

Unit 4 Review Sheet

Electrons and the Periodic Table

The review sheet is due at the beginning of class on the review day. Answer the following questions on a separate sheet of paper. Then, check your answers (on the back of this sheet). Be prepared to ask questions at the beginning of the review session.

- What did the following scientists contribute to the development of the modern periodic table: Newlands, Mendeleev, Meyer, and Moseley?
- Identify the following elements as metals, non-metals, or metalloids.
a. P b. Ca c. Cl d. K e. Ni f. As
- Identify the following elements as noble gases, halogens, alkali metals, alkaline earth metals or transition metals.
a. Li c. Cr e. Ar g. Ba
b. Br d. Mg f. Zn h. Ag
- How is Bohr's model different from Rutherford's model of the atom? How is Schrodinger's quantum mechanical model for the atom different from Bohr's atomic model?
- Write the electron configuration for the following elements. Draw the electron dot structures for the following elements. What are valence electrons?
a. Be b. Ne c. Al d. Mn e. Br f. O
- What element is identified by the following electron configurations?
a. $1s^2 2s^2 2p^3$ c. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
b. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ d. $1s^2 2s^2 2p^6 3s^2 3p^6$
- Identify the element that:
a. Has a completely filled second energy level c. Has an outer energy level of $5s^2$
b. Contains 7 electrons in the 3d level d. Has 3 electrons in the 2p orbital
- What group of elements has completely filled outer energy levels?
- Which subatomic particle plays the greatest role in determining the physical and chemical properties of an element?
- Which of the following elements have the same outer energy level electron configurations?
Na Mg Ca Ne Ba Cr Al
- What is the purpose of flame tests (Lab 4-2)?
- Describe the periodic trends for atomic size, ionization energy, and electronegativity. Explain what causes the trends. Define electronegativity and ionization energy.
- Which element has the largest atomic radius? Na Cs F I
- Which element has the lowest ionization energy? Na Cl Cs I
- Which element has the highest electronegativity? F Br Mg Na
- Describe the trend in reactivity as you move down a group/across a period. How did you determine this in Lab 4-3?
- Rank the following forms of electromagnetic radiation in terms of increasing (smallest to largest) energy: radio waves, gamma rays, infrared, x-rays, visible light, ultraviolet.
- CD players have a small infrared laser that emits light at 7.40×10^{-7} m (740 nm). What is the frequency of this radiation? What is the energy of this radiation?
- A colored solution absorbs strongest at 680 nm, which is in the visible red region. Does this solution appear red to our eyes? Explain your answer. What is the difference between transmittance and absorbance? Be able to interpret a graph similar to that from Lab 4-1.

Practice for the Exam

Try completing this review sheet again without your notes, book, or assignments. This will give you a good idea of what you still need to study. Do the standardized test practice questions and practice problems listed below.

Standardized Test Practice

Chapter 5—pp.149 #1-6

Answers: d,a,c,d,a,b

Chapter 6—pp.177 #2-10

Answers: a,a,c,d,b,c,d,b,d

Practice Problems (Answers in Appendix D starting on page 922)

Chapter 5

p.121 #1-4

p.124 #5-6

p.139 #18-22

p.141 #23

Chapter 6

p.162 #7-9

p.165 #16-18

Unit 4 Review Sheet Answers

Check your answers to the review sheet. Be ready to ask questions in class about the ones you got wrong and/or the ones that are still unclear to you even after you read the answer. Which questions will be short answer???

1. Newlands—law of octaves, every 8th element has similar properties when put in order of increasing atomic mass

Mendeleev- produced first periodic table and predicted unknown elements

Meyer- produced first periodic table

Mosley – put elements in order of atomic number instead of atomic mass

2. a. non-metal b. metal c. non-metal d. metal e. metal f. metalloid

3. a. alkali metal b. halogen c. transition metal d. alkaline earth metal

e. noble gas f. transition metal g. alkaline earth metal h. transition metal

4. Rutherford stated that electrons are outside the nucleus, while Bohr stated that the electrons travel in an orbit around the nucleus, like the planets orbit the sun. Schrodinger stated that electrons are in orbitals, regions in space, 90% of the time. There are s-shaped, dumbbell shaped, clover shaped and flower shaped orbitals.

5. valence electrons –electrons found in the outermost energy level, which are used in bonding

a. Be- $1s^2 2s^2$

b. Ne- $1s^2 2s^2 2p^6$

c. Al- $1s^2 2s^2 2p^6 3s^2 3p^1$

d. Mn- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

e. Br- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^5$

f. O- $1s^2 2s^2 2p^4$

a. $\cdot \text{Be} \cdot$ b. $:\ddot{\text{Ne}}:$ c. $\cdot \text{Al} \cdot$ d. $\cdot \text{Mn} \cdot$ e. $:\ddot{\text{Br}}:$ f. $:\ddot{\text{O}}:$

6. a. N b. Ni c. K d. Ar

7. a. Ne b. Co c. Sr d. N

8. noble gasses

9. electron

10. Mg, Ca, Ba

11. identify an unknown metal

12. atomic size – how far the outermost electron is from the nucleus

- down a group – increases - because you are adding energy levels, so the outermost electrons are found farther from the nucleus

- also, the inner electrons (non-valence electrons) shield the outer electrons from the force of the (+) charge in the nucleus

- across a period – decrease

- because you are adding (+) charges and (-) charges, making more of a pull on the electrons from the protons in the nucleus

ionization energy – the amount of energy required to remove the outermost electron

- down a group – decreases

- because the outermost electron gets farther and farther from the nucleus, so it's easier to steal the outermost electron from the atom

- across a period – increases

- because the outermost electron gets closer and closer to the nucleus, so it's harder and harder to remove the outermost electron from the atom

electronegativity – how much an atom wants to steal an electron from another atom

- down group – decreases

- because the outermost electron is farther from the nucleus, making it more difficult for the atom to grab another electron

- across a period – increases

- because the outermost electron is closer to the nucleus it is easier for the atom to grab another electron

13. Cs

14. Cs

15. F

16. down a group, increases; increasing reaction w/H₂O of Li/Na/K/Rb/Cs; Ca reacted more than Mg across a period, decreases – Al didn't react much even w/HCl, Mg reacted more, then Na

17. radio, infrared, visible, ultraviolet, x-rays, gamma 18. $4.05 \times 10^{14}/s$, $2.69 \times 10^{-19}J$

19. no, if red is absorbed most then the complimentary color, green, is what our eyes will most likely see.

transmittance is what wavelengths of color are allowed through a solution or reflected, the color we see. absorbance is the color that is absorbed, the complimentary color of the color we see.