Name: _____ Period: _____

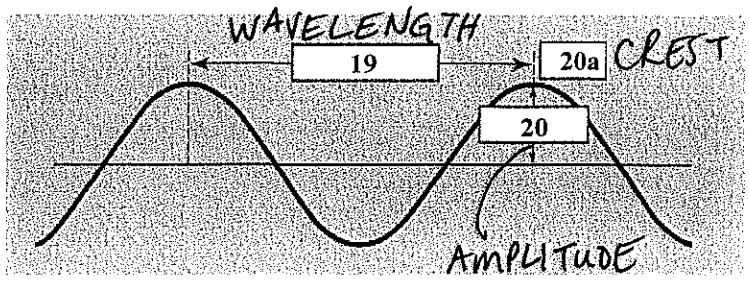
5 Chapter 5 Review Sheet ELECTRONS IN ATOMS

Test on:

Vocabulary

1. 2.998 x 10^8 m/s
2. 6.626 x 10^-34 Js
3. photoelectric
4. radio (longest)
5. microwaves
6. infrared
7. visible (humans can see)
8. ultraviolet
9. x-rays
10. gamma (shortest)
11. red (longest visible)
12. orange
13. yellow
14. green
15. blue
16. indigo
17. violet (shortest visible)
18. quantum
19. wavelength
20. amplitude

- The speed of light is __1__ m/s and is a constant, so it doesn't affect significant digits when doing calculations.
- Planck's constant is __2__ Js and is a constant, so it doesn't affect significant digits when doing calculations. Planck showed mathematically that the amount of radiant energy is proportional to the frequency of radiation.
- The __3__ effect states that electrons are ejected when light shines on a metal. Can also be described as the emission of electrons from a metal when light shines on it. The light must have a minimum frequency for this to occur.
- The seven types of electromagnetic radiation, listed from longest wavelength to shortest wavelength are __4__ (longest wavelength), __5__, __6__, __7__ (the only portion that human eyes can see), __8__, __9__, and __10__ (shortest wavelength).
- The visible spectrum of light includes the following colors of light, listed from longest wavelength to shortest wavelength: __11__ (longest wavelength), __12__, __13__, __14__, __15__, __16__, and __17__ (shortest wavelength).
- A __18__ is the minimum quantity of energy needed to move an electron from one energy level to another.
- Label the following locations on the diagram below based on the descriptions. The __19__ is the distance between corresponding points on adjacent waves and is represented by the letter λ. It is labeled in nm or meters. The __20__ of a wave is the wave's height from zero to the crest. (#20a on the diagram). The frequency is the number of wave cycles to pass a given point per unit of time. It is represented by the letter ν. It is labeled in Hertz (Hz).



21. Pauli exclusion
22. ↑↓
23. Hund's rule
24. Aufbau principle
25. Noble gas
26. 3
27. 4
28. 1
29. 2
30. 2
31. Quantum Mechanical Model
32. Schrödinger

- The __21__ states that atomic orbitals can only hold up to two electrons. An orbital that contains paired electrons is written as __22__.
- __23__ states that electrons occupy orbitals of the same energy in a way that makes the number of electrons with the same spin direction as large as possible.
- The __24__ states that electrons occupy the orbitals of the lowest energy first.
- The __25__ notation uses the noble gas from the period above it as a "shortcut" method. After you put the noble gas in brackets, you only list the stopping points for the information that follows.
- To calculate the number of valence electrons in groups 13-18, you simply subtract 10 from the group number. Using this method, Group 13 would have __26__ valence electrons, Group 14 would have __27__ valence electrons and so on. In Group 1, the number of valence electrons would be __28__ while those in Group 2 would have __29__ valence electrons. To calculate the number of valence electrons in those elements in the d or f block, look at the electron configuration and add up the electrons in the highest levels. For example, Curium (Cm), element #96 is [Rn] $7s^2\ 6d^1\ 5f^7$ would have __30__ valence electrons.
- The current model of atoms is the __31__, which determines how likely it is to find an electron within an electron cloud. This model is based on mathematics, specifically solutions to __32__ equation.

Practice Problems

Give the full electron configuration *and* abbreviated (noble gas notation) for the following elements:

33. S: Sulfur $1s^2 2s^2 2p^6 3s^2 3p^4$
34. *[Noble Gas]:* $Ne\ 3s^2 3p^4$

35. Sc: Scandium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$
36. *[Noble Gas]:* $Ar\ 4s^2 3d^1$

37. Ge: Germanium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$
38. *[Noble Gas]:* $Ar\ 4s^2 3d^{10} 4p^2$

39. Sr: Strontium $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2$
40. *[Noble Gas]:* $Kr\ 5s^2$

Indicate which block (s, p, d, or f) each of the following elements are found:

41. Ti D
42. N P
43. Ra S
44. Pd D
45. Sm F

Identify the element from the noble gas notation shown.

46. [Ne] $3s^2\ 3p^6$ Ar
47. [Ar] $4s^2\ 3d^8$ Ni
48. [Xe] $6s^1$ Cs

Calculate:

49. What is the wavelength of light that has a frequency of 3.00×10^{-4} Hz in a vacuum?

$\lambda = \frac{c}{v} = \frac{2.998 \times 10^8}{3.00 \times 10^{-4}} = 9.993333333 \times 10^{11}$

3 digits = 9.99×10^{11} m

50. What is the frequency of light that has a wavelength of 680. nm in a vacuum?

$680\text{nm} \cdot \frac{1\text{ m}}{1 \times 10^9\text{nm}} = 6.8 \times 10^{-7}$ meters (λ) ← convert to meters!

$v = \frac{c}{\lambda} = \frac{2.998 \times 10^8}{6.8 \times 10^{-7}} = 4.408823529 \times 10^{14}$

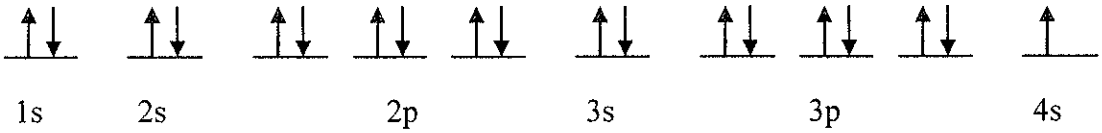
3 digits

4.41×10^{14} Hz

Identify the elements below from their orbital notation.

1s 2s 2p 3s 3p

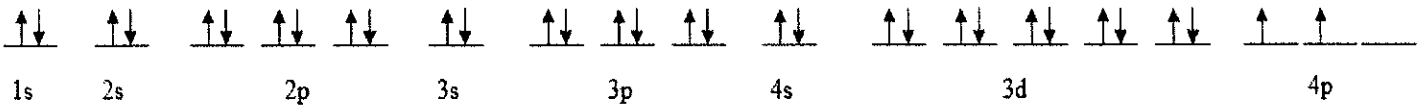
51. What is the element's symbol? S
52. What is this element's atomic number? 16
53. How many unpaired electrons does it have? 2



54. What is the element's symbol? K

55. What is this element's atomic number? 19

56. How many unpaired electrons does it have? 1



57. What is the element's symbol? Ge

58. What is this element's atomic number? 32

59. How many unpaired electrons does it have? 2

Draw the orbital notation for the following elements:

	1s	2s	2p	3s	3p	4s	3d	4p	Element
60.	↑↓	↑↓	↑ ☐ ☐	☐	☐ ☐ ☐	☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐	B
	1s	2s	2p	3s	3p	4s	3d	4p	Element
61.	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐	K
	1s	2s	2p	3s	3p	4s	3d	4p	Element
62.	↑↓	↑↓	↑↓ ↑↓ ↑	☐	☐ ☐ ☐	☐	☐ ☐ ☐ ☐ ☐	☐ ☐ ☐	F
	1s	2s	2p	3s	3p	4s	3d	4p	Element
63.	↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓	↑↓	↑↓ ↑↓ ↑↓ ↑↓ ↑↓	↑↓ ↑ ↑	Se