Use of the Periodic Table:
1. Which of the following statement is/are true? (a) 18/8 O and 19/9 F have the same number of neutrons (b) 14/6 C and 14/7 N are isotopes (c) 18/8 O\(^2\) and 20/10 Ne have the same number of electrons (d) a and b (e) a and c
2. Which compound has the largest molecular mass? (a) C\(_2\)H\(_4\)O (b) CO\(_2\) (c) CH\(_3\)Cl (d) C\(_2\)H\(_2\)
3. An atom of Bromine- 79 contains how many protons, neutrons, and electrons?

Significant Digits
4. What is the answer to the following in the correct number of significant digits: 
   \[(16.778 – 15.99) / 118.9\]

Homogeneous, Heterogeneous, States of Matter
5. Which of the following transitions involves a chemical change? 
   (a) heterogeneous mixture → homogeneous matter (b) compounds → elements (c) water → ice (d) homogeneous mixtures → pure substances

Dimensional Analysis
6. How many nanoseconds are there in 35 ms?
7. If an automobile is able to cover 22 miles on one gallon of gasoline, what is the gas mileage in Km/L? (1.61 Km = 1 mi, 1 L = 1.057 qt)

Writing formulas for and naming ionic compounds
8. Which of these formulas are incorrect? (a) CaPO\(_4\) (b) (NH\(_4\))\(_2\)SO\(_4\) (c) NaHCO\(_3\) (d) Na(OH)\(_2\) (e) HClO\(_4\)
9. Name the following compounds: (a) Na\(_2\)O (b) CO\(_2\) (c) CO (d) FeCl\(_3\) (e) MgSO\(_4\) (f) N\(_2\)O\(_5\) (g) Cu(NO\(_3\))\(_2\) (h) HF (i) HNO\(_3\) (j) HNO\(_2\)

Dimensional Analysis (Mole Concept)
10. 46 g of water = ___ moles.
11. 3.5 moles of NaOH = ___ g
12. 60 g of CO\(_2\) = ___ CO\(_2\) molecules
13. 30 g of H\(_2\)SO\(_4\) = ___ O atoms
14. What is the mass of one atom of Mg?

Empirical and Molecular Formulas (change to moles, divide by smallest to get the lowest whole number ratio, multiply by a factor to make whole numbers if necessary)
15. Adipic acid contains: 49.32% C, 43.84% O, and 6.85% H by mass. What is the empirical formula for adipic acid?
16. If the molecular mass of adipic acid it 146 amu, what is the molecular formula?

Percent Composition
17. What is the % of O in KClO\(_3\)?
Stoichiometric Problems

18. When 6 g of H₂ reacts with an excess of O₂, how many grams of H₂O will be produced?

Limiting Reactants

19. How many grams of CO₂ will be produced when 3.0 g of C₂H₄ reacts with 3.0 g of O₂? (ans. 2.8)

% Yield

20. 30 grams of H₂ reacts with an excess of O₂ and produces 190 g of water. What is the % yield? (ans. 70.4)

Balance Equations

21. Balance: H₂SO₃ + O₂ → H₂SO₄
   
   Ca(NO₃)₂ + AlPO₄ → Ca₃(PO₄)₂ + Al(NO₃)₃

Calculate Atomic Mass From Isotopes

22. Element X consists of two isotopes. X-34 is 70%. What is the mass of the second isotope if the recorded atomic mass of X is 35.5 amu?

Molarity and Dilution Equation

23. __ g of NaOH is required to make 200 ml of 3M NaOH.

24. 30 g of NaOH is dissolved in enough water to make 300 ml. What is the M?

25. How many ml of water must be added to 300 ml of 3M KOH to change it to 1.5 M KOH?

Extra Mixed Concept Problems

26. Copper has two naturally occurring isotopes, copper-63 with a mass of 62.9298 amu and copper-65 with a mass of 64.9278 amu. Its average atomic mass is 63.55 amu. What is the percent abundance of the copper-63 isotope? (a) 23.5 (b) 38.1 (c) 50.2 (d) 59.6 (e) 69.0

27. The density of chloroform, CHCl₃, is 1.492 g/cm³. How many chlorine atoms are present in 2.5 µL of CHCl₃? (a) 5.6 X 10¹⁹ (b) 3.8 X 10²² (c) 1.3 X 10²² (d) 1.9 X 10²⁵ (e) 1.9X 10¹⁹

28. A certain unknown compound contains only carbon and hydrogen. Combustion of 1.000 g of this compound produces 3.138 g of CO₂ and 1.285 g of H₂O. The molar mass of this compound is between 75 and 90 g/mol. What is the molecular formula of the unknown?
29. The average atomic mass of carbon is 12.011. Assuming that you were able to pick up only one carbon atom, the chance that you would randomly choose one with a mass of 12.011 amu is (a) 1.1% (b) 12% (c) 12.001% (d) greater than 50% (e) 0%

Most often missed questions on test last semester:

30. When the following calculation is performed, how many significant figures will the answer have? \[1.900 + 0.0200/ 23.75 + 0.25] + 0.06223=\] (27% answered correctly)

31. What is the SI unit of mass and what is the SI unit of volume? (22% correct)

32. Potassium nitrate decomposes on heating, producing potassium oxide and gaseous nitrogen and oxygen. Write the balanced equation for the reaction. What is the coefficient on potassium nitrate when this equation is balanced using the smallest whole-number coefficients? (40% correct)

Simple Rules for naming Compounds:

- **Binary Compounds (Two different elements)**
- **Polyatomic (3 elements)**

  - _____ _____ide
  - ↓

(a) If the two elements are non-metals
- prefixes must be used: mono, di, tri, tetra, and penta

(b) If it is a metal and non-metal and the first metal is a transition metal, Roman Numerals must be used.

Rules for Naming Acids:

(A) Binary acids (H and one element) hydro____ic acid

(B) Oxy acids (acids containing oxygen)
- If polyatomic ion ends in –ate: _____ic acid
- If polyatomic ion ends in –ite: _____ous aci