Name _____ Period _____ Date _____ ①

Chemistry 1 – Final Study Guide

1. **Characteristics of solids, liquids, gases**

	Shape	Volume
Solid	ridgid	smallest
Liquid	fluid (fills shape of container)	a little bigger than
Gas	no shape fill) container.	expands to fill container

2. **How does kinetic molecular theory relate to states of matter**

	Motion	Kinetic Energy
Solid	vibrational (low)	low
Liquid	vibrational & next to eachother (med)	med
Gas	all over the place (high)	high

3. **Explain states of matter as it relates to kinetic energy. Describe the change in energy and the particle motion as an ice cube is heated to boiling water.**

Boiling Water → Liquid Water → Frozen Water – Ice

his energy
high/fast
motion

lower
energy
med
motion

the lowest
energy
low
motion, only vibrational.

4. **Gas Laws**

	Equation	What does it mean?
Boyle's Law	$P_1 V_1 = P_2 V_2$	P↑ then V↓ if all else is constant
Charles' Law	$\dfrac{V_1}{T_1} = \dfrac{V_2}{T_2}$	V↑ then T↑ if all else is constant.

5. **Gas Law Word Problems**

The temperature of a gas is 20°C. What is the temperature in Kelvin (K)?

$$K = °C + 273$$

$$273 + 20°C = \boxed{293 \text{ K}}$$

The temperature of a flexible 2.5 Liter container of hydrogen gas is increased from 100 K to 200 K. What is the new volume?

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \qquad \frac{2.5L}{100K} = \frac{V_2}{200K} \qquad V_2 = \frac{(200K)(2.5L)}{100K} \quad \boxed{= 5L}$$

The pressure of a 4 Liter sample of gas is 3 atm. What is the pressure of the gas if the volume is increased to 8 Liters?

$$P_1 V_1 = P_2 V_2 \qquad (3 \text{ atm})(4L) = P_2 (8L)$$

$$P_2 = \frac{(3 \text{ atm})(4L)}{(8L)} = \boxed{1.5 \text{ atm}}$$

6. **Kinetic Molecular Theory** explains relationships between pressure, temperature, and volume

	Pressure	Temperature	Volume
Pressure ↑	—	↑	↓
Temperature ↑	↑	—	↑
Volume ↑	↓	↑	—

7. **History of structure**

Democritus	Dalton	Thomson	Rutherford	Bohr
atoms	Solid Sphere	Plum Pudding	Nuclear	Solar System

8. **Particles of an atom**

	Location	Mass	Charge
Protons	nucleus	1	+1
Neutrons	nucleus	1	0
Electrons	outside nucleus	0	−1

Subatomic particles in an atom

Element	Atomic Number	Protons	Neutrons	Electrons	Atomic Mass	Charge
Magnesium	12	12	14	10	26	+2
Nitrogen	7	7	10	10	17	−3

9. Isotopes and ions – Definitions and Examples

Isotope atoms of the same element w/ different #s of neutrons.

Ion atom that has gained or lost electrons and has a charge.

10. Isotope Notation

$$^{42}_{20}\text{Ca}^{+2}$$

How many Protons?	20
How many Neutrons?	12
How many electrons?	18
What is the mass?	42
What is the charge?	+2

11. Parts of a periodic table

Family	Location	Properties	Elements
Alkali Metals	Gp.1	+1 ions highly reactive	Li, Na, K . . .
Alkaline Earth Metals	Gp.2	+2 ions	Be, Mg, Ca . . .
Transition Metals	Middle chunk	Can have multiple charges metallic . .	Co, Fe, Cu, Ag . . . .
Halogens	Gp.7	−1 ions -highly reactive.	Cl, I, Br . .

Family	Location	Properties	Elements
Noble Gases	grp. 8	non reactive	Ne, Ar...
Metals	↙	conduct (+) ions electricity, mostly solid	Zn, Al, Na...
Non-Metals	↘	form (-) ions not conductive	C, O, N ...
Metalloids	on the zig zag	(semi conductors	B, Si, As .

12. Trends in periodic table

Property	Trend	Description
Electronegativity	increase towards F	atoms desire for electrons.
Atomic Radius	increase towards Fr	radius of atom.
Ionization Potential	increases toward F	amount of energy to take away an e-

13. Nuclear reactions and chemical reactions

Chemical Reaction	Nuclear Reaction
Reaction involves electrons	involves nucleus
Involves moderate to low levels of energy	high energy
Elements do not change	Elements change.

14. Types of Radiation

	Characteristics	How is it stopped
Alpha	releases α particle ($_2^4 He$)	
Beta	releases β particle (e^- from nucleus) (loose 1 n^o & gain 1 p^+)	
Gamma	just energy	

15. Half life

Definition – the time it takes for ½ of a sample to decay.

If a 40 kg sample of Carbon-14 is allowed to decay for 3 half lives, how much is left if the half life of carbon-14 is 10 days?

$40 kg \xrightarrow{\frac{1}{2} life} 20 kg \xrightarrow{\frac{1}{2} life} 10 kg \xrightarrow{\frac{1}{2} life} 5 kg$

⟨ 5 kg ⟩

How many days are there in three half lives of Carbon-14

3(10) = 30 days.

16. Valence electrons

Definition – electrons in the outer shell/ring of an atom.

How do you determine the number of valence electrons?

corosponds to grp # on P.T. or make a Bohr Model.

17. Charge

Element (Symbol)	Protons	Electrons	How Many Gained or Lost	Charge	Ion Name
Oxygen	8	10	Gain 2	−2	Oxide
Aluminum (Al)	13	10	lost 3	+3	Aluminum
Fluorine	9	10	gained 1	−1	Fluoride
Lithium (Li)	3	2	lost 1	+1	Lithium

18. Balance a molecule - Write the balanced molecular formula and the name.

What method do you use?

	Oxygen	Nitrogen	Fluoride
Lithium	Li^+ O^{2-} Li_2O	Li^+ N^{3-} $1 Li_3 N$	Li^+ F^- LiF
Boron	B^{3+} O_2^- B_2O_3	B^{3+} N^{3-} BN	B^{3+} F^- BF_3
Calcium	Ca^{2+} O^{2-} CaO	Ca^{2+} N^{3-} Ca_3N_2	Ca^{2+} F^- CaF_2