Adventures in Flipped-Mastery

The Do's and Don'ts of Changing a Traditional Classroom into a Flipped Learning and Standards Reference Environment

Contact Information

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Vocabulary

Flipped – using resources (usually videos) to take content notes outside of class time so that class time is used for collaboration/questions/labs/etc

Mastery level – repeatedly demonstrating understanding of certain content

Standards based – moving forward in the curriculum once mastery is reached; learning is the constant and time is variable

Standards referenced – grade is based on mastery level of the curriculum; time is the constant and the level of mastery is variable

Self-paced – students work through material at their own pace

Objective – specific piece of content

Learning target – broad statement that encompasses multiple objectives

Unit – broad topic that includes multiple related learning targets

Scoring scale – arrangement of objectives into mastery levels based on a learning target, used to help determine student mastery level

Proficiency scale – same as scoring scale

Unit 1: Alchemy			
Learning Target 1: Understand and explain the organization of matter.			
Advanced Score: 4.0 (100%)	In addition to the Expected (3.0) performance, makes inferences and extended applications of learning; may include connections to experiences outside of coursework.	Science Practices ▪ Planning and carrying out investigations ▪ Analyzing and interpreting data ▪ Using mathematics and computational thinking	Objectives: Students will be able to: ▪ Calculate density, volume or mass of an object. ▪ Evaluate a graph to calculate the density of an object.
Expected + Score: 3.5 (92%)	In addition to the Expected (3.0) performance, shows partial success in making inferences and extended applications of learning; may include connections to experiences outside of coursework.		
Expected Score: 3.0 (86%)	No major errors or omissions regarding any of the information processes (simple or complex) that were explicitly taught.	▪ Developing and using models ▪ Using mathematics and computational thinking	▪ Calculate density and use it to identify objects ▪ Evaluate a graph of mass vs. volume or particle diagrams to determine differences in density. ▪ Illustrate differences among elements, compounds and mixtures by composition.
Foundational + Score: 2.5 (80%)	No major errors or omissions regarding any of the information processes (simple or complex) that were explicitly taught.		
Foundational Score: 2.0 (72%)	No major errors or omissions regarding the simpler details and processes, but major errors or omissions regarding more complex ideas and processes.	▪ Developing and using models	▪ Define chemistry, mass and volume; give appropriate units for mass and volume. ▪ Distinguish differences among elements, compounds and mixtures by composition. ▪ Interpret chemical formulas.
Developing + Score 1.5 (68%)	Full knowledge of vocabulary and partial understanding of some of the simpler details and processes (Foundational 2.0) and major errors regard the more complex ideas and processes (Expected 3.0)		
Developing Score 1.0 (65%)	Demonstrates knowledge of the following learning target vocabulary: chemistry, matter, mass, volume, gram, liter, milli-, centi-, centimeters cubed, atom, compound, element, mixture, chemical formula, density, balance, ~~graduated cylinder~~		
Beginning Score0.5 (55%)	Insufficient evidence of understanding of some of the simpler details and processes, and no evidence of understanding of more complex ideas and processes.		
Failing Score: 0 (40%)	No evidence of student learning.		

Vocab from the box

Unit 1: Alchemy			
Learning Target 2: Understand and explain the structure of atoms.			
Advanced Score: 4.0 (100%)	In addition to the Expected (3.0) performance, makes inferences and extended applications of learning; may include connections to experiences outside of coursework.	Science Practices ▪ Developing and using models ▪ Analyzing and interpreting data	Objectives: Students will be able to: ▪ Calculate average atomic mass. ▪ Construct electron configurations atoms and ions. ▪ Identify valence electrons in an electron configuration.
Expected + Score: 3.5 (92%)	In addition to the Expected (3.0) performance, shows partial success in making inferences and extended applications of learning; may include connections to experiences outside of coursework.		
Expected Score: 3.0 (86%)	No major errors or omissions regarding any of the information processes (simple or complex) that were explicitly taught.	▪ Developing and using models ▪ Analyzing and interpreting data ▪ Using mathematics and computational thinking	▪ Analyze experimental evidence to distinguish models of the atom. ▪ Use atomic structure data to determine the numbers of subatomic particles
Foundational + Score: 2.5 (80%)	No major errors or omissions regarding any of the information processes (simple or complex) that were explicitly taught.		
Foundational Score: 2.0 (72%)	No major errors or omissions regarding the simpler details and processes, but major errors or omissions regarding more complex ideas and processes.		▪ Draw the progression of the models of the atom as proposed by Dalton, Thomson, Rutherford, and Bohr. ▪ Classify particles as atoms, ions or isotopes. ▪ Determine the number of valence electrons and predict what ion will form in representative elements.
Developing + Score 1.5 (68%)	Full knowledge of vocabulary and partial understanding of some of the simpler details and processes (Foundational 2.0) and major errors regard the more complex ideas and processes (Expected 3.0)		
Developing Score 1.0 (65%)	Demonstrates knowledge of the following learning target vocabulary: atom, subatomic particle, nucleus, energy level, ion, isotope, valence electron, proton, neutron, mass number, atomic number, average atomic mass, electron configuration, periodic table, group, period, chemical symbol		
Beginning Score0.5 (55%)	Insufficient evidence of understanding of some of the simpler details and processes, and no evidence of understanding of more complex ideas and processes.		
Failing Score: 0 (40%)	No evidence of student learning.		

Name: _____ Date: _____ Block: _____

Mastery Level:
LT 1.1: ___ LT 1.2: ___
% %

Unit 1 Exam_R

Learning Target 1.1: Understand and explain the structure of matter.

Level 1 (65%) : Developing (Vocabulary) **Mastered? 1 2 3**

1. ____ chemical formula
2. ____ gram
3. ____ graduated cylinder
4. ____ liter
5. ____ cubic centimeter
6. ____ balance

A. A unit to measure the amount of volume of a liquid
B. A unit to measure the amount of mass
C. A unit to measure the amount of volume of a solid
D. a tool to measure the mass of an object
E. a tool to measure the volume of a liquid
F. a way to represent the composition of a substance

7. A substance composed of identical atoms
   a. balance
   b. mixture
   c. element
   d. chemistry

8. A metric prefix meaning one-hundredth of a base unit
   a. centi
   b. liter
   c. milli
   d. kilo

9. A physical combination of elements and/or compounds
   a. liter
   b. mixture
   c. milli
   d. compound

10. A chemical combination of elements combined in whole number ratios
    a. compound
    b. mixture
    c. element
    d. chemistry

11. The ratio of mass to volume
    a. balance
    b. density
    c. element
    d. chemistry

12. Measure of the amount of space an object takes up
    a. liter
    b. mass
    c. mixture
    d. volume

13. Anything that has mass and takes up space → matter
    a. True
    b. False

14. A metric prefix meanng a thousand base units → milli
    a. True
    b. False

15. The study of matter and how it changes → chemistry
    a. True
    b. False

16. Measure of the amount of matter in an object → volume
    a. True
    b. False

17. The smallest piece of an element that retains its properties → atom
    a. True
    b. False

18. A metric prefix meaning one-thousandth of a base unit → centi
    a. True
    b. False

Level 2 (72%): Foundational	Mastered? 1 2 3

19. You need to measure the **mass** of a beaker. Which metric unit would be the most appropriate unit to use?
    a. Liter
    b. Gram
    c. Centimeters cubed
    d. meters

20. You need to measure the volume of a **liquid**. Which metric unit would be the most appropriate to use?
    a. Liter
    b. Gram
    c. Centimeters cubed
    d. Meters

21. You need to measure the volume of a **solid object**. Which metric unit would be most appropriate to use?
    a. Liter
    b. Gram
    c. Centimeters cubed
    d. Meters

22. Write the chemical formulas for the following compounds:
    a. 1 Ca + 1 O

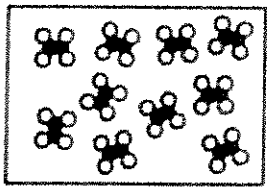
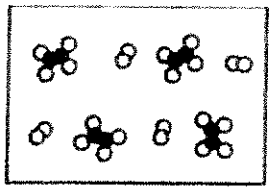
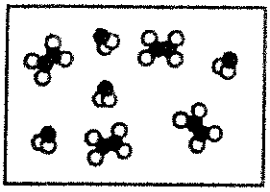
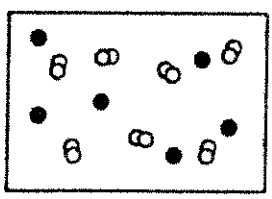
    b. 1 C + 4 H

    c. 2 H + 1 S

23. Determine the makeup of each compound based on the formula:
    a. PBr_5

    b. H_2O

    c. Al_2O_3

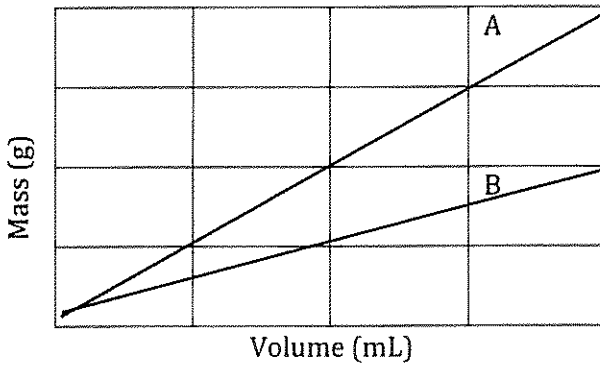
		Circle the description of the picture to the left:	
24.		PURE MIXTURE	ELEMENT COMPOUND BOTH
25.		PURE MIXTURE	ELEMENT COMPOUND BOTH
26.		PURE MIXTURE	ELEMENT COMPOUND BOTH
27.		PURE MIXTURE	ELEMENT COMPOUND BOTH

Level 3 (86%): Expected	Mastered? 1 2 3

28. Makayla found the mass of a brick to be 5761 g and the volume to be 1991 cm^3. What is the density of the brick?

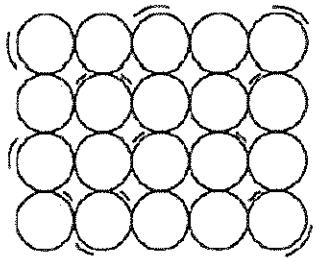
29. Mason wanted to determine the density of a pebble that he found. He found the volume by water displacement. The initial volume of the water was 25.3 mL and the final volume of the water was 29.8 mL. The mass of the pebble was 21.7 g. What is the density of the pebble?

30. Using the graph to the right, which object has the lower density? Explain how you know this in 1-2 complete sentences.

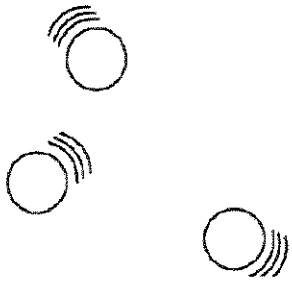


31. Rank the following diagrams in order of least dense (1) to most dense (3).

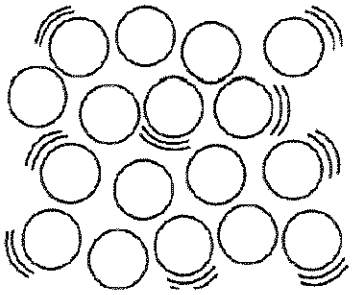
A



B



C



_____ _____ _____

32. Illustrate the following descriptions in the space provided. **Draw at least 3 particles in each box.**

A pure element

A mixture of 2 elements and 1 compound

Level 4 (100%): Advanced	Mastered? 1 2 3

33. A cube of aluminum has an edge length of 1.35 cm. What is the mass of the aluminum cube?

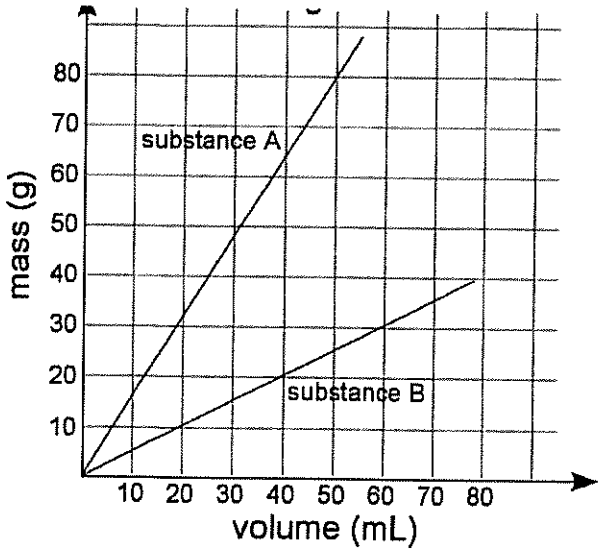
Table 2	
Density / g*cm^{-3}	
Aluminum	2.70
Iron	7.87
Silver	10.5
Gold	19.3

34. A sample of molten iron has a mass of 554 g. What is the volume of the sample?

35. Use the graph to the right to calculate the density of each substance:

A:

B:



Learning Target 1.2: Understand and explain the structure of atoms.

Level 1 (65%) : Developing (Vocabulary)	**Mastered?**	**1**	**2**	**3**

36. ____ isotope
37. ____ neutron
38. ____ proton
39. ____ ion
40. ____ electron
41. ____ atom

A. Negatively charged subatomic particle
B. Atoms that have gained or lost electrons
C. Positively charged subatomic particle
D. Neutral subatomic particle
E. Smallest unit of an element
F. Atoms of the same element with different mass numbers

42. Electron configuration
    a. A representation of the organization of electrons
    b. A representation of a particular atom
    c. A column in the periodic table
    d. A weighted average of the mass numbers of isotopes of an element

43. The particles that make up atoms
    a. Atomic number
    b. Atomic symbol
    c. Subatomic particle
    d. Valence electron

44. Energy level
    a. The electrons on the outermost energy level
    b. Diagram organizing chemical elements by atomic number and properties
    c. Specific locations where electrons are allowed in an atom
    d. The center of the atom that contains protons and neutrons

45. Valence electron
    a. The number of protons in the nucleus
    b. A representation of a particular atom
    c. The electrons on the outermost energy level
    d. The number of subatomic particles in the nucleus

46. The center of the atom that contains protons and neutrons
    a. Nucleus
    b. Mass number
    c. Isotope
    d. Energy level

47. A column in the periodic table
    a. Atom
    b. Proton
    c. Group
    d. Electron configuration

48. Average atomic mass → Diagram organizing chemical elements by atomic number and properties
    a. True
    b. False

49. Mass number → The number of subatomic particles in the nucleus
    a. True
    b. False

50. A representation of a particular atom → atomic number
    a. True
    b. False

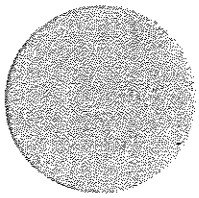
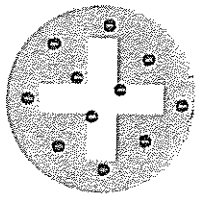
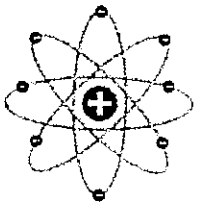
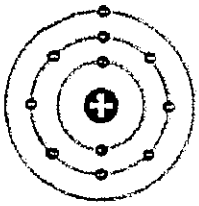
51. Periodic table → Diagram organizing chemical elements by atomic number and properties
    a. True
    b. False

52. Atomic number → The number of protons in the nucleus
    a. True
    b. False

53. Period → A row in the periodic table
    a. True
    b. False

Level 2 (72%): Foundational **Mastered? 1 2 3**

54. Match the atomic model to the scientist by writing the Roman numeral below the drawing.

I. Rutherford
II. Thomson
III. Bohr
IV. Dalton

_____ _____ _____ _____

Use the following table to answer questions 57-60.

	Protons	Electrons	Neutrons
Particle 1	37	36	37
Particle 2	35	36	37
Particle 3	36	36	36
Particle 4	37	37	36

55. Which particles are the same element? Circle all that apply.

1 2 3 4

56. Which particles are neutral atoms? Circle all that apply.

1 2 3 4

57. Which particle is a positively charged ion?

1 2 3 4

58. Which particle is a negatively charged ion?

1 2 3 4

59. Determine the number of valence electrons for the following atoms:
    a. Magnesium (Mg)
    b. Cobalt (Co)
    c. Nitrogen (N)
    d. Bromine (Br)

60. Determine the common ion charge for each of the following elements:
    a. Potassium (K)
    b. Aluminum (Al)
    c. Gold (Au)
    d. Sulfur (S)

Level 3 (86%): Expected	**Mastered?**	**1**	**2**	**3**

61. State which scientist discovered which subatomic structure with which experiment.

	Scientist	Experiment
Electrons		
Neutrons		
Protons and Nucleus		
Energy Levels		

WORD BANK: Bohr Chadwick Rutherford Thomson

Gold Foil Cathode Ray Tube X-Rays Emission Spectra/Flame Test

62. Complete the following table. **Assume that all atoms are neutral.**

Symbol	# of Protons	# of Electrons	# of Neutrons	Mass
$^{23}_{11}Na$				
	7	7	8	
	18	18		40

Level 4 (100%): Advanced **Mastered? 1 2 3**

63. Oxygen has 3 stable isotopes: O-16, O-17, O-18.
    a. The average atomic mass of oxygen is 15.999. Which isotope is most abundant? How do you know?

    b. Give an explanation for why the average atomic mass is lower than the masses of the three isotopes.

64. Silver-107 is 51.86% abundance and Silver-109 is 48.14% abundant. Calculate the average atomic mass of silver.

65. Write the full electron configurations for the following **neutral** element: Germanium (Ge)

66. Write the full electron configuration for the following **ion**: Sulfur -2 (S^{-2})

67. Construct the **noble gas** electron configurations for the following element: Molybdenum, Mo