

NAME _____
CHEM1450/Exam 1/Dr. Dooley
Feb 2, 2016

Multiple Choice: (3 Points each) Write the letter associated with the correct response in the space provided to the left of each numbered problem.

- _____1. Which of the following statements about the phases of matter is TRUE?
a) In both solids and liquids, the atoms or molecules pack closely to one another.
b) Solids are highly compressible.
c) Gaseous substances have long-range repeating order.
d) There is only one type of geometric arrangement that the atoms or molecules in any solid can adopt.
e) Liquids have a large portion of empty volume between molecules.
- _____2. Classify sugar ($C_6H_{12}O_6$) dissolved in water as:
a) a homogeneous mixture.
b) an element.
c) a heterogeneous mixture.
d) a compound.
e) None of the above
- _____3. Which of the following would be classified as a pure substance?
a) sweet tea
b) a sample of iron ore before being purified
c) dry ice (solid CO_2)
d) blood
e) a cake mix out of the box
- _____4. Which of the following are examples of a chemical change?
a) copper building materials oxidize to form a green patina over time
b) a match burns
c) ethanol evaporates
d) Both A and B are examples of chemical change.
e) All of the above are examples of chemical change.
- _____5. If the temperature is $178^\circ F$, what is the temperature in degrees Celsius?
a) $352^\circ C$
b) $451^\circ C$
c) $67^\circ C$
d) $81.1^\circ C$
e) $378^\circ C$

- _____6. Determine the volume of an object that has a mass of 455.6 g and a density of 19.3 g/cm³.
- 87.9 mL
 - 42.4 mL
 - 18.5 mL
 - 23.6 mL
 - 31.2 mL
- _____7. How many significant figures are in the measurement, 0.0005890 g?
- 4
 - 5
 - 6
 - 7
 - 8
- _____8. What answer should be reported, with the correct number of significant figures, for the following calculation? $(433.621 - 333.9) \times 11.900$
- 1.19×10^3
 - 1.187×10^3
 - 1.1868×10^3
 - 1.18680×10^3
 - 1.186799×10^3
- _____9. Convert $3.77 \times 10^4 \mu\text{m}^3$ (Cubic micrometers) to cm³.
- $3.77 \times 10^4 \text{ cm}^3$
 - $3.77 \times 10^1 \text{ cm}^3$
 - $3.77 \times 10^{-8} \text{ cm}^3$
 - $3.77 \times 10^{20} \text{ cm}^3$
 - $3.77 \times 10^6 \text{ cm}^3$
- _____10. Which of the following statements about subatomic particles is false?
- Protons and electrons have charges of the same magnitude but of different signs.
 - Protons and neutrons have similar masses.
 - Some atoms don't have any protons
 - It is ok for an atoms of a particular element to have different numbers of neutrons.
- _____11. Determine the number of protons, neutrons and electrons in the following:
- ${}_{29}^{65}\text{X}$
- # p = 36 #n = 29 #e⁻ = 36
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_____12. What species is represented by the following information?

#p = 47 #n = 62 #e⁻ = 46

- a) Ag⁺
- b) Nd
- c) Pd
- d) Ag
- e) Pd⁺

_____13. Which of the following exists as a diatomic molecule?

- a) N
- b) C
- c) P
- d) Na
- e) Ne

_____14. A compound is found to be 72.4% (by mass) boron. How many grams of boron are there in 85.42g sample of the compound?

- a) 61.84 g
- b) 1.17 g
- c) 13.02 g
- d) 23.58 g
- e) none of the above

_____15. Which scientist is responsible for discovering the electron and suggesting that the atom is made of a positively charged sphere with smaller negatively charged electrons distributed throughout (Plum-Pudding Model)?

- a) Rutherford
- b) Lavoisier
- c) Mendeleev
- d) J. J. Thompson
- e) Dalton

_____16. Which of the following statements is FALSE?

- a) Halogens are very reactive elements.
- b) The alkali metals are fairly unreactive.
- c) Sulfur is a main group element.
- d) Noble gases do not usually form ions.
- e) Zn is a transition metal.

- _____17. Which pair of elements would you expect to be the most similar?
- a) Na and Hg
 - b) He and H
 - c) Cl and F
 - d) Si and P
 - e) N and O
- _____18. Sodium belongs to which family (or group)?
- a) alkali metals
 - b) alkaline earth metals
 - c) halogens
 - d) noble gases
 - e) none of these
- _____19. Which of the following is probably not a property of fluorine?
- a) it is very reactive
 - b) it usually gains one electron to become F^-
 - c) it usually loses an electron to form F^+
 - d) It is a gas at room temperature
 - e) Its natural, elemental form is as a diatomic molecule, F_2
- _____20. How many protons and electrons does W^{4+} have?
- a) 74 protons and 74 electrons
 - b) 74 protons and 78 electrons
 - c) 74 protons and 70 electrons
 - d) 70 protons and 74 electrons
 - e) 78 protons and 74 electrons

Problems. Conversion factors, needed equations and a periodic table are provided, and a calculator is allowed. Show all work where work is required. Answers with work that cannot be logically followed will not receive credit.

1. (5 Points) Convert 6.59×10^8 ng to kg

2. (5 Points) Two samples of carbon tetrachloride are decomposed into their elements. One sample produces 38.9g C and 448 g Cl. The other produces 14.8g C and 134g Cl. Are these results consistent with the law of definite proportions? Show reasonable work to support your answer.
3. (10 Points) The diameter of a hydrogen atom is 212pm. Find the length in kilometers of a row of 6.02×10^{23} hydrogen atoms.
4. (10 Points) A child's pool holds about 258 gallons of water when full. The density of water is 64.4 lbs/ft^3 . How much will the pool weigh when full?

5. (10 Points) Magnesium has three naturally occurring isotopes. Using the information in the table for two of the isotopes, determine the percent abundance and mass of the third isotope. (Report the mass to 4 decimal places, and the abundance to 2 decimal places.)

Isotope	Mass (amu)	Abundance (%)
1	23.9850	78.99
2	24.9858	10.00
3	?	?