

Chemistry 1st Semester Study Guide L

Unit 1: Safety and Measurement

1. Solve using your calculator and correct amount of significant figures:

a. $2.01 \times 10^{25} + 2.0 \times 10^{26}$ 2.0×10^{-6} $.00000020$
 $.0000000201$

b. $2.325 \times 10^{-2} \div 2.36 \times 10^{-2}$ 0.985

c. $10.2 - 8.563$ 1.64

accuracy - how close measurements are to the true value

2. What is the density of 10 mL of a liquid that has a mass of 5 grams? Show work:

$$D = \frac{M}{V}$$

$$D = \frac{5g}{10ml}$$

$$D = 0.5g/ml$$

how close measurements are to each other

3. Using the table, tell which group was most precise. Group 2

	Group 1	Group 2
Trial 1	1.998	2.052
Trial 2	2.020	2.054
Trial 3	2.051	2.053

4. If you walk 13 kilometers to the store how many meters do you walk?

Show your work: K H Da b d c m x x M

$$13_{km} = 13,000 \text{ meters}$$

5. What is the correct scientific notation for this number? 5.62×10^{11}

6. List 3 **chemical changes** something new forms
iron rusting, copper oxidizing, wood burning, silver tarnishing

7. List 3 **physical changes**
boiling, freezing, melting, dissolving, evaporating, crystallization

8. How many particles are in 1 mole? 6.02×10^{23} particles

9. A block of steel with a volume of 20 grams and a density of 2 g/cm³ is cut into fourths. The density of one of the blocks is $2g/cm^3$?

10. Complete the following:

Dependent

Manipulated

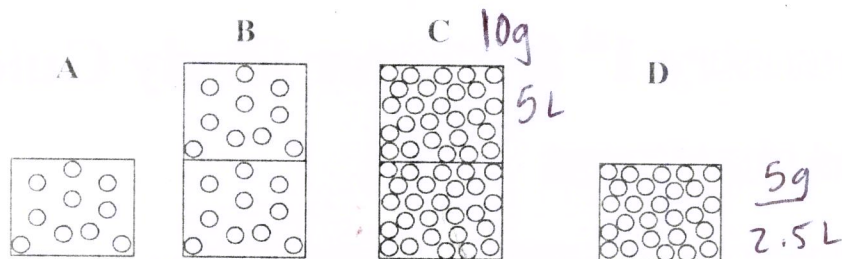
Response

Independent

Y-axis

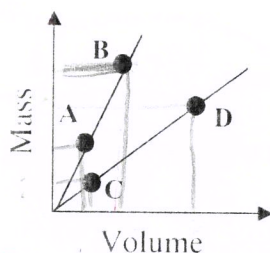
X-axis

11. The diagrams below represent objects and the particles that make up the object. Use the following choices and rank each according to mass, volume, and density:



- a. Least Mass A B D C Greatest Mass
 b. Least Volume A B D C Greatest Volume
 c. Least Density A = B D = C Greatest Density

12. Each line on the graph represents the mass vs volume relationship for 2 different substances. Using this graph rank the mass, volume, and density from least to greatest.

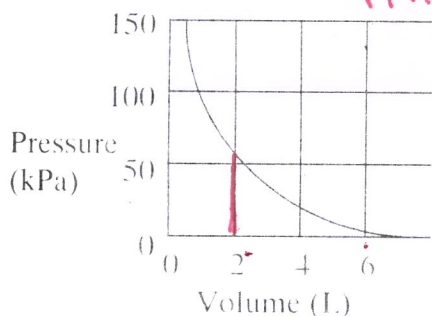


$$D = \frac{m}{V}$$

- a. Least Mass C A D B Greatest Mass
 b. Least Volume A C B D Greatest Volume
 c. Least Density C A B D Greatest Density

Unit 2: Gases

$$PV = nRT \quad P_1 V_1 = P_2 V_2 \quad \frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$



13. According to the graph, if volume is increased from 2 L to 6000 mL, the pressure (increases / decreases). (6L)

14. At what pressure does the gas in the graph have a volume of 2 L? about 75 kPa

15. A gas at 3.8×10^4 torr and 75 K is at a constant volume. If the temperature is changed to 100K, what is the new pressure?

16. Hydrogen gas was cooled from 100°C to 70°C. Its new volume is 75 L. What was its original volume, if pressure is held constant?

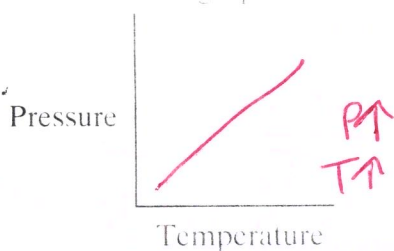
$$\frac{V_1}{313} = \frac{75}{343} \quad 343 V_1 = 21975 \quad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$V_1 = 81.6 \text{ L} \quad V_1 = 81.7 \text{ L (SIG FIGS)}$$

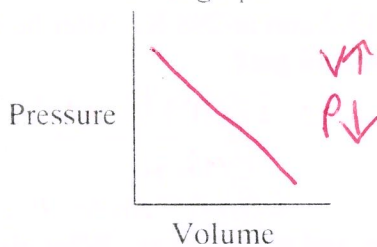
100 + 273 = 373 K
 70 + 273 = 343 K → Kelvin!!

$$\frac{V_1}{373} = \frac{75}{343} \quad 343 V_1 = 21975 \quad V_1 = 81.6 \text{ L}$$

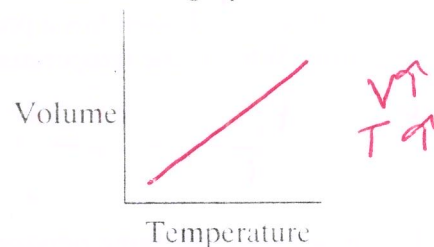
17. Draw the graph



14. Draw the graph



15. Draw the graph



16. What are four principles of the Kinetic Molecular Theory?

- constant random motion
- elastic collisions
- do not attract or repel
- kinetic energy depends on temp.

17. If the temperature of a balloon suddenly increases, the volume (**increases** / **decreases**).

18. Complete the following chart:

	Definite Shape?	Definite Volume?
Solid	YES	YES
Liquid	NO	YES
Gas	NO	NO

19. What is the Standard Temperature? 273K

20. What is the Standard Pressure? 1 atm

21. absolute zero (0 Kelvin or -273°C) is the temperature at which all particle motion ceases.

22. If a gas is at STP, 1 mole of that gas will occupy a volume of 22.4 Liters.

23. A tank filled with helium and oxygen has a total pressure of 200 atm. The partial pressure of oxygen is 20 atm. What is the partial pressure of helium?

$$\begin{aligned} \text{Total Pressure} &= P_1 + P_2 \\ 200 &= P_1 + 20 \\ \boxed{180} &= P_1 \end{aligned}$$

24. A machine requires 1 mL of gas at 2 atm. What will be the pressure of the gas if it is in a 500 L tank if the temperature is constant?

$$\begin{aligned} V_1 P_1 &= V_2 P_2 \\ 0.001 \text{ L} (2 \text{ atm}) &= 500 \text{ L } P_2 \\ \boxed{4 \times 10^{-6}} &= P_2 \end{aligned}$$

KHDabcd cm

25. A gas in an 11.2 L tank has a pressure of 13.2 atm at 298 K. After heating the tank the pressure increases to 15.2 atm. What is the temperature of the heated gas?

$$P_1 V_1 = P_2 V_2 \quad \frac{13.2 \text{ atm} (11.2 \text{ L})}{298 \text{ K}} = \frac{15.2 \text{ atm} (11.2 \text{ L})}{T_2}$$

$$147.84 \text{ atm} \cdot \text{L} / 298 \text{ K} = 170.24 / T_2 \quad T_2 = 343 \text{ K}$$

26. Two gases have the same pressure, volume, and temperature. What else is identical about the two gases?

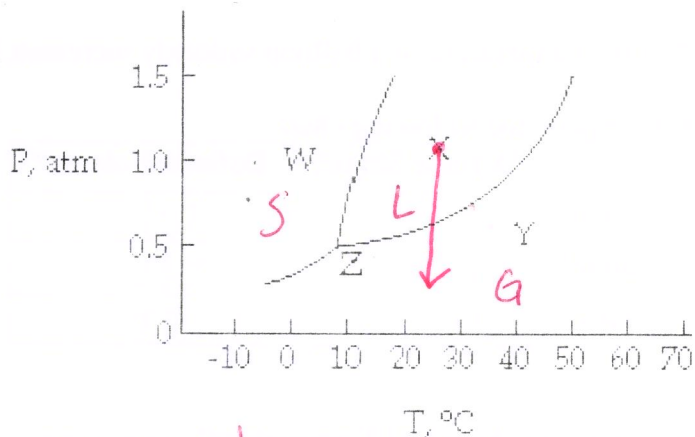
Same number of moles

27. Which gas has the greatest kinetic energy? *at higher temps, particles have greater KE*

- a. N₂ at 10°C b. N₂ at 30°C c. N₂ at 50°C

Unit 3: Phase Changes

28. What would be the new state of matter if the pressure at point X is lowered to .25 atm, but the temperature remained the same? gas



S-L or L-S / L → G or G → L

	Specific Heat (°C)	Heat of Fusion (ΔH _{fus})	Heat of Vaporization (ΔH _{vap})
Water (H ₂ O)	4.18 J/g °C	333.55 J/g	2256 J/g
Ethanol (C ₂ H ₅ OH)	2.44 J/g °C	108.99 J/g	854 J/g
Mercury (Hg)	0.140 J/g °C	11.8 J/g	272 J/g

29. How much heat is lost when freezing 10.0 grams of water?

$Q = m H_{fus}$ $Q = 10.0 \text{ g} (333.55 \text{ J/g})$

3335.5 J
3340 J sig figs

30. How much heat is transferred when 14.5 grams of mercury is melted?

$Q = m H_{fus}$ $Q = 14.5 \text{ g} (11.8 \text{ J/g})$
 $Q = 171.1 \text{ J}$

171 J

31. How much heat is required to vaporize 4.00 grams of ethanol?

$Q = m H_{vap}$ $Q = 4.00 \text{ g} (854 \text{ J/g})$
 $Q = 3416 \text{ J}$

SIG FIGS ↑
3420 J

32. How much heat is released when 33 g of solid Lead is cooled from 350°C to 122°C?

$$Q = mc\Delta T$$

$$Q = 33g(.13J/g^{\circ}C)(122-350^{\circ}C) \quad \uparrow \text{sig figs}$$

980 J

$$Q = -978.12J$$

↑ means released!

33. How much heat is needed to change 74 g of ice at -18°C to steam at 120°C?

[]

Substance	H_f (J/g)	H_v (J/g)	C_p (J/g°C)
Sodium	114.7	4256.5	1.23
Iron	266.1	2765.6	.45
Silicon	1414.2	10607.1	.71
Lead	24.7	858	.13
Silver	88	2300	.233
H ₂ O (g)	334	2260	2.02
H ₂ O (l)	334	2260	4.18
H ₂ O (s)	334	2260	2.06

35. Which substance has the highest boiling point?

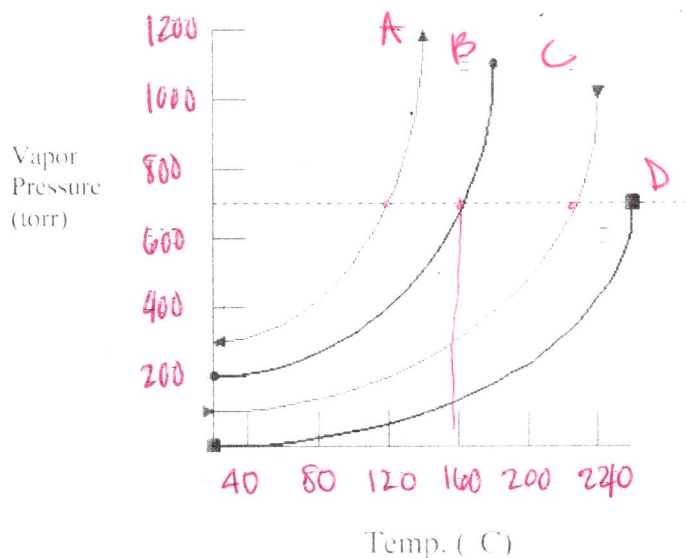
D where line intersects curve @ highest point!

36. Which substance has the strongest intermolecular forces?

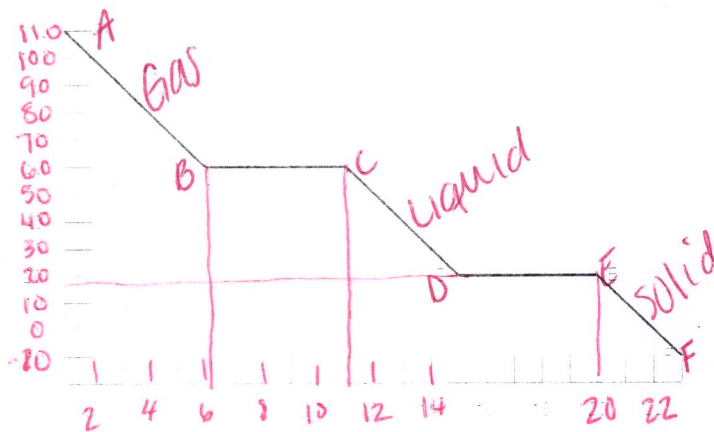
D ↑ HBP

37. If the pressure is 600 torr, what temp. would substance B boil?

160°C



Temp. (°C)



Time (minutes)

39. Where does the substance begin to melt? 20°C

40. What state of matter is in section A - B?

gas

41. What section shows heat of fusion? D-E

42. How long does it take to absorb heat of vaporization? 5.86 minutes

43. What state of matter is in section E - F? Solid

1 mol = 6.02×10^{23} particles
 1 mol = 22.4 L
 M = mol/L

Unit 4: Pure Substances and Mixtures

44. How many moles of copper (Cu) would have a mass of 150.0 grams?

$$\frac{150.0g}{63.546g} \times 1 \text{ mole} = 2.360 \text{ moles}$$

2.360 moles

45. How many atoms are in 780.32 grams of platinum (Pt)?

$$\frac{780.32g}{195.08g} \times 1 \text{ mole} \times 6.02 \times 10^{23} \text{ atoms} = 2.4080 \times 10^{24} \text{ atoms}$$

2.4080×10^{24} atoms

46. How many moles are there in 1.204×10^{23} atoms of cadmium (Cd)?

$$\frac{1.204 \times 10^{23} \text{ atoms}}{6.02 \times 10^{23} \text{ atoms}} \times 1 \text{ mole} = 0.2000 \text{ moles}$$

0.2000 moles

47. How many liters would 3.0 moles of fluorine gas (F) occupy in a closed container at STP?

$$\frac{3.0 \text{ moles}}{1 \text{ mole}} \times 22.4 \text{ L} = 67.2 \text{ L}$$

67.2 L

48. A gas canister contains NO₂ with a pressure of 0.32 atm and CO₂ with a pressure of 0.66 atm. What is the total pressure inside the canister?

Total Pressure = P₁ + P₂
 Total = 0.32 atm + 0.66 atm = 0.98 atm

0.98 atm

Calculate the molar mass of each compound.

45. C₆H₁₂O₆ = 180.156

C - 12.011 (6) = 72.066
 H - 1.008 (12) = 12.096
 O - 15.999 (6) = 95.994

72.066 + 12.096 + 95.994 = 180.156

46. Mg(SO₄)₂ = 24513.124

Mg - 24.321
 S - 32.066 (2) = 64.132
 O - 15.999 (8) = 127.992

24.321 + 64.132 + 127.992 = 24513.124

47. What is the molarity of a solution with 10.0 moles of NaCl dissolved in 2.00 L of water?

$$\text{Molarity} = \frac{\text{moles}}{\text{Liters}} = \frac{10.0 \text{ moles}}{2.0 \text{ L}} = 5.00 \text{ M}$$

5.00 M

48. How many liters are needed to prepare a 0.50 M KBr solution from 6.0 moles of KBr?

$$\text{Liters} = \frac{\text{moles}}{\text{Molarity}} = \frac{6.0 \text{ moles}}{0.50 \text{ M}} = 12.0 \text{ L}$$

12.0 L



Match the method of separation to each mixture.

49. B Flour and Cheerios
 50. A Iron filings and Sand
 51. F Fish poe and water

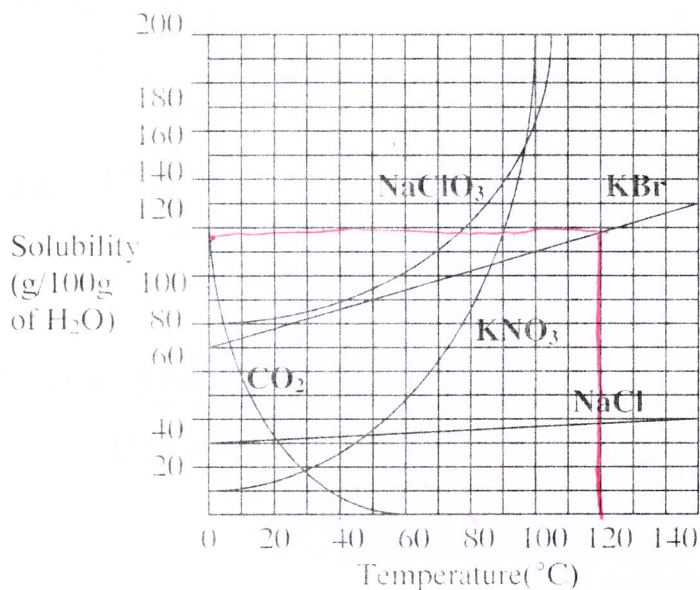
- a. magnetism
 b. sifting
 c. chromatography
 d. tweezers
 e. centrifuging
 f. filtration

Classify these examples as element, compound, or mixture.

52. Water C
 53. Silver E
 54. Oxygen E
 55. Chex mix M
 56. Salt C
 57. Granite C
 58. Salt water M
 59. 10K gold M

Classify the following as chemical or physical change.

60. rusting C
 61. alka-seltzer in water C
 62. burning paper C
 63. evaporation P
 64. cutting hair P
 65. water boiling P



66. Which substance is least soluble at 20 °C?
KNO₃
 67. How many grams of KBr will dissolve at 120 °C to make a saturated solution?
119 g
 68. Which substance is least affected by temperature?
NaCl

Unit 5: Atomic Theory Marie

69. Who discovered radioactivity? Curie

70. What did Rutherford's experiment prove? nucleus

71. What atomic theory do we believe in today? modern atomic theory

72. How is Li-7 different than Li-6? Li-7 has 1 more neutron

Mass number

73. How do you identify an element? # of protons

74. Write the isotope notation for the most common isotope of Carbon. $^{12}_6\text{C}$

75. Which isotope is most abundant: Si-28, Si-29, or Si-30? Si-28

76. What is the average atomic mass of C-12 (96.0%), C-13 (2.34%), and C-14 (1.66%)?

$$12(.960) = 11.52$$

$$13(.0234) = .3042$$

$$14(.0166) = .2324$$

$$11.52 + .3042 + .2324$$

$$\boxed{12.0516}$$

77. What is the mass number of an atom with 10 protons, 10 electrons and 11 neutrons? 21

78. The number 9 in Beryllium-9 represents the mass

79. What is an alpha (α) particle? helium atom ^4_2He

80. What is a beta particle? an electron

81. Which nuclear decay has the greatest penetration ability? gamma

82. How much of a sample of a radioactive element will remain after 4 half-lives?

$$1 - 1/2$$

$$2 - 1/4$$

$$3 - 1/8$$

$$4 - 1/16$$

$$\boxed{1/16}$$

83. The half-life of radium-222 is 38 seconds. If you had a 32 gram sample, how much would be left after 114 seconds?

3 half lives

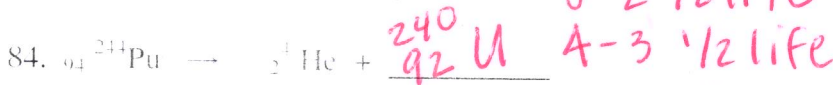
32

16 - 1 1/2 life

8 - 2 1/2 life

4 - 3 1/2 life

$$\boxed{4\text{g}}$$

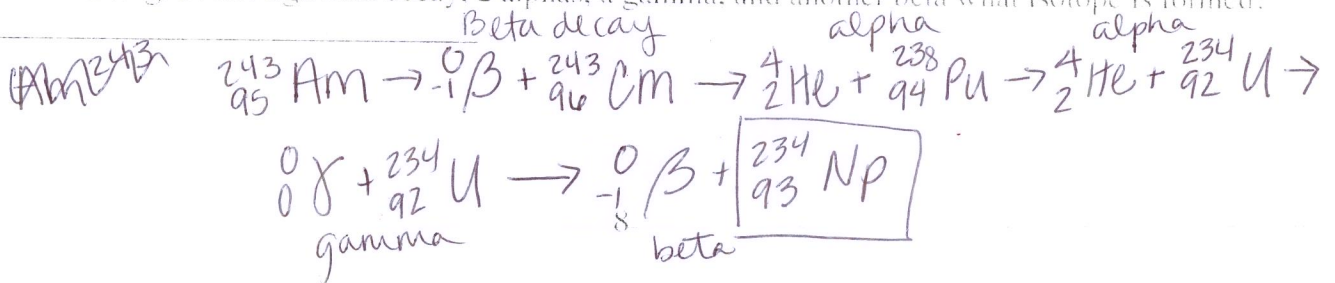


85. Write a nuclear reaction example of beta decay. $^{238}_{92}\text{U} \rightarrow ^0_{-1}\beta + ^{238}_{93}\text{Np}$

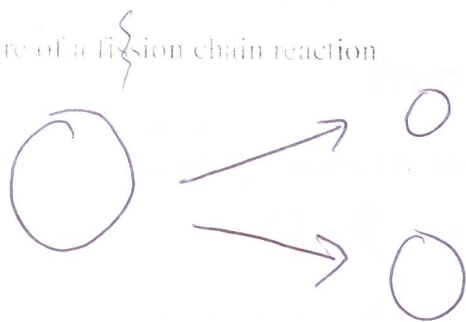
86. When Am-243 goes through beta decay what isotope is formed? Cm-243

87. When Am-243 goes through alpha decay what isotope is formed? Np-238

88. When Am-243 goes through beta decay, 2 alphas, a gamma, and another beta what isotope is formed?



89. Draw a picture of a fission chain reaction

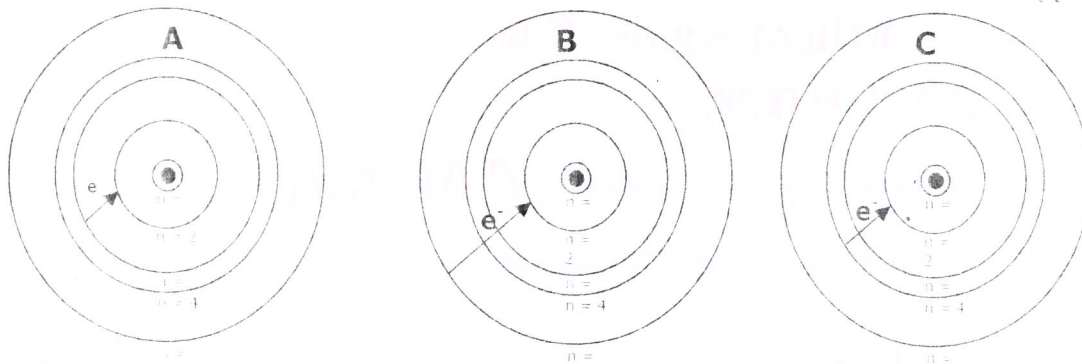


Unit 6: The Electron

90. What is the full electron configuration for Titanium? $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$

91. Write the noble gas configuration for (K) potassium. $[Ar] 4s^1$

The diagram below shows a hydrogen atom as an electron moves from one energy level to another.



92. Rank from the least to greatest frequency of photons emitted.

Least A C B Greatest

Fill in the following table for each element

	Nitrogen	Calcium
93. Total # of e-	7	20
94. Valence e-	5	2
95. Electron configuration	$1s^2 2s^2 2p^3$	$1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$
96. Orbital notation	$\uparrow\downarrow \uparrow\downarrow \uparrow\uparrow\uparrow$	$\uparrow\downarrow \uparrow\downarrow \uparrow\downarrow\uparrow\downarrow \uparrow\downarrow \uparrow\uparrow\uparrow\uparrow\downarrow$
97. Lewis dot structure	$\begin{array}{c} \cdot\cdot \\ \cdot\text{N}\cdot \\ \cdot\cdot \end{array}$	Ca:
98. Ion dot structure	$[\text{N}]^{-3}$	$[\text{Ca}]^{+2}$
99. # of energy levels	2	4
100. # of protons	7	20
101. Noble gas configuration	$[\text{He}] 2s^2 2p^3$	$[\text{Ar}] 4s^2$

Unit 7: Periodic Table

LABEL THE FOLLOWING

- | | |
|--|--|
| 102. Names for the A groups with roman numerals | 107. In pd. 5, label the oxidation number for all of the Representative A groups |
| 103. Transition metals | 108. Alkali Metals |
| 104. Period numbers | 109. Alkaline Earth Metals |
| 105. Lanthanide and Actinide series | 110. Halogens |
| 106. Draw in the stair step where metalloids are located | 111. Noble Gases |

Using **ARROWS** and the words **INCREASING** and **DECREASING**, show the following trends on the periodic table:

- | | |
|----------------------------------|---------------------|
| 112. Electronegativity | (use GREEN arrows) |
| 113. Atomic radii | (use RED arrows) |
| 114. Ionic Radii | (use BLUE arrows) |
| 115. Ionization Energy | (use PURPLE arrows) |
| 116. Metal and Nonmetal Activity | (use BLACK arrows) |

LOOK ON YOUR QUIZ