1. Biology is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ science.
	1. What does this mean?
2. How does the bombardier beetle use chemistry to defend itself?
3. Organisms are composed of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Define **matter –**
	1. All matter is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Define **element –**
6. Define **compound –**
	1. Sodium is a ( element or compound )
		1. Give two properties of sodium:
	2. Chlorine is a ( element or compound )
		1. Give two properties of chlorine:
	3. Sodium chloride is a ( element or compound )
		1. Give two properties of sodium chloride:
7. The four elements that make up 96% of living matter are:
	1.
	2.
	3.
	4.
8. Most of the other 4% of living matter is what elements:
9. Which element makes up most of the human body?
10. What effects can a nitrogen deficiency have?
11. What effects can an iodine deficiency have?
12. How many atoms would make a 1 centimeter row?
13. Label the **nucleus, protons, electrons, and neutrons** of this atom:



1. Protons and neutrons have the same \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. What charge do protons have?
3. What charge do neutrons have?
4. Protons and neutrons bind together to form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. What charge does an electron have?
6. How big is an electron?
7. Electrons are in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ surrounding the nucleus.
8. Atoms have \_\_\_\_\_\_\_\_\_\_\_\_ numbers of protons and neutrons.
	1. This makes atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
9. How many protons does the carbon atom have?
10. How many neutrons does the carbon atom have?
11. How many electrons does the carbon atom have?
12. Define **atomic number –**
13. Define **mass number –**
14. Define **ions –**
15. Where are each of these ions found?
	1. Na+
	2. K+
	3. Ca+
16. Atoms of an element always have the same number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
17. Define **isotopes –**
18. Most isotopes are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but some are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. What does it mean to be radioactive?
19. Give three applications for radioactive isotopes:
	1.
	2.

* 1.

**Carbon-14 Dating**

1. Carbon-14 has a half-life of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. Every time a half life passes, what happens?
2. Example: If a 100g organism dies, how much C-14 would be left after…
	1. 5,700 years?
	2. 11,400 years?
	3. 17,100 years?
3. When the Shroud of Turin was carbon-14 dated, three steps were taken to make sure the results were not biased. Explain them:
	1.
	2.
	3.
4. What date of the Shroud was calculated?

**Covalent Bonds**

1. Elements can combine to form \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. They are held together with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Define **covalent bond –**
3. Define **ionic bond –**
4. There are three types of covalent bonds:
	1. **Single Bond –**
	2. **Double Bond –**
	3. **Triple Bond –**
5. Fill out the chart below:

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of Compound** | **Electron Diagram** | **Structural Formula** | **Space Model** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Energy in Covalent Bonds**

1. Define **energy –**
2. Define **potential energy –**
	1. Location potential energy –
	2. Structural potential energy –

**Ionic Bonds**

1. An ionic bond involves \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. Define **ion** –



* 1. Ions with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ charges

\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each other.

1. When does a hydrogen bond occur?
2. All of the unusual properties of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are

caused by hydrogen bonding.

1. Define **cohesion –**
2. Give two affects caused by cohesion:
	1.
	2.

1. Define **adhesion –**
2. Give one example of how adhesion is used:
3. Define **heat capacity –**
	1. Which is colder in the summer? ( Lake Michigan / Chicago )
	2. Which is colder in the winter? ( Lake Michigan / Chicago )
4. Water is considered a \_\_\_\_\_\_\_\_\_\_\_ molecule.
	1. What does this mean?
	2. Which end has a negative charge?
	3. Which end has a positive charge?
5. Water is known as the universal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. Water can dissolve many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. This creates a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Acids, Bases, and pH**

1. A few water molecules split into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Write the chemical equation of water splitting below:
3. Neutral means that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Acids have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Bases have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. Give three examples of common acids:
	1.

* 1.
1. Give two examples of common bases:
	1.
	2.
2. pH measures \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. Solutions with a pH below 7 are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	2. Solutions with a pH above 7 are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	3. Solutions with a pH of exactly 7 are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. What is the homeostasis pH level of blood?
	1. What pH does sweat have and why?
	2. What pH does saliva have and why?
4. Define **buffers –**
5. Why are buffers important for life?

**Other Chemical Bonds**

1. Define **Van der Waals interactions** –
	1. Give an example:
2. Rank the chemical bonds from strongest to weakest:
	1.
	2.