

**1. What is the total number of protons and neutrons in a “normal” atom of potassium?**

**39- The total number of protons and neutrons is the mass number on the periodic table.**

Extensions:

- The mass number is the number of protons and neutrons.
- The atomic number (smaller of the two numbers) is the number of protons
- The number of protons can not change without a change in identity.
- The number of electrons is equal to the number of protons if the atom is not charged.

**2. List the numbers of protons, neutrons and electrons will you expect to find in an atom of Boron.**

**p = 5 this is the atomic number**

**n = 6 11 - 5**

**e = 5 the number of electrons is the same as the number of protons in a neutral atom.**

Extensions

- Know how to use the two numbers in each square on the periodic table to find these answers for any atom.

**3. Compare the mass of a proton to that of a neutron. Compare the mass of an electron to the mass of a proton.**

**Protons and neutrons have equal mass. The electron is VERY small compared to the mass of the proton**

Extensions

- Know that protons and neutrons have a mass of 1 amu each, while an electron has a mass of 0 amu.
- Also know charges. Protons are +1, neutrons are 0 and electrons are -1.

**4. What sublevels are in the outer shell of phosphorus? How many electrons are in the outer shell of phosphorus?**

- **s and p**                      **There are 5 valence electrons in P.**

Extensions

- Know how to write an electron configuration for any atom
- Know what sublevels are in the outer shell (either s only, or s and p. NEVER d)

**5. Where are the protons, neutrons and electrons located within the atom?**

**Protons and neutrons are in the nucleus and the electrons are in energy levels around the nucleus.**

Extensions

- Know that energy levels are divided into sublevels. The sublevels are divided into orbitals.

**6. If sulfur and oxygen bond, which atom will the electrons migrate to? Why?**

**The electrons move toward the more electronegative atom.**

Extensions

- Know the periodic trends with respect to atomic radius, ionization energy, activity and electronegativity.

**7. Which of the following types of compounds are formed by sharing electrons?**

**a. metal and nonmetal                      b. two or more nonmetals.**

**B**

Extensions

- Ionic bond = transfer of electrons from one atom to another. FORMED BETWEEN METALS AND NONMETALS
- Covalent bond = sharing electrons between atoms. FORMED BETWEEN NONMETALS.

**8. When elements having the following electron configurations react, the formula is:  
 $1s^2 2s^2$  (element X) and  $1s^2 2s^2 2p^5$  (element Y)**

**$XY_2$**

Extensions

- Know how to determine valence electrons from electron configuration
- Know that 4 or less valence electrons will create a positive oxidation state.
- Know that 5 or more valence electrons will create a negative oxidation state.
- Know how to write a chemical formula after you know the charges.

**9. In each case, which of the following has the highest ionization energy?**

**H, Li, Na, K**

**Mg, P, Cl, Ar**

**Case 1 --- hydrogen --- it is the smallest, so it holds its electrons the tightest**

**Case 2 --- Argon ---- it is the smallest so it holds its electrons the tightest**

Extensions

Know the definitions of ionization energy, and electronegativity, as well as the trends.

**10. In each case, which of the following is more metallic?**

**Al or S**

**S or O**

**Al and S**

Extensions

- Bigger atoms are more metallic—and smaller atoms are more nonmetallic.

11. Where are the alkali metals, noble gases, halogens, alkaline earth metals, transition metals?

s<sup>1</sup>                      p<sup>6</sup>                      p<sup>5</sup>                      s<sup>2</sup>                      d block

12. What sublevel is partially full in the transition metals of the 4<sup>th</sup> period?

3 d

Extensions

- remember that the d block within a period is one energy level lower than the period.
- Know that series and periods are horizontal and families and groups are vertical

13. How many electrons are in the outer shell of each family on the periodic table? Draw a dot diagram for nitrogen.

1,2,2,2,2,2,2,2,2,2,2,2,3,4,5,6,7,8                      N surrounded by 5 dots

Extensions

- The dot diagram includes only the valence electrons.

14. Hydrogen reacts with oxygen to make water. How many molecules of water can form from 15 molecules of oxygen?

**30** In the balanced equation, 2 hydrogen molecules and 1 oxygen molecule combine to make 2 molecules of water. So, 15 molecules of oxygen will make 30 molecules of water.

Extensions

- Balanced chemical equations tell us relationships between the numbers of particles.

15. Where are the most active metals on the periodic table? The most active non metals?

Metals – lower left                      Non metals -- upper right

16. If carbon changed into oxygen in a nuclear reaction, what would happen to the number of protons during the change?

**The number of protons increases by two.**

Extension

- The number of protons determines IDENTITY of an element. If the number of protons changes, the identity changes.

17. What is a homogeneous mixture? What does (aq) mean when written in a chemical equation?

**A solution. aq means dissolved in water.**

Extension

- Know the states of matter and their symbols. (s, l, g, aq)

**18. Do big atoms, or small atoms tend to have high ionization energies?**

**SMALL. Small atoms hold their electrons tighter.**

**19. What are isotopes?**

**Atoms of the same element that contain different number of neutrons.**

Extension

- This means their masses will be different.

**20. What is an “excited” electron?**

**An electron that has moved away from the nucleus.**

Extension

- When the electron returns to its ground state it gives off light. ---- for example, the flame test lab.

**21. When potassium becomes an ion, what noble gas has a matching electron configuration?**

**Argon**

Extension

- Atoms that lose electrons (4 or less valence electrons) become like the noble gas in the previous row.
- Atoms that gain electrons become like the noble gas at the end of their row.

**22. What are the periodic trends with respect to ionization energy, electronegativity, activity and atomic radius?**

**Ionization energy increases within a period and decreases within a family.**

**Electronegativity increases within a period and decreases within a family.**

**Atomic radius decreases within a period and increases within a family.**

**Activity is greatest in the lower left corner and upper right corner (F)**

**23. What part of the periodic table tends to contain ions that are colored?**

**Transition metals (d block)**

**24. Differentiate between elements, mixtures and compounds.**

**Element --- one identity, made of one kind of atom**

**Compound --- one identity, made of two or more kinds of atoms chemically combined**

**Mixture ---- multiple identities.**

**25. Differentiate between colloids, suspensions and colloids in terms of particle size and Tyndall effect.**

**Suspension: Biggest particles, they fall out on standing. Tyndall Effect occurs.**

**Colloid: Intermediate particles, they do not fall out on standing. Tyndall Effect occurs.**

**Solution: Smallest particles. Never fall out. No Tyndall effect.**

**The Tyndall effect is the scattering of a light beam that passes through, like fog in headlights of a car.**

**26. What is the ratio of lithium to oxygen atoms in lithium oxide?**

**2:1 The formula is  $\text{Li}_2\text{O}$**

Extension:

When expressing ratios, write the formulas first and then express the number of atoms of the first element relative to the number of atoms of the second element.

**27. What is the charge of cobalt in  $\text{Co}_3(\text{PO}_4)_2$ ?**

**+2 Each phosphate has a negative three charge  
There are two phosphates, so the total negative charge is six.  
The total positive charge has to be six.  
There are three cobalt atoms, so each one has to be +2**

**28. Differentiate between reactants and products in a chemical reaction.**

**Reactants are on the left side of the arrow and products are on the right side.**

Extension

- Know how to balance an equation.
- The total number of atoms of each element must be the same on both sides of the arrow.

**29. Differentiate between endothermic and exothermic.**

**Endothermic means energy is going IN. The container gets COLD**

**Exothermic means energy is going OUT. The container gets HOT**

**30. Which reaction type has a single element reacting with a compound?**

**Single Replacement**

Extension

- Understand the 5 basic types of reactions.

**31. What does “aqueous” mean?**

**Dissolved in water.**

Extension

- aqueous means “solution” which means “homogeneous mixture”

**32. Which reaction type involves a compound reacting with a compound?**

**Double replacement, and a few specialized cases of synthesis. Synthesis reactions that fit this criteria would create the same substances that you began with if you treat them as double replacement.**

**33. Which reaction type involves the formation of a single product?**

**Synthesis**

**34. What is the law of conservation of mass? How does it relate to chemical reactions?**

**Matter is not created or destroyed in chemical or physical changes.  
Chemical reactions must be balanced in order to obey the law of conservation of matter.**

**35. How do liters, cubic decimeters, cubic centimeters and milliliters relate to each other?**

**liters and cubic decimeters are the same thing.  
cubic centimeters and milliliters are the same thing.**

Extension

• Know the metric prefixes---- kilo, deci centi, milli

**36. Convert 20 inches per hour to cm per minute.**

**20 in/hr x 2.54 cm/in x 1 hr/60 min**

**37. Which has more volume: a ton of lead or a ton of feathers?**

**A ton of feathers**

Extension

• Know how to calculate density. ( $D = M/V$ )

**38. A marble is dropped into a cylinder that has 35 milliliters of water in it. The volume raises to 38 ml. What was the volume of the marble?**

**3 ml. The difference in volume must have been the volume of the marble.**

Extension

• Understand how to calculate volume by formula or by water displacement.

**39. If the mass of the marble is 30 grams, what is its density?**

**10 g/ml Know the formula for density.**

40. What element is the standard of mass for the periodic table?

Carbon 12. All masses on the periodic table are relative to Carbon 12. (like the “people mass units” we developed in class)

41. Which is heavier, a mole of copper, a mole of water or a mole of lead?

Cu = 63.5 g      water = 18 g      Pb = 207 grams.    Answer----Pb

42. Change 15 grams of sodium hydroxide to moles.

15 grams NaOH x 1 mole NaOH/40 grams NaOH = .375 moles NaOH

43. Change  $2.4 \times 10^{25}$  molecules of water to grams.

$2.4 \times 10^{25}$  molecules x 1 mole /  $6.02 \times 10^{23}$  molecules x 18 grams water/ mole water = 718 grams

Extension

- note that this was a two step problem, while number 42 was a one step problem

Put a copy of the “mole map” on your “cheat sheet.”

44. What is the percentage of iron in iron(III) oxide?

Percentages are determined by dividing the “part” by the “whole.” The total mass of the compound is 160 amu. The mass of the 2 iron atoms is 112.  $112 / 160 = .70 \times 100 = 70\%$

45. What is the percentage of carbon in lead (IV) acetate?

The total mass of the compound is 443 amu. The mass of the Carbon is 96. So, the percentage of compound that is carbon is  $(96/443) \times 100$ .