

# Chemistry Chapter 4 Worksheet

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Name: \_\_\_\_\_

Provide a short and specific definition in YOUR OWN WORDS. Do not use the definition from the book

Additional Notes:

Electromagnetic Radiation \_\_\_\_\_

\_\_\_\_\_

Electromagnetic Spectrum \_\_\_\_\_

\_\_\_\_\_

Wavelength \_\_\_\_\_

\_\_\_\_\_

Frequency \_\_\_\_\_

\_\_\_\_\_

Photoelectric Effect \_\_\_\_\_

\_\_\_\_\_

Quantum \_\_\_\_\_

\_\_\_\_\_

Photon \_\_\_\_\_

\_\_\_\_\_

Ground State \_\_\_\_\_

\_\_\_\_\_

Excited State \_\_\_\_\_

\_\_\_\_\_

Line-emission Spectrum \_\_\_\_\_

\_\_\_\_\_

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Continuous Spectrum \_\_\_\_\_

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Heisenberg Uncertainty Principle

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Quantum Theory \_\_\_\_\_

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Orbital \_\_\_\_\_

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Quantum Number \_\_\_\_\_

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Principle Quantum Number \_\_\_\_\_

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Angular Momentum Quantum Number \_\_\_\_\_

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Magnetic Quantum Number \_\_\_\_\_

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Spin Quantum Number \_\_\_\_\_

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Electron Configuration \_\_\_\_\_

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Aufbau Principle \_\_\_\_\_

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Pauli Exclusion Principle \_\_\_\_\_

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Hund's Rule \_\_\_\_\_

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Noble Gas \_\_\_\_\_

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Noble-gas Configuration \_\_\_\_\_

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365

MrG

Mr. Gunkelman

## Section 4.1

1. Give 3 examples of electromagnetic radiation.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
2. What is the wavelength range for visible light?
3. Light moves at \_\_\_\_\_ m/s in a vacuum.
4. Violet light has a wavelength of  $4.10 \times 10^{-12}$  m. What is the frequency?
5. Green light has a frequency of  $6.01 \times 10^{14}$  Hz. What is the wavelength?
6. Calculate the wavelength of radiation with a frequency of  $6 \times 10^{13}$  Hz.
7. Draw a wave (on the line below) and label the amplitude, crest, trough, and identify a wavelength.

\_\_\_\_\_

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8. Who discovered “quanta” and what is it?

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9. State Planck’s constant. \_\_\_\_\_

10. Ultraviolet radiation has a frequency of  $6.8 \times 10^{15}$  Hz. Calculate the energy, in joules, of the photon.

11. What is the frequency of radiation with a  $2.5 \times 10^{-17}$  J of NRG?

12. Contrast the ground state and excited state of an atom.

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13. What is meant by the dual wave-particle nature of light?

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14. Describe Bohr’s model of the atom.

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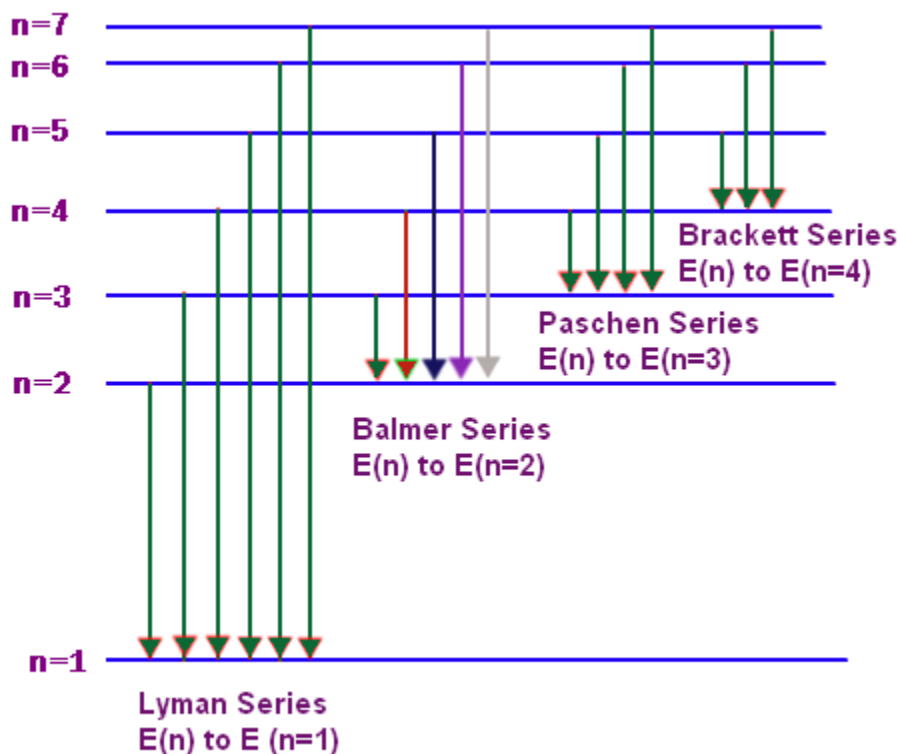
15. Which NRG level change in, Picture A, emits or absorbs the highest NRG?

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16. Which NRG level change in, Picture A, emits or absorbs the lowest NRG?

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**Picture A**



<http://chemistry.tutorvista.com/inorganic-chemistry/bohr-s-model-of-the-atom.html>

17. When an electron moves from  $E_1$  to  $E_3$ , is it absorbing NRG or releasing NRG? Explain how you know this.

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18. The Emission-Line Spectrum for a sample found on a distant planet is given to you. How could you use this to identify the element(s) present in the sample?

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19. Which has a longer wavelength, orange or blue light?

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20. Which has a higher frequency, orange or blue light?

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21. A light is found to have a wavelength of  $5.3 \times 10^{-7}$  m. What is the frequency of the light?

22. What is the frequency of a photon that has  $2.58 \times 10^{-46}$  J of NRG?

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## Section 4.2

23. When talking about light...

a. What does destructive interference mean? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

b. What does constructive interference mean? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

c. What does diffraction mean? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

24. State de Broglie's equation.

25. What is the mass of an electron, in kilograms?

\_\_\_\_\_

26. What is the frequency of an electron that has a frequency of  $2.6 \times 10^2$  Hz?

27. An electron has a wavelength of  $4.6 \times 10^{-6}$  m, what is the frequency of this electron?



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28. State the Heisenberg Uncertainty Principle in YOUR OWN WORDS.

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29. Identify each of the 4 quantum numbers and the properties they represent.

- a. \_\_\_\_\_  
\_\_\_\_\_
- b. \_\_\_\_\_  
\_\_\_\_\_
- c. \_\_\_\_\_  
\_\_\_\_\_
- d. \_\_\_\_\_  
\_\_\_\_\_

30. The \_\_\_\_\_ orbital is spherical.

- a. *p*  
b. *s*  
c. *d*  
d. combination of *s* and *p*  
e.

31. The \_\_\_\_\_ orbital is dumbbell shaped.

- a. *p*  
b. *s*  
c. *d*  
d. combination of *s* and *p*

32. How many electrons can the following NRG levels hold?

- a. NRG level 2 \_\_\_\_\_  
b. NRG level 3 \_\_\_\_\_

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33. Complete the following table.

Principal Quantum Number	Number of Sublevels	Types of Sublevel(s)
1		
2		
3		
4		

34. Draw the *s* and a *p* orbital.

*s*

*p*

35. Complete the following table.

Orbital Type	MAX electrons it can hold
<i>s</i>	
<i>p</i>	
	10
	14

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## Section 4.3

36. Fill in the orbitals (Draw your own orbitals AND fill them in for Br)

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Be	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
N	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Ne	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Al	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Cl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Cr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Br

37. Write out the electron configuration notation for the following elements.

H

He

C

F

Al

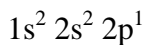
P

Cr

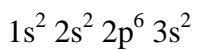
Sodium

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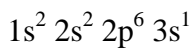
38. Give me the element for the following.



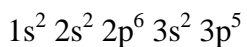
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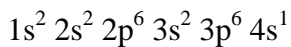
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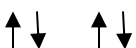
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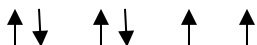
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\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



\_\_\_\_\_



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39. State the Pauli Exclusion Principle:

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40. State the Aufbau Principle:

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41. State Hund's Rule:

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42. Which 2 columns in the periodic table contain the electron configuration “exceptions”?

a. Column \_\_\_\_\_

b. Column \_\_\_\_\_

43. Why do those 2 columns have those exceptions?

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44. What is an octet of electrons and which elements contain the octet?

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45. Determine the highest occupied NRG level for the following elements.

a. He \_\_\_\_\_

b. Mg \_\_\_\_\_

c. P \_\_\_\_\_

d. Sn \_\_\_\_\_