

# CHEMISTRY I – CH-1211

## EXTRA PRACTICE

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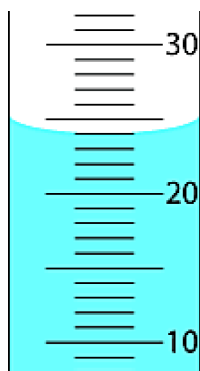
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## Exam 1 Review: Measurements, Derived Units, Significant Figures

1. How many significant figures are in each number?
  - A. 554 km
  - B. 7 pennies
  - C.  $1.01 \times 10^5$  m
  - D. 0.00099 s
  - E. 1.4500 km
  - F. 21,000 m
  
2. What is the volume (in  $\text{cm}^3$ ) of a 2.50 gram block of metal whose density is 6.72 grams per cubic centimeter?
  
  
  
  
  
  
  
  
  
  
3. A cube of 1.2 inches on the side has a mass of 36 grams. What is the density (in  $\text{g mL}^{-1}$ )?

4. A student is using a graduated cylinder to measure the volume of a liquid. What reading should be recorded?



5. A student performs an experiment to determine the density of a sugar solution. She obtains the following results:  $1.11 \text{ g mL}^{-1}$ ,  $1.81 \text{ g mL}^{-1}$ ,  $1.95 \text{ g mL}^{-1}$ ,  $1.75 \text{ g mL}^{-1}$ . The actual value for the density of the sugar solution is  $1.75 \text{ g mL}^{-1}$ . Determine if the following statements are true or false.

- A. Her results are precise.  
B. Her results are accurate.

6. What answer should be reported, unambiguously, with the correct number of significant figures, for the following calculation?

$$(433.621 - 333.9) \times 11.900$$

7. What is the length (in mm) of 3.20 cm?
  
  
  
  
  
  
  
  
  
  
8. If the walls in a room are  $955 \text{ ft}^2$  in area, and a gallon of paint covers  $15 \text{ yd}^2$ , how many gallons of paint are needed for the room? ( $3 \text{ ft} = 1 \text{ yd}$ )
  
  
  
  
  
  
  
  
  
  
9. What symbol is used to represent the factor  $10^9$ ?
  
  
  
  
  
  
  
  
  
  
10. A piece of metal ore has a mass of 9.25 g. When a student places it into a graduated cylinder containing water, the liquid level rises from 21.25 mL to 26.47 mL. What is the density (in  $\text{g mL}^{-1}$ ) of the ore?

11. How many significant figures are in the answer to the following calculation?

$$12.011 \text{ g} - 11.11 \text{ g} + 2.412 \text{ g} =$$

12. How many significant figures are in the answer to the following calculation?

$$(29.0025 + 0.2) (6.134 - 6.101) / 5.196 \times 10^{-2}$$

13. Nitric acid is a very important industrial chemical and  $1.612 \times 10^{10}$  lb were produced in 1992. If the density of nitric acid is  $12.53 \text{ lb gal}^{-1}$ , what is the volume (in L)?  $1 \text{ gal} = 3.7854 \text{ L}$



14. A rectangular block has the following dimensions:  $2.9 \text{ cm} \times 3.5 \text{ cm} \times 10.0 \text{ cm}$ . The mass of the block is  $615.0 \text{ g}$ . What is the volume (in  $\text{cm}^3$ ) and density (in  $\text{kg m}^{-3}$ ) of the block?
15. The average daytime temperatures on Earth and Jupiter are  $72^\circ\text{F}$  and  $313 \text{ K}$ , respectively. Which planet is hotter, on average, and by how much (in  $^\circ\text{C}$ )?

16. At room temperature, elemental bromine ( $\text{Br}_2$ ) is a liquid with a density of  $3.12 \text{ g cm}^{-3}$ . What is the mass (in g) of 125 mL of bromine and what volume (in mL) does 85.0 g of bromine occupy?
17. A sample containing 33.42 g of metal pellets is poured into a graduated cylinder that initially contains 12.7 mL of water. The final water level in the cylinder is 21.6 mL. What is the density (in  $\text{g mL}^{-1}$ ) of the metal?

18. Which of the following has three significant figures?

- A.  $6.070 \times 10^{-15}$
- B.  $0.053 \times 10^2$
- C. 700
- D.  $3.00 \times 10^2$
- E. 8650.

19. Which of the following is a chemical change?

- A. forging of metal
- B. boiling water
- C. shattering glass
- D. rust forming on a bike
- E. melting ice

20. Write the following numbers in normalized scientific notation to three significant figures.

- A. 0.00046701
- B. 8973.002
- C. 0.0279020
- D. 32.4513
- E. 0.000090999

21. A student goes to the lab and is tasked with measuring the mass of a block of nickel metal that has a known mass of 15.00 g. The student takes three different measurements in which they collect the following masses: 13.29 g, 13.28 g, and 13.29 g. What statement best describes their results?
- A. Their measurements are both precise and accurate
  - B. Their measurements are precise, but not accurate
  - C. Their measurements are accurate, but not precise
  - D. Their measurements are neither precise or accurate
22. Perform the following conversions below. Report your answers in normalized scientific notation to the appropriate number of significant figures.
- A. 145.21 kg to mg
  - B. 0.490 nm to m
  - C. 42.1 cm<sup>3</sup> to L
  - D.  $1.73 \times 10^5$  m<sup>3</sup> to cm<sup>3</sup>

23. Determine the number of significant figures for each of the following values.

- A. 4700
- B. 0.4700
- C. 4700 pencils
- D. 00.4700
- E. 4700.0 g
- F. 4700.0100

24. Evaluate each expression and report your answer to the appropriate number of significant figures.

A.  $0.5000 \times 21.000000 =$

B.  $29.1 \times (8.31 \times 10^4) \times 120 =$

C.  $0.459 + 12.33 - 0.001 =$

D.  $14.010 - 13.99 + 5 =$

E.  $\frac{(2.36 \times 10^3)(2.360 \times 10^2)}{2.3600 \times 10^1} =$

F.  $(41.540 \times 2.715) - 4.513 =$

G.  $\frac{(2.83 \times 10^3)(0.2100 + 312.12)}{20.55} =$

25. Which of the following options is at the highest temperature?

- A. 71.4 °F
- B. 22.1 °C
- C. 294.65 K

26. Zirconium metal has a density of  $6.49 \text{ g cm}^{-3}$ . What volume (in L) of zirconium are present in 5.41 lb of this metal? (1 lb = 453.59 g)

27. A student fills a graduated cylinder with deionized water up to the 35.50 mL line. They then carefully place a copper rod into the cylinder and note that the new volume reading is 36.51 mL. If the density of copper is  $8.96 \text{ g cm}^{-3}$ , what was the mass (in g) of the copper rod?
28. A student obtains a silver rod that has a mass of 23.99 g and carefully places it in a graduated cylinder filled with deionized water. They note the new volume reading in the graduated cylinder is 110.25 mL. Unfortunately, the student forgot to take an initial reading of the volume in the cylinder prior to adding the silver rod. If the density of silver is  $10.49 \text{ g cm}^{-3}$ , what was the initial volume (in mL) of the water?

29. 750. mL of ethanol weighs 570. g. What is the density (in  $\text{g mL}^{-1}$ ) of ethanol?
30. Which of the following is the same as one milliliter?
- A. 1,000 L
  - B. 0.01 L
  - C. 0.001 L
  - D. 0.000001 L
  - E. 0.000000001 L
31. 1.00 L of helium gas has a mass of 0.178 g. What is the mass (in g) of 2.4 L of helium gas?



32. The Hindenburg contained  $7.062 \times 10^6 \text{ ft}^3$  of a gas. If the gas was helium ( $\rho(\text{He}) = 1.78 \times 10^{-4} \text{ g mL}^{-1}$ ), how much lighter (in kg) would it be than if the gas was air ( $\rho(\text{air}) = 1.293 \times 10^{-3} \text{ g mL}^{-1}$ )? (1 ft = 0.3048 m)



## Exam 1 Review: Scientific Method, Properties, Classification of Matter

1. Classify each statement as being either qualitative or quantitative.
  - A. This recitation worksheet took a good amount of time to complete
  - B. This recitation worksheet took 50 minutes to complete
  - C. The University of Georgia is a very large school
  
2. Identify the incorrect statement.
  - A. Helium in a balloon is an element
  - B. Paint is a mixture
  - C. Tap water is a compound
  - D. Mercury in a barometer is an element
  
3. Which answer includes all the following that are chemical changes and not physical changes?
  - I. freezing of water
  - II. rusting of iron
  - III. dropping a piece of iron into hydrochloric acid where  $H_2(g)$  is produced
  - IV. burning of a piece of wood
  - V. emission of light by a kerosene oil lamp
  - A. III and IV
  - B. II and V
  - C. I, II, III, IV, and V
  - D. II, III, and V
  - E. II, III, IV, and V

4. Which answer includes all of the following properties of sulfur that are physical properties and not other properties?
- I. It reacts with hydrogen when heated
  - II. It is a yellow solid at room temperature
  - III. It is soluble in carbon disulfide
  - IV. It has a density of  $2.97 \text{ g cm}^{-3}$
  - V. It melts at  $112 \text{ }^\circ\text{C}$
- A. II, III, IV, and V
  - B. II, IV, and V
  - C. I
  - D. II, III, and IV
  - E. III, IV, and V
5. Molecules can be described as
- A. mixtures of two or more pure substances
  - B. mixtures of two or more elements that has a specific ratio between components
  - C. two or more atoms chemically joined together
  - D. heterogeneous mixtures
  - E. homogeneous mixtures
6. Which statement best explains the difference between a law and a theory?
- A. A law is truth whereas a theory is mere speculation.
  - B. A law summarizes a series of related observations, while a theory gives the underlying reasons for them.
  - C. A theory describes what nature does; a law explains why nature does it.

7. Inks and food coloring are typically composed of many different dyes which can be separated by paper chromatography. Which of these terms apply to inks?
- A. substance
  - B. homogeneous mixture
  - C. compound
  - D. element
  - E. heterogeneous mixture
8. Which of these separations cannot be achieved using a physical process and, therefore, requires a chemical process?
- A. salt from sea water
  - B. water from honey
  - C. hydrogen from water
  - D. ice from water
  - E. fish from water
9. All of the following will lead to a heterogeneous mixture except (select all that apply)
- A. sugar and coffee
  - B. mud and water
  - C. salt and water
  - D. tea and no-pulp lemonade
  - E. vinegar and water

10. All of these will lead to a homogeneous mixture except
- A. sugar and coffee
  - B. mud and water
  - C. salt and water
  - D. tea and no-pulp lemonade
  - E. vinegar and water
11. How are gases different from solids and liquids?
- A. Gases can only be made up of atoms
  - B. Particles in a gas attract each other more strongly than in solids and liquids
  - C. Gases are compressible
  - D. Only gases can take the shape of their container
  - E. Gases are colorless
12. A scientific law...
- A. is a statement that summarizes past observations and makes predictions.
  - B. is subject to change via legal action.
  - C. contains an explanation of observations.
  - D. must have a mathematical formula.
  - E. cannot be modified.
13. All statements about scientific theories are true except
- A. they explain why nature behaves the way it does.
  - B. they must have the ability to make predictions on future behavior.
  - C. they should use observations to test the theory.
  - D. they are derived from hypothesis.
  - E. they are speculation.

14. Which of these represents a hypothesis?
- A. Sodium reacts with water to form sodium hydroxide and hydrogen gas.
  - B. Nitrogen gas is a fairly inert substance.
  - C. Nickel has a silvery sheen.
  - D. When a substance combusts, it combines with air.
  - E. When wood burns, heat is given off.
15. Which of the following is a homogeneous mixture?
- A. wine
  - B. mud
  - C. salad
  - D. salsa
16. Which of the following is an element?
- A. sodium chloride
  - B. water
  - C. carbon monoxide
  - D. argon
  - E. rust

17. Which of the following is a heterogeneous mixture?
- A. sports drink
  - B. chlorine gas
  - C. black coffee
  - D. bowl of cereal
  - E. carbon (graphite)
18. Which of the following is not an example of a homogeneous mixture?
- A. air
  - B. rain
  - C. steel
  - D. blood
  - E. coffee
19. Which of the following would you expect to have the highest density?
- A. oxygen
  - B. lead
  - C. water
  - D. helium



## Exam 1 Review: Atoms and Atomic Theory

1. Complete the empty cells.

Symbol	# of p	# of n	# of e <sup>-</sup>	Z	A
<sup>51</sup> V		18	18		34

2. Which of the statements about two isotopes is false?

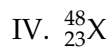
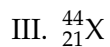
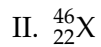
- A. They will have the same charge on the nucleus.
- B. They will have different numbers of neutrons.
- C. They will have essentially the same chemical reactivity.
- D. They will have the same atomic numbers.
- E. They will have the same atomic weights.

3. An unused flashbulb contains magnesium and oxygen. After use, the contents are changed to magnesium oxide but the total mass does not change. This observation can best be explained by the...

- A. Law of Constant Composition
- B. Law of Multiple Proportions
- C. Avogadro's Law
- D. Law of Conservation of Mass

4. What is the mass number for  $^{25}\text{Mg}$ ?

5. Which of the following represents isotopes?



- A. I and II  
B. I and III  
C. I and IV  
D. III and IV

6. Complete the empty cells.

Symbol	# of p	# of n	# of $e^-$	Z	A
$^{93}\text{Nb}$					
	88		86		226
		76	52		128

7. Write the group number for each of the following elements.

- A. Ba
- B. Sb
- C. Zr
- D. Tl
- E. Rn

8. Write the period number for each of the following elements.

- A. Hf
- B. Am
- C. Ga
- D. Si
- E. He

9. Which of the following elements is a metal?

- A. Ge
- B. Sb
- C. H
- D. Sn
- E. Cl

10. Which of the following elements is a nonmetal?

- A. Ca
- B. Si
- C. Mo
- D. Cs
- E. Se

11. What quantity did J. J. Thompson determine using a cathode ray tube?
- A. the mass of an electron
  - B. the charge-to-mass ratio of an electron
  - C. the density of a proton
  - D. the charge of a neutron
  - E. the charge-to-mass ratio of a proton
12. Which of the following is found in the nucleus?
- A. cations
  - B. neutrons
  - C. electrons
  - D. anions
  - E. none of these
13. Which of these is not found in an atom?
- A. electron
  - B. neutron
  - C. photon
  - D. proton
  - E. all of them are
14. True or False: an atom consists mostly of empty space.
- A. true
  - B. false, an atom consists primarily of electrons
  - C. false, an atom consists primarily of the nucleus
  - D. false, an atom consists primarily of neutrons
  - E. false, an atom consists primarily of protons

15. Which of the following contribute to the mass of an atom? (select all that apply)
- A. protons
  - B. neutrons
  - C. electrons
  - D. electrons
  - E. the nucleus
  - F. atomic charge
16. What is the atomic mass (in amu) of a magnesium ion containing 12 protons, 13 neutrons, and 10 electrons?
17. An element consists of four naturally occurring isotopes. The percent abundance and isotope masses are given as:
- (a) 1.40 %; 203.973 u
  - (b) 24.10 %; 205.9754 u
  - (c) 22.10 %; 206.9759 u
  - (d) 52.40 %; 207.9766 u

Find the standard atomic weight (in u) of the element.

18. The element rhenium (Re) has a standard atomic weight of 186.207 and exists as two naturally occurring isotopes. Given the following percent abundance and isotope mass

1.  $^{185}\text{Re}$
2.  $^{187}\text{Re}$ : 62.60 %; 186.956

find the relative atomic weight of rhenium-185.

## Exam 1 Review: Ions, Ionic Compounds, Molecules, and Nomenclature

1. What is the correct charge of a sulfur atom with 16 protons, 16 neutrons, and 18 electrons?
2. What charge will most likely be formed by lithium?
3. Is iodine more likely to gain or lose an electron?
4. Fill out the missing information regarding a binary ionic compound.
  - A. Name: sodium chloride
  - B. Cation:
  - C. Anion:
  - D. Formula:

5. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:  $\text{Mg}^{2+}$
- C. Anion:  $\text{O}^{2-}$
- D. Formula:

6. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:
- C. Anion:
- D. Formula:  $\text{Al}_2\text{S}_3$

7. Fill out the missing information regarding a binary ionic compound.

- A. Name: iron(III) oxide
- B. Cation:
- C. Anion:
- D. Formula:



8. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:  $\text{Sn}^{2+}$
- C. Anion:  $\text{Cl}^-$
- D. Formula:

9. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:
- C. Anion:
- D. Formula:  $\text{PbF}_4$

10. Fill out the missing information regarding a binary ionic compound.

- A. Name: sodium hydroxide
- B. Cation:
- C. Anion:
- D. Formula:

11. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:  $\text{Mg}^{2+}$
- C. Anion:  $\text{CO}_3^{2-}$
- D. Formula:

12. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:
- C. Anion:
- D. Formula:  $\text{Na}_2\text{SO}_3$

13. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:  $\text{Fe}^{2+}$
- C. Anion:  $\text{OH}^-$
- D. Formula:

14. Fill out the missing information regarding a binary ionic compound.

- A. Name:
- B. Cation:
- C. Anion:
- D. Formula:  $\text{TiPO}_3$

15. Provide the names for the following compounds.

- A.  $\text{N}_2\text{O}$
- B.  $\text{P}_2\text{O}_5$
- C.  $\text{SF}_2$
- D.  $\text{S}_2\text{O}$
- E.  $\text{P}_2\text{I}_4$

16. What is the proper chemical formula for lithium hypoiodite?

- A.  $\text{LiIO}$
- B.  $\text{LiO}_2$
- C.  $\text{LiIO}_3$
- D.  $\text{LiIO}_4$

17. Write the chemical formula for a compound formed between aluminum and sulfur.

18. In which set do all elements tend to form cations in binary ionic compounds?

- A. Na, Al, S
- B. Ca, Mn, Sn
- C. P, As, Sb
- D. S, Cl, Br

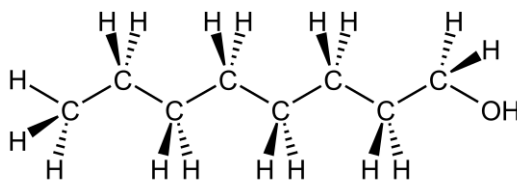
19. Which of the following contains both ionic and covalent bonds?

- A.  $\text{CaBr}_2$
- B. COS
- C.  $\text{BaSO}_4$
- D.  $\text{SF}_6$
- E. none of these

20. What is the name of the  $\text{C}_3\text{H}_8$ ?

- A. hexane
- B. propane
- C. decane
- D. butane
- E. ethane

21. What is the name of this compound?



22. What is the name of  $\text{H}_3\text{P}$ ?
23. What is the chemical formula for magnesium carbide?
24. Write the empirical formulas for the following compounds.
- A. iron(II) sulfide
  - B. iron(III) sulfide
  - C. iron(II) sulfate
  - D. iron(III) sulfate
  - E. iron(II) sulfite

25. Provide the name for each of the following and identify it as a molecular or ionic compound

Formula	Name	Compound Type
$C_6H_{12}O_2$		
$Al_4C_3$		
$Ca_3P_2$		
$KC_2H_3O_2$		
$NaHCO_3$		
$FeCl_3$		

26. Provide the name for each of the following and identify it as a molecular or ionic compound

Formula	Name	Compound Type
$\text{HNO}_2(\text{aq})$		
$\text{Hg}_2\text{O}$		
$\text{CuSe}$		
$\text{Cl}_2\text{O}_7$		
$\text{H}_2\text{O}_2$		
$\text{Be}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$		

27. Provide the name for each of the following and identify it as an alkane, alcohol, or carboxylic acid.

Formula	Name	Compound Type
$C_7H_{15}OH$		
$C_9H_{19}COOH$		
$C_4H_{10}$		
$C_6H_{14}$		
$C_4H_9COOH$		
$C_8H_{17}OH$		



28. Provide the chemical formulas and identify each as molecular or ionic compound. Include phase labels where necessary.

Name	Formula	Compound Type
sulfurous acid		
iron(II) bromide		
manganese(IV) thiocyanate		
cadmium phosphite		
dihydrogen monosulfide		
potassium permanganate		

29. Provide the chemical formulas and identify each as molecular or ionic compound. Include phase labels where necessary.

Name	Formula	Compound Type
iron(II) oxalate		
sodium chromate		
beryllium dichromate		
perchloric acid		
nitric acid		
sodium carbonate decahydrate		

30. Which of the following names is most appropriate for the molecule  $\text{CH}_3(\text{CH}_2)_2\text{COOH}$ ?
- A. dimethylene-acetic acid
  - B. propanoic acid
  - C. butanoic acid
  - D. oxobutylalcohol

31. Name the following compounds.

- A.  $\text{Si}_2\text{Br}_2$
- B.  $\text{Na}_2\text{CO}_3$
- C.  $\text{HClO}_4$
- D.  $\text{Zn}(\text{CN})_2$
- E.  $\text{OH}^-$
- F.  $\text{Ca}^{2+}$



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