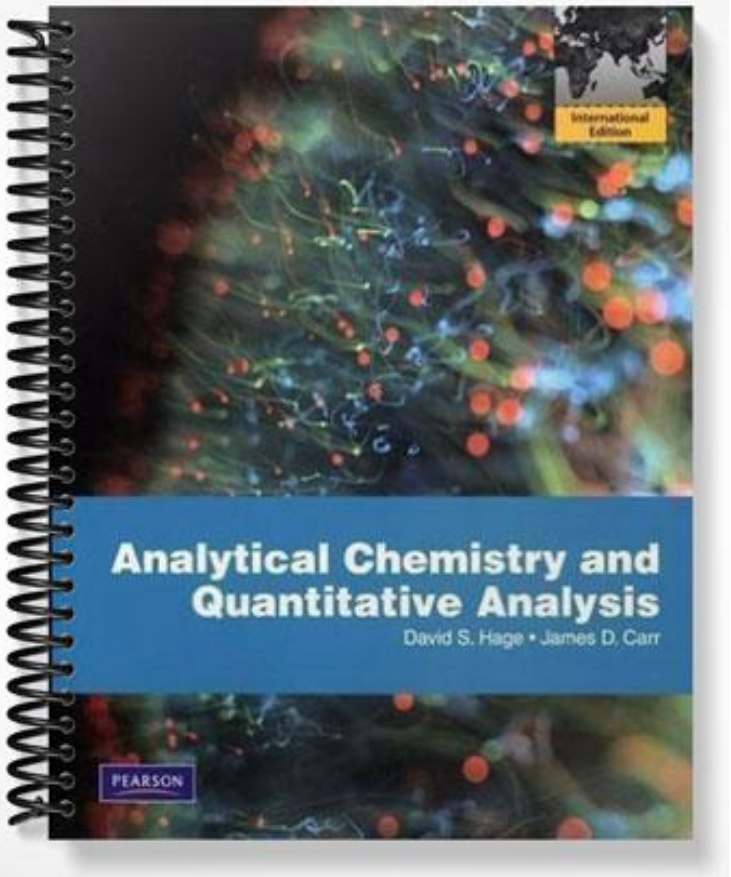
TEST BANK


International Edition
Analytical Chemistry and Quantitative Analysis
David S. Hage • James D. Carr
PEARSON

Chapter 2: Good Laboratory Practices

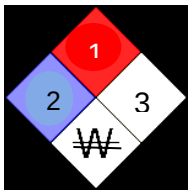
1. (A) Cite one example of a standard operating procedure (S.O.P.) for operating a buret in analytical chemistry.
(B) The following NFPA warning sign was attached to a bottle of a chemical. Name two safety concerns you would have about the chemical inside the bottle.

(i)

(ii)

(C) What do the letters **M.S.D.S.** represent? What type of information about a compound is available on an M.S.D.S.?

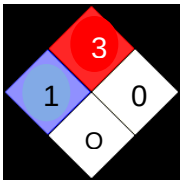
2. (A) The National Fire Association labels universally allow safety awareness on the hazards of chemical reagents. The following label was found on a reagent bottle. What would be your assessment of the handling/storage concerns?



(circle one choice)

(i) The material is a significant high fire hazard.
(ii) The material is an explosive hazard; avoid contact with water.
(iii) The material is an extreme health hazard; avoid contact with water.
(iv) The material is corrosive; avoid contact with water.
(v) Both (i) and (iii) are true.

(B) If the top number, in the red diamond, was zero instead of "1," how would that affect your safety concerns?



(C) Working in a lab you glance under the exhaust hood and notice that a large bottle of liquid does not have a lid covering the opening! If the Chemical Hazard label shown here was on the opened bottle what would be your major safety concern or worry about getting the lid back on the bottle?

3. The recommended procedures for utilizing a proper notebook in academic, research or industrial lab settings include several key instructions.
(A) A student working on a titration analysis realizes, after leaving the lab and beginning to calculate the volume of a solution delivered through a buret, that they have reversed their notations on the initial and final volume reading on the buret. How should they handle this error in their notebook?
(B) Identifying counterfeit and genuine pharmaceuticals is challenging. One method currently in use is to identify tiny pollen grains in the pills. (All pills will have some embedded pollen grains. The region of manufacture can be identified by the type of grain.) A pharmaceutical chemist records, in their notebook, a pollen grain sample as being about 20μm wide. The chemist however, needs to convert this width to **millimeters.** What is the width of that grain?

4. Converting measurements into convenient units is part of many scientific processes. Make the following conversions
(A) Beyond the common 20 amino acids, some biochemists work with selenocysteine. Their work may involve concentrations of 2.5×10^{-5} M. Express this same concentration as μM.
(B) If a given vaccination injection has a volume of **3 mL**, how many deciliters would have been administered?
(i) 3 dL (ii) 0.3 dL (iii) 30 dL (iv) 0.03 dL (v) none of these

5. (A) The carbonless paper used in many double entry lab notebooks works by having extremely small capsules of ink on one side (that are broken open when the other side is written on). If the diameter of one of the ink capsules is 6 000 nanometers, what would you report as the diameter in millimeters?
(B) Examine the following calculations. Which would yield answers with **three** significant digits? (*Note: it is not necessary to actually calculate the answers, just predict the resulting significant digits for the answers.)
(i) **(97.42 – 88.5)** (ii) **(42.55 x 1.66)** (iii) **(0.01010/0 .5000)** (iv) **(1.10 x 10^{-2} x 0.610)**

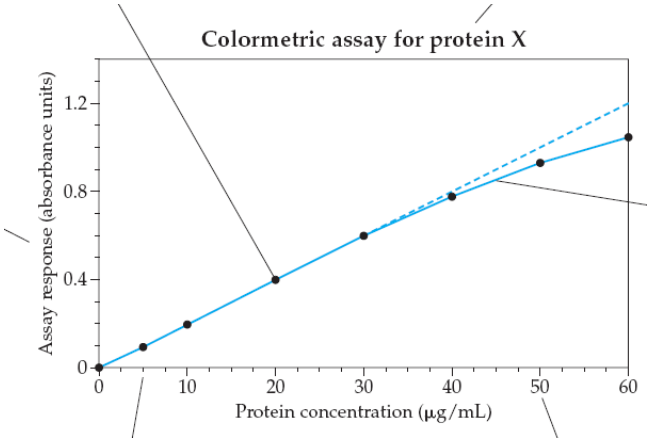
6. (A) Cholesterol has been linked to heart disease, so the determination of blood cholesterol can be very important. The chemical formula of this important biological molecule is $C_{27}H_{46}O$. Use this and the atomic masses (note significant digits) of each atom to determine the molar mass of cholesterol.
(B) Round this value to four significant digits.
(C) A blood level of 240 mg/dL cholesterol (*note this is two sig dig) is considered high. That unit is based on mass of cholesterol in a volume. What would this value be if it were reported in units of **g/L**?

7. (A) Report the arithmetic answer, with the appropriate number of significant digits for the following operations:
(i) subtraction:
Mass of an empty filtering crucible = 42.356 g
Mass of crucible with dried precipitate = 43.2453 g
Mass of precipitate = _____

(ii) pH is a common way to express acid concentration. It is a logarithm function. How many significant digits are found when pH = 7.1010?

8. (A) Astronauts may someday land on Mars. If instruments are brought to Mars for some analytical chemistry, they will have to function at some extreme temperatures. If the temperature at a specific Mars location was 213K, what would be the corresponding temperature in Celcius?
(B) The average temperature of an astronaut is about 37°C. What is that value in K?

9. The graph shown here (Figure 2.10 from the textbook) shows a comparison of light absorbance and protein concentration. To what decimal place would you be able to estimate values on the Y-axis? To what decimal place would you be able to estimate values on the X-axis?



10. Round each of the following values to two significant digits:
(A) The pH of human blood is approximately **7.350** (pH is the – log (activity of H^+)).
(B) The pH of human urine varies, but a particular sample has a pH = 6.0250.
(C) Humans may have an average of 5.025 liters of blood.
(D) Human blood may contain 135.1 grams of hemoglobin per liter.

(E) There are an estimated 7.589×10^{10} cells in a human body

SOLUTIONS TO TEST BANK FOR CHAPTER TWO:

1. (A) (Among other answers) Always add a small amount of the solution that will be used in the analysis to be used in rinsing the buret, before using the buret in the analysis.
(B) The "3" notation for health raises the concern that the compound may be toxic or corrosive and should never contact skin. The W with the cross line indicates that water should not be used in such a way to come in direct contact with the substance.
(C) Material Safety Data Sheet. This sheet will have chemical and physical properties of the substance, fire and explosion concerns, reactivity, disposal procedures, and identification information such as formula and CAS number.

2. (A) (ii)
(B) A "1" indicates a combustible material but a zero fire hazard indicates a noncombustible material.
(C) Since the Blue diamond (health) has a "3," great care must be taken to avoid any skin contact or inhalation. (A qualified professional should be immediately notified.)

3. (A) The error should not be erased. Rather a single line could be drawn though the two entries. The correction should be made, then the student should initial and date the changes.
(B) This conversion could be done using two-dimensional analysis steps within the SI system:

$$20\mu m \times \left(\frac{1m}{1x10^{6}\mu m}\right) \times \left(\frac{1x10^{3}mm}{1m}\right) = \mathbf{\underline{0.02\ mm}}$$

4. (A) 2.5×10^{-5} M $\times \left(\frac{1m}{1x10^{6}\mu m}\right) =$ **25 μM**

(B) 3 mL $\times \left(\frac{1L}{1x10^{3}mL}\right) \times \left(\frac{10dL}{1L}\right) =$ **0.03 dL**

5. (A) 6 000 nm $\times \left(\frac{1m}{1x10^{9}nm}\right) \times \left(\frac{1x10^{3}mm}{1m}\right) =$ **0.006 mm**

(B) (ii); (iv)

6. (A) 27C $\times \frac{12.0107g}{1mol} = 324.2889$; 47 H $\times \frac{1.00794g}{1mol} = 47.37318$; O = 15.9994 g

$$\begin{array}{r} 324.2889 \\ 47.37318 \\ +\ 15.9994 \\ \hline 387.661648 \end{array}$$

= **387.661 g/mol**

(B) **To four significant digits = 387.7**

(C) 240 mg $\times \frac{1g}{1x10^{3}mg} = 0.24$ g; 1dL $\times \frac{1L}{10dL} = 0.1$L; 0.24g/0.1L = **2.4 g/L**

7. (A) 0.8893 = **0.889**

(B) Since this is a logarithm value, the significant digits begin after the mantissa. This pH value has four digits beyond the mantissa, so there are four significant digits.

8. (A) K = ^{o}C +273; 213 = X^{o}C +273; X = **-60^{o}C**
(B) K = ^{o}C +273; X = 37^{o}C +273; X = 310K

9. The labels on the Y-axis indicate readings at the 0.1 unit. Therefore, estimates could be made between those marks at the 0.01 unit level. The labels on the X-axis indicate reading at the unit level. Therefore, readings could be estimated at the 0.1 unit level.

10. (A) The pH of human blood is approximately **7.350** (pH is the – log (activity of H^{+})
Rounded to **7.40**
(B) The pH of human urine varies, but a particular sample has a pH = 6.0250
Rounded to **6.02**
(C) Humans may have an average of 5.025 liters of blood.
Rounded to **5.0**
(D) Human blood may contain 135.1 grams of hemoglobin per liter
Rounded to **140**
(E) There are an estimated 7.589 x 10^{10} cells in a human body.
Rounded to **7.6 x 10^{10}**