Fall 2019 Chemistry Final Review

UNIT 0

List and be able to apply the 7 CCC and 10 SEP of NGSS.

UNIT 1

Describe the scientific method, fully understanding the various parts and terms: hypothesis,

experiment, observations, theories, laws, control, independent variable, dependent variable, experiment, etc.

Convert between ordinary decimal numbers and scientific notation.

Compare, contrast, and categorize observations as quantitative or qualitative.

Determine the accuracy and precision of measurements

Determine the number of sig figs in a measurement.

Know the SI and its units for length (m), mass (kg), temperature (K), time (s), volume (m3), and

density (g/mL or g/cm3)

Perform mathematical calculations and state the answer with the correct number of sig figs and

proper units, using the rules for addition, subtraction, multiplication, and division

Know the metric prefixes, their symbols, and what each one stands for as a power of 10 from

Giga- through nano-

Perform dimensional analysis or unit conversion calculations involving unit conversions,

including those of metric prefixes, English 🡨🡪 metric/SI

Perform temperature conversion from 0C 🡨🡪 0F 🡨🡪 K

Realize that a conversion factor is simply a ratio of the same measurement with different units –

the top of the ratio must equal the bottom – can be flip-flopped so that units cancel correctly

Indicate various units of each type of measurement

Define density and its units and perform calculations using D = m/V

Determine volume using water displacement.

UNIT 2

Define matter

Compare and contrast the three different states of matter and their properties– solid, liquid, gas

Know the five indications of chemical reaction: formation of a gas or odor, formation of a solid or precipitate, color change, production of heat or energy, production of light

Know different methods of physically separating mixtures – filtration, evaporation, etc.

Know what the Law of Conservation of Mass states

Other terms to know: allotrope, alloy, suspension, colloid, emulsion

Classify changes and properties as physical or chemical

Categorize substances as a compound, element, solution (homogeneous mixture), or

heterogeneous mixture.

Know the general principles of the kinetic-molecular theory of gases

Know what pressure is and the effects of changes in temperature or pressure (relate to volume and

density as well)

Classify properties as intrinsic/intensive or extrinsic/extensive

Know the names for all phase changes (boiling, melting, evaporation, vaporization, sublimation, condensation)

Understand Heating/cooling curves, and the related calculations

Know the important features of a phase diagram (P vs T, critical point, triple point, mp, bp, S, L, G, SCF)

Know terms associated with energy - specific heat capacity, calorie

Perform specific heat calculations using Q = mc∆T

Understand the difference between temperature and heat, and know acceptable units for each

Differentiate between endothermic and exothermic reactions

Differentiate between a system and its surroundings

Convert between cal, Cal, kcal, J, and kJ

Describe changes in gas states using the simple gas laws (Boyle’s, Charles’, Gay-Lussac, Avogadro, Combined), using Initial-Final-Effect tables and particle diagrams.

Calculate changes in gas states.

Use Energy Chart diagrams to show changes in energy types (Phase Energy, Thermal Energy)

Describe how a greenhouse gas operates to increase temperature.

Describe the key features of a greenhouse gas in terms of the way its molecules vibrate.

UNIT 3

Know the important scientists that have contributed to our understanding of the atom and the periodic table (Thomson, Rutherford, Mendeleev etc..) and what theories and experiments they are connected with.

Know the mass, charge, and location within the atom of subatomic particles – electrons, protons,

and neutrons

Define atomic number (# of protons, which also = # of electrons if the atom is neutral)

Define atomic mass or mass number (# of protons + # of neutrons)

Define isotope – How are isotopes of the same element alike? How are they different?

Relate atomic mass, atomic number, # of electrons, # of protons, and # of neutrons to one another

Define period and family (groups) on the periodic table

Locate and describe characteristics of metals, non-metals, and metalloids

Know the different family names and properties – alkali metals, alkaline earth metals, halogens,

noble gases

Know the different parts to the periodic table – transition metals, rare earth metals, main group

elements

Know which elements exist naturally as diatomic molecules

Know which elements exist naturally as liquids, gases, and solids

What is an ion? How is it formed?

Define cation and anion

Define radioactivity.

What are the three types of radiation?

Know the key characteristics of the three types of radiation including name, symbol, charge, mass and penetrating ability.

Write a decay reaction or a bombardment nuclear reaction.

Describe and calculate half-lifes of radioactive nuclides.

Test Format

75 Multiple Choice questions

YOU WILL BE GIVEN:

A periodic table like your colored one, but blank. It’s a good idea to give yourself instructions on how to modify this periodic table with the useful additions we have made on it.

YOU WILL NOT BE GIVEN:

Any equations – density, specific heat; A list of the metric prefixes or their conversions; The density or specific heat of water (1.00 g/mL and 4.186 J/goC) Any memory items from unit tests.

YOU MAY BRING IN (Only for the Final)

A single sheet of 8 1/2” by 11” paper with *anything* you want **HANDWRITTEN** on **one side** with NOTHING on the other side. If you violate these rules by having anything printed or anything on the back of your sheet, I will confiscate your sheet.

CHEMISTRY

SEMESTER ONE EXAM REVIEW

Determine whether the following are a heterogeneous mixture (HE), solution (S), element (E), or compound (C)

1. salt water 6. trinitrogen hexafluoride
2. distilled water 7. calcium
3. Italian salad dressing 8. tap water
4. silver 9. chicken noodle soup
5. carbon dioxide 10. milk

State whether the following changes are physical (P) or chemical (C)

1. Burning paper 6. Breaking a glass jar
2. Melting ice 7. Digesting food
3. Dissolving salt in water 8. Lighting a match
4. Distillation 9. Filtration
5. Cheese becoming moldy 10.Iron rusting

What does the Law of Conservation of Mass/Matter state?

Give one example (NOT a definition) each of a theory, a law, and a hypothesis

Theory:

Law:

Hypothesis:

Read the following paragraph and categorize the data as quantitative or qualitative.

Ty Tanium has 20 g of chemical X, 40 mL of solution Y, and a small handful of powder Z. He mixed everything together and let it sit for a few minutes. When he returned, he noticed that there was dark steam coming up from the black, smoggy liquid. He then felt the container and was shocked to see that it was very cold. He then recorded the temperature as 60 C and also found that it had a mass of 45 g.

Quantitative measurements Qualitative measurements

1.

2.

3.

4.

The accepted value is 9.740C. The experimental values are as follows:

7.380C 7.940C 8.320C 16.790C

As a whole, are these values accurate? Are they precise? Explain why.

State the number of sig figs in each of the following numbers/measurements

1. 5.299 mL 6. 4.56 x 104 mm
2. 0.0035 g 7. 9.01 x 10-2 K
3. 0.405 km 8. 90 books
4. 5460 cm3 9. 0.4040 s
5. 300.00 m2 10 45.004 hr

Write the following ordinary numbers in scientific notation

1. 138 5. 980000
2. 257921 6. 0.004500
3. 0.01004 7. 5.1890
4. 0.0000094 8. 91.000

What physical quantities are measured in the following units? For example, cm measures length.

1. mL 5. cm2
2. K 6. m3
3. g/cm3 7. kg
4. ns 8. Gm

Write the following numbers that are in scientific notation as ordinary numbers.

1. 3.00 x 103 4. 5.004 x 104
2. 9.312 x 10-3 5. 2 x 10-6
3. 9.6 x 101 6. 1.900 x 10-1

A ball with a mass of 13.32 g has a volume of 2.06 mL. Calculate the density of the ball.

Perform the following unit conversion

1. 13.80C 🡪 K
2. 153 K 🡪 0C
3. 16.4 uL 🡪 GL

4. How many ackufulzers are there in 1.94 x 107 oogas?

1 ooga = 13.4 fruity

1 fruity = 14.2 ihni

6 ihni = 18.7 ackufulzer

Complete the following table

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mass # | # of protons | # of electrons | # of neutrons | Symbol | Atomic # | Charge |
|  |  |  | 19 | K |  | 0 |
| 191 | 76 | 73 |  |  |  |  |
| 55 | 24 |  |  |  |  | +2 |
|  |  | 61 |  | 145Pm |  |  |

What are four physical properties of metals?

Which 7 elements are diatomic?

Which 2 elements exist naturally as liquids?

Which 11 elements exist naturally as gases?

What are five indications or signs of a chemical change?

What similarities do isotopes of the same element have? What differences do they have?

What are the pure substances? Can any pure substances be separated? If so, how?

What are mixtures? How can they be separated? Give at least 3 examples of common methods used to separate mixtures.

Convert 1.95 kJ into cal.

Compare and contrast solids, liquids, and gases with respect to expandability and compressibility, density, volume, shape, and movement on a molecular level.

|  |  |  |  |
| --- | --- | --- | --- |
| State of Matter | Solid | Liquid | Gas |
| Expandability/  Compressibility |  |  |  |
| Density |  |  |  |
| Volume |  |  |  |
| Shape |  |  |  |
| Movement |  |  |  |

Calculate the energy needed to raise the temperature of 0.00932 kg of gold by 78.30C. The specific heat capacity of gold is 0.13 J/g0C. (4 pts)

What name is given to each of the following phase changes?

Solid 🡪 liquid Gas 🡪 liquid

Solid 🡪 gas liquid 🡪 solid

Gas 🡪 Solid liquid 🡪 gas

Sketch and label a phase diagram with states, normal boiling and melting points, triple point and critical point.

How does the phase diagram of water differ from most others? Why is this important? (think density)

Perform each of the following metric conversions. Express your answer in correct scientific notation

a. 2225 mL = L b. 0.581 kg = cg

If the density of a small piece of silver is 10.49 g/cm3, what is the density of 10 identical pieces of silver? Explain your answer.

Evaluate each of the following and write the answer to the appropriate number of sig figs. Answers do not need to be in scientific notation

1. 0.500 x 3.6 x 19.34 c. (3.95 x 104) / (1.725 x 10-3)

b. 15 – 3.1 + 7.114 d. 56.92 – (2.71 x 3) + 1.2874

Classify each of the following properties as intensive (I) or extensive (E).

a. color b. surface area

c. boiling point d. density

List one element by symbol that belongs in each of the following categories:

1. a noble gas b. an alkali metal

c. a transition metal d. a halogen

e. a rare earth metal f. an alkaline earth metal

Identify each of the following as metals (M), metalloids (ML), or non-metals (NM):

a. S b. Fr

c. Mn d. H

e. Co f. B

Identify the scientist who made the following discovery or performed the following experiment:

a. gold foil experiment

b. discovered the electron

c. oil drop experiment

d. designed the periodic table

e. discovered the nucleus

Sketch a diagram of the earth and the sun and describe symbolically and in words how greenhouse gases increase the temperature of the earth.

Draw two energy chart diagrams: for a) the lemonade and b) the ice cube if a single ice cube is added to room temperature lemonade and completely melts significantly cooling the lemonade.

1. If 16.3 L of argon gas at a pressure of 3.2 atm is changed to 1.8 atm at constant temperature, what is the new volume? *Draw particle diagrams to support your answer.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **P** | **T** | **V** |
| **Initial** |  |  |  |
| **Final** |  |  |  |
| **Effect** |  |  |  |

1. A gas with a volume of 4.0 L at a STP is allowed to expand to a volume of 12.0 L and 22.9C. What is the new pressure in the container? *Draw particle diagrams to support your answer.*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **P** | **T** | **V** |
| **Initial** |  |  |  |
| **Final** |  |  |  |
| **Effect** |  |  |  |