Chem 121 Rybolt  Exam 1  Fall 2007  Name  KEY

Numerical constants may be listed below. Other needed information is given in the problem or written on the board or found in the periodic tables you will use during exam. For numerical problems, be sure to show your work, include units and circle your final answer. If several choices are given, circle the correct answer. Your written answers should be brief and to the point. You can use your own calculator on the exam, but no notes, books, external information, or other electronic devices are to be used. No cell phone is to be used in Exam room.

1) The element from the fourth period that is a transition metal is
K  Ca  Ti  As  Br  Kr

2) The element from the fourth period that is a noble gas is
K  Ca  Ti  As  Br  Kr

3) The element from the fourth period that is poisonous metalloid is
K  Ca  Ti  As  Br  Kr

4) The element from the fourth period that forms a -1 charge is
K  Ca  Ti  As  Br  Kr

5a) Chemistry such as burning wood to stay warm goes back to what earliest time in the history of chemistry (name time period) Ancient

b) Burning wood and believing that the heat that was given off was an actual substance that left the wood goes back to what chemistry time period (name time period) Phlogiston

6) Radioactive Uranium 235 has how many neutrons? 143

7) Sketch the path of an alpha particle and a beta particle as they pass through a magnetic field

8) Write a balanced chemical equation (using element and compound symbols) to represent the reaction magnesium plus chlorine to make magnesium chloride

\[ \text{Mg} + \text{Cl}_2 \rightarrow \text{MgCl}_2 \]

9) Write and balance the following chemical reaction
C,\text{H}_10 + \text{ oxygen} \rightarrow \text{ carbon dioxide} + \text{ water}

\[ 1\text{C}_4\text{H}_{10} + \frac{13}{2}\text{O}_2 \rightarrow 4\text{CO}_2 + 5\text{H}_2\text{O} \]

10) When Lance Armstrong was competing in the Tour de France it was necessary to get his bike as close as possible to the Union Cycliste Internationale minimum bike weight of 6.8 kilograms. If his bike weighed 15.3 pounds (lb) then what is the weight in kg? Recall the 454g = 1 lb.

\[ ?\text{kg} = 15.3 \text{lb} \left( \frac{454\text{g}}{1\text{lb}} \right) \left( \frac{1\text{kg}}{10^3\text{g}} \right) \]

\[ = \text{6.95 kg} \]
11) During 21 days of the Tour de France, each cyclist covers 2,110 miles and burns about 5,200 dietary Calories per day. If a dietary Calorie (Cal) = 1,000 regular calories (cal) and there are 4.184 joules (J) = 1 cal, then how many kilojoules of energy are expended for the entire 21 day race?

\[ \text{k} \text{kJ} = \left( \frac{21 \text{days}}{\text{race}} \right) \left( \frac{5,200 \text{ Cal}}{\text{day}} \right) \left( \frac{10^3 \text{ cal}}{\text{Cal}} \right) \left( \frac{4.184 \text{ J}}{\text{cal}} \right) \left( \frac{1 \text{ kJ}}{10^3 \text{ J}} \right) \]

\[ = 4.6 \times 10^5 \text{ kJ} \]

12) I have a bucket of water, and I wish to determine the mass of water in it before I tried to pick it up. I know that the density of water is 1.00g/cm\(^3\) and the bucket contains 2.00ft\(^3\) of water. Given that 2.54cm = 1 in and 12in = 1 ft and your knowledge of SI units then what is the mass of the water in kilograms?

\[ \text{kg} = \left( \frac{2.00 \text{ ft}^3}{\text{bucket}} \right) \left( \frac{12 \text{ in}}{\text{ft}} \right)^3 \left( \frac{2.54 \text{ cm}}{\text{in}} \right)^3 \left( \frac{1000 \text{ g}}{\text{kg}} \right) \left( \frac{10^3 \text{ g}}{\text{kg}} \right) \]

\[ = 5.66 \times 10^1 \text{ kg} \]

\[ 57 \text{ kg} \] is about 125 lb

13) A temperature of \(-440.0^\circ\text{F}\) is equal to what temperature in K kelvin?
Recall that \( K = ^\circ\text{C} + 273.15 \) and \( ^\circ\text{C} = (^\circ\text{F} - 32)/1.8 \) (32 and 1.8 are exact values)

\[ ^\circ\text{C} = \frac{-440^\circ\text{F} - 32}{1.8} = -262.2^\circ\text{C} = 273.15 + (-262.2^\circ\text{K}) = 10.95 \text{ or } 11.0 \text{ K} \]

14) Write the name of the following:

\( \text{OH}^- \) hydroxide

\( \text{Ca}_3(\text{PO}_4)_2 \) calcium phosphate

15) Write the name of the following:

\( \text{SO}_3 \) sulfur trioxide

\( \text{NH}_3 \) ammonia

16) Write the formula of the compound that might be mispronounced as moly-b-dcn-um (I) bic-ar-bon-ate.

\( \text{MoO}_4\text{HCO}_3^- \)

17) Write the formula of the following:

nitrate ion \( \text{NO}_3^- \)

aluminum sulfate \( \text{Al}^{3+} \text{SO}_4^{2-} \)

18) Write the formula of the following:

ammonium chloride \( \text{NH}_4\text{Cl} \)

iron(II) perchlorate \( \text{Fe}^{2+} \text{ClO}_4^- \)

19) Some of the more valuable metals include \( \text{Au} \) gold and \( \text{Pt} \) platinum. (Write element symbol next to name)
20) A 7.600g sample of the compound CS₂ is decomposed into its elements, the amount of carbon is 1.206g and the amount of sulfur is 6.394g. If the mass of a single carbon atom is 12.000 amu then what is the average atomic mass of carbon? Write your answer to 4 sig fig and show work.

\[
\frac{2.5}{1} \text{ c} \quad \text{ Setup ratios and solve for S} \\
\frac{2.5}{1} = \frac{6.394g}{12.00g} \\
S = 3.181 \text{ amu}
\]

21) Unopened beer is a mixture of water, ethanol, carbon dioxide, and various flavoring compounds (from hops, malt and other ingredients), and beer is uniform through out so therefore it would be ______ homogeneous ______ heterogeneous ______ elemental ______ Lavoisier

22) Hops are a flower (Humulus lupulus) used as a flavoring agent in beer. When beer is exposed to light it is possible to give a reaction with a compound from hops that gives a smell similar to that of skunk spray. This molecule has a formula C₃H₁₀S so therefore the elements that it is made of are (write out the element names in words)

carbon ______ hydrogen ______ sulfur

23) One way to avoid the reaction that makes skunky beer is to store beer in cans or brown bottles. Green or clear glass bottles allows more light to reach the liquid stored in the container. If a light causes a new compound to be made in beer (one that gives it a skunky odor) then this type of reaction is a ________ change ________ physical ________ chemical ________ homogeneous ________ heterogeneous

24) How many protons ______ 16 ______ and how many electrons ______ 18 ______ in the ion \(^{32}_{16}\)S\(^{2-}\)

25) In S the percent composition of the main isotopes found in nature are given below. Use these values to determine the average atomic mass of S in amu (answer to 4 sig fig and show work) 95.00\% mass 32.00 and 0.8000\% mass 33.00 and 4.2000\% mass 34.00

\[
\begin{align*}
= (.9500)(32.00) + (.008000)(33.00) + (.04200)(34.00) \\
= 32.69 \text{ amu}
\end{align*}
\]

26) In one class Demo you saw a dollar bill that was soaked in a liquid and set on fire. What did you observe with regard to the dollar bill itself (not why – just what did you see?)

Dollar bill did not burn.