

1) State the rules for the number of *sublevels* and the number of *orbitals* allowed in any energy level n .
There are n sublevels and n^2 orbitals (each holding up to 2 electrons) in any energy level n .

2) What are the first *six* different sublevels and how many orbitals can be in each?
s: 1 orbital; p: 3 orbitals; d: 5 orbitals; f: 7 orbitals; g: 9 orbitals; h: 11 orbitals

3) Draw representations of an s orbital, a p orbital, and a d orbital (you can draw either version).

S orbital



p orbital



d orbital



4) How many s orbitals are there in each principal (main) energy level?

- a) **1** b) 2 c) 3 d) 4 e) depends on the atom

5) How many orbitals are there in the $n=6$ principal energy level?

- a) 2 b) 6 c) 12 **d) 36** e) 72

6) What is the maximum number of electrons that the $n=6$ principal energy level can hold?

- a) 2 b) 6 c) 12 d) 36 **e) 72**

7) How many p orbitals are there in each principal energy level $n \geq 2$?

- a) 1 b) 2 **c) 3** d) 5 e) 7

8) How many orbitals are there in the $n=2$ principal energy level?

- a) 2 **b) 4** c) 9 d) 16 e) 25

9) What is the maximum number of electrons can the $n=3$ principal energy level can hold?

- a) 2 b) 8 **c) 18** d) 32 e) 72

10) If a principal energy level contains only s, p, d, f and g orbitals, which energy level is it?

- a) $n=1$ b) $n=2$ c) $n=3$ d) $n=4$ **e) $n=5$** f) $n=6$

11) How do the energy levels of the different sublevels (s, p, d, etc.) behave in multi-electron atoms compared to a single-electron atom? Why? What order do they take?

In a single-electron atom, all sublevels are at the same energy within each main energy level n , but in multi-electron atoms, the sublevels split because the electrons interfere with each other. The order is always s, p, d, f, g, etc.

12) Within a single main energy level n , what happens to the spacing between sublevels as n increases?

As n increases, the spacing between the sublevels decreases.

13) What happens among the sublevels in different main energy levels as n increases?

As n increases, the sublevels of different main energy levels overlap, with more overlap as n increases.