

Chapter 3 Review and Reinforcement Questions

1. How many protons and electrons are present in a Vanadium atom?
2. How many protons and electrons are present in a nitrogen atom?
3. How many protons and neutrons are present in a Platinum atom?
4. What is the name of the element that has atoms that contain 5 protons?
5. What is the name of the element that contains 25 protons?
6. Write the isotopic chemical symbol for the atom with 95 protons.
7. Write the isotopic chemical symbol for the ion with 29 protons.
8. How many protons, neutrons, and electrons are present in the $^{59}_{28}\text{Ni}$?
9. How many protons, neutrons, and electrons are present in the $^{79}_{34}\text{Se}$?
10. Write the complete isotopic symbol for the atom with 84 protons, 125 neutrons?
11. Write the complete isotopic chemical symbol for the ion with 73 protons, 108 neutrons?

Complete the following table.

Subatomic particle	Location	Charge	Mass (amu)
12.	Inside nucleus	1+	
13. neutron			1
14.		1-	0

15. How do two isotopes of oxygen, oxygen-16 and oxygen-18, differ from each other in structure? Does this difference affect the chemical properties of these two atoms?

Use the periodic table to complete the following chart.

Chemical Symbol	Number of protons	Number of electrons	Number of neutrons
$^{131}_{53}\text{I}$	16.	17.	18.
19.	35	20.	45
21.	11	22.	12
23.	24.	55	78

25. Write the chemical symbols for the isotopes of uranium with the following numbers of neutrons.
 - a. 142 neutrons
 - b. 143 neutrons
 - c. 146 neutrons

On the line at the left, write the term from the list that matches each description below.

Electron
Alpha particle

cathode ray
atomic nucleus

proton
neutron

- _____ 26. stream of particles originating from a cathode
- _____ 27. negatively charged particle found outside the atomic nucleus
- _____ 29. small core at the center of an atom containing a positive charge
- _____ 30. particle used by Rutherford to "fire" at a thin sheet of gold foil.
- _____ 31. positively charged particle found inside the atomic nucleus
- _____ 32. neutral charged particle found inside the atomic nucleus

Match each description to the correct term.

_____ 33. atom

_____ 34. Dalton's atomic theory

_____ 35. John Dalton

_____ 36. Democritus

_____ 37. atomic number

_____ 38. mass number

_____ 39. isotopes

_____ 40. atomic mass

- theory to explain the reactive behavior of elements
- teacher in ancient Greece
- the smallest particles of an element that retains the properties of that element
- 19th century English school teacher who formulated a theory to describe the structure and chemical reactivity of matter in terms of atoms.
- atoms that have the same number of protons but different numbers of neutrons
- weighted average mass of the atoms in a naturally occurring sample of an element
- the total number of protons and neutrons in an atom
- the number of protons in the nucleus of an atom of an element

Calculate the average atomic weight for:

41. molybdenum: given data for 7 isotopes to the right

mass number	exact weight	percent abundance
92	91.906808	14.84
94	93.905085	9.25
95	94.905840	15.92
96	95.904678	16.68
97	96.906020	9.55
98	97.905406	24.13
100	99.907477	9.63

Fill in the word(s) that will make each statement true.

42. The number of protons in an atom is called its _____ number.

43. There are 10 neutrons and _____ electrons in an atom of oxygen-18.

44. Isotopes of an element have different numbers of neutrons. They also have different _____ numbers.

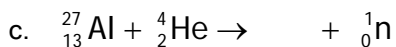
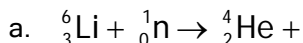
45. The total number of protons, neutrons, and electrons in an atom of silver-109 is _____.

46. The mass number of an element with 14 electrons and neutrons is _____.

Answer the following Nuclear Chemistry questions:

47. Write the nuclear equations for the alpha decay of Po-218, the beta decay of Po-218, the positron emission of Po-218 and the electron capture of Po-218.

48. Complete the transmutation reaction equations:



49. Po-214 has a relatively short half-life of 164 seconds. How many seconds would it take for 8.0 g of this isotope to decay to 0.25 g?

50. How many days does it take for 16 g of Pa-103 to decay to 1.0g? The half-life of Pa-103 is 7 days.

51. By approximately what factor would the mass of a sample of Cu-66 decrease in 51 minutes? The half-life of Cu-66 is 5.10 min.

52. In 5.49 seconds, 1.20 g of Ar-35 decays to leave only 0.15 g. What is the half-life of Ar-35?

REVIEW OF THE MOLE

- 1) Which contains more molecules: 1.00 mol H_2O_2 , 1.00 mol C_2H_6 , or 1.00 mol CO ?
- 2) Find the number of particles in each substance.
 - a. 3.00 mol Sn
 - b. .400 mol KCl
 - c. 7.50 mol SO_2
 - d. 4.8×10^{-3} mol NaI
- 3) Calculate the molar mass of each substance.
 - a. H_3PO_4
 - b. N_2O_3
 - c. CaCO_3
 - d. $(\text{NH}_4)_2\text{SO}_4$
 - e. $\text{C}_4\text{H}_9\text{O}_2$
 - f. Br_2
- 4) Calculate the mass of 1.00 mol of each of these substances.
 - a. Silicon dioxide (SiO_2)
 - b. Diatomic nitrogen (N_2)
 - c. Iron (III) hydroxide ($\text{Fe}(\text{OH})_3$)
 - d. Copper (Cu)
- 5) How many moles is each of the following?
 - a. 15.5g SiO_2
 - b. 0.0688 g AgCl
 - c. 5.96 g KOH
 - d. 937 g $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$
- 6) Find the mass of each substance.
 - a. 1.50 mol C_5H_{12}
 - b. 14.4 mol F_2
 - c. 0.780 mol $\text{Ca}(\text{CN})_2$
 - d. 7.00 mol H_2O_2
- 7) Calculate the volume of each of the following gases at STP.
 - a. 7.6 mol of Ar
 - b. 0.44 mol C_2H_6
 - c. 1.20 mol O_2
- 8) Find each of the following quantities.
 - a. The volume of 835 g SO_3 at STP
 - b. The mass of 1 molecule of aspirin ($\text{C}_9\text{H}_8\text{O}_4$)

"ELECTRON STUFF" REVIEW

- Identify the elements described below:
 - Contains a full third energy level
 - Contains the first f electron
 - Contains 6 valence electrons in its 4th energy level
 - Contains only 2 electrons in its sixth energy level
 - Contains a full set of valence electrons in the third energy level
 - The only element where its last electron would be $3d^8$

- Identify the following elements.

- $3d^8$
- $4p^5$
- $2p^4$
- $6s^1$
- $5f^{11}$
- $4d^7$

- Complete the following chart summarizing the energy levels in atoms.

Sublevel	Number of orbitals	Number of electrons
s		
p		
d		
f		

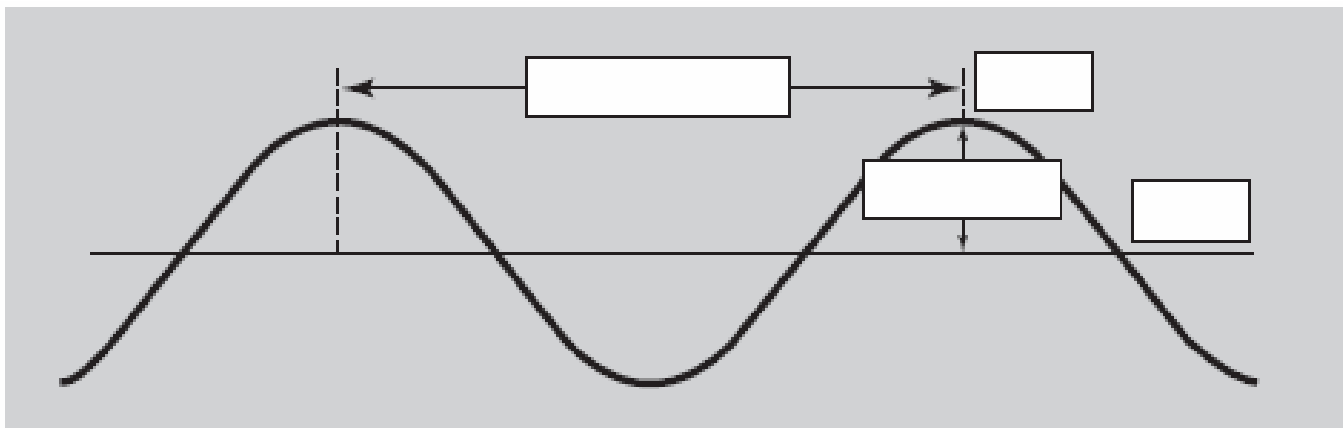
- Write the electron configuration of each atom (3 of the 6 must be long hand).

- Barium
- Krypton
- Vanadium
- Bromine
- Arsenic
- Magnesium

- Identify the elements described below:

- Contains a full third energy level.
- Contains the first p electron

- Label the parts of a wave in this drawing. Label the wavelength, the amplitude, the crest, and the origin.



7. Put the visible colors in order from light with the longest wavelength and lowest frequency to light with the shortest wavelength and the highest frequency.

_____ orange
 _____ yellow
 _____ green
 _____ indigo
 _____ blue
 _____ red
 _____ violet

8. Use all the information given to complete the table.

Electron Configurations for Some Selected Elements							
Element	Orbital filling					Electron configuration	
	1s	2s	2p _x	2p _y	2p _z		3s
<input type="text"/>	↑						<input type="text"/>
He	↑↓						<input type="text"/>
<input type="text"/>	↑↓	↑					1s ² 2s ¹
C	↑↓	↑↓	↑	↑			<input type="text"/>
<input type="text"/>	↑↓	↑↓	↑	↑	↑		1s ² 2s ² 2p ³
O	↑↓	↑↓	↑↓	↑	↑		<input type="text"/>
<input type="text"/>	↑↓	↑↓	↑↓	↑↓	↑		1s ² 2s ² 2p ⁵
Ne	↑↓	↑↓	↑↓	↑↓	↑↓		<input type="text"/>
<input type="text"/>	↑↓	↑↓	↑↓	↑↓	↑↓	↑	1s ² 2s ² 2p ⁶ 3s ¹

9. Which of the following electron configurations is written correctly? What is wrong with each of the other three?

	1s	2s	2p	3s	3p	4s	3d
a.	↑	↑	↑ ↑ ↑	↑	↑ ↑ ↑	↑	↑ ↑ ↑ ↑ ↑
b.	↑↓	↑↑	↑↓ ↑↓ ↑↓	↑↑	↑ ↑ ↑		
c.	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑		
d.	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑ ↑ ↑		

10. The yellow light emitted by the sodium lamps in streetlights has wavelengths of 589.6 nm and 589.0 nm. What is the frequency of the 589.0 nm light? What is the energy of 1.00 mole of photons of yellow light with a wavelength of 589.0nm?