

# Exam #2

Name *Key*

	A	B	C	D	E		A	B	C	D	E
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7	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		17	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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1	1 H 1.008	IIA											IIIA					2 He 4.003	
2	3 Li 6.941	4 Be 9.012												5 B 10.91	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 23.00	12 Mg 24.31												13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.55	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (99)	44 Ru 101.0	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
6	55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.9	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At (210)	86 Rn (222)	
7	87 Fr (223)	88 Ra (226)	89 Ac* (227)																

Compound of	Rule
Li <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , or NH <sub>4</sub> <sup>+</sup>	Always soluble
NO <sub>3</sub> <sup>-</sup> or C <sub>2</sub> H <sub>3</sub> O <sub>2</sub> <sup>-</sup>	Always soluble
Cl <sup>-</sup> , Br <sup>-</sup> , or I <sup>-</sup>	Insoluble with Ag <sup>+</sup> , Hg <sub>2</sub> <sup>2+</sup> , or Pb <sup>2+</sup> . Soluble with any other ion.
SO <sub>4</sub> <sup>2-</sup>	Soluble with all the ions except Sr <sup>2+</sup> , Ba <sup>2+</sup> , Ag <sup>+</sup> , Hg <sub>2</sub> <sup>2+</sup> , or Pb <sup>2+</sup>
CO <sub>3</sub> <sup>2-</sup> or PO <sub>4</sub> <sup>3-</sup>	Soluble with Li <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , or NH <sub>4</sub> <sup>+</sup> . Insoluble with any other ion.
OH <sup>-</sup> or S <sup>2-</sup>	Soluble with Ca <sup>2+</sup> , Sr <sup>2+</sup> , Ba <sup>2+</sup> , Li <sup>+</sup> , Na <sup>+</sup> , K <sup>+</sup> , or NH <sub>4</sub> <sup>+</sup> . Insoluble with any other ion.

- 1. What is the correct definition of a subatomic particle?**
  - a) A particle that has no charge and is always located outside the nucleus
  - b) A particle that is larger than an atom and carries an electric charge
  - c) A particle that makes up the entirety of the atom and is always neutrally charged
  - d) A particle that is smaller than an atom and makes up the fundamental components of matter, including protons, neutrons, and electrons
- 2. Why is the mass number the sum of protons and neutrons?**
  - a) Protons and neutrons are the heaviest particles in the atom, and electrons have negligible mass.
  - b) Protons and neutrons are both positively charged, and their mass is combined to give the mass number..
  - c) Electrons and neutrons have the same mass, so the mass number excludes protons.
  - d) Protons and electrons make up most of the mass of an atom, which is why they determine the mass number.
- 3. What is the common charge of Cesium (Cs)?**
  - a) +1
  - b) +2
  - c) +3
  - d) -2
- 4. Which of the following is not a diatomic molecule?**
  - a) Oxygen
  - b) Carbon
  - c) Nitrogen
  - d) Hydrogen
- 5. What is the correct name for  $\text{Al}_2\text{O}_3$ ?**
  - a) Aluminum dioxide
  - b) Aluminum (III) oxide
  - c) Dialuminum trioxide
  - d) Aluminum Oxide
- 6. Which of the following polyatomic ions has a -3 charge?**
  - a) Sulfate
  - b) Phosphate
  - c) Nitrate
  - d) Carbonate
- 7. Which of the following is incorrect about the Stock system?**
  - a) The Roman numeral is placed in parentheses after the name of the metal
  - b) The Stock system is used for naming both ionic and molecular compounds
  - c) The Stock system uses Roman numerals to indicate the oxidation state of a metal in a compound
  - d) Metals with only one possible oxidation state do not require a Roman numeral in the Stock system
- 8. Which of the following is the correct name for  $\text{HNO}_3(\text{aq})$ ?**
  - a) Nitrous acid
  - b) Nitric acid
  - c) Hydrogen nitrate
  - d) Hydroxynitric acid
- 9. Ionic compounds must be represented by their empirical formula. True or false?**
  - a) True
  - b) False
  - c) Need more information
- 10. What is the correct conversion factor between grams and molecules?**
  - a) Volume and Avogadro's number
  - b) Density and molar mass
  - c) Molar mass and Avogadro's number
  - d) Atomic number and Avogadro's number

**11. What is the name of the number used to balance chemical equations?**

- a) Molar mass
- b) Superscript
- c) Subscript
- d) Coefficient

**12. Which of the following statements is false about a double-displacement reaction?**

- a) Two compounds exchange ions to form two new compounds
- b) A precipitate, gas, or water is often formed as a result of the reaction.
- c) Double-displacement reactions only occur in aqueous solutions
- d) One of the products must be non-aqueous in the solution for the reaction to proceed.

**13. What is the main difference between an ionic equation and a net ionic equation?**

- a) An ionic equation shows only the neutral compounds
- b) A net ionic equation shows only the species that undergo change, while an ionic equation includes all ions present in the reaction
- c) The net ionic equation includes spectator ions, while the ionic equation does not
- d) An ionic equation only shows the products of the reaction

**14. In  $\text{SO}_3^{2-}$ , which element has an oxidation number of -2?**

- a) Oxygen
- b) Sulfur
- c) Both
- d) Need more information

**15. Which of the following reactions involves the reduction of Zn?**

- a)  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
- b)  $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$
- c)  $\text{ZnO} + \text{CO} \rightarrow \text{Zn} + \text{CO}_2$
- d)  $\text{Zn} + \text{O}_2 \rightarrow \text{ZnO}$

**16. Reducing agent and reduced element can be the same. True or false?**

- a) True
- b) False
- c) Need more info

**17. What is the correct definition of an isotope?**

- a) Atoms of the same element that have the same number of protons but different numbers of neutrons
- b) Atoms with different numbers of protons but the same mass number.
- c) Atoms of different elements that have the same number of protons.
- d) Atoms with the same number of neutrons but different numbers of protons.

**18. Which of the following statements is not correct about dissociation?**

- a) Molecular compounds dissociate into ions when dissolved in water.
- b) Dissociation refers to the process where ionic compounds separate into their individual ions in solution.
- c) Ionic dissociation typically occurs when an ionic compound is dissolved in a polar solvent, like water.
- d) Dissociation happens with aqueous compounds.

**19. What is the correct prefix used for 10 atoms?**

- a) Deca-
- b) Dodeca-
- c) Nona-
- d) Hexa-

**20. When NaOH and HCl react with each other, which of the following is not a possible product?**

- a) Nickel-60 (Ni-60)
- b) Cobalt-59 (Co-59)
- c) Strontium-88 (Sr-88)
- d) Rubidium-85 (Rb-85)

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Name: Key-

21. A mystery element Q occurs as three isotopes. Analysis of a sample of Q showed:

Isotope	Mass (amu)	Abundance (%)
A	2.45	32.00
B	3.33	14.00
C	6.76	54.00

Calculate the average atomic mass of Q.

$$(A \times \%A) + (B \times \%B) + (C \times \%C) = \text{Avg}$$

$$(2.45 \times 0.32) + (3.33 \times 0.14) + (6.76 \times 0.54) = \text{Avg}$$

$$0.784 + 0.4662 + 3.6504$$

$$= \boxed{4.9 \text{ amu}}$$

4

22. A solution is composed of 343 mg of NaCl (salt) dissolved in 10.43 g of water. What is the percent composition of NaCl in this solution?

$$\% \text{NaCl} = \frac{\text{NaCl}}{\text{Solution}} \times 100$$

↑ Salt & water.

$$343 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 0.343 \text{ g NaCl.}$$

$$= \frac{(0.343 \text{ g})}{(0.343 \text{ g} + 10.43 \text{ g})} \times 100 = \boxed{3.18 \% \text{ NaCl}}$$

3

23. What is the correct formula for a cyanide ion?



5

24. How many g is equivalent to  $2.23 \times 10^{12}$  molecules of  $Al_2(SO_4)_3$ ?

$$\begin{array}{l}
 Al : 26.98 \times 2 = 53.96 \\
 S : 32.06 \times 3 = 96.18 \\
 O : 16.00 \times 12 = 192.00
 \end{array}
 \left. \vphantom{\begin{array}{l} Al \\ S \\ O \end{array}} \right\} 342.14$$

$$2.23 \times 10^{12} \text{ molecules} \times \frac{1 \text{ mol}}{6.022 \times 10^{23} \text{ molecules}} \times \frac{342.14 \text{ g}}{1 \text{ mol}}$$

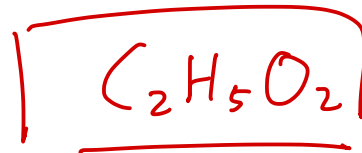
$$= \boxed{1.27 \times 10^{-9} \text{ g } Al_2(SO_4)_3}$$

6

25. A compound is composed of 39.341% carbon (C), 8.254% hydrogen (H), and 52.406% oxygen (O)

a) Determine the empirical formula

C	$39.341 \text{ g} \times \frac{1 \text{ mol}}{12.01 \text{ g}}$	$= 3.2756 / 3.2753 = 1 \times 2 = 2$
H	$8.254 \text{ g} \times \frac{1 \text{ mol}}{1.01 \text{ g}}$	$= 8.1722 / 3.2753 = 2.5 \times 2 = 5$
O	$52.406 \text{ g} \times \frac{1 \text{ mol}}{16.00 \text{ g}}$	$= 3.2753 / 3.2753 = 1 \times 2 = 2$



3

b) Determine the molecular formula of the compound if the experimental molar mass of the compound is 180.16 g/mol

$$\frac{180.16}{61.07} = 2.95 \sim 3 \times (C_2H_5O_2) = \boxed{C_6H_{15}O_6}$$

26. Consider a reaction between NaCl and AgNO<sub>3</sub>.

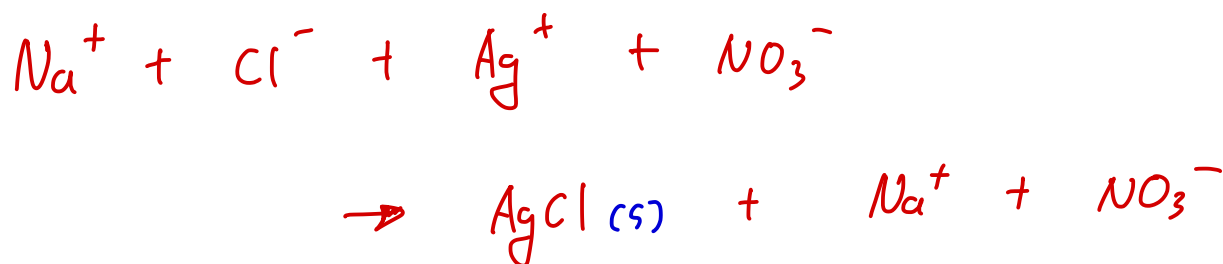
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a) Write the balanced molecular equation for this reaction, including the physical states of all reactants and products.



3

b) Write ionic equation



2

c) Write net ionic equation

