Unit 4 Test Review: Electrons and EMR

1. Complete the following table.

Lewis Dot	Orbital Notation	Noble Gas Configuration
:P·	1s 2s 2p 3s 3p	[Ne]$3s^2 3p^3$
	Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^3$	
·Ge·	1s 2s 2p 3s 3p 4s 3d 4p	[Ar]$4s^2 3d^{10} 4p^2$
	Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$	
:F:	1s 2s 2p	[He]$2s^2 2p^5$
	Electron Configuration: $1s^2 2s^2 2p^5$	
K·	1s 2s 2p 3s 3p 4s	[Ar]$4s^1$
	Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$	
NO Lewis Dot	1s 2s 2p 3s 3p 4s 3d	
V	Electron Configuration: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$	Noble Gas Configuration: [Ar]$4s^2 3d^3$

2. What is the difference between an atom in the ground state and the excited state?

everything is normal

electrons jumped to higher level (looks wrong)

3. Identify the element and if it in excited or ground state. Then highlight the valence electrons.

Element	Electron configuration	Ground state or excited state?
Al	$1s^2 2s^2 2p^6 3s^2 3p^1$	G
Ge	$[Ar] 4s^2 3d^8 4p^4$	E
F	$1s^2 2s^2 2p^4 3s^1$	E
Cs	$[Xe] 6s^1$	G
Ni	$1s^2 2s^2 2p^6 3s^2 3p^5 4s^2 3d^9$	E
Na	$1s^2 2s^2 2p^6 3s^1$	G

d should have 10

p should have 6

4. How many total electrons are needed to fill:

a) the first energy level? 2 (level 1, only s)

b) the second energy level? 8 (level 2, 2s, 2p)

c) the third energy level? 18 (level 3, 3s, 3p, 3d)

5. You have two waves:

Wave A: 

Wave B: 

a) Which wave has a longer wavelength? B

b) Which wave has a higher frequency? A

c) Which wave has a lower energy? B

6. What is the speed of all forms of electromagnetic radiation (in a vacuum)? (Hint: this is a constant!)

$c = 3 \times 10^8$ m/s speed of light

7. *UV radiation* ***(UV)****, Visible light* ***(VL)****, Gamma rays* ***(GR)****, Microwaves* ***(MW)****, Radio waves* ***(RW)*** *,Infrared radiation* ***(IR)****, X rays* ***(XR)***

Rank the types electromagnetic radiation (EMR) shown above in order from:

a) highest to lowest **energy**

HIGH: GR, XR, UV, VL, IR, MW, RW :LOW

b) highest to lowest **frequency**

HIGH: GR, XR, UV, VL, IR, MW, RW :LOW

c) longest to shortest **wavelength**

HIGH: RW, MW, IR, VL, UV, XR, GR :LOW

8. Circle the correct answer for each question below:

i. Which has higher energy? Circle one: Visible or (Ultraviolet)

ii. Which has lower frequency? Circle one: X-Ray or (Microwave)

iii. Which has the shorter wavelength? Circle one: (Gamma) or Radio

iv. Which has the lower energy? Circle one: (Orange light) or Indigo light

R O Y G B I V

9. a) What equation shows how the wavelength and frequency of electromagnetic radiation are related?

i. Frequency and wavelength are indirect (opposite) proportional. This means when f goes up, λ goes ↓ (shorter).

b) What equation shows how the energy and frequency of electromagnetic radiation are related?

i. Energy and frequency are direct (same) proportional. This means when E goes down, f goes ↓.

c) What equation shows how the energy and wavelength of electromagnetic radiation are related?

i. Wavelength and energy are indirect (opposite) proportional. This means when λ goes down, E goes ↑.

Use the GUESS method to solve the math problems below, *using the GUESS boxes.*

10. A certain photon of light has a wavelength of 4.22×10^{-7} m. What is the frequency of this light?

11. A photon has a wavelength of 0.960 m. What is the energy of this photon?

12. A certain red light has a frequency of 4.41×10^{14} Hz. What is the energy of this light?

13. A photon of light has 4.93×10^{-19} J of energy. What is the frequency of this photon?

#10

G: $\lambda = 4.22 \times 10^{-7} m$

U: f

E: $C = \lambda \cdot f$

S: $3 \times 10^{8} m/s = 4.22 \times 10^{-7} (f)$

S: $f = 7.11 \times 10^{14}$ Hz

units!

#11

G: $\lambda = 0.960 m$

U: E

E: $E = \frac{hc}{\lambda}$

S: $E = \frac{6.63 \times 10^{-34}(3 \times 10^{8})}{0.960}$

S: $E = 2.07 \times 10^{-25}$ J

units!

#12

G: $f = 4.41 \times 10^{14}$ Hz

U: E

E: $E = h \cdot f$

S: $E = 6.63 \times 10^{-34}(4.41 \times 10^{14})$

S: $E = 2.92 \times 10^{-19}$ J

units

G: $E = 4.93 \times 10^{-19}$ J

U: f

E: $E = h \cdot f$

S: $4.93 \times 10^{-19} = 6.63 \times 10^{-34} (f)$

S: $f = 7.44 \times 10^{14}$ Hz