1. A 25 kg ball has a kinetic energy of 225 J. What is the speed of the ball?
   What kind of question is this? energy
   $3 \text{ m/s}$

2. How many molecules of water are there in 100 mL of water? (The density of water = 1.000 g/ml.)
   What kind of question is this? stoichiometry
   $3.34 \times 10^24$ molecules

3. Given that the atomic mass of carbon is given as 12.0107 g/mol, what are the approximate relative abundances of the two isotopes $^{12}$C and $^{13}$C?
   What kind of question is this? isotopes
   $98.93\% \text{ } ^{12}\text{C}, \text{ } 1.07\% \text{ } ^{13}\text{C}$

4. In the electrolysis of $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$, how many atom of O in O$_2$ are made from 4 g of H$_2$O?
   What kind of question is this? stoichiometry
   $1.34 \times 10^{23}$ molecules

5. What are the most likely ionic forms of (a) sodium and (b) calcium?
   What kind of question is this? periodic trends
   (a) $\text{Na}^+$; (b) $\text{Ca}^{2+}$

6. What is the product of a reaction between metallic lithium and oxygen, O$_2$?
   What kind of question is this? oxidation numbers
   Li$_2$O

7. Name the following species: (a) Cl$^-$, (b) NO$_3^-$, (c) C$_3$H$_8$.
   What kind of question is this? naming
   (a) chloride; (b) nitrate; (c) propane

8. The combustion of ethanol has the following equation: $\text{C}_2\text{H}_5\text{OH} + 3 \text{ O}_2 \rightarrow 2 \text{ CO}_2 + 2 \text{ H}_2\text{O}$
   What mass of CO$_2$ is formed from 1 kg of ethanol?
   What kind of question is this? stoichiometry
   $1.913$ kg

9. Vitamin K contains 78.95% C, 3.95% H, and 21.05% O by mass. What is its empirical formula?
   What kind of question is this? empirical formula calculation
   C$_5$H$_3$O

10. Given that vitamin K (see question 9) has molecular weight of 158.15 g/mol, what is its molecular formula?
    What kind of question is this? molecular formula calculation
    C$_{10}$H$_6$O$_2$
11. When sand is stirred up in a glass of water a (homogeneous of heterogeneous?) mixture is formed.  
*What kind of question is this? Types of mixtures*  
homogeneous

12. If 10.0 g of hydrochloric acid is dissolved in enough water to make 1.00 liter of solution, what is the molarity of the solution?  
*What kind of question is this? concentration*  
0.274M

13. Balance the following chemical equation:  
___BCl3 + ___H2O $\rightarrow$ ___B(OH)3 + ___HCl  
*What kind of question is this? equation-balancing*  
BCl3 + 3 H2O $\rightarrow$ B(OH)3 + 3 HCl

14. A microwave oven used radiation at a frequency of 2450 MHz to vibrationally excite water molecules in food. What is the wavelength of this radiation?  
*What kind of question is this? electromagnetic radiation*  
12.24 cm

15. How many protons, neutrons, and electrons are in the most common atomic form of chlorine?  
*What kind of question is this? subatomic particles*  
17 protons, 18 neutrons, 17 electrons

16. If 75 mL of water is added to 25 mL of 1 M H2SO4 in water, what is the new concentration of H2SO4?  
*What kind of question is this? dilution*  
0.25 M

17. Classify the following properties of matter as physical or chemical: (a) color, (b) flammability, (c) density.  
*What kind of question is this? properties of matter*  
(a) physical; (b) chemical; (c) physical

18. Rank the following four forms of electromagnetic radiation in terms of decreasing energy: Microwave, X-ray, radiofrequency, yellow light.  
*What kind of question is this? electromagnetic radiation*  
X-ray > yellow light > microwave > radiofrequency

19. Which of the following is *not* a strong acid: HI, H2SO4, HCl, or HNO2?  
*What kind of question is this? strong acids*  
HNO2, nitrous acid

20. What is the oxidation number of nitrogen in nitrate?  
*What kind of question is this? oxidation numbers*  
+5