Chemist:

Final Exam Review-Semester One: Chemistry 12-22

Pre 1 Unit (Light and dark purple packets from beginning of year, embedded into curriculum)

Learning Target	Video Link	QR Code	Mastery Level
I can identify and apply the common steps of scientific method	https://www.youtube.com/watch?v=GKGtkzgKfkc		
I can describe the difference between a theory and a scientific law	https://www.youtube.com/watch?v=R56gU1-Nmgg		
I can convert between scientific notation and standard notation	http://www.khanacademy.org/math/algebra/exponents-radicals/e/scientific_notation?exid=scientific_notation		
I can use significant figures in measurement	http://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/sig-figs-pre-alg/v/significant-figures http://www.khanacademy.org/math/pre-algebra/decimals-pre-alg/sig-figs-pre-alg/v/multiplying-and-dividing-with-significant-figures		
I can distinguish between accuracy and precision	**https://www.youtube.com/watch?v=5APhVxCEPFs**		
I can read a metric ruler, thermometer and graduated cylinder to its limit (correct number of significant figures).	**https://www.youtube.com/watch?v=ftdZhiEvREo**		
I can perform dimensional analysis problems	http://www.khanacademy.org/math/arithmetic/rates-and-ratios/e/units?exid=units		

Unit One: Matter and Density(Dark Purple Packet)

Learning Target	Video Link	QR Code	Mastery Level
I can distinguish between physical and chemical properties	**https://www.youtube.com/watch?v=X328AWaJXvI**		

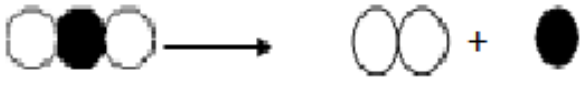
1. State the difference between physical and chemical properties:

2. Classify the following properties as chemical or physical:
   a. Flammability
   b. Melting Point

Learning Target	Video Link	QR Code	Mastery Level
I can define distinguish between physical and chemical changes by using several indications that a chemical change has taken place	**https://www.youtube.com/watch?v=hcunQqbNEMQ**		

3. State the difference between a physical change and a chemical change, and list four likely **indications** that a chemical change has occurred.

4. Classify the following changes as physical or chemical.
   a. Silver forms a black solid with oxygen
   b. Metals melt in a furnace
   c. Salt dissolves in water.
   d. A metal chair rusts.

5. 

a. The following picture represents a physical **or** chemical change? _____EXPLAIN your answer:

b. The picture to the left of the arrow is classified as a compound, element, **or** molecule? _____EXPLAIN your answer:

c. The picture to the left or to the right can be classified as pure **or** impure? _____EXPLAIN your answer:

Learning Target	Video Link	QR Code	Mastery Level
I can demonstrate that mass is conserved in a chemical or physical process data	**https://www.youtube.com/watch?v=g2V7s3sR8T4**		

6. State the law of conservation of mass. How does the mass of reactants compare with the mass of products in a given reaction?

7. Consider the law of conservation of mass as you answer this problem. When ammonium nitrate (NH_4NO_3) breaks down explosively, it forms nitrogen gas (N_2), oxygen gas (O_2), and water (H_2O). When 40 grams of ammonium nitrate explode, 14 grams of nitrogen and 8 grams of oxygen are formed. How many grams of water are formed?

Learning Target	Video Link	QR Code	Mastery Level
I can classify a sample of matter as an element, compound or mixture based on its chemical and or physical properties	**https://www.youtube.com/watch?v=0Frb3gsWV5o**		

8. What is the difference between a heterogeneous and a homogeneous mixture?

9. Classify each of the following as a substance or a mixture.
    a. gold
    b. lemonade
    c. table salt (sodium chloride)

10. Describe a procedure that could be used to separate a mixture consisting of sand and salt.

11. Classify each of these samples of matter as an element, a compound, or a mixture.
    a. spaghetti sauce
    b. table sugar ($C_{12}H_{22}O_{11}$)
    c. Ag

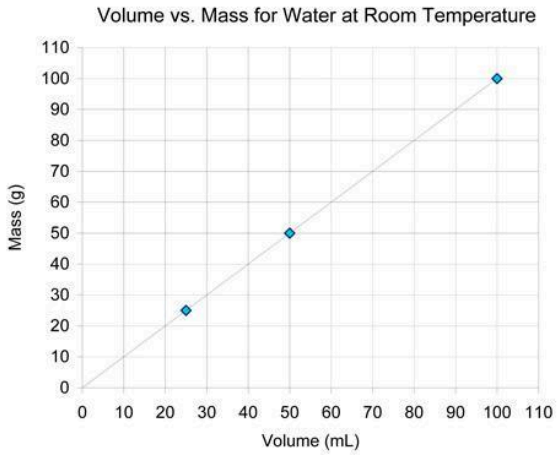
Learning Target	Video Link	QR Code	Mastery Level
I can measure mass, volume, density and temperature using appropriate chemistry lab equipment and report measurements to the correct degree of precision (Ch.2) I can determine density for different substances through measurements, calculations, graphs and behavior	https://www.youtube.com/watch?v=jHfBMjw0m7Y		

12. A glass cylinder contains three liquids: water, ether (d = 0.714 g/mL), and mercury (d = 13.6 g/mL). If a cork (d = 0.25 g/mL) is dropped into the cylinder, where does it come to rest? Where does beeswax (d = 10.5 g/mL) come to rest? Where does a silver coin (d = 18.9 g/mL) come to rest?

13. A 1.1-g ice cube raises the level of water in a 10-mL graduated cylinder 1.2 mL. What is the density of the ice cube?

14. Suppose you drop a solid gold cube into a 10-mL graduated cylinder containing 8.50 mL of water. The level of the water rises to 10.70 mL. You know that gold has a density of 19.3 g/cm^3, or 19.3 g/mL. What is the mass of the gold cube?

15. Calculate the **density** using the following graph:



16. If an object has a density of 2.1 g/mL, where would it fall on the graph? _____Sketch it
17. Substance X has a higher density than substance Y: IF substance X and Y have the same mass, than substance X will have a _____ volume than Y.

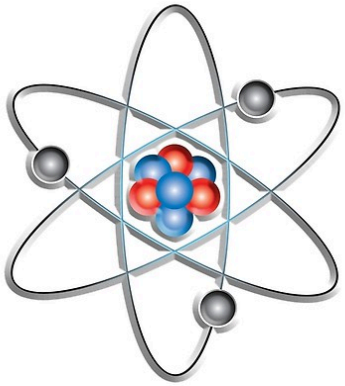
Unit Two: The Atom and Nuclear (Red Packet)

Learning Target	Video Link	QR Code	Mastery Level
I can describe the structure of the atom, including the relative locations, charge and mass of the subatomic particles. (Ch.4) **I can use the atomic number and mass number to calculate the number of protons, neutrons and electrons**	***https://www.khanacademy.org/science/chemistry/introduction-to-the-atom/v/introduction-to-the-atom*** **https://www.khanacademy.org/science/chemistry/introduction-to-the-atom/v/elements-and-atoms**		

18. Fill in the following chart:

Nuclear Symbol	Isotope notation	Atomic #	Mass #	Protons	Neutrons	Electrons
			244	94		94
$^{35}_{17}Cl^{-1}$						
	Iron-56		56			24
				35	45	36
		55	133			
$^{27}_{13}Al^{+3}$						

19. Label the following **neutral** atom. (terms: neutrons, protons, nucleus, electrons, energy levels). Label which ELEMENT it is on the periodic table: _____ How many Protons? _____



Learning Target	Video Link	QR Code	Mastery Level
I can define an isotope and calculate average atomic mass using the relative abundance and mass of each atom in a naturally occurring sample of the element	**https://www.youtube.com/watch?v=ULRsJYhQmlo**		

20. Iodine has three naturally occurring isotopes. Iodine - 127 (80%), Iodine - 126 (17%), and Iodine - 128 (3%). Determine the weighted average atomic mass for iodine.

21. Draw an atomic picture (Bohr model) of the element sulfur-32. Include: protons, neutrons, electrons, nucleus

Learning Target	Video Link	QR Code	Mastery Level
I can describe and write equations for nuclear reactions and discuss their applications. I can characterize alpha, beta and gamma radiation in terms of mass and charge I can write equations representing radioactive decay of unstable nuclei	**https://www.youtube.com/watch?v=oFdR_yMKOCw**		

22. Which of the three kinds of radiation described in this section is the most penetrating? (Alpha, Beta or Gamma)

23. *Determine the identity of "X" for the following:*

a. $^{212}_{84}Po \longrightarrow {}^{208}_{82}Pb + X$

b. $^{137}_{55}Cs \longrightarrow X + {}^{0}_{-1}e$

c. $^{235}_{92}U + {}^{1}_{0}n \longrightarrow {}^{94}_{36}Kr + {}^{139}_{56}Ba + 3X$

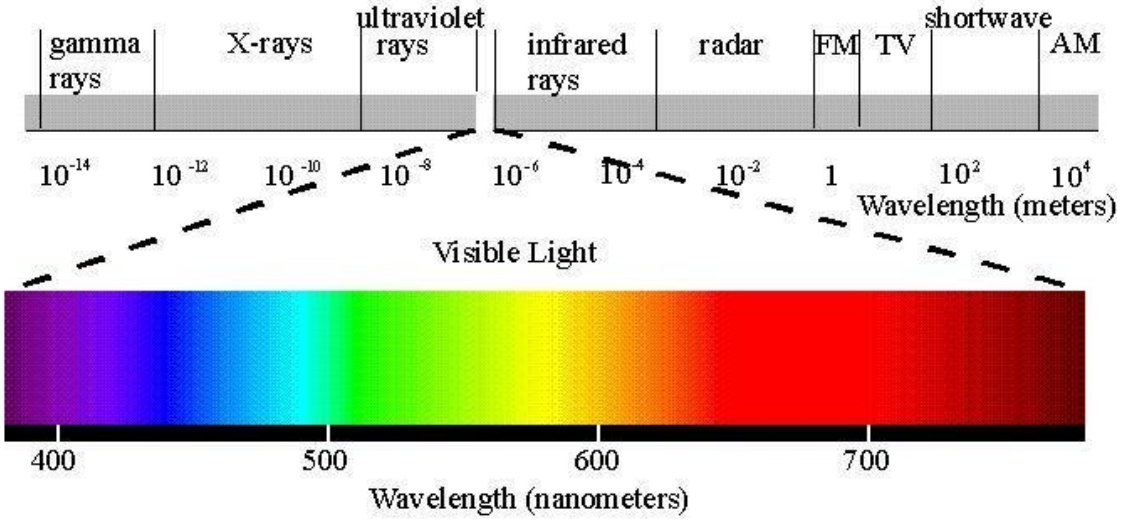
Learning Target	Video Link	QR Code	Mastery Level
I can write balanced nuclear equations for the different types of nuclear reactions	**https://www.youtube.com/watch?v=CjmUiovLMKQ**		

24. Complete the following decay equations:
    a. alpha decay of Gd-150

    b. beta decay of Xe-152
25. Compare and contrast fission and fusion:

26. Write/Draw the fusion reaction between Hydrogen-1 and Hydrogen-2. Draw an atomic picture.

Learning Target	Video Link	QR Code	Mastery Level
I can use atomic emission spectra to identify elements. (Ch.5) I can identify the relationships between wavelength, frequency and energy I can differentiate types of electromagnetic radiation based on energy, frequency and wavelength	**https://www.youtube.com/watch?v=eO73DFqXr0A**		



27. Using the above diagram where would a wave with a length of 5.0×10^3 be located? _____Label it

28. How are wavelength and frequency of light related? _____ How are energy and frequency of light related? _____

29. Arrange the following in order of decreasing wavelength.
    a. gamma rays from nuclear weapons
    b. dental X rays
    c. signal from a shortwave radio station

30. What processes must occur with respect to electrons in order for light to be emitted? Describe the full process in detail.

Learning Target	Video Link	QR Code	Mastery Level
I can identify areas of the periodic table based on electron configuration I can apply Pauli Exclusion Principle, Aufbau's Principle and Hund's rule to write electron configurations using orbital diagrams and electron configuration notation	https://www.khanacademy.org/science/chemistry/electronic-structure-of-atoms/electron-configurations-jay-sal/v/electron-configurations-2		

1. Determine the electron configuration of:
    a. S
    b. Sr
    c. Pb

2. Determine the identity of the element given the electron configuration:
    a. $1S^2 2S^2 2P^5$
    b. $1S^2 2S^2 2P^6 3S^2 3p^6 4S^2 3d^{10}$
    c. [Xe] $6S^2\ 4f^{14} 5d^{10} 6p^3$

3. Determine the noble gas configuration of:
    a. Ge
    b. Rb
    c. Po

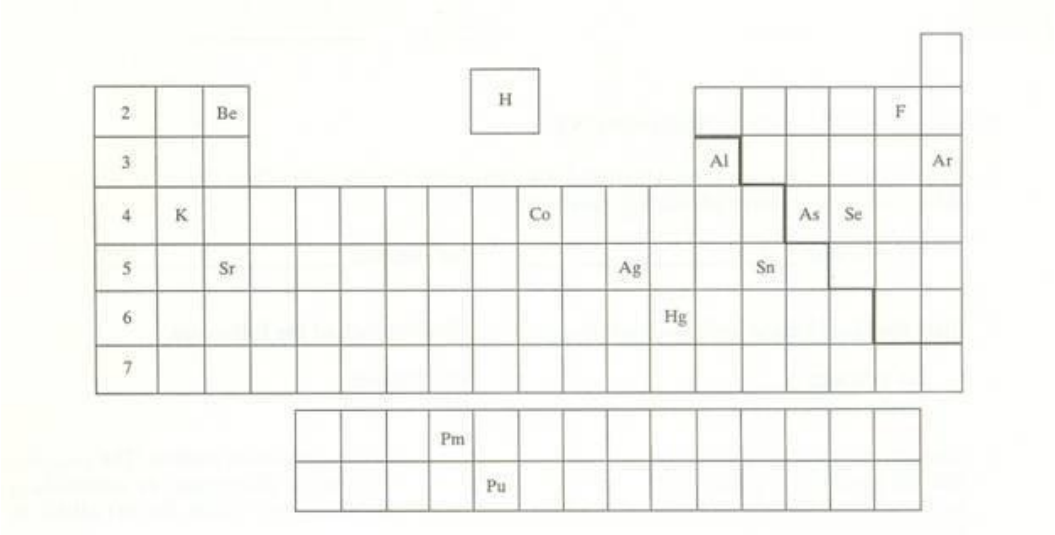
4. Draw the orbital diagram for Iodine:

Unit Three: Periodic Table and Ionic Naming (green packet)

Learning Target	Video Link	QR Code	Mastery Level
I can use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms **I can use the periodic table to identify and name significant regions or groups** **I can recognize that elements in the same group have similar properties** **I can use the periodic table to determine the number of valence electrons** **I can use the periodic table to compare elements in reference to ionization energy**	https://www.youtube.com/watch?v=fLSfgNxoVGk		

31. Which elements on the periodic table tend to gain electrons? _____ lose electrons? _____

32. Refer to the following periodic table:



a. Which element has the highest ionization energy? ___

b. Which element is in the noble gas family? _____

c. Name the family potassium is part of _____

d. List the metalloid ____ How did you know? _____

e. List the metal that tends to lose 2 electrons _____

f. List the element that forms a 1+ charge _____

g. List the element that gains to electrons charge _____

h List the element that forms the general compound X_2O _____ What would element X be?

i. Why are elements arranged in families/groups? _____

Learning Target	**Video Link**	**QR Code**	**Mastery Level**
I can describe characteristics of ionic bonding **I can illustrate bond formation through electron transfer and formation of positive and negative ions** **I can write formulas and name ionic compounds**	https://www.youtube.com/watch?v=Qf07-8Jhhpc		

33. Define:
    a. Cation:
    b. Anion:
34. Explain how atoms become ions

35. Using Bohr models show how & why sodium and fluorine form an ionic bond

36. Name the following ionic compounds:
    a. $Fe(NO_3)_3$
    b. NaBr
    c. $MgCl_2$
    d. $(NH_4)_2SO_4$
    e. Cu_3P_2
37. Write the formula for the following ionic compounds (look up the following charges)
    a. potassium nitride
    b. ammonium phosphate
    c. aluminum oxide
    d. cobalt (II) iodide
    e. iron (III) sulfate

Learning Target	**Video Link**	**QR Code**	**Mastery Level**
I can write and balance chemical reactions **I can balance chemical reactions from formulas** **I can write chemical reactions from words**	https://www.youtube.com/watch?v=_B735turDoM		

38. Balance the following equation:

    a. $FeCl_3 + (NH_4)_3PO_4 \rightarrow FePO_4 + NH_4Cl$

    b. $AgNO_3 + BaCl_2 \rightarrow AgCl + Ba(NO_3)_2$

39. Write & balance the following reactions:
    a. Iron (III) chloride reacts with calcium hydroxide to form iron (III) hydroxide and calcium chloride

    b. Solid sodium metal reacts with aqueous iron (III) chloride solution to produce solid iron metal and sodium chloride aqueous solution

Learning Target	Video Link	QR Code	Mastery Level
I can classify chemical reactions **I can describe, characterize and give an example of each of the following reaction classifications: single replacement, double replacement** **I can use reaction classification to predict the products of single replacement and double replacement reactions**	https://www.youtube.com/watch?v=qhmTXdOKTBo		

40. Using a reactivity series predict the following **products**. What type of reactions are these?_____
    a. $Ag + NaNO_3 \rightarrow$ _____ + _____
    b. Copper plus silver nitrate produces _____ + _____

41. Predict the **products** for the following reaction. What type of reactions are these?
    a. Ammonium nitrate reacts with magnesium chloride to produce _____ + _____

    b. Solutions of potassium fluoride and calcium nitrate are mixed and produce _____+ _____.___

    c. Now go back and balance your equations from #42a and #42b.

Unit Four: Types of Reactions and Balancing (yellow packet)

Learning Target	Video Link	QR Code	Mastery Level
I can write and balance equations for chemical reactions (such as combustion)- Chapter 10 **I can recognize/classify a combustion reaction based on the reactants and products involved** **I can write and balance equations of combustion reactions**	http://www.youtube.com/watch?v=ed0h11IfEPU		

42. Balance the following equations:

a. $C_5H_{12} + O_2 \rightarrow CO_2 + H_2O$

b. $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$

43. Balance the following equations:

a. $\_\_\_\_ Fe + \_\_\_\_ H_2S0_4 \longrightarrow \_\_\_\_ Fe_2(SO_4)_3 + \_\_\_\_ H_2$

b. $\_\_\_\_ FeO_3(s) + \_\_\_\_ CO(g) \longrightarrow \_\_\_\_ Fe(\ell) + \_\_\_\_ CO_2(g)$

C. $\_\_\_\_ Mg(OH)_2 + \_\_\_\_ HCl \longrightarrow \_\_\_\_ MgCl_2 + \_\_\_\_ H_2O$

44. Write the combustion equation for and balance the equation for Butane C_4H_{10}

Unit 5: Moles and Stoichiometry (orange packet)

Learning Target	**Video Link**	**QR Code**	**Mastery Level**
I can use the mole in converting between mass and representative particles I can calculate the molar mass of an element and compound I can inter-convert chemical quantities between the mass, the moles and the number of representative particles of an element or compound	http://www.youtube.com/watch?v=HMAOrGpkTsQ		

45. Calculate the molar mass of the following compounds:
    a. $FePO_4$
    b. $Mg(C_2H_3O_2)_3$

46. Calculate the moles of Cu atoms in 30.0 g of Al.

47. Given 1.5 moles of ABr_3, calculate the mass (g) of $AlBr_3$

48. Calculate the number of molecules of H_2O in 100 g of H_2O

49. Calculate the number of molecules in 2.75 moles of $C_{12}H_{22}O_{11}$

50. Calculate the mass of 2.27×10^{24} molecules of BCl_3

51. Calculate the number of moles in 1.48×10^{24} molecules of CO_2

Learning Target	Video Link	QR Code	Mastery Level
I can use mathematical representations to support the claim that atoms, and therefore mass are conserved during a chemical reaction- Refer to Chapter 12 I can use a balanced chemical reaction to calculate the amounts of reactants and products for a reaction (stoichiometry) I can describe which substance is used up in a chemical reaction and define the limiting reactant I can show that the total mass is conserved in a chemical reaction	***http://www.youtube.com/watch?v=flm2lJNzmpw* (stoich)** ***http://www.youtube.com/watch?v=0ovs9laEibg* (LR and excess)**		

52. Use the following combustion reaction of octane, C_8H_{18}

$$\mathbf{2\ \ C_8H_{18} + 25\ O_2 \rightarrow 16\ CO_2 + 18\ H_2O}$$

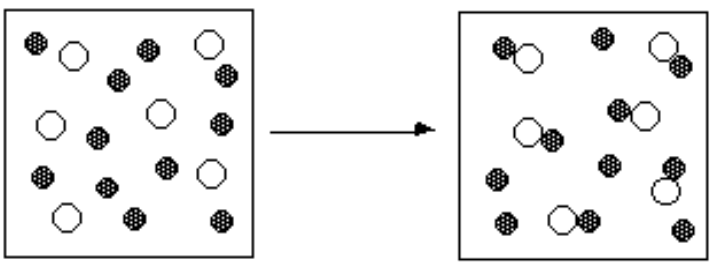
a. How many moles of H_2O would be produced by reacting 0.67 moles of octane and excess of oxygen?

b. If we react 550 g of octane with oxygen, how many grams of O_2 are required?

53. If 4.5g of ammonia (NH_3) reacts with 5.99g oxygen to form nitrogen monoxide and water, determine the <u>mass of each product</u> and the <u>mass of the leftover excess reactant</u>. BALANCE equation first.

$$\mathbf{NH_3 + O_2 \rightarrow NO + H_2O}$$

54. A chemical reaction is demonstrated by the picture below. Determine the limiting reactant and the excess reactant: (shaded vs unshaded)



Learning Target	Video Link	QR Code	Mastery Level
I can use mathematical representations to support the claim that atoms, and therefore mass are conserved during a chemical reaction **I can use a balanced chemical reaction to calculate the amounts of reactants and products for a reaction** **I can identify the limiting reactant and excess reactant and calculate the amount of remaining excess reactant after the reaction is complete** **I can determine the percent yield from the actual and theoretical yield of a chemical reaction**	https://www.youtube.com/watch?v=YoAvImdSPDc		

55. Refer to the following double replacement reaction:

$3\ H_2SO_4\ +\ 2\ Al(OH)_3\ \rightarrow\ Al_2(SO_4)_3\ +\ 6\ H_2O$

If 30 g of sulfuric acid reacts with 25 g of aluminum hydroxide, determine the **limiting reactant**.

Determine the amount of excess reactant

56. Refer to the following double replacement reaction:

$2\ LiOH\ +\ ZnSO_4\ \rightarrow\ Li_2SO_4\ +\ Zn(OH)_2$

If 1.32 mole of LiOH reacts with excess $ZnSO_4$, 18.92 g of $Zn(OH)_2$ are actually formed. What is the **% yield** of zinc hydroxide $Zn(OH)_2$? (hint: you need stoich to find theoretical yield.