

WJCC School Closure Extended Learning

CHEMISTRY

Dear WJCC Families,

This packet contains activities, resources and information to extend learning for your child during this extended school closure.

Additional resources may be posted on Student VUE for this course and other classes on your child's schedule. Students are encouraged to check Student VUE during this time.

Thank you for your partnership and support of WJCC Schools.

Sincerely,
WJCC Staff

Suggested Sequence to Complete the Chemistry Review Packet - Complete the learning activities listed below which review content covered in your course.

Activity 1	Activity 2	Activity 3	Activity 4	Activity 5
Chemistry SOL Review CH. 1 Notes and Practice	Chemistry SOL Review CH. 1 Review Questions	Chemistry SOL Review CH. 2 Notes and Practice	Chemistry SOL Review CH. 2 Review Questions	Chemistry SOL Review CH. 3 Notes and Practice
Activity 6	Activity 7	Activity 8	Activity 9	Activity 10
Chemistry SOL Review CH. 3 Review Questions	Chemistry SOL Review CH. 4 Notes and Practice	Chemistry SOL Review CH. 4 Review Questions	Chemistry SOL Review CH. 5 Notes, Practice, and Review Questions	Chemistry SOL Review Questions

Online Resources for additional support (optional)

Online Activity 1 <http://www.rsc.org/learn-chemistry/resources/gridlocks/puzzles/level-3/significant-figures.html>

Online Activity 2 <https://www.chemteam.info/SigFigs/Density.html>

Online Activity 3 <https://www.chemteam.info/Mole/AverageAtomicWeight.html>

Online Activity 4 https://phet.colorado.edu/sims/html/build-an-atom/latest/build-an-atom_en.html

Online Activity 5 <https://www.simbucket.com/simulation/chemthink-ionic-formulas/>

Online Activity 6 <https://phet.colorado.edu/en/simulation/balancing-chemical-equations>

Online Activity 7 https://www.softschools.com/quizzes/chemistry/stoichiometry_mass_mass_problems/quiz1196.html

Online Activity 8 <http://www.sciencegeek.net/Chemistry/taters/solubility.htm>

Online Activity 9 <https://www.chemteam.info/Thermochem/Time-Temp-Graph.html>

Online Activity 10 <https://education.jlab.org/solquiz/>

Secondary Online Programs Available at Home

- Discovery Education - CONNECT VIA OFFICE 365
Content by standard/subject. Includes virtual experiences and instructional strategies We fully license Essentials and K-8 Science plus Streaming for K-8
- Office 365 - <https://www.office.com/>
Online tools for WORD, EXCEL, POWERPOINT, ONENOTE with heavy emphasis on TEAMS. We are fully licensed
- EMediaVA - <https://www.emediava.org/>
Online educational service offering media resources appropriate for PreK-14 All students and teachers. Students use computer login for username and last five digits of student ID for password curriculum, for use in classrooms, home schools, and informal educational environments, such as after-school, community facilities, and museums (the "Service").
- Imagine Learning - <https://www.imaginelearning.com/login>
This program is designed to support the language, literacy, and early reading skills of certain English Learners. Cannot use on a cell phone. Recommendation is 20 minutes a day Licensed for our ELL students
- VUE - <https://www.office.com/>
Student access: https://va-wjccp-psv.edupoint.com/PXP2_Login.aspx Primary communication and [grading tool](#)
- Culture Grams - <http://online.culturegrams.com/>
- Explora - Online Database that students should access from school webpage
- World Book Online
- <https://www.worldbookonline.com/wb/products?ed=all&gr=Welcome+WJCC+Public+Schools>

ACTIVITY 1

Chemistry SOL Review CH. 1 Notes and Practice

1. Experimental Design:

- The _____ is manipulated by the experimenter.
- The _____ are the different types of the IV being tested.
- The _____ is how many times the level is tested. The repeated trials allows for increased reliability of data
- The _____ responds to the change made by the experimenter. This variable should be measurable!
- The _____ is the level of the IV that serves as the standard of comparison. It is the “normal” treatment received. Not all experiments have a control.
- The _____ are things in the experiment that cannot change. All possible variables other than the IV must be kept constant to prove that the IV is what caused the change in the DV.

2. Lab skills:

- Use an _____ digit with all non-digital instruments!
- Measure temperature from the center of the sample
- Know the names and uses of the essential lab equipment
 - Graduated cylinder, beaker, flask, test tube, Bunsen burner, crucible, mortar & pestle

3. Graphing skills:

- All graphs should include a title and labels on the axes with units if known.
- The _____ is always graphed on the x-axis and the _____ is always graphed on the y-axis
- Use a _____ graph when there are categories on the x-axis
- Use a _____ graph when there is continuous number data on the x-axis
- Only graph the AVERAGE of the trials, not each trial of the experiment!

4. Significant Figures:

- Leading zeros are _____ significant
- Trailing zeros are only significant if the number contains a _____.
- When you add or subtract measurements, the measurement with the _____ limits the number of decimal places in the answer
- When you multiply or divide measurements, the measurement with the fewest number of _____ limits the number of significant figures in the answer

5. Dimensional analysis:

- Use dimensional analysis (tracks) to make conversions. You must know the following conversion factors:

$$1 \text{ kilo} = 1000 \text{ base units}$$

$$10 \text{ deci} = 1 \text{ base unit}$$

$$100 \text{ centi} = 1 \text{ base unit}$$

$$1000 \text{ milli} = 1 \text{ base unit}$$

6. Data analysis:

- _____ describes data that is close to the accepted value (low percent error)
- _____ data that is close to each other (low range)
- You want data from an experiment to be both accurate and precise!
- The _____ can be calculated for an experiment using the equation below.

$$\frac{|\text{accepted value} - \text{experimental value}|}{\text{accepted value}} \times 100$$

7. Density:

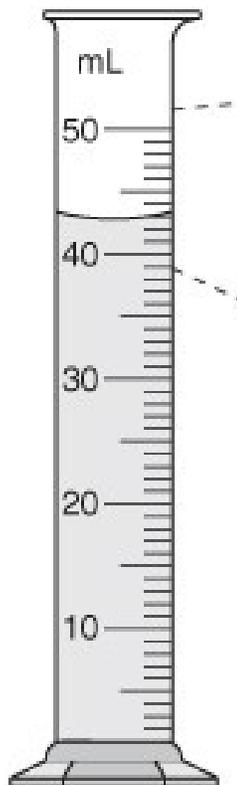
The density equation is given below:

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

- For irregular objects, the volume can be calculated from the water displacement method. The original volume of water is subtracted from the final volume of water containing the object.
- Remember that 1 mL is equal to 1 cm³, so both units can be used when measuring volume. Typically, mL is used with liquids and cm³ is used with solids. So the density unit for liquids is g/mL and the density unit for solids is g/cm³.
- Because of the combined units of density, it can be used as a conversion factor. For example, a density of 1.20 g/mL is the same as writing 1.20 g = 1 mL.

Examples:

- What is the volume of the liquid in the graduated cylinder below?



2. How many significant figures are in each of the following numbers?

(a) 10.3060 _____

(c) 0.080 _____

(b) 370 _____

(d) 22.70 _____

3. Express the answer to each problem below with the correct number of significant figures.

(a) $2.25 + 3.1 =$

(b) $10.2500 - 3.000 =$

(c) $12.2 \times 0.045 =$

(d) $145 \div 60 =$

(e) The average of the following measurements. Be sure to make sure all units are the SAME first.

12.25m, 10.78 cm, 9.74 cm, 11.88 cm

4. How many liters are in 5000 milliliters?

5. Convert 45 km to cm.

6. The mass of a piece of copper pipe is known to be 11.8 g. A student measured its mass as 12.5g. What is the student's percent error?

7. An object has a density of 0.85 g/mL. A graduated cylinder is filled originally to a level of 25.0 mL. When the object is placed in the graduated cylinder, the volume of water rose to 27.2 mL. What is the mass of this object?

ACTIVITY 2

Chemistry SOL Review CH. 1 Review Questions

1. The mass of an object was recorded as 9.93 g, 9.91 g, and 10.02 g, using an electronic analytical balance. What is the average of these three masses expressed to the correct number of significant figures?

F 9.9 g
G 9.95 g
H 9.953 g
J 10.0 g

2.



Data Table

evaporating dish + watch glass	42.70 g
evaporating dish + watch glass + NaHCO ₃	45.20 g
evaporating dish + watch glass + NaCl	44.45 g

A student conducted an experiment and was interested in the mass of the product of the chemical reaction. Some results of the experiment are shown above. What is the mass of the NaCl?

A 0.75 g
B 1.75 g
C 2.25 g
D 2.50 g

3. Which of these shows a volume of 1.25 liters expressed in milliliters?

F 125 mL
G 12.5×10^1 mL
H 1.25×10^2 mL
J 1.25×10^3 mL

4. The density of an unknown metal was determined to be 2.85 g/mL. The actual density was 2.70 g/mL. What is the percent error in this determination?

A 0.056%
B 0.15%
C 5.6%
D 94.4%

5.

Group	Mass Data for Sample X (g)	Displacement Data for Sample X (mL)
1	2.7	3.4
2	1.20	1.5
3	6.2	7.40

According to the above data, which of the following represents the average density for sample X using the correct number of significant figures?

F 1 g/mL
G 0.8 g/mL
H 0.81 g/mL
J 0.821 g/mL

6. Which of the following pieces of glassware can be used to measure the volume of a liquid with the greatest accuracy?

- A Test tube
- B Beaker
- C Flask
- D Graduated cylinder

7. How is 0.00124 expressed in proper scientific notation?

- F 1.24×10^{-3}
- G 0.124×10^{-2}
- H 1.24
- J 1.24×10^3

8. A student spills a diluted acid solution on his hand. He should

- A wipe it off with a paper towel
- B let it air dry
- C apply a base to neutralize it
- D rinse it off with running water

9. How many kilograms are equivalent to eight grams?

- F 8000 g
- G 800 g
- H 0.8 g
- J 0.008 g

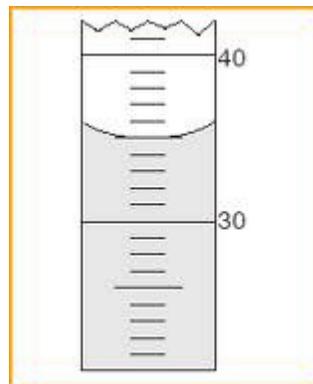
10.

	Trials			
	1	2	3	4
Temperature	18°C	18°C	18°C	18°C
Amount of Catalyst	3 mg	2 mg	1 mg	0 mg
Amount of A	5 g	5 g	5 g	5 g
Amount of B	7 g	7 g	7 g	7 g
Time	10 min	10 min	10 min	10 min

A student designed an experiment to study the effects of a catalyst on a reaction. Which trial serves as the experimental control?

- A 1
- B 2
- C 3
- D 4

11. What is the volume of the liquid in the graduated cylinder below?



- F 35 mL
- G 35.0 mL
- H 36 mL
- J 36.0 mL

12. If a sample has a mass of 1.25×10^2 g and a volume of 51 mL, what is its density?

- A 0.00025 g/mL
- B 0.0125 g/mL
- C 2.5 g/mL
- D 250 g/mL

13. Which set of lab equipment would be most useful to determine the density of a liquid?

- F balance and periodic table
- G periodic table and thermometer
- H balance and graduated cylinder
- J graduated cylinder and thermometer

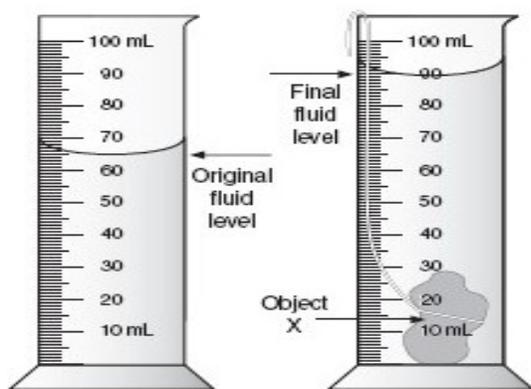
14. Which is the safest practice when heating the contents of a test tube over a flame?

- A wearing long hair down
- B having safety goggles within reach
- C point the tube away from people
- D keeping the tube securely stoppered

15. The boiling point of ethanol is 78.3 °C. The boiling point of ethanol on the Kelvin scale is approximately

- F 26 K
- G 178 K
- H 351 K
- J 451 K

16. The volume of object X in the cylinder below is approximately



- A 20 mL
- B 25 mL
- C 30 mL
- D 35 mL

17. The following data were collected. The volume of the gas is known to be 2.20 L. This data reflects:

Trial	Volume (L)
1	5.20
2	5.20
3	5.19
4	5.20
5	5.20

- F low precision and low accuracy
- G low precision and high accuracy
- H high precision and low accuracy
- J high precision and high accuracy

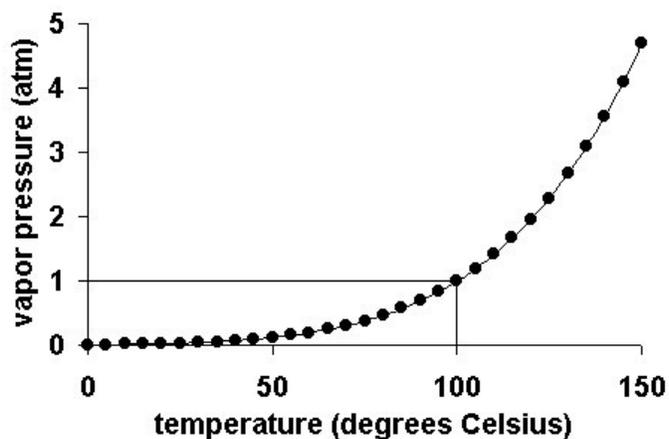
18. A sample of iron has a volume of 10.0 mL. The density of iron is 7.87 g/mL. Which is the correct expression to calculate the mass of the sample using dimensional analysis?

- A $10.0 \text{ mL} \times \frac{7.87 \text{ g}}{1 \text{ mL}}$
- B $10.0 \text{ mL} \times \frac{1 \text{ g}}{7.87 \text{ mL}}$
- C $10.0 \text{ mL} \times \frac{1 \text{ mL}}{7.87 \text{ g}}$
- D $10.0 \text{ mL} \times \frac{7.87 \text{ mL}}{1 \text{ g}}$

19. A student must make a 3 M acid solution using a 5 M acid solution. Which of these is the safest way to make the solution?

- F slowly pour the 5 M acid into water
- G slowly add water to the 5 M acid solution
- H mix half the acid with water, then add the remaining water
- J mix half the water with acid, then add the remaining acid

20. The following graph shows the results of a scientific study. What is the independent variable in the study?



- A molar mass
- B melting point
- C vapor pressure
- D temperature

ACTIVITY 3

Chemistry SOL Review CH. 2 Notes and Practice

1. Atomic structure:

The contributions of the atomic theory scientists, including:

- _____ – father of atomic theory, solid sphere model
- _____ – discovered the electron, plum pudding model
- _____ – gold foil experiment, discovered nucleus & empty space
- _____ – organized first periodic table
- _____ – planetary model, electrons in different energy levels around the nucleus

2. Characteristics about each of the subatomic particles

- _____ – _____ charge, in nucleus, same mass as a neutron
- _____ – _____ charge, in nucleus, same mass as a proton
- _____ – _____ charge, outside of nucleus, negligible mass

3. The _____ of an element is the number of protons in the atom

- all atoms of the same element have the same number of protons
- The _____ of an element is equal to the sum of the protons and neutrons in the atom.
_____ of an element have the same number of protons but different numbers of neutrons, and thus different mass numbers.
- Mass # = protons + neutrons
- The number of electrons is equal to the number of protons in a _____. If the atom is a positive ion (**cation**), the atom has _____ electrons.
If the atom is a negative ion (**anion**), the atom has _____ electrons.

4. The Periodic Table:

- There are 7 _____ (rows) in the periodic table,
- and 18 _____ / _____ (columns) in the periodic table.

Know the names of the groups and the most important properties of those elements!

- Group 1 - _____ metals – *most reactive metals*
- Group 2 - _____ - _____ metals
- Groups 3-12 - _____ metals
- Group 13 – Boron group
- Group 14 – Carbon group
- Group 15 – Nitrogen group
- Group 16 - Oxygen group
- Group 17 - _____ – most reactive nonmetals
- Group 18 - _____ – inert (they do not react)
- _____ are the electrons in the outer most energy level of an atom.
 - To count the number of valence electrons, count over to the element from the beginning of its period, skipping the transition metals if necessary.
- _____ represent the valence electrons in an atom
 - Place one dot for each valence electron around the element's symbol
 - Put a dot on each side of the symbol BEFORE making any pairs
- The _____ represents how many electrons an atom needs to lose or gain to become _____ (have a _____ energy level like the noble gases)
 - You should know the oxidation number for the following groups:
 - Alkali metals = +1
 - Alkaline earth metals = +2
 - Boron group = +3
 - Nitrogen group = -3
 - Oxygen group = -2
 - Halogens = -1

- Many of the transition metals can have more than one oxidation number, so you cannot predict their oxidation numbers. The oxidation numbers for transition metals are usually told to us through roman numbers, for example the oxidation number of Iron (III) is Fe^{+3} .
 - Zinc and silver are two transition metals that do NOT need roman numbers because they only have one possible oxidation number. Note that Zinc is +2 and Silver is Ag^+

Examples

5. Fill in the chart below for each of the atoms given.

Atom	Atomic #	Mass #	p^+	e^-	n^0
Li					
$^{34}_{16}\text{S}$					
Ne-22					
^{23}Mg					
Se^{-2}					
$^{23}\text{Na}^+$					

6. Write the Lewis dot structure for each of the following atoms.

Carbon

Aluminum

Iodine

Barium

ACTIVITY 4

Chemistry SOL Review CH. 2 Review Questions

1. The element chlorine exists as two naturally occurring isotopes. Cl-35 occurs 75% of the time and Cl-37 occurs 25% of the time. Which of the following calculations should be used to calculate the correct average atomic mass of chlorine?

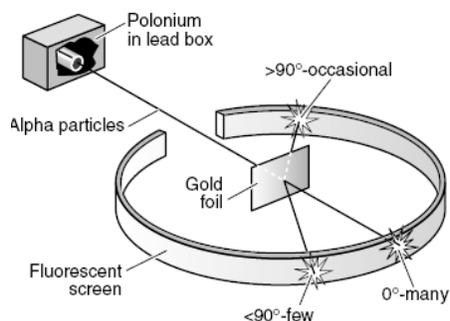
F $(35 \text{ amu} \times 0.75) + (37 \text{ amu} \times 0.25)$

G $\frac{(35 \text{ amu} \times 3) + 37 \text{ amu}}{2}$

H $\frac{(35 \text{ amu} \times 3) + 37 \text{ amu}}{3}$

J $\frac{35 \text{ amu} + 37 \text{ amu}}{2}$

2.



Which of these conclusions can be drawn from Rutherford's experiment?

- F Each atom contains electrons
 G The nucleus of an atom can be split
 H Each atom contains protons
 J Atoms are mostly empty space
3. Which grouping identifies chemical properties?
- A malleability, ductility, conductivity
 B luster, hardness, texture
 C combustibility, flammability, reactivity
 D density, melting point, boiling point
4. How does the radioactive isotope C-14 differ from the stable C-12?
- F It has a different number of protons and two less neutrons
 G It has the same number of protons and two more electrons

- H It has the same number of protons and two more neutrons
 J It has a different number of protons and two more neutrons

5. How many atoms are represented in this formula?



- A 5
 B 8
 C 28
 D 29

6. The net charge on an aluminum ion is +3 because there are-

- A 10 protons and 13 electrons
 B 13 protons and 10 neutrons
 C 10 neutrons and 13 electrons
 D 13 protons and 10 electrons

7. The elements that are characterized by having only seven valence electrons are from which family of elements?

- F Transition
 G Alkali
 H Noble gas
 J Halogens

8. Three elements, X, Y, and Z, have consecutive increasing atomic numbers. If element X is a noble gas, what will be the symbol for the ion of element Z in its compounds?

- A Z^{2-}
 B Z^-
 C Z^+
 D Z^{2+}

9. Atoms of the same element must-

- F contain the same number of neutrons
 G have the same mass number
 H contain the same number of protons
 J have equal protons and neutrons

10. How many valence electrons does a neutral atom of silicon have?

- A 3 C 5
 B 4 D 6

11. The elements that are characterized by having multiple oxidation states (ionic charges) are

- F transition elements
- G alkali earth metals
- H halogens
- J lanthanoids

12. A scientist found the following isotope of oxygen:



How many neutrons are present in this isotope?

- A 8
- B 11
- C 19
- D 27

13. Which represents a neutral atom of sodium?

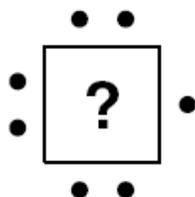
	Protons	Neutrons	Electrons
1	11	12	11
2	11	11	11
3	11	11	12
4	11	23	11

- F 1
- G 2
- H 3
- J 4

14. Chlorine forms a 1- ion. How many electrons does a chloride ion have?

- A 1
- B 16
- C 17
- D 18

15.



Which of the groups below has the electron dot structure shown above?

- F Noble gases
- G Halogens
- H Alkali metals
- J Transition elements

16. Which of these elements is found in a family that tend to lose three electrons when forming an ion?

- A Al
- B Sr
- C Si
- D Sb

17. Isotopes of an element have different-

- A atomic numbers
- B atomic masses
- C number of protons
- D number of valence electrons

18. Which of these is an ion with a charge of 1+?

	Protons	Neutrons	Electrons
1	11	12	10
2	1	0	2
3	15	16	15
4	20	20	18

- F 1
- G 2
- H 3
- J 4

19. The alkali metals are located in which group on the periodic table?

- A 1
- B 2
- C 3
- D 4

20. Which scientist proposed the planetary model, which suggested that electrons move in circular orbits around the nucleus?

- F Bohr
- G Dalton
- H Mosley
- J Rutherford

ACTIVITY 5

Chemistry SOL Review CH. 3 Notes and Practice

1. Chemical bonding:

- a) _____ **bond** – formed from the _____ **of electrons** between atoms to create positive and negative _____
- The oppositely charged ions will then attract each other and form a bond.
 - This usually occurs between a _____ atom and a _____ - _____ atom
 - Once the bond is formed, the compound is known as a _____
- b) _____ **bond** – formed from the _____ **of electrons** between atoms
- By sharing electrons, each atom can achieve a full valence level and become stable.
 - This usually occurs between _____ atoms
 - Once the compound is formed, it is known as a _____

2. **Ionic formulas** are known as _____. These are the lowest whole number ratios of the ions in the compound. To write a formula unit:

- a) Determine the oxidation numbers of the cation (usually a metal atom) and the anion (usually a nonmetal atom or a polyatomic ion).
- b) Determine the number of each ion needed to make the compound neutral.
- c) Polyatomic ions you should know by now include:

Sulfate		Nitrate	
Phosphate		Chlorate	
Carbonate		Hydroxide	

3. To name formula unit (ionic compound):

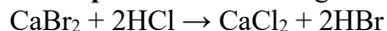
- a) Name the cation first
- ***If cation is a transition metal, tin or lead, you must use a roman numeral to indicate the oxidation number. You will have to determine this mathematically!
- b) If the anion is a nonmetal, change its ending to -ide
- c) If the anion is a polyatomic ion, simply write the name of the polyatomic
4. To determine an empirical and molecular formula for a compound, chemists use **percent composition**. This is the percent of an element by mass in the entire compound.

$$\% \text{ composition} = \frac{\text{total mass of element}}{\text{total mass of compound}} \times 100$$

5. Chemical Equations:

- a) The **Law of _____ of _____** proves there must be the same number of each atom on both sides of a chemical reaction.
- b) To balance a chemical equation, you may only add coefficients – NEVER change the subscripts!!
6. Reactions can be classified into different types.
- a) _____ - two or more reactants combine to produce **one product** $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$
- b) _____ – **one reactant** breaks down into two or more products $2\text{NH}_4\text{NO}_3 \rightarrow 2\text{N}_2 + 4\text{H}_2\text{O} + \text{O}_2$
- c) single-replacement a **free element** replaces another element from an **ionic compound**.
- This produces a different compound and a different free element
 - Cations must be replaced by a cation; anions must be replaced by an anion
- $$\text{Cu} + \text{AgCl}_2 \rightarrow \text{CuCl}_2 + \text{Ag}$$

d) Double-replacement is when **two ionic compounds** are exchanged with each other.



e) Combustion— **O₂ (g)** combines with another substance, often releasing light or heat. Carbon dioxide and water are often the products! $\text{CH}_4 (\text{g}) + 2\text{O}_2 (\text{g}) \rightarrow \text{CO}_2 (\text{g}) + 2\text{H}_2\text{O} (\text{g})$

Examples:

7. Write the formula for each of the following compounds:

Potassium Fluoride

Sodium oxide

Titanium (III) chloride

Calcium sulfate

Copper (II) nitrate

Aluminum sulfide

Magnesium nitrate

Cobalt (II) hydroxide

8. Write the chemical name for each of the following

FeI₂

NaNO₂

Fe(OH)₃

Ca₃(PO₄)₂

Ag₂O

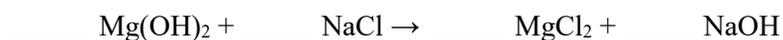
K₂CO₃

NaBr

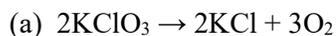
MgCl₂

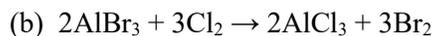
9. What is the percent of sodium in Na₂CO₃?

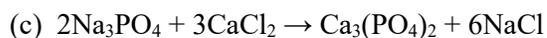
10. Balance the following chemical reaction and identify the type of reaction



11. Identify each type of reaction shown below









ACTIVITY 6

Chemistry SOL Review CH. 3 Review Questions

1. Using the table below, what is the correct formula for ammonium phosphate?

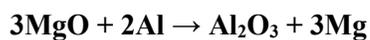
Some Selected Polyatomic Ions

Positive Ions		Negative Ions	
Names	Symbols	Names	Symbols
ammonium	NH_4^+	acetate	CH_3COO^-
mercury (II)	Hg^{2+}	cyanide	CN^-
		oxalate	$\text{C}_2\text{O}_4^{2-}$
		phosphate	PO_4^{3-}

- A NH_4PO_4
B $(\text{NH}_4)_2(\text{PO}_4)_3$
C $(\text{NH}_4)_3\text{PO}_4$
D $\text{NH}_4(\text{PO}_4)_3$
2. Which is the correct formula for iron (III) sulfate?

- F $\text{Fe}_3(\text{SO}_4)_2$
G FeSO_4
H $\text{Fe}_2(\text{SO}_4)_3$
J $\text{Fe}_2(\text{SO}_3)_3$

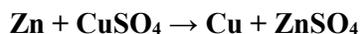
3. What type of reaction is this?



- A Synthesis
B Combustion
C Single-Replacement
D Double-Replacement
4. What is the percentage of aluminum in aluminum oxide (Al_2O_3)?

- F 47%
G 48%
H 53%
J 54%

5. Which reaction type *best* describes the reaction below?

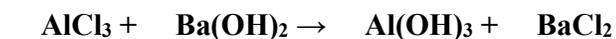


- F synthesis
- G decomposition
- H single replacement
- J combustion

6. The correct name for the compound CuCl_2 is

- F copper (II) chloride
- G copper dichloride
- H copper (I) chloride
- J carbon (IV) chloride

7. When this equation is correctly balanced, the coefficient of the AlCl_3 will be –



- F 1
- G 2
- H 4
- J 6

8. The correct name for MgI_2 is –

- A magnesium iodide
- B magnesium iodite
- C magnesium (II) iodide
- D magnesium diiodide

9. The bond found in magnesium chloride is-

- F covalent
- G nonpolar
- H ionic
- J metallic

10. Elements from which two groups in the periodic table would *most* likely combine with each other to form an ionic compound?

- A 1 and 2
- B 16 and 17
- C 1 and 17
- D 17 and 18

11. The formula for lithium nitride is –

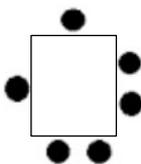
- A LiN
- B Li_3N
- C Li_3N_3
- D NLi_3

12. What type of reaction does this illustration represent?

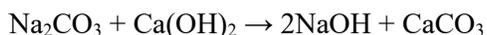


- A decomposition
B synthesis
C single replacement
D double replacement
13. If the diagram below were the correct representation for the Lewis structure of a molecule, then the X would be representative of the element-

- A oxygen
B fluorine
C nitrogen
D argon

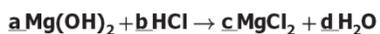


14. Which type of reaction is represented here?



- A single replacement
B double replacement
C synthesis
D decomposition
15. Which of the following is the correct name for the compound MnF_3
- A Manganese fluoride(III)
B Manganese (III) fluoride
C Manganese (I) fluoride (III)
D Manganese (III) fluoride (I)

16.



The coefficients necessary to balance the equation correctly are —

- F $a = 2, b = 1, c = 1, d = 2$
G $a = 1, b = 2, c = 1, d = 2$
H $a = 1, b = 1, c = 1, d = 1$
J $a = 2, b = 2, c = 1, d = 1$

17. One example of an ionic compound is —

- A F_2
B CO_2
C HBr
D MgCl_2

ACTIVITY 7

Chemistry SOL Review CH. 4 Notes and Practice

The mole & stoichiometry:

- **1 mole = 6.02×10^{23} particles**
 - “Particles” includes atom, molecules, ions, isotopes, cations, anions, formula units, etc.
- **1 mole = _____ g**
 - Use the periodic table to find the number of grams in one mole of the element or compound
- A balanced chemical reaction relates the number of moles of all substances in the reaction. The **coefficients** provide a conversion factor, known as a **mole ratio**, to relate two different substances to each other.
_____ mol X = _____ mol Y

Gas behavior:

There are several variables that affect gas behavior:

- Pressure (P) – this indicates how frequently the gas particles are colliding.
 - More collisions = higher pressure
- Volume (V) – the amount of space occupied by the gas particles
 - More space = less collisions (lower pressure)
- Moles (n) – this indicates the number of gas particles in the sample.
 - More particles = more collisions (higher pressure)
- Temperature (T) – this reflects the amount of energy the particles have
 - More energy = faster moving particles = more collisions (higher pressure)

equation:

Solutions:

- The concentration of a solution describes how many particles of a solute are dissolved in a solvent. A higher concentration means that more particles were dissolved in the same volume of solvent as compared to a solution with a lower concentration.
- **Molarity (M)** is most common way that chemists express the concentration of a solution.

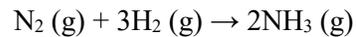
$$M = \frac{\text{mol of solute}}{\text{L of solution}}$$

- Concentrated solutions can be diluted by adding more solvent. To determine the concentration of the diluted solution, you can use the following equation: $M_c V_c = M_d V_d$

Examples:

1. How many molecules are found in 16.0 g CO₂?

2. How many grams are in 3.50 moles of NH₃?



3a) How many molecules of H_2 are needed to react completely with 16.0 g of N_2 ?

3b) How many moles of hydrogen are needed to produce 15.0 moles of ammonia?

3c) How many grams of ammonia can be produced by 100.0 grams of nitrogen in the presence of excess hydrogen.

4. What is the molarity of a solution with 10.0 g of CaCl_2 in 750 mL of water?

5. What volume of a 2.0 M solution is needed to give 250 mL of a 0.7 M solution?

ACTIVITY 8

Chemistry SOL Review CH. 4 Review Questions

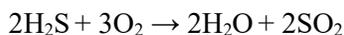
1. What is the concentration of a solution if 0.25 moles of solute is added to enough water to make a 250 mL solution.

- A 1.0 M
- B 0.0010 M
- C 0.063 M
- D 6.3 M

2. The average kinetic energy of a sample of water molecules is-

- F increased as the temperature is decreased
- G increased as the temperature is increased
- H unaffected by temperature changes
- J always equal to zero

3. If 3.50 g of H₂S are used in the above reaction, what will be the theoretical yield of water in grams?



- A 0.102 g
- B 0.185 g
- C 1.85 g
- D 185 g

4. A solution contains 225 g of glucose, C₆H₁₂O₆, dissolved in enough water to make 0.825 L of solution. What is the molarity of the solution?

- F 0.66 M
- G 0.97 M
- H 1.03 M
- J 1.52 M

5. Which of these is about 2 moles?

- A 2.0 grams of H₂
- B 4.0 grams of H₂
- C 2.0 x 10²³ molecules of H₂
- D 4.0 kg of H₂

6. A solution which has a concentration that exceeds its predicted solubility at a certain temperature and pressure would be-

- F unsaturated
- G saturated
- H supersaturated
- J dilute

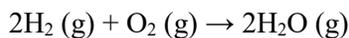
7. Carbon disulfide is prepared by reacting carbon with sulfur dioxide according to the above equation. If 5.9 moles of carbon react, how many moles of CS₂ are produced?



- F** 0.077 moles
G 1.2 moles
H 1.5 moles
J 30 moles
8. What is the final concentration of 50.0 mL of a 2.00 M solution are diluted to 500.0 mL?

- A** 0.100 M
B 0.200 M
C 0.400 M
D 1.00 M

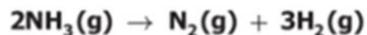
9. How many moles of oxygen are required to produce 2 moles of water?



- A** 1
B 2
C 3
D 4
10. Nitrogen gas is a diatomic molecule. What is the mass of one mole of nitrogen gas?

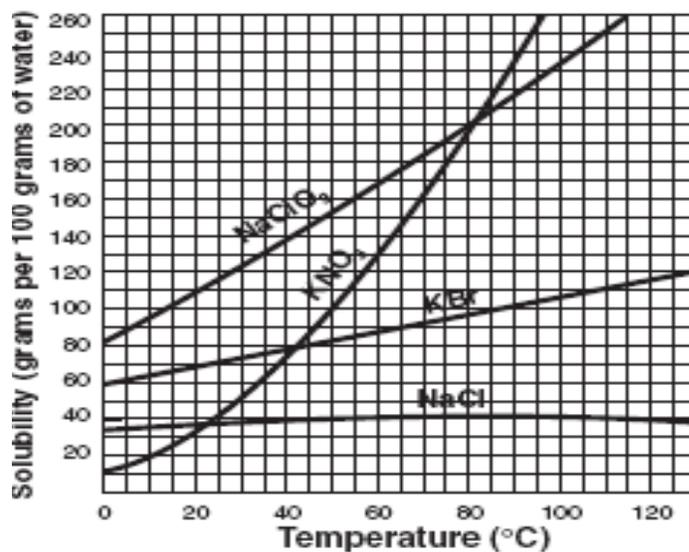
- A** 7 g
B 14 g
C 28 g
D 6×10^{23} g

11.



The reaction for the decomposition of ammonia (NH₃) can be written as shown. If a student starts with 21.7 g of NH₃, how many grams of hydrogen (H₂) gas will be produced by the reaction?

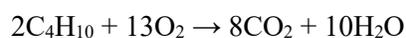
- F** 1.28 g
G 2.55 g
H 3.85 g
J 32.5 g



12. Which salt is most soluble in water at 90°C?

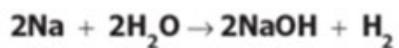
- F NaClO₃
- G KNO₃
- H KBr
- J NaCl

13. What is the mole ratio of C₄H₁₀ to CO₂ in the reaction?



- A 1:4
- B 2:13
- C 4:5
- D 13:8

14.



How many moles of hydrogen gas are produced when 0.066 mole of sodium is completely reacted?

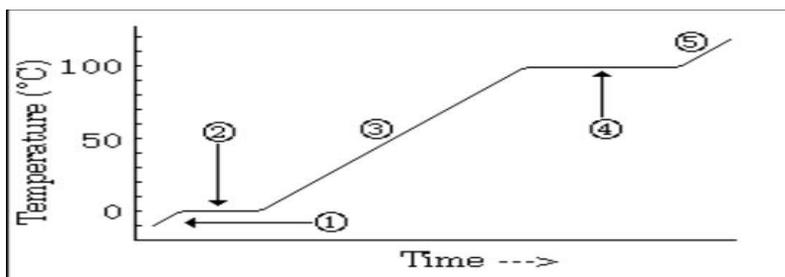
- F 0.022 mol H₂
- G 0.033 mol H₂
- H 0.066 mol H₂
- J 0.099 mol H₂

ACTIVITY 9

Chemistry SOL Review CH. 5 Notes, Practice, and Review Questions

Thermochemistry:

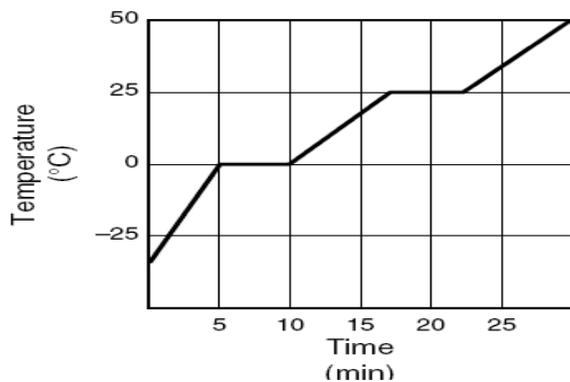
- A **heating curve** graphically displays the phase changes of a substance, as a function of temperature versus time.
- When the temperature remains constant over a period of time, this is when a phase change is occurring. The energy is being used to spread out or condense the particles from one state of matter to the next.



- Heat is also absorbed or released during chemical reactions. A reaction that absorbs heat from the surroundings is **endothermic**.
 - The surroundings get colder (temperature decreases) as heat goes into the system.
- A reaction that releases heat to the surroundings is **exothermic**.
 - ΔH The surroundings get hotter (temperature increases) as the heat leaves the system.

Practice Multiple Choice:

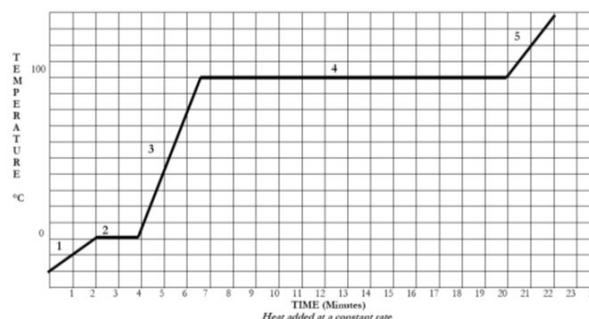
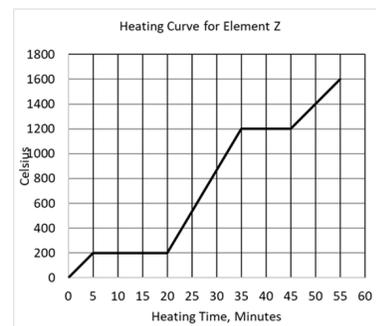
1. An experiment yielded the below temperature and time information. What is the freezing point of the material in this experiment if the material is a solid at time zero?



- F -25°C
- G 0°C
- H 25°C
- J 50°C

2. Which phase(s) is/are present at 10 minutes?
- a. solid
 - b. gas
 - c. liquid
 - d. solid and liquid
 - e. liquid and gas

3. Which phase(s) is/are present at 800°C?
- a. solid
 - b. gas
 - c. liquid
 - d. solid and liquid
 - e. liquid and gas



4. What segment(s) contain the liquid phase?
- a. 1
 - b. 1 and 2
 - c. 1, 3, and 5
 - d. 2, 3, and 4
 - e. 2 and 4

ACTIVITY 10

Chemistry SOL Review Questions

- The number 0.00232 expressed in exponential notation is
(A) 2.32×10^3 (B) 2.32×10^{-3} (C) 2.32×10^2 (D) 2.32×10^{-1}
- Convert 4.96 kg to g
(A) 496 (B) 0.00496 (C) 4960 (D) 49600
- The number of cubic centimeters (cm^3) in 43.0 mL is
(A) 0.0430 (B) 4.30 (C) 43.0 (D) 43000
- Calculate the following with significant figures: $6.167 + 70 =$
(A) 76 (B) 60 (C) 76.167 (D) 77
- Calculate the following with significant figures: $(4.0021)(0.004) =$
(A) 0.0160084 (B) 0.016 (C) 1 (D) 0.02
- At 20°C the density of mercury is 13.6 g/cm^3 . What is the mass of 50.0 mL of mercury at 20°C ?
(A) $6.80 \times 10^2 \text{ g}$ (B) 3.68 g (C) 1.00 g/mL (D) 0.272 g
- Which of the following is a physical change?
(A) cooking an egg (C) boiling water
(B) burning gas (D) decomposing water
- Which involves a chemical change
(A) melting ice (C) chopping wood
(B) grinding grain (D) fermenting fruit juice
- Which of these is a chemical property?
(A) ice melts at 0°C (C) water has a high specific heat
(B) helium is non-reactive (D) oxygen is a gas
- Which of the following is a compound?
(A) oxygen (B) salt (C) iron (D) hydrogen
- A sample of an element contains only one kind of
(A) isotope (B) mixture (C) atom (D) pure substance
- Which of the following is an element?
(A) sugar (B) salt (C) air (D) nitrogen
- A solution is a
(A) homogeneous mixture (C) pure substance
(B) heterogeneous mixture (D) compound
- An example of a mixture is
(A) hydrogen fluoride (C) purified water
(B) gold (D) air
- Which of the following is NOT a pure substance?
(A) elements (C) compounds
(B) carbon dioxide (D) air
- The method of separating a mixture into its solid and liquid components is called
(A) vaporization (C) homogenization
(B) filtration (D) solidification
- The name for the NO_3^- ion is
(A) nitrate (B) nitrite (C) nitrogen (D) nitric
- In balancing an equation, we change ___ to make the number of atoms on each side of the equation balance.
(A) formulas of compounds in the reactants
(B) coefficients of compounds
(C) formulas of compounds in the products
(D) subscripts of compounds
- In balancing the equation:
 $\text{C}_5\text{H}_{12}(\text{l}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
the coefficient in front of O_2 will be
(A) 10 (B) 6 (C) 4 (D) 3
- What is the coefficient for the underlined substance when the following equation is balanced?
 $\underline{\text{O}_2(\text{g})} + \text{C}_2\text{H}_6(\text{g}) \rightarrow \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$
(A) 2 (B) 3 (C) 6 (D) 7
- What type of reaction is $\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$?
(A) acid-base (C) combination
(B) single replacement (D) double replacement
- Choose the false statement.
(A) $1 \text{ mol} = 6.02 \times 10^{23} \text{ amu}$
(B) $6.02 \times 10^{23} \text{ atoms} = 1 \text{ mol of atoms}$
(C) fluorine is a diatomic gas
(D) 1 mol of carbon atoms weighs 12.0 g
- One mole of oxygen atoms represents
(A) 32.0g (B) 1.00 g (C) 6.02×10^{23} atoms (D) 16 atoms
- One mole of water weighs
(A) 3 g (B) 18 g (C) 1 g (D) 18 mL
- What is the mass of 2.00 moles of $\text{Ca}(\text{OH})_2$?
(A) 74.1 g (B) 56 g (C) 222.4 g (D) 148.2 g
- Calculate the number of moles of water molecules in 25.0 g of water.
(A) 1.39 mol (B) 6.98 mol (C) 0.720 mol (D) 2.78 mol
- The molar mass of blood sugar, $\text{C}_6\text{H}_{12}\text{O}_6$, also known as glucose and dextrose, is
(A) $6.02 \times 10^{23} \text{ g/mol}$ (B) 29 g/mol (C) 180 g/mol (D) 169 g/mol
- The mass of 0.80 mol of H_2 is
(A) 1.6 g (B) 0.80 g (C) 3.2 g (D) 0.8 g
- Which of the following is a metal?
(A) argon (B) hydrogen (C) calcium (D) bromine
- Which of the following is a nonmetal?
(A) cerium (B) cesium (C) carbon (D) copper
- The halogens contain how many valence electrons?
(A) 1 (B) 7 (C) 0 (D) 8
- The noble gases have how many valence electrons?
(A) 1 (B) 7 (C) 0 (D) 8
- The elements chlorine and iodine have similar chemical properties because they
(A) are both metals
(B) are in the same chemical period
(C) have the same number of electrons in their outer energy levels
(D) have the same number of stable isotopes
- When moving down a group in the periodic table, the number of valence electrons:
(A) remains constant
(B) increases by 2 then 8 then 18 then 32
(C) doubles with each move
(D) decreases regularly