

Week 2 - Chemistry 14A

Summer A - 2019 (UA: Riya Shah and Kate Santoso)

Q1. A radio station broadcasts on a frequency of 1368 kHz. Calculate the wavelength of the electromagnetic radiation emitted by it. Which part of the electromagnetic spectrum does it belong to?

Q2. Calculate the energy of one mole of photons whose frequency is 5×10^{14} Hz.

Q3. A 100 watt light bulb emits monochromatic light of wavelength 400 nm. Calculate the number of photons emitted per second by the bulb.

Q4. What will be the wavelength of a ball of mass 100 g moving with a velocity of 10 m/s?

Q5. What are the frequency and wavelength of a photon emitted during a transition from $n = 5$ to the $n = 2$ state in the hydrogen atom?

Q6. Calculate the mass of a photon with a wavelength of 3.6 angstroms.

Q7. A golf ball has a mass of 40 g and a speed of 45 m/s. If the speed can be measured with an accuracy of 2%, calculate uncertainty in its position.

Q8. Using s, p, d, f notation, describe the following orbitals.

- a. $n = 2, l = 1$
- b. $n = 4, l = 0$
- c. $n = 5, l = 3$
- d. $n = 3, l = 2$

Q9. Quantum numbers of six electrons are given below. Arrange them in order of increasing energies (if any of them have the same energy put them together).

- a. $n = 4, l = 2, m_l = -2, m_s = -\frac{1}{2}$
- b. $n = 3, l = 2, m_l = 1, m_s = +\frac{1}{2}$
- c. $n = 4, l = 1, m_l = 0, m_s = +\frac{1}{2}$
- d. $n = 3, l = 2, m_l = -2, m_s = -\frac{1}{2}$
- e. $n = 3, l = 1, m_l = -1, m_s = +\frac{1}{2}$
- f. $n = 4, l = 1, m_l = 0, m_s = +\frac{1}{2}$

Q10. The unpaired electrons in Al and Si are present in 3p orbital. Which electrons will experience more effective nuclear charge from the nucleus?

Q11. Arrange the following elements in increasing order of metallic character considering their positions in the periodic table - Si, Be, Mg, Na, P.

Q12. Which of the following will have the most and least electron gain enthalpy (electron affinity) - P, S, Cl, F? Explain your answer.

Q13. The first ionization enthalpy values (in kJ/mol) of group 13 elements are - B (801), Al (577), Ga (579), In (558), Tl (589). Explain the deviation in the general trend.

Q14. Describe the theory associated with the radius of an atom as it

- a. Loses an electron
- b. Gains an electron

Q15. Write electron configurations for the following -

- a. Ca
- b. P
- c. Ar
- d. F
- e. B

Q16. The electron configurations for V is $[\text{Ar}] 3d^3 4s^2$ and that for Ni is $[\text{Ar}] 3d^8 4s^2$. However, that for Cr is $[\text{Ar}] 3d^5 4s^1$ and for Cu is $[\text{Ar}] 3d^{10} 4s^1$. Explain the reason behind this.