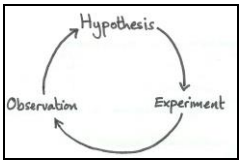
Homework Questions – Chapter 1 – Getting Started

1. Is the conclusion part of the 'scientific method' process?
2. Draw a diagram showing the three parts of the scientific method, and how they fit together.
3. Label the following statements as 'hypothesis', 'observation', or 'experiment';
   (a) These shoes are too tight
   (b) Try on a different size shoe
   (c) Boil a pot of salt water
   (d) The salt should make the water boil at a higher temperature
   (e) The salt should make the water boil at a lower temperature
   (f) This movie sucks
   (g) I'm going to watch the movie again with different friends
4. Label the following as 'mixture', 'compound', 'element', or 'molecule' (more than one might apply);
   (a) Three atoms of oxygen chemically bonded together
   (b) One atom of oxygen bonded to two atoms of hydrogen
   (c) A very large number of chromium atoms chemically bonded together
   (d) Ten xenon atoms mixed with three helium atoms
   (e) 1 billion chloride ions chemically bonded to 1 billion sodium ions
5. Label the following sets of data as accurate, precise, neither, or both;
   (a) True value is 23.678 mm, data set is; 23.2 mm, 24.1 mm, 24.0 mm
   (b) True value is 16 kg, data set is; 10 kg, 50 kg, 16 kg
   (c) True value is 0.3872 g/L, data set is 0.1 g/L, 0.6 g/L, 0.46 g/L
   (d) True value is 2341 J, data set is 2890 J, 2892 J, 2884 J
6. Which of the measurements is most accurate, and which is the most precise in each example?
   (a) True value is 34.99289765 cm, measurements are 34.9 cm and 34.65 cm
   (b) True value is 13.1122375909 L, measurements are 11.2983 L and 10.2 L
   (c) True value is 0.0675321233 g, measurements are 0.067773 g and 0.067 g
   (d) True value is 376.8928874 nm, measurements are 52.7488 nm and 300 nm
7. How many significant figures do the following numbers have?
   (a) 2900 (b) 0.73 (c) 1.00000 (d) 0.000020 (e) 5000. (f) 3001 (g) 0.4000203
8. Round the following numbers to 3 s.f.
   (a) 3143 (b) 84992 (c) 0.002098 (d) 1.034002 (e) 2501 (f) 17.0 (g) 664300.
9. Give answers to the following using the correct number of s.f.;
   (a) 3 + 1280 (b) 0.893 / 0.001 (c) 16.81 – 0.03321 (d) 29 x 100
   (e) 29 x 100. (f) (17.0 + 0.23) / 2 (g) (17.0 + 0.23) / 2.000
10. If A's mass is given as 180 pounds and B's mass is given as 176 pounds;
    (a) what is the maximum amount that A could be heavier than B (to 1 decimal place)?
    (b) what is the maximum amount that B could be heavier than A (to 1 decimal place)?
11. Use the unit factor method to convert the following measurements;
    (a) 23.5 mm to nm (b) 0.872 kg to g (c) 187.3 μL to mL (d) 25 Mbytes to Gbytes
    (e) 33.09 g/L to ng/mL (f) 14 cm^2 to square inches (g) 4.2 L.atm/g to mL.torr/kg (760 torr = 1atm)
12. What is the density (g/mL) of each of the following?
    (a) mass 218 g and volume 40.0 mL (b) mass 4.1 kg and volume 1.00 L
13. What is the volume (L) of each of the following?
    (a) mass 2 g and density 37.7 g/L (b) mass 11.1 mg and density 0.88 g/mL
14. What is the mass (kg) of each of the following?
    (a) volume 0.437 L and density 2.84 kg/L (b) volume 61004 nL and density 0.927 g/mL
15. The mass of a cube of metal with 1.00 inch sides is 185.8 g. The metal is lead, iron, or aluminum. Which one is it (use library or Internet resources to help you)?

16. A furnace burns 20.0 L of gas every day (24.0 hours) and produces 93 kJ of heat. Every 30.0 minutes, 0.818 g of gas is burned. How much heat (kJ) is released in 20.0 minutes, and what is the density of the gas (g/L)?
17. Follow up question of the same type as 16, to be done for practice after working through the solution on Canvas: A furnace burns 36.0 L of gas every 12.0 hours and produces 137 kJ of heat. Every week, 0.368 kg of gas is burned. How much heat (kJ) is released in 45.0 minutes, and what is the density of the gas (g/L)?

Answers

1. No. The conclusion is a summary of the most recent hypothesis when the scientific method process was stopped. The process may have been stopped due to time/resource/financial constraints, but further study would still either alter the hypothesis, or make it a more convincing hypothesis.
2. 

3. (a) Obs (b) Exp (c) Exp (d) Hyp (e) Hyp (f) Obs (g) Exp
4. (a) Element & molecule (b) Compound & molecule (c) Element (d) Mixture (e) Compound
5. (a) Both (b) Neither (c) Only accurate (d) Only precise
6. (a) 34.9 more accurate, 34.65 more precise (b) 11.2983 L more accurate and precise (c) 0.067773 g more accurate and precise (d) 52.7488 nm more precise, 300 nm more accurate
7. (a) 2 (b) 2 (c) 6 (d) 2 (e) 4 (f) 4 (g) 7
8. (a) 3140 (b) 85000 (c) 0.00210 (d) 1.03 (e) 2500 (f) 17.0 (g) 664000
9. (a) 1280 (b) 900 (c) 16.78 (d) 3000 (e) 2900 (f) 9 (g) 8.62
10. (a) 9.5 pounds (b) 1.5 pounds
11. (a) 2.35×10^7 nm (b) 872 g (c) 0.1873 mL (d) 0.025 Gbytes (e) 3.309×10^7 ng/mL (f) 2.2 square inches (g) 3.2×10^9 mL.torr/kg
12. (a) 5.45 g/mL (b) 4.1 g/mL
13. (a) 0.05 L (b) 1.3×10^{-5} L
14. (a) 1.24 kg (b) 5.66×10^{-5} kg
15. Density is 11.3 g/cm^3 so the metal is lead (aluminum density = 2.70 g/cm^3, iron density = 7.87 g/cm^3)
16. 1.3 kJ of heat is released and the gas density is 1.96 g/L
17. 8.56 kJ of heat is released and the gas density is 0.730 g/L