Quantum number, Electronic configuration and Shape of orbitals

121. (d) For f orbital $l = 3$.

122. (b) n=1, l=1, m=0, s=-1/2

Rules to check:

Principal quantum number (n): n = 1, 2, 3…
Azimuthal quantum number (l): 0 ≤ l ≤ n – 1
Magnetic quantum number (m_l): –l ≤ m_l ≤ +l
Spin quantum number (s): ±1/2

123. (b) 4*d*-orbital have highest energy in given data.

124 (b) $[Xe]4f^7\ 5d^1\ 6s^2$

125. (d) If $m = -3, l = 3$ and $n = 4$.

126. (d) 4

An electron in an atom is completely described by 4 quantum numbers:

Principal quantum number (n) → energy level
Azimuthal quantum number (l) → shape of orbital
Magnetic quantum number (m_l) → orientation of orbital
Spin quantum number (s) → spin of electron

127. (b) $N_7^{14} = 1s^2 2s^2 2p_x^1 2p_y^1 2p_z^1$.

128. (c) *m* can't be greater than *l*.

129. (a) 3f

130. (b) $n = 1$ and $m = 1$not possible for *s*-orbitals.

131. (a) $Fe_{26} = [Ar]3d^6 4s^2$
$Fe^{3+} = [Ar]3d^5 4s^0$.

132. (c) Maximum number of electron $= 2n^2$(where $n = 4$) $= 2 \times 4^2 = 32$.

133. (d) When 2*p* orbital is completely filled then electron enter in the 3*s*. The capacity of 2*p* orbital containing $e^-$is 6. So $1s^2, 2s^2 2p^2 3s^1$ is a wrong electronic configuration the write is $1s^2 2s^2 2p^3$.

134. (b) This electronic configuration is *Cr* (chromium element) in the ground state $= 1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

135. (a) n=3; l=2; m=2; s=+1/2

136. **valid options: (a) and (c)**
(a) n=1, l=2
l ≤ n–1 → 2 ≤ 0 **Not valid**
(c) m=3, l=0
m_l must satisfy –l ≤ m ≤ l → –0 ≤ 3 ≤ 0 **Not valid**

137. (c) No. of electron are same (18) in Cl^- and Ar.

138. (c) For *s*-subshell $l = 0$ then should be $m = 0$.

139. (c) 19th electron of chromium is $4s^1$ $\boldsymbol{n = 4,\ l = 0,\ m = 0,\ s = +\frac{1}{2}}$

140. (c) The value of *m* is – *l to* l including zero so for *l* = 3, *m* would be –3, –2, –1, 0, +1, +2, +3.

141. (c) $l = 1$ is for p orbital.

142. (d) Magnetic quantum number of sodium $(3s^1)$ final electron is *m* = 0.

143. (c) Generally azimuthal quantum number defines angular momentum.

144. (c) Pauli's exclusion principle

Pauli's exclusion principle states that **no two electrons in an atom can have the same set of four quantum numbers**.

This principle is the basis for defining **n, l, m_l, s** for each electron.

145. (b)

146. (d) $m = (2l + 1)$ for *d* orbital $l = 2m = (2 \times 2 + 1) = 5$.

147. (a) The atomic number of chlorine is 17 its configuration is $1s^2 2s^2 2p^6 3s^2 3p^5$

148. (c)

n	l	m_1	m_2
3	2	1	0

This set (c) is not possible because spin quantum number values $= \pm\frac{1}{2}$.

149. (b) The ground state of neon is $1s^2 2s^2 2p^6$on excitation an electron from $2p$ jumps to $3s$ orbital. The excited neon configuration is $1s^2 2s^2 2p^5 3s^1$.

150. (c) The spatial orientation of the orbital

m_l defines the **orientation of the orbital in space** relative to an external magnetic field.

It **does not affect the energy** of the orbital in the absence of a magnetic field.