Honors Chemistry Final Study Guide Answers

1. What are the branches of chem?

A. organic – study of chemicals containing carbon

B. inorganic – study of chemicals that do not contain carbon (usually nonliving)

C. biochemistry- study of processes that take place in organisms (muscle contraction, digestion)

D. analytical- study of composition of matter

E. physical- study of mechanisms, the rate of energy transfer when matter undergoes a change

2. Pure vs applied chem

Pure chem is when you pursuit chemical knowledge for its own sake and applied is when the research is directed towards a practical goal

3. Observation vs inference

Observation is when you use your senses to obtain info and an inference is an idea or conclusion that is drawn from evidence, data and observations (educated guess)

4. What are the steps of the scientific method?

1. Form hypothesis

2. Perform experiment

3. Observe and record data

4. Analyze

5. What is a controlled experiment?

When both the control group and the variable are kept under similar variables or conditions

6. Independent (manipulated) vs dependent (responding) variable

The independent variable is the variable that you can change and the dependent variable responds to the independent variable

7. Hypothesis 🡪 Theory 🡪 Law

Hypothesis is an educated guess drawn from observations which can turn into a theory which is a well-tested explanation for a broad set of observations which can then turn into a scientific law which is a concise statement that summarizes the result of many observations and experiments

8. What is ACE \*hint it is a problem solving method

1. Analyze – identify what you know from the problem and what you need to find out

2. Calculate – ex. Include converting a measurement or equation

3. Evaluate – Does your answer make sense?

9. Accuracy vs. Precision

Accuracy is the measurement of how close a measurement comes to the actual volume and precision is a measure of how close a series of measurements are to one another

10. What is the equation for percent error?



11. How do you find density?

D=m/v m=mass v= volume

12. What are the physical properties of matter?

Color, melting point, size, texture, density

13. Elements vs Compounds

Elements- basic building block of matter, can’t be decomposed, ex hydrogen and calcium Compounds- contains 2 or more elements ex CO2 OR H2O

14. What is a chemical reaction and what are the signs of one?

A process that creates a new substance and some signs are burning, rusting, change in temp, color change, gas formation, precipitate

15. What is the history of the atom including the discovery?

Democritus a Greek philosopher believed that atoms were invisible and indestructible and John Dalton an English chemist and teacher transformed Democritus’ idea and turned it into his Atomic Theory which is:

1) All matter is made of **atoms**. **Atoms** are indivisible and indestructible.

2) All **atoms** of a given element are identical in mass and properties.

3) Compounds are formed by a combination of two or more different kinds of **atoms**.

16. Info and discovery of subatomic particles – protons, neutrons and electrons

Electrons: negatively charged, discovered by J.J Thompson in 1897, as a result of one of his experiments in which created a glowing beam called a cathode ray

Protons: positively charged

Neutrons: neutral charge, same size as proton

17. What is the atomic number?

# of protons in the nucleus, proton # = electron #

18. What is mass number?

Total # of protons and neutrons

\*To find number of neutrons: mass #- atomic #

19. What is atomic mass?

The mass of an atom of a chemical element expressed in atomic mass units. It is approximately equivalent to the number of protons and neutrons in the atom (the mass number)

20. What are isotopes?

Atoms that have the same # of protons but different # of neutrons

21. What are ions?

An atom or molecule with a net electric charge due to the loss or gain of one or more electrons.

22. What is the periodic law?

**Law** stating that many of the physical and chemical properties of the elements tend to recur in a systematic manner with increasing atomic number.

23. What is the history of the periodic table?

In 1869 Russian chemist Dimitri Mendeleev started the development of the **periodic table**, arranging chemical elements by atomic mass. He predicted the discovery of other elements, and left spaces open in his **periodic table** for them.

24. What is a metal?

**Metals** are conductors of electricity, have crystalline solids with a metallic luster and have a high **chemical** reactivity.

25. What is a nonmetal?

Is a **chemical** element that mostly lacks metallic attributes, opposite of a metal

26. What is a metalloid?

Has characteristics of metals and nonmetals, a combination of a metal and nonmetal

27. What is a family and period in a periodic table?

Family: A vertical column in the periodic table

Period: Horizontal Row

28. What is the atomic radius?

Measure of the size of its **atoms**

29. What is an anion?

Negatively charged ion

30. What is a cation?

Positively charged ion

31. What are valence electrons?

Electrons in the outer most shell

32. What is the octet rule?

The **octet rule** is a chemical **rule** of thumb that states that atoms of main-group elements tend to combine in such a way that each atom has eight electrons in its valence shell, giving it the same electronic configuration as a noble gas. The main goal is to get 8 valence electrons in the outer most shell.

33. What is a chemical equation and what does it represent?

Fe + O2 🡪 Fe2O3 – It represents a chemical reaction

34. Explain the types of chemical reactions and other information about them? \*Hint there are 5

Combination: A + B 🡪 AB – 2 elements as reactants and they form a compound

Decomposition: AB 🡪 A + B – single compound that breaks into 2 simpler compounds

Single Replacement: A + BC🡪 AC + B – 1 element replaces a second element in a compound

Double Replacement: AB + CD 🡪 AD + BC – exchange of positive ions, aqueous solutions, produce a precipitate typically

Combustion: Oxygen must be a reactant, other reactant must be a hydrocarbon

35. What is a complete ionic equation?

An equation that shows dissolved ionic compounds as disassociated free ions

36. What is the mole?

Specified # of particles –

37. What is Avogadro’s number?

6.022 x 10^23

28. How to find molar mass?

Same as atomic mass

Mole Equations:

Particles 🡪 Moles: particles x 1 mole/ 6.022 x 10^23

Mass 🡪 Moles: moles x mass/1mole

Calculating Volume: moles of gas x 22.4 L/ 1 mole