

Chapter 2; Atoms, Molecules and pH

Basic Concepts and Terminology

- There are 3 states of matter: _____
- _____: Maintain shape and volume under normal circumstances
- _____: Molecules move past each other, shape is dependent on the container, volume is fixed.
- _____: Molecules move at a higher speed, low attraction for each other, volume and shape are _____.

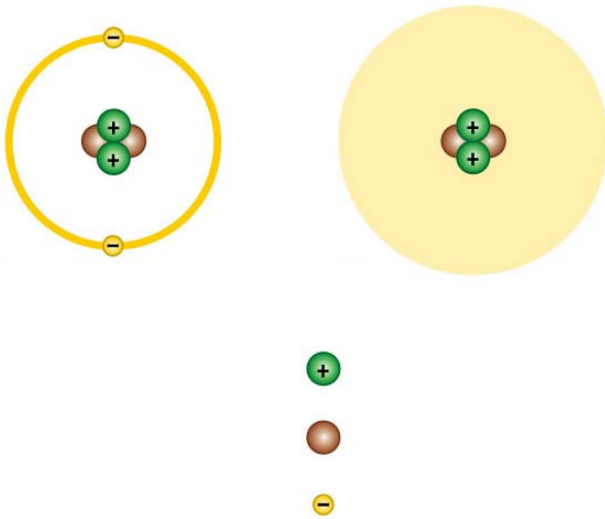
Basic Concepts and Terminology (2)

- _____: an atom or group of atoms that are all the same
- If a material is composed of two or more different _____, then it is a _____
- Is water an element or a compound? _____
- **Periodic table of the elements:** arrangement of _____ lists the elements based on their _____.
- What are the families on the periodic table? _____

Atoms

- Each element consists of one kind of _____
 - An _____ is the smallest unit of _____ that still retains the properties of an _____

Fill in/explain for quiz;



Atomic structure (2)

- The electrons in an atom are arranged into _____ levels or _____
- The behavior of atoms is due to the number of _____ in their outer (_____) shell.
- Stable atoms are those that have 8 electrons in their outer (_____) shell. (noble gases, ex; _____)
- When atoms that do not have _____ electrons gain more, they seek to fill their shells, until the _____ has 8 (_____)

- What are the four most abundant elements in living things? _____

Molecules and Chemical Formulas

- **Molecule:** When two or more atoms are bonded together by sharing _____
- Example: H₂O (_____)
- H is the _____ for hydrogen
- The subscript 2 means that there are _____ of them in the molecule
- The O is the symbol for _____
- Since there is no number after the O, you can assume that there is only _____ in the molecule

Trends in the Periodic Table; the “Happy Family” rule

- All atoms (as they sit on the table) are “_____”; that is they are unstable because the number of electrons in the outer shell is not equal to _____.
- Atoms can gain electrons by forming _____ with other atoms
- A _____ is formed when 2 atoms share 2 or more electrons between them.
- You can determine how many bonds an atom will usually make by looking at its _____ number.
- Example: Carbon is in family number 4. Since it seeks to have 8 electrons, it will normally form _____ bonds, gaining _____ extra electrons and becoming “happy”
- All of the elements are listed in the _____
- How many bonds will nitrogen (N) form? _____
- How many bonds will boron (B) form? _____
- _____ elements are essential to life
 - Four of these _____ make up about 96% of the weight of the _____ body
 - _____ elements occur in _____ amounts

Ions

- Atoms and molecules are electrically _____ when they have equal number of protons and electrons
- When an atom or molecule gains or loses an electron (or two), it is called an _____.
- If an ion has a positive charge (lost an electron) it is called a _____. Example _____
- If an ion has a negative charge (gained an electron) it is called an _____. Example _____

Ionic and Covalent bonds

- When certain _____ are arranged together, one atom (with _____ many electrons) will donate an _____ to another atom (with too _____)
- This forms a _____
- When a cation (+) and an anion (-) are near each other they are _____ due to opposite charges. Like a _____
- This attraction is called an _____ **bond**.

Covalent Bonds

- When two atoms share two or more electrons, this is called a _____ **bond**.

Chemical Reactions

- Definition; _____
- The number of atoms of oxygen and hydrogen on the _____ side of the arrow is the _____ as those on the _____ side
- The _____ of those atoms has changed
- The “_____” between the atoms represent the _____ bonds in those molecules
- The materials on the left side of the arrow are called _____
- The materials on the right side of the arrow are called _____

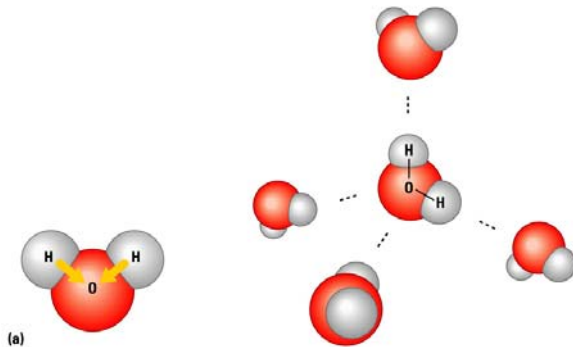
The five signs of a chemical reaction;

1. _____
2. _____
3. _____
4. _____
5. _____

Which of these is seen in a fire? Which one is not? _____

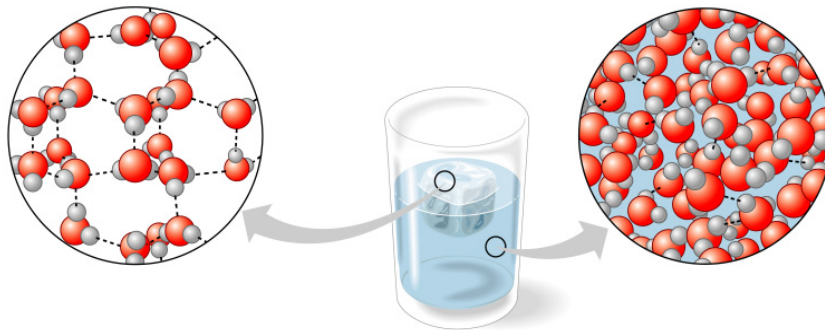
The Structure of Water

- Without water, no _____ can exist on Earth
- Water is one part _____ and two parts _____ with single _____ bonds between them (at an angle)
- One _____ (end) has a slight positive charge (+) and the other has a slight _____ (-) charge
- this is due to the fact that the _____ molecules are so much _____ than are the hydrogens and “pull” more of the _____ near them
- This “_____” causes the water molecules to be attracted to each other like the ends of a _____
- The resulting attraction is called a _____
- These _____ bonds are responsible for water’s _____



Water's Life-Supporting Properties

- _____ and _____; water sticks to _____
 - This allows water to move up into _____ and gives the water a _____
- High _____: Water absorbs _____ from warm air and releases it into _____
 - Large bodies of water _____ slowly; beach areas are _____ than deserts
 - Water takes _____ energy away with it when it _____; this allows _____ and swamp _____ to work
- Ice _____ due to the fact that water molecules spread apart when they _____
 - this allows _____ to live under the surface of frozen water without _____
- Water is called the _____; it will dissolve more types of _____ than any other _____ (main ingredient in _____)

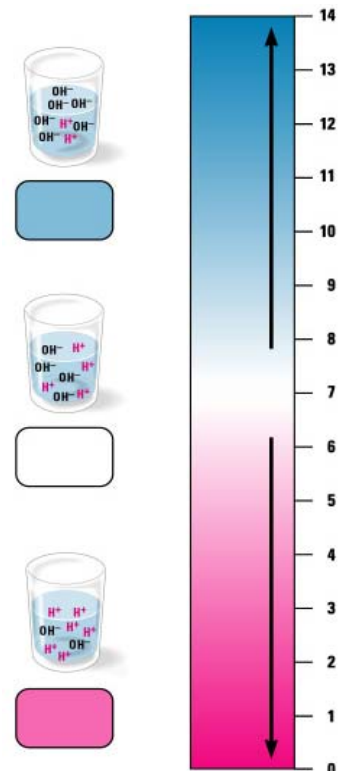


Acids and Bases

- _____ are chemicals that release hydrogen ions (H^+) when mixed with water.
- Acids usually taste _____
- _____ are chemicals that release hydroxide ions (OH^-) when mixed with water.
- Bases are usually slippery to the touch and bitter tasting.

pH scale

- The _____ measures the acidity or basicity of a solution.
- The numbers range from 0 (strong acid) through 7 (_____) to 14 (strong base)



Buffers

_____ are substances that resist _____ change
 They accept _____ when they are in _____
 They donate _____ when they are _____
 Your blood contains _____ to help _____

Review Questions:

- Which of the following is not one of the 3 states of matter?
 - Solid
 - Ice
 - Liquid
 - Gas
 - None of the above are correct
- There are all 3 states of matter inside you ; T (A) or F (B)
- What state of matter maintains shape and volume unless you bend or break it?
 - Solid
 - Ice
 - Liquid
 - Gas
 - None of the above are correct
- What state of matter fills the container it is in, but only on the bottom if it is $\frac{1}{2}$ full?
 - Solid
 - Ice
 - Liquid
 - Gas
 - None of the above are correct
- What state of matter fills the container it is in completely and the molecules are not very attracted to each other?
 - Solid
 - Ice
 - Liquid
 - Gas
 - None of the above are correct
- What would a chunk of solid (pure) gold be called?
 - Compound
 - Element
 - Atom
 - Alloy
 - None of the above are correct
- What is the difference between an element and a compound?
 - Elements are purely one type of atom and a compound is a combination of different atoms
 - Compounds are purely one type of atom and an atom is a combination of different atoms
 - Both elements and compounds are pure atoms, but of different varieties
 - Elements are fire, air, earth and water, while compounds are chemicals
 - None of the above are correct
- What is a visual arrangement of elements that shows similar characteristics within columns?
 - pH table
 - Compound table
 - Periodic table of the elements
 - Period rows
 - None of the above are correct
- How many types of atoms make up an element?
 - 0
 - 1
 - 2
 - Unlimited
 - None of the above are correct
- What is the smallest unit of matter that still acts like that element?
 - Electrons
 - Atoms
 - Molecules
 - Cells
 - None of the above are correct
- How are electrons in atoms arranged?
 - Randomly
 - In shells or rings
 - All in the outside part
 - Two by two
 - None of the above are correct
- What is the outermost shell of all atoms called?
 - Flavor shell
 - Outer ring
 - Valence shell
 - Valiant shell
 - None of the above are correct
- What determines the behavior of atoms (how they will react)?
 - Their size
 - The total number of electrons
 - The number of shells
 - The number of electrons in the valence shell
 - None of the above are correct
- What makes an atom stable?
 - Being large
 - Having its outer/valence shell filled with electrons
 - Bonding with at least 4 other atoms
 - Being very small
 - None of the above are correct
- What do unstable atoms need to do to become stable?
 - More electrons
 - More protons
 - To form bonds
 - Both A and C are correct
 - None of the above are correct
- How do unstable atoms gain extra electrons?
 - By forming bonds
 - By stealing them
 - By buying them
 - They don't
 - None of the above are correct

17. You are made up of what four elements (primarily)?
A. A, B, C, and D
B. O, Ca, C, H
C. C, H, O, N
D. Fire, water, air, earth
E. None of the above are correct
18. What is defined as two or more atoms that are bonded together by sharing electrons?
A. Atom
B. Molecule
C. Stable formation
D. Ion
E. None of the above are correct
19. Water is an example of an element; True (A) or False (B)
20. In NaCl, the Na is the _____ for sodium
A. Symbol
B. Name
C. Formula
D. Equation
E. None of the above are correct
21. What does the 2 in H₂O mean?
A. That there are 2 molecules of water
B. That there are 2 atoms of oxygen in water
C. That there are 2 atoms of hydrogen in water
D. That you have to square the hydrogen in the equation
E. None of the above are correct
22. If you do not see a subscript after a symbol in a formula that means;
A. You should assume that a zero is present
B. You should assume that there is one atom of that in the formula
C. You cannot assume anything; it could be any number
D. Nothing
E. None of the above are correct
23. When molecules or atoms rearrange their bonds, forming new bonds, what has happened?
A. A fire
B. A chemical reaction
C. A nuclear explosion
D. Nothing
E. None of the above are correct
24. What two types of symbols do you see in almost all chemical reactions?
A. #, \$
B. O, C
C. +, →
D. +, -
E. None of the above are correct
25. The chemicals on the left side of a chemical reaction are called;
A. Reactants
B. Products
C. Enzymes
D. Reactions
E. None of the above are correct
26. The chemicals on the right side of a chemical reaction are called;
A. Reactants
B. Products
C. Enzymes
D. Reactions
E. None of the above are correct
27. Why are most atoms on the periodic table “unhappy”?
A. They did not get any presents at their last birthday party
B. They are lonely
C. They have no electrons
D. They have too many electrons
E. None of the above are correct
28. How can unhappy atoms gain more (two ways)
A. Sharing electrons, melting
B. Sharing electrons, giving/receiving electrons
C. Passing, running
D. Leaving the periodic table, taking its ball
E. None of the above are correct
29. How can you determine how many bonds an atom will form?
A. It is its family number
B. It is its family number + 8
C. It is its family number - 8
D. It is 8 minus its family number
E. None of the above are correct
30. What happens to atoms and molecules when they have equal numbers of protons and electrons?
A. They explode
B. They are happy
C. They are electrically neutral
D. They
E. None of the above are correct
31. When an atom or molecule gains or loses an electron (or two) is it called a(n);
A. Acid
B. Base
C. Ion
D. Valence
E. None of the above are correct
32. If an ion has a positive charge it is a;
A. Non-ion
B. Onion
C. Anion
D. Cation
E. None of the above are correct
33. If an ion has a negative charge it is a;
A. Non-ion
B. Onion
C. Anion
D. Cation
E. None of the above are correct

34. When one atom gives its electron to another atom because it has too many, this forms what type of bond?
A. Ionic
B. Covalent
C. Hydrogen
D. Magnetic
E. None of the above are correct
35. Why are anions and cations attracted to each other?
A. Because they are sharing electrons
B. Because they have opposite charges, like magnets
C. Because they become magnetic
D. Because one is a boy and the other a girl
E. None of the above are correct
36. Which of following is not one of the five signs that a chemical reaction has occurred?
A. Gas/smoke produced
B. Light formation
C. Precipitate formed
D. Temperature change
E. None of the above are correct
37. When two atoms share two or more electrons between them this is called a;
A. Ionic bond
B. Covalent bond
C. Hydrogen bond
D. James Bond
E. None of the above are correct
38. What does polar mean?
A. Being near Alaska
B. Having two ends, each of which carries a slightly different charge
C. Lost an electron
D. Being white and fluffy
E. None of the above are correct
39. What are the bonds between water molecules called?
A. Ionic bonds
B. Covalent bonds
C. Hydrogen bonds
D. James Bonds
E. None of the above are correct
40. Hydrogen bonds affect water's behavior; True (A) or False (B)
41. What term means that water molecules tend to stick to each other?
A. Adhesion
B. Cohesion
C. Hydrophobic
D. Stickiness
E. None of the above are correct
42. What term means that water molecules tend to stick to surfaces?
A. Adhesion
B. Cohesion
C. Hydrophobic
D. Stickiness
E. None of the above are correct
43. Cohesion is necessary for most plants to live; True (A) or False (B)
44. Why is it usually cooler at the beach than at the desert in the summer?
A. Because there is more water near a beach than in a desert
B. Because a desert is more north than is a beach
C. Because there is more sand in a desert than at a beach
D. Because there are more clouds in a desert than at a beach
E. None of the above are correct
45. What do water molecules do when they evaporate?
A. Take heat energy with them
B. Go from a liquid to a gas
C. Cool the liquid or surface
D. All of the above are correct
E. None of the above are correct
46. Why does ice float (answer using the figures)?
A. Because the ice is more dense than is liquid water
B. Because the water molecules in ice separate making it less dense than liquid water
C. Heavier things tend to float
D. All solids float in their corresponding liquid forms
E. None of the above are correct
47. What animals could not survive the winter if ice became denser than water when it solidified?
A. Humans
B. Aquatic animals
C. Whales
D. Bears
E. None of the above are correct
48. What is the term for the fact that water can dissolve a very large number of different types of solutes?
A. Hydration
B. Dehydration
C. Universal solvent
D. Universal solute
E. None of the above are correct
49. What are chemicals that release H⁺ ions when mixed with water
A. Acids
B. Bases
C. Buffers
D. Ions
E. None of the above are correct
50. Lemon juice, grapefruit juice and vinegar are all _____
A. Acids
B. Bases
C. Buffers
D. Ions
E. None of the above are correct

51. What are chemicals that absorb H^+ ions or release OH^- ions into solution when mixed with water?
- Acids
 - Bases
 - Buffers
 - Ions
 - None of the above are correct
52. What are some examples of bases?
- Lemon juice
 - Lye
 - Oranges
 - Stomach juice
 - None of the above are correct
53. What is a mixture of two or more chemicals in a liquid state?
- Solvent
 - Solute
 - Solution
 - Element
 - None of the above are correct
54. What is a measure of the acidity or basicity of a solution?
- Alkaline
 - Ph
 - pH
 - toxicity
 - None of the above are correct
55. What are substances that resist changes in pH?
- Acids
 - Bases
 - Buffers
 - Ions
 - None of the above are correct
56. What do buffers do in the presence of acids and in bases?
- Absorb or release hydrogen ions
 - Nothing
 - A jig
 - Turn into water
 - None of the above are correct
57. Why do you have buffers in your blood?
- To help your blood remain constant pH
 - To help your blood remain very acidic
 - To help you blood remain very basic
 - No reason, just for looks
 - None of the above are correct

Essays;

- Using the images in the notes, what are some of water's life supporting properties and what causes these properties to exist?
- What is the "Happy Family" rule and how is it used?
- Explain the difference between an ionic bond and a covalent bond in terms of what happens to the electrons in the out shell of the participating atoms.
- What causes the polarity of water and the behavior of ice?
- What are the five signs of a chemical reaction? Which of these is seen in a fire? Which is not?