

7. Correct your work for this question and explain your correction in WORDS.

Extra Help for #7:

The frequency of red light is 4.62×10^{14} Hz while the frequency of X-rays is 3.8×10^{19} Hz. Draw two sample waves that correctly compare their relative wavelengths and explain how their energies compare.

8a, b, and c. Write the correct answer.

Extra Help #8a, b, and c:

i. Write the longhand electron configuration, orbital diagram, and identify the number of unpaired electrons for Fe^{3+} .

ii. Write the longhand electron configuration, orbital diagram, and identify the number of unpaired electrons for Br.

9. Write the correct answer and EXPLAIN IN WORDS the trend that is responsible for your answer.

Extra Help #9:

i. Which has a larger atomic radius, sulfur or chlorine? Explain how you know.

ii. Which has a smaller atomic radius, calcium or strontium? Explain how you know.

10. Write the correct answer and in your explanation, note what term refers to “how easily an atom gives up electrons”.

Extra Help #10:

i. Which atom will more readily give up electrons, sodium or potassium? Explain why.

ii. Which atom will more readily give up electrons, phosphorous or sulfur? Explain why.

11. Explain the correct answer, making sure to include in your explanation the terms valence and core electrons.

Extra Help #11:

i. Where would the largest jump in ionization energies be for oxygen? Explain why.

ii. Where would the largest jump in ionization energies be for magnesium? Explain why.



1. For this question, complete the Extra Help question rather than correcting your work.

Extra Help for #1:

A firework produces its beautiful colors by absorbing energy, which causes the electrons of metal atoms to jump from a _____ energy state (also called a _____ state) to a _____ energy state (also called a _____ state). When they fall back down, they release a _____, a little packet of light. This is a form of _____ radiation and if it is within the _____ region, we see color.

2a and b. Correct your work for this question and explain your correction in WORDS.

Extra Help for #2a and b:

i. What is the frequency (in Hz) and energy (in MJ) of red light that has a wavelength of 630 nm?

ii. What is the frequency (in Hz) and wavelength (in nm) of orange light that has an energy 2.18×10^{-25} MJ?

3. Write the correct answer with a complete explanation in WORDS.

Extra Help for #3:

i. Write the shorthand electron configuration of zirconium.

ii. Write the shorthand electron configuration of rubidium.

4. Write the correct answer and EXPLAIN IN WORDS how you determined the correct number of valence electrons.

Extra Help for #4:

i. How many valence electrons does zirconium have?

ii. How many valence electrons does rubidium have?

5. Write the correct answer and EXPLAIN IN WORDS how you determined the charge that the atom assumes when it becomes an ion.

Extra Help for #5:

i. What charge does rubidium assume when it becomes an ion?

ii. What charge does oxygen assume when it becomes an ion?

6. Correct your work for this question and explain your correction in WORDS.

Extra Help for #6:

i. If the wavelength of electromagnetic radiation is 5.6×10^{-9} m, what is the frequency in Hz?

ii. If the energy of electromagnetic radiation is 1.44×10^{-20} J, what is the frequency in Hz?

- $c = \lambda \nu$ $c = 3.00 \times 10^8 \text{ m/s}$
- $E = h\nu$ $h = 6.626 \times 10^{-34} \text{ J}\cdot\text{s}$

When legally used, fireworks are beautiful! I especially love the stark **GREEN** made by barium and the **RED** made by rubidium. Answer the following questions about these different forms of electromagnetic radiation.

Name	Symbol	Example
Tera	T	1 <i>Tbu</i> = 10^{12} <i>bu</i>
Giga	G	1 <i>Gbu</i> = 10^9 <i>bu</i>
Mega	M	1 <i>Mbu</i> = 10^6 <i>bu</i>
Kilo	k	1 <i>kbu</i> = 10^3 <i>bu</i>
Hecto	H	1 <i>Hbu</i> = 10^2 <i>bu</i>
Deka	D	1 <i>Dbu</i> = 10 <i>bu</i>
Base Units	No Prefix	m, s, L
Deci	d	1 <i>dbu</i> = 10^{-1} <i>bu</i>
Centi	c	1 <i>cbu</i> = 10^{-2} <i>bu</i>
Milli	m	1 <i>mbu</i> = 10^{-3} <i>bu</i>
Micro	μ	1 μ <i>bu</i> = 10^{-6} <i>bu</i>
Nano	n	1 <i>nbu</i> = 10^{-9} <i>bu</i>
Pico	p	1 <i>pbu</i> = 10^{-12} <i>bu</i>

- On a subatomic level, explain what happens to allow these beautiful colors to form when we set off fireworks.
- The energy released by barium in a firework is $3.6 \times 10^{22} \text{ kJ}$. What is the frequency of this electromagnetic radiation in Hz?
 - What is the wavelength of this electromagnetic radiation in nm?
- Write the shorthand electron configuration of barium.
- How many valence electrons does barium have?
- Barium that is used in fireworks is actually an ion, often $\text{Ba}(\text{NO}_3)_2$. What charge does barium assume when it becomes an ion?
- Rubidium releases $7.8 \times 10^{-7} \text{ m}$ of electromagnetic radiation to produce the distinctive green color we see in fireworks. What is the frequency of this electromagnetic radiation in Hz?
- Using the frequency values you calculated for barium (#2a) and rubidium (#6), draw two sample waves that correctly compare their relative wavelengths. Then in words explain which metal ion would release electromagnetic radiation with a greater energy and how you know this. Hint: You should be using the terms inversely or directly related in your explanation.
- Write the longhand electron configuration for Rb^+ .
 - Draw the orbital diagram of Rb^+ .
 - How many unpaired electrons does Rb^+ have?
- Which has a larger atomic radius, Ba or Rb? Explain how you know. Hint: Remember, vertical position affects size more than horizontal position.
- Which atom, barium or rubidium, will more readily give up electrons? Explain how you know.
- Looking at the successive ionization energies below, I can confirm that the element I am testing is rubidium and not barium. Explain how this data helps me to do that, making sure to include the terms valence and core electrons in your explanation.

IE_1	IE_2	IE_3
403 KJ/mol	2,633 KJ/mol	3,787 KJ/mol

