The Prezi for Chapter 1 as presented in class.

Here are additional notes and answers to the embedded questions.  The same information is in the attachment.

Answers to Chemistry Basics Prezi Questions –

Know the following SI units – from Table 1.2 Chang and Goldsby

|  |  |  |
| --- | --- | --- |
| Base Quantity | Name of Unit | Symbol |
| Length | meter | m |
| Mass | kilogram | kg |
| Time | second | s |
| Temperature | kelvin | K |
| Amount of substance | mole | mol |

Know the following SI prefixes         – from Table 1.3 Chang and Goldsby

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Prefix | Symbol | Multipler           (in decimal form) | (in Sci. Notation) | Example: (length) | Relative size |
| mega- | M | 1,000,000 | 106 | 1 pm = 1 x 106 m | Larger than base unit |
| kilo- | k | 1,000 | 103 | 1 km = 1 x 103 m |
| No prefix |  | 1 | 100 | 1 m   = 1  m |  |
| deci- | d | 0.1 | 10-1 | 1 dm = 1 x 10-1 m | Smaller than base unit |
| centi- | c | 0.01 | 10-2 | 1 cm = 1 x 10-2 m |
| milli- | m | 0.001 | 10-3 | 1 mm = 1 x 10-3 m |
| micro- | μ (mu) | 0.000,001 | 10-6 | 1 μm = 1 x 10-6 m |
| nano- | n | 0.000,000,001 | 10-9 | 1 nm = 1 x 10-9 m |
| pico- | p | 0.000,000,000,001 | 10-12 | 1 pm = 1 x 10-12 m |

Question 1: Which of the following is / are an extensive property of oxygen?

A.  boiling point

B.  temperature

C.  average kinetic energy of molecules

D.  density

**E.  mass**

Answer:  E.  mass.  Mass is the only property on this list that is extensive.  The mass of a substance depends on how much of the substance you are considering.  The other properties, including temperature, do not depend on the amount of the material.  For example, a sample of titanium metal at 375 °C does not depend on the amount of material in the same; it could be a small sample of a 2.0 grams or a large sample of several kg.

Question 2: Classify each as a chemical or physical change:

A. boiling of water

B. melting wax

C. broiling a steak on a grill

D. condensing water vapor into rainfall

Answer:  C.  The process in A, B and D are phases changes and therefore are physical changes.  Broiling a steak is a complicated chemical process that involves many different reactions where bonds between molecules are being broken and new ones are being formed.  Unlike boiling water (which can be condensed into its original liquid state), melting wax (which can be solidified when cooled) and water condensing into rainfall (which can be re-evaporated), there’s no way to unbroil a steak.

Question 3: Select the best statement.

A. Physical changes are often reversed by changing the temperature.

B. Physical changes alter the composition of the substances involved.

C. Physical properties are not valid characteristics for identifying a substance.

D. Physical properties are mostly extensive in nature.

E. Physical changes are usually accompanied by chemical changes.

Answer: A.   Physical changes that involve changing states of matter are reversible with temperature changes.  Choice B is incorrect because change the composition of a substance involves breaking, forming or rearranging bonds which is the definition of chemical change.  Choice C is incorrect because many physical properties (like color or density) are excellent ways to identify a substance.  Choice D is incorrect because many physical properties are intensive properties.  Choice E is incorrect because physical changes may or may not be accompanied by a chemical change.

Question 4: Select the best statement.

A. Chemical changes provide the only valid basis for identification of a substance.

B. Chemical changes are easily reversed by altering the temperature of the system.

C. Chemical changes always produce substances different from the starting materials.

D. Chemical changes are associated primarily with extensive properties.

E. Chemical changes are accompanied by changes in the total mass of the substances involved.

Answer: C.  Choice A is incorrect because many physical characteristics provide identification of substances.  Choice B is incorrect because it is the definition of physical changes.  Choice D is incorrect because both chemical and physical changes are associated with both extensive and intensive properties.  E is incorrect because, as we will see next week, mass is conserved during chemical reactions.

Question 5:  Which one of the following is a "substance" in the sense of the word as used in your textbook?

A. air

B. tap water

C. sea water

D. pure water

E. toothpaste

Answer: D. pure water.  The term substance is used to indicate a pure substance meaning that it contains elements or compounds of only one type.  For example here, pure water means that the sample contains only H2O molecules and nothing else.  In all of the other choices, there are a variety of substances together creating mixtures.

Question 6: The weight of a coin measured as 1.96235 g on one balance is definitely more accurate than a weight measurement of 1.95 g on another balance.  T/F

Answer: False.  The measure to the hundred thousandths place in the first weighing is much more PRECISE than the measurement to the hundredth place in the second weighing.  However, without further information, no statement can be made about either measurement’s ACCURACY.

Question 7:  How many sig figs are there in the number 0.010?

A.  1

B.  2

C.  3

D.  4

Answer: B.  The 1 is significant and the trailing 0 is significant.  The other two zero are leading zeros and are therefore not significant.  This number can be written in scientific notation as 1.0 x 10-2 that clearly shows the number of sig figs.

Question 8:  Isopropyl alcohol, commonly known as rubbing alcohol, boils at 82.4° C. What is the boiling point in kelvins?

Answer:  355.6 K.  To convert from ° C to K, we add 273.15 (exactly).  82.4 + 273.15 = 355.55 which must be rounded to the tenths place to get the correct answer.

Question 9:  How many sig figs, and what units will the answer to this calculation have?

16.18 cm × 9.6114 g ÷ 1.4783 cm2 =

Answer: First, find the units to the answer, cm x g ÷ cm2 = g/cm.

Second, find the numerical answer to the mathematical operation.  Your calculator will show the number 105.1968153.

Third, find the correct number of significant figures.  Because the mathematical operation is multiplication/division, the number of sig. figs. will be determined by the least number of sig figs of the three values in the problem; that is the first number has 4 sig figs, the second has 5 sig figs, and the third has 5 sig figs.  Therefore, the answer will have 4 sig figs.

Fourth, round off the answer to the correct number of sig figs which gives 105.2.

Last, report the value to the correct number of sig figs with the correct units; **105.2 g/cm**.

Question 10: Convert a density of 20.1 g/cm3 to units of kg /m3.

Question 11:  Which of the following numbers contains a digit or digits which is/are not significant?

A.  970.0

B.  502

C.  .300

D.  .0043

E.  20.01

Answer: D.  The leading zeros are not significant.  Written in scientific notation, .0043 = 4.3 x 10-3.  This representation more clearly shows the two sig figs.  Choice C has trailing zeros AFTER the decimal point, which ARE significant.  Choices B and E have trapped zeros between non-zeros.  Choice A has a zero after the decimal point (like choice B) and another zero before the decimal point which is trapped between the trailing zero (significant) and the seven and therefore that zero is also significant.

Question 12: Express 96,342 m using 2 significant figures.

A. 9.60 × 104 m

B. 9.6 × 104 m

C. 9.60 × 10-4 m

D. 9.6 × 10-4 m

E. 96,000. M

Answer: B.

Question 13: The result of (3.8621 × 1.5630) - 5.98 to the correct number of sig. figs. properly written as:

A.   0.06           1 sig fig

B.   0.056          2 sig figs

C.   0.0565        3 sig figs

D.   0.05646      4 sig figs

E.   0.056462    5 sig figs

Answer A.  Some students will choose answer C, because 5.98 has three sig figs.  That is INCORRECT.  This problem needs to be solved in two steps; first multiplication and then subtraction.  Your calculator will show the answer to the first problem is 3.8621 × 1.5630 = 6.0364623.  That number is good to 5 sig figs because both of the original numbers has 5 sig figs; properly rounded the answer is 6.0365.

Carrying this answer into the second part of the problem we need to find the answer to

              6.0365

            - 5.98

              0.0565

Or, if you simply do the multiplication followed by the subtraction problems in your calculator directly, the calculator will show 0.0564623.  This number needs to be rounded according to the rules of addition and subtraction.  Since the MOST precise digit of the LEAST precise value (which is the 8 in 5.98) occurs in the hundredths place, the final answer must be rounded to that place.  The 6 in the thousandths place round up giving 0.06.  So, even though the original numbers in the problem contain 5, 5 and 3 significant figures, the answer to the problem has only 1 significant figure.

Question 14: The mass of a sample is 550 milligrams (mg).  Express that mass in kilograms?

A. 5.5 × 108 kg

B. 5.5 × 105 kg

C. 5.5 × 10-4 kg

D. 5.5 × 10-6 kg

E. 5.5 × 10-1 kg

Answer C.