and slippery feeling
    b. Everyday examples: bleach, ammonia
    c. Bases are also known as alkaline
86. Neutral solutions – has a pH of 7. There are NO ions in solution.
    a. Theses solution are unable to conduct electricity
    b. Pure water
87. Salt and water form as a result of an acid and a base mixing in solution.
88. Nuclear reaction is when there is a change to the atom itself causing an atom to either split or combine with another resulting in a different element then the one originally used.
89. Fission Nuclear Reaction is when an atom is split into two pieces after being hit by a free electron. This splitting creates two different atoms and a lot of energy.
    a. This is the nuclear reaction that occurs in nuclear power plants and the atomic bomb.



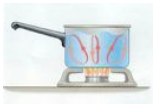
90. Fusion Nuclear Reaction is when two atoms come together creating a new atom of a different element. This reaction creates lots of energy and tons of heat.
    a. This nuclear reaction occurs on our sun. Two hydrogen atoms come together creating a helium atom and a lot of energy.



91. The problem with nuclear reaction is that the waste is radioactive. It takes millions of years for the waste to become safe again. Finding places to store the waste safely is another dilemma when using nuclear energy.
92. Energy is the ability to do work.
93. There are several forms of energy
    a. electrical
    b. light
    c. heat
    a. mechanical
    b. chemical
94. Potential energy is the stored energy. The amount of potential energy is depended upon the location of the item. If the item could easily move, it has a high potential energy.
95. Kinetic energy is energy in motion. The amount of kinetic energy an object can have depends on the velocity in which the object is traveling and the mass of the object.
96. Chemical energy is the energy that is released during a chemical reaction.
97. Mechanical energy is the amount of work an object can do based upon its potential and kinetic energy.
98. Energy can be converted from one form to another. During this process heat can be released.
    a. A battery in a flashlight is an example of chemical energy converting into electrical energy.
99. Temperature is the measurement of the average kinetic energy of the molecules of a substance.
100. Thermometer is a device that is used to measure temperature.
101. Celsius is the SI temperature scale. 0^oC is the freezing points of water; 100^oC is the boiling point of water.
102. Fahrenheit is the temperature scale used in the USA. 32^oF is the freezing point of water, and 212^oF is the boiling point of water.
103. Only scientists in the lab setting use the Kelvin temperature scale. 0K is absolute zero, 273 K is the freezing point of water, and 373K is the boiling point of water.
104. Absolute zero is the theoretical point in which all molecular movement stops.

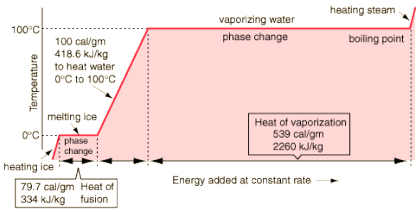
105. Heat is the energy transfer between two objects of different temperatures.
106. Heat transfers from a warm object to a colder object.
107. Conduction is the transfer of heat by direct contact.

108. Convection is the transfer of heat by circulation of fluids. Warmer fluids will always rise while colder fluids will always sink.



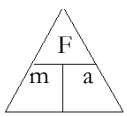
109. Radiation is the transfer of heat in the form of waves.

110. Transition from a solid to a liquid to a gas is called phase change. During a phase change there is no change in temperature, however the amount of energy added to the substance undergoing the phase change increases.
111. A phase change chart shows how much energy is needed for a substance to go from one phase to another.



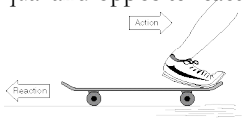
112. Freezing point/melting points is the temperature in which a substance goes from a solid to a liquid and vise versa. For water this is at 0°C or 32°F.
113. Boiling point is the temperature at which a liquid goes to a gas. For water this happens at 100°C or 212°F.
114. Condensation occurs when a gas cools and forms a liquid.
    a. Dew on grass is an example of condensation.
115. Vaporization occurs when a liquid goes to a gas in temperatures well below the boiling point.
    a. Example: if a cup of water is spilled on the countertop, a few hours later there is no water left.
116. Refrigerators work by pumping the warm air inside the fridge to a cooling chamber where the air is chilled then returned to the inside of the fridge.
117. Thermostats work by using two metals with different expansion rates and a mercury switch. When a change in temperature occur the thermostats triggers an electrical switch which will cause the heater/AC to start.
118. Heat engines convert heat energy into mechanical energy. They are also known as combustion engines.
119. Newton's First Law of Motion, an object at rest will stay at rest, and object in motion will stay in motion unless another force acts upon it.

120. Newton's Second Law of Motion, the acceleration of an object depends on the amount of force and the mass of the object.

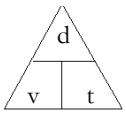


F= ma
Force = mass * acceleration

121. Newton's Third Law of Motion, for every action there is an equal and opposite reaction.



122. Force is a push or pull on an object.
    a. Force is measured in a unit called Newton (n)
123. Newton is equal to 1 kilogram meters per second squared.
124. Speed is the relationship between the distances an object travels and the amount of time it takes to travel this distance.

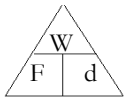


v=d/t
velocity = distance/time

125. Velocity is the same as speed except it tells you the direction in which the object traveled.
    a. Example of Velocity a car traveling NORTH at 55mph. NORTH makes it velocity.
126. Acceleration is the change of velocity in a set amount of time for one object.
    a. Example: A car can go from 0-60 mph in 6 seconds.

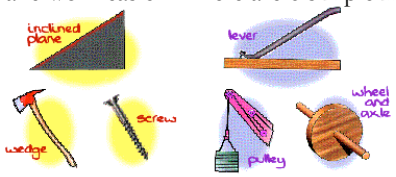
$$a = \frac{v_f - v_i}{t} \quad \text{acceleration} = \frac{\text{final velocity} - \text{starting velocity}}{\text{time}}$$

127. Mass is the amount of matter that makes up an object. The mass of an object will never change unless the object itself changes.
128. Weight is the measurement of the amount of gravity on an object. Weight can change depending on an object's location.
    a. Your mass will stay the same on the moon as on Earth, but your weight will change, since the moon has less gravity.
129. Gravity is a force of attraction between two objects.
    a. The distance between two objects and the size of the two objects affects gravity.
130. Work is the amount of force needed to move an object a distance.

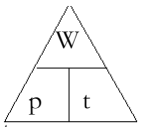


W= F*d
Work=force*distance

    a. If an object does not move, no work is done.
131. Work is measured in a unit called a joule.
132. Simple machines are devices that make work easier. There are 6 simple machines.
    a. Lever
    b. Pulley
    c. Wheel and axle
    d. Incline plane
    e. Screw
    f. Wedge

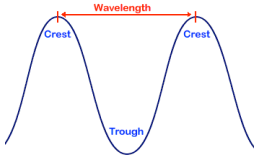


133. Mechanical advantage is the number of times the machine multiples the force done.
    a. The larger the mechanical advantage the easier the work for individual.
134. Friction is a force that slows or prevents movement of an object.
135. Power is the rate at which work is done.

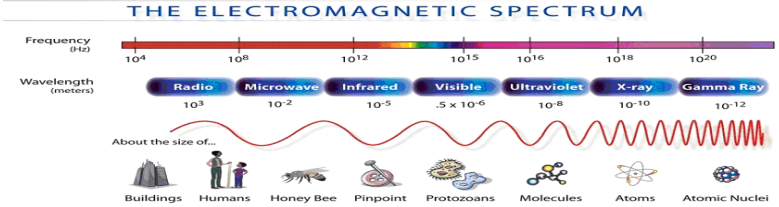


p=W/t
power = Work/time

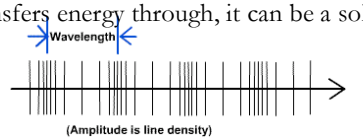
136. Light travels in a transverse wave. Transverse waves travel in a sight line until it hits an object and reflects, transmitted, or absorbed



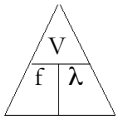
137. Transverse waves have an up down motion; like water waves.
138. Light waves/transverse waves can travel without a medium. Light is able to travel in the vacuum of space.
139. Crest is the highest point of the transverse wave.
140. Trough is the lowest point of the transverse wave.
141. As the frequency of the wave increase, the wavelength decreases.
142. Reflection of a wave is when the wave hits an object and bounces back towards the source
    a. Examples: image in a mirror, sound echoes
143. Refraction of a wave is when a wave bends as it moves from one medium to another. This causes a change in wave velocity.
144. Electromagnetic spectrum is an arrangement of electromagnetic waves in order based on wavelength.
    a. Radio wave
    b. Microwaves
    c. Infrared wave
    d. Visible light
    e. Ultraviolet wave
    f. X- ray
    g. Gamma Ray
145. Radio waves have the longest wavelength but the shortest frequency and gamma rays have the shortest wavelength but the highest frequency.



146. Visible light is the smallest part of the electromagnetic spectrum and the only part we can see with our unassisted eye.
147. The color spectrum, Red, Orange, Yellow, Green, Blue, and Violet can separate visible light even more.
    a. Red has the longest wavelength, violet has the shortest wavelength.
148. Sound is a form of mechanical energy that is produced by vibrations of a medium.
149. Sound can NOT travel in space. Sound needs a medium to travel.
150. Medium is any material that a wave transfers energy through, it can be a solid, liquid or gas.
151. Sound travel in a compression wave.



152. The speed of sound depends on the type medium and the temperature of the medium. Sound travels the fastest in solids and the slowest in gases.
153. Rarefaction is the part of the compression wave in which the molecules are far apart.
154. Compression is the part of the compression wave in which the molecules are close together.
155. All wave exhibit the same characteristics
    a. amplitude
    b. wavelength
    c. frequency
156. Amplitude is the maximum distance that the particles of a wave's medium vibrate from their rest position.
157. Wavelength is the distance between two identical points on a wave.
158. Frequency of a wave is how many identical parts of a wave can pass one point in one second of time.
159. Frequency is measured in a unit called Hertz (Hz).
    a. Hertz is the number of wave in one second of time.
160. Wave velocity is based on the wave length and the wave frequency.



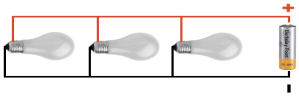
$v=f\lambda$
velocity = frequency*wave length

161. Applications of sound waves include
    a. ultrasonic imaging (medical ultrasound)
    b. sonar
    c. Doppler radar (weather mapping)
162. Light waves can be changed and modified with the uses of lenses.
163. Concave lenses are thinner in the middle of the lens than at the edges. The image is always right side up and larger. Concave lenses are used in microscopes.

164. Convex lenses are thicker in the middle of the lens and thinner towards the edge. The images is smaller and upside. Convex lenses are used in camera lenses.

165. Mirror is a surface that reflects an image. Mirrors can have concave or convex shape or be flat.
166. Power is measured in a unit called a watt.
167. Electricity is the flow of electrons (electrical power) from one location to another.
168. Resistance is an objects ability to slow the flow of electricity.
169. There are two form of electrical power that we use every day, Alternating current (AC) and direct current (DC) power.
170. The electricity that comes into your house is alternating current electricity.
171. The electrical power produced by batteries is direct current electricity.
172. There are two types of electrical circuits, series and parallel circuits.
173. Series circuits are electrical circuits where the current has only one path; if the path is interrupted in any point, it stops the current flow in the entire circuit
    a. Example: Christmas lights – when one light goes out, they all go out.

174. Parallel circuits are electrical circuits where the current flows through more than one path; if one path is interrupted, current will still flow through the other paths.
    a. Example: Household circuit - if one light goes out, the rest stay on.



175. Static Electricity is the net buildup of electric charges on an object. The buildup of electrical charges is done with friction. Friction moves electrons from one surface to another.
    a. Example: taking clothes out of a dryer and getting a shock.
176. Magnetism is a property of some materials in which there is a force of repulsion or attraction between certain like and unlike poles
177. A magnet is a device that is made of iron and produces a magnetic field.
178. Magnetic field is the region around a magnet where magnetic forces act.
179. Magnets react with certain metals, such has steel and iron.
180. The Earth has a magnetic field. We use the Earth's magnetic field for navigation with the use of a compass.
181. Magnetic fields can create electrical current, and an electrical current can make a magnetic field.
182. An electromagnet is a device that has an iron center wrapped in a coil of wires. When an electrical current is added to the wire, a magnetic force is produced. Once the electrical currents ends, the magnet will not work.
183. A generator is a device that converts mechanical energy into electrical energy. Most of the electrical energy we use comes from generators.
184. Electric motors work with the same principle of turning electrical energy into mechanical energy.
    a. Examples of electric motors: blender, toaster, hair dryer, etc.