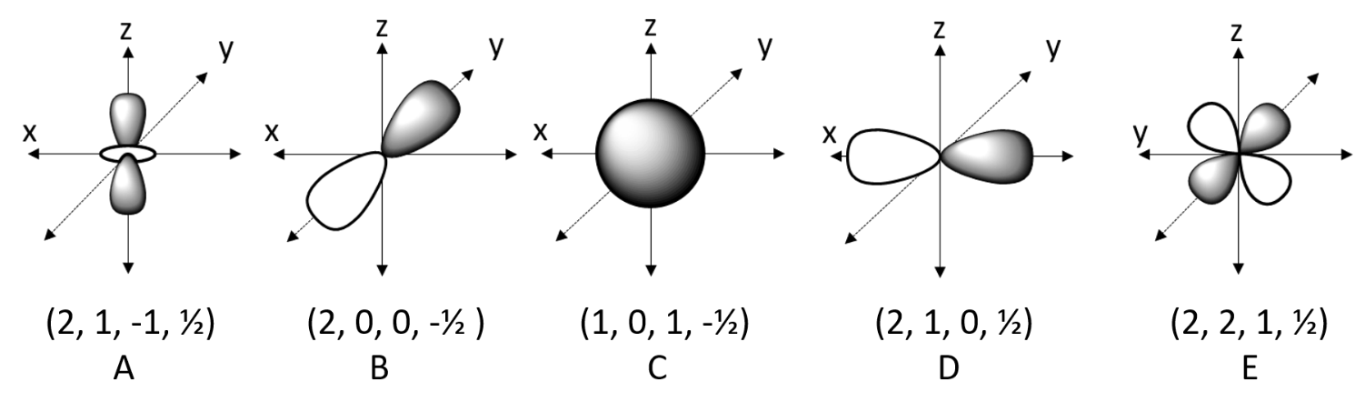
1. When frequency increases, wavelength \_\_\_\_\_\_\_\_\_\_\_\_ and energy \_\_\_\_\_\_\_\_\_\_\_\_.
   1. Increases, increases
   2. Decreases, decreases
   3. Increases, decreases
   4. **Decreases, increases**
2. What is the wavelength of light in nm that has an energy of 1.92 x 10-20 J?
   1. 1.03 x 10-5 nm
   2. 3.81 x 10-45 nm
   3. 9.67 x 104 nm
   4. **1.03 x 104 nm**
   5. 9.67 x 1013 nm
3. Which statement is true if the frequency of the wave in the picture decreased?
   1. The distance between points 5 and 9 would decrease.
   2. **The distance between points 3 and 7 would increase.**
   3. The height of points 5 and 9 would increase.
   4. The distance between points 7 and 11 would remain the same.
   5. The picture would contain more individual wavelengths.

A picture containing timeline

Description automatically generatedUse the atomic emission spectrum to answer questions 4 and 5.

1. Which line in the atomic emission spectrum would most likely have a wavelength of 700 nm? **D**
2. Which line in the atomic emission spectrum corresponds to the highest energy electronic transition? **A**
3. What information does the quantum number l provide?
   1. The primary energy level
   2. **The shape of the orbital**
   3. The number of each orbital
   4. The electron’s spin value
4. Which orbital designation matches the set of quantum numbers (4,1,-1,+1/2)?
   1. 4s
   2. 3p
   3. **4p**
   4. 3d
   5. 4d
5. Which set(s) of quantum numbers is/are **invalid**? Select any that apply.
   1. (8,3,-2,-1/2)
   2. (2,1,1,+1/2)
   3. (4,0,0,+1/2)
   4. **(1,1,0,-1/2)**
   5. **(3,2,-3,+1/2)**
6. Which set of quantum numbers describes an electron in a 5d orbital?
   1. (5,0,0,+1/2)
   2. (2,2,-2,-1/2)
   3. **(5,2,1,+1/2)**
   4. (4,3,-3,-1/2)
   5. (5,1,-1,+1/2)
7. Which orbital has the lowest energy in a gold atom?
   1. (4, 1, -1, ½)
   2. (5, 0, 0, -½)
   3. (4, 2, 1, ½)
   4. (5, 1, 0, ½)
   5. **(4, 0, 0, -½)**
8. Which orbital has the lowest energy, provided all the n values are the same?
   1. **s**
   2. p
   3. d
   4. f
9. Which is the highest energy orbital?
   1. 1s
   2. 4p
   3. 3d
   4. **5s**
   5. 2p
10. Which orbital is correctly matched to a valid set of quantum numbers that can describe it? **E**



(2, 1, 0, +1/2) (3, 2, 0, -1/2) (2, 1, -1, +1/2) (2, 0, 0, +1/2) (4, 2, 1, -1/2)

1. B. C. D. E.
2. In an alternate universe, each orbital can hold three electrons instead of two. What does this imply about electrons in this universe?
   1. There are fractional energy levels.
   2. There are more orbital shapes.
   3. There are more total orbitals with each shape.
   4. **There are three values for electron spin.**
   5. There is not enough information.