

Chemistry Common Assessment #2 Study Guide

Name: KEY

- Atomic # is equal the number of protons in an atom. It is found at the top of the periodic squares.
- Atomic mass ^{Arg.} is the average mass of all the isotopes for an element. It's found at the bottom of the squares.
- Mass # is the sum of the protons and neutrons of an atom.
- isotope are forms of the same element, but different numbers of neutrons.
- ions are atoms that have gained or lost electrons.
- families groups Vertical columns on the periodic table. All elements in these columns have similar properties.
- periods Horizontal rows on the periodic table. All elements in these rows have same # of energy levels.
- oxidation # the number of electrons gained or lost in order to become stable
- valence is the term for the outermost electrons of an atom.
- ionic type of bonding where electrons are transferred. Formed between a metal and nonmetal.
- Covalent type of bonding where electrons are shared. Formed between two nonmetals.
- metals are to the left of the staircase and have + oxidation #'s, this means they lose electrons.
- Nonmetals are to the right of the staircase and have - oxidation #'s, this means they gain electrons.
- Metalloids are the elements that touch the staircase. They have properties of both metals and nonmetals.
- ∅ the sum of the oxidation numbers in an ionic bond. ex: CaF_2
 $(+2) + 2(-1) = \emptyset$

Fill in the following chart

NAME	SYMBOL	ATOMIC #	MASS #	PROTONS	ELECTRONS	NEUTRONS	CHARGE
Nickel-59	$^{59}_{28}Ni$	28	59	28	28	31	0
Strontium-88	$^{88}_{38}Sr^{-2}$	38	88	38	40	50	-2
Phosphorous-33	$^{33}_{15}P^{-3}$	15	33	15	18	18	-3
Sulfur-33	$^{33}_{16}S^{-2}$	16	33	16	18	17	-2
Manganese-56	$^{56}_{25}Mn^{+1}$	25	56	25	24	31	+1
Molybdenum-92	$^{92}_{42}Mo^{+2}$	42	92	42	40	50	+2

- The amount of energy it takes to remove a valence electron is called ionization Energy.
- The tendency for the nucleus of one atom to attract electrons of another atom into a chemical bond is electronegativity
- The size of an atom is referred to as it's atomic radius.
- Why is the electronegativity of bromine more than gallium? It has more nuclear pull.
- Why is the ionization energy of potassium much lower than that of iron? It has one valence electron and it has less nuclear pull.

22. Rank Sodium, Lithium and Potassium from lowest to highest electronegativity: K, Na, Li

23. Rank Sulfur, Phosphorus, and Chlorine from smallest to largest in size: Cl, S, P

24. Rank Silicon, Carbon, and Tin from lowest to highest ionization energy: Sn, Si, C

25. Which element from the Halogen family would have the greatest shielding effect? Why?

Astatine (At) because it has the most energy levels

26. Explain the process of light emission. When an electron falls from a higher to lower energy level, light is released as a photon of energy

27. What are the relationships between wavelength, frequency, and energy of a wave?

$\uparrow \lambda \quad \downarrow f \quad \downarrow E \quad \therefore$ Longer wavelengths have shorter frequency which have less energy.

28. Which element is represented by the following electron configurations?

A) $1s^2 2s^2 2p^6 3s^2 3p^1$ Aluminum

B) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{14} 5d^{10} 6p^6 7s^2 5f^6$ Americium

C) $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$ Copper

29. Write the complete configuration for the following:

A) Silver $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^9$

B) Antimony $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^3$

C) Phosphorous $1s^2 2s^2 2p^6 3s^2 3p^3$

30. Write the noble gas configuration (shorthand configuration) for the following elements:

A) Magnesium $[\text{Ne}] 3s^2$

B) Bromine $[\text{Ar}] 4s^2 3d^{10} 4p^5$

C) Gold $[\text{Xe}] 6s^2 4f^{14} 5d^9$

31. (HONORS ONLY) Calculate the wavelength of red light with a frequency = 450 Hz.

$$\lambda = \frac{c}{\nu} \quad \lambda = \frac{3.0 \times 10^8 \frac{\text{m}}{\text{s}}}{450 \text{ s}^{-1}} \quad \lambda = 6.67 \times 10^5 \text{ m}$$

32. (HONORS ONLY) An element emits a spectral line with a wavelength of $5.18 \times 10^{-7} \text{ m}$. Determine the frequency of the wave.

$$\nu = \frac{c}{\lambda} \quad \nu = \frac{3.0 \times 10^8 \frac{\text{m}}{\text{s}}}{5.18 \times 10^{-7} \text{ m}} \quad \nu = 5.79 \times 10^{14} \text{ s}^{-1}$$

33. (HONORS ONLY) Determine the energy of the wave in question 32.

$$E = h\nu \quad E = (6.626 \times 10^{-34} \text{ J}\cdot\text{s})(5.79 \times 10^{14} \text{ s}^{-1}) \quad E = 3.84 \times 10^{-19} \text{ J}$$

34. Identify if the diagram or configuration is incorrect. If it is incorrect, explain why. If it is correct, identify the element.

a. $\uparrow\downarrow \quad \uparrow\downarrow \quad \uparrow\downarrow \quad _ _$ violation of Hund's Rule
1s 2s 2p

b. $\uparrow\downarrow \quad \uparrow\downarrow \quad \uparrow\downarrow \uparrow\downarrow \uparrow\downarrow \quad \uparrow\uparrow \quad \uparrow\downarrow \uparrow\downarrow \uparrow$ violation of Pauli Exclusion Principle
1s 2s 2p 3s 3p

c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$ Barium

d. $[\text{Xe}] 5s^2 4d^{10} 5p^4$ violation of Noble Gas. Should be $[\text{Kr}]$

e. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^5$ violation of Aufbau Principle

35. Name the following compounds:

A) $\text{CaBr}_2 =$ calcium bromide

B) $\text{NiP} =$ Nickel (III) phosphide

C) $\text{N}_3\text{O}_7 =$ trinitrogen hepta oxide

D) $\text{AlF}_3 =$ aluminum fluoride

E) $\text{H}_2\text{S} =$ hydrosulfuric acid

F) $\text{CuBr}_2 =$ Copper (II) bromide

G) $\text{KNO}_3 =$ potassium Nitrate

H) $\text{CCl}_4 =$ carbon tetrachloride

I) $\text{S}_2\text{F}_3 =$ disulfur trifluoride

J) $\text{H}_2\text{SO}_4 =$ Sulfuric acid

K) $\text{ZnI}_3 =$ Zinc (III) iodide

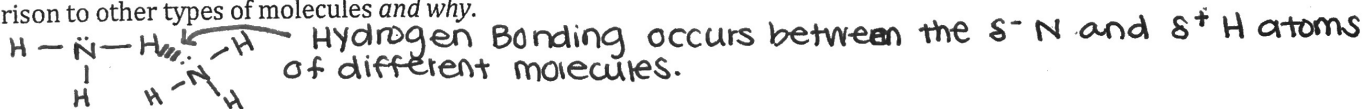
L) $\text{H}_3\text{PO}_3 =$ phosphorous acid

36. Write the correct formulas for the following compounds:

- A) Lithium Sulfite = Li_2SO_3 B) Iron (II) Phosphide = Fe_3P_2 C) Tetrasulfur Pentafluoride = S_4F_5
 D) Phosphoric Acid = H_3PO_4 E) Barium Nitride = Ba_3N_2 F) Hydronitric Acid = H_3N
 G) Copper (III) Iodide = CuI_3 H) Aluminum Phosphate = AlPO_4 I) Calcium Oxide = CaO
 J) Barium Oxide = BaO K) Gallium Hydroxide = $\text{Ga}(\text{OH})_3$ L) Silicon Heptabromide = SiBr_7

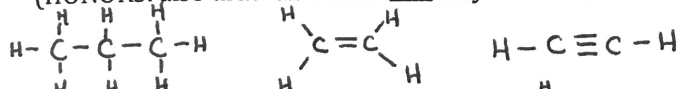
Chemical Formula	Lewis Dot Structure	Polar or Nonpolar Bonds	Polar or Nonpolar molecule	VSEPR Shape and bond angle	(HONORS) Strongest Intermolecular Force Present
37. CO_2	$\text{:}\ddot{\text{O}}=\text{C}=\ddot{\text{O}}\text{:}$	Polar	Nonpolar	Linear 180°	London Dispersion
38. NF_3	$\begin{array}{c} \text{:}\ddot{\text{F}}-\ddot{\text{N}}-\ddot{\text{F}}\text{:} \\ \\ \text{:}\ddot{\text{F}}\text{:} \end{array}$	Polar	Polar	Trigonal Pyramidal 107.3°	Dipole-Dipole
39. SiF_2	$\begin{array}{c} \text{:}\ddot{\text{Si}}\text{:} \\ \diagup \quad \diagdown \\ \text{:}\ddot{\text{F}}\text{:} \quad \text{:}\ddot{\text{F}}\text{:} \end{array}$	Polar	Polar	Bent 104.5°	Dipole-Dipole
40. CBr_4	$\begin{array}{c} \text{:}\ddot{\text{Br}}\text{:} \\ \\ \text{:}\ddot{\text{Br}}-\text{C}-\ddot{\text{Br}}\text{:} \\ \\ \text{:}\ddot{\text{Br}}\text{:} \end{array}$	Nonpolar	Nonpolar	tetrahedral 109.5°	London Dispersion

41. Explain which intermolecular force would act between molecules of NH_3 and draw a picture to support your answer. State whether you would expect this compound to have a relatively low or relatively high boiling point in comparison to other types of molecules *and why*.

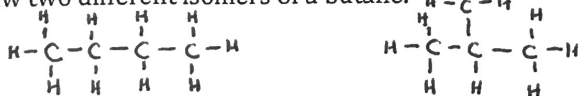


42. Draw one alkane that **does not** have any isomers.

(HONORS: also draw an alkene and alkyne that do not have any isomers)



43. Draw two different isomers of a butane.



44. What is the purpose of orbital hybridization?

To make more electrons available for bonding.

45. What is a polymer and what are at least 3 uses for polymers? What is the major disadvantage of a polymer?

A polymer is a chain of monomers.

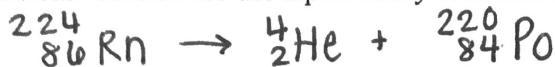
- Three uses:
 ① kevlar vests ③ sails
 ② plastic bottles

Disadvantage:
 Not biodegradable

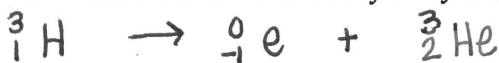
46: List all three types of radiation (including symbols) from strongest to weakest.

Gamma (γ) > beta (β) > Alpha (α)

47. Write the nuclear reaction for the alpha decay of Radon-224



48. Write the nuclear reaction for the beta decay of Hydrogen-3.



49. Carbon has a half life of 250 years. How much of a sample will be left after 500 years?

25%

50. Ac-222 has a half life of 29 hours. If you start with a 82.0 gram sample, how much remains Ac-222 after 87 hours?

$$\frac{87 \text{ hrs}}{29 \text{ hrs}} = 3 \text{ half lives} \quad 82.0 \xrightarrow[\textcircled{1}]{\div 2} 41.0 \xrightarrow[\textcircled{2}]{\div 2} 20.5 \xrightarrow[\textcircled{3}]{\div 2} \boxed{10.3 \text{ grams left}}$$

51. Where is background radiation found? List at least 5 uses for nuclear chemistry in the world.

Background Radiation:

radon emitted from soil
uv rays from the sun

① Power plants

③ Smoke detectors

⑤ cancer treatment

② submarines

④ medical imaging (MRI, CT, PET)

52. What are 3 differences between fission and fusion (i.e. atoms involved, conditions required, etc...)?

Fission

* large atoms, can be controlled, powerplants

Fusion

* small atoms, hot temps, in the

53. What does the equation $E=mc^2$ explain?

E = the amount of energy converted from the small amount of mass "lost" in a nuclear reaction due to particles traveling at the speed of light.

54. What are the 7 diatomic molecules?

BRINClHO₂ Brothers!

55. Why must we balance chemical equations?

To obey the Law of Conservation of Matter

56. The movement of ions occurs in which type(s) of chemical reactions?

Double Replacement

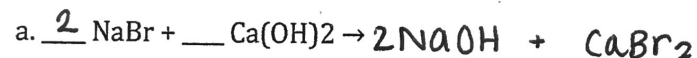
57. The movement of electrons occurs in which type(s) of chemical reactions?

Addition, Decomposition, Single Replacement, Combustion

58. The movement of protons (H^+) occurs in which type(s) of chemical reactions?

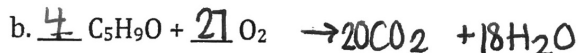
Acid-Base

59. Predict products, balance and identify the type of reaction:

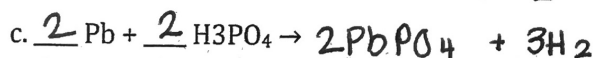


Type:

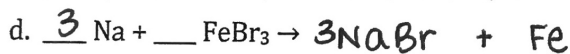
DR



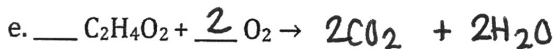
CB



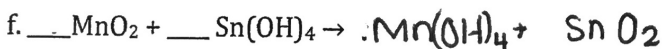
SR



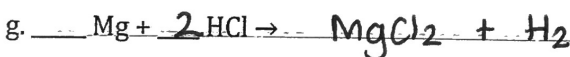
SR



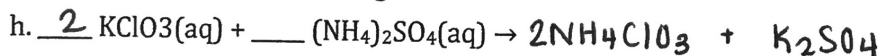
CB



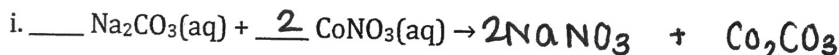
DR



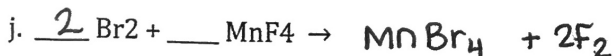
SR



DR



DR



SR

60. Predict products and determine the substance being oxidized and reduced in the following reactions:

