

Tutorial Series N°3-2

Exercise 1

1- Calculate the wavelengths associated with the following material systems:

- 2 g bullet launched at 300 m/s
- 2-tonne car travelling at 100 km/h
- an electron travelling at $3 \cdot 10^4$ m/s

Exercise 2

a- Assuming that the radius of the Bohr orbit $a_0 = 0,529 \text{ \AA}$ is known to within 1%, calculate the uncertainty in the speed Δv of the electron of mass $9.1 \cdot 10^{-31} \text{ Kg}$. Conclusion?

b- Assuming that the position of a ball of mass 1 g is known to within $1 \text{ }\mu\text{m}$, what is the uncertainty about its velocity? What is the conclusion?

Data: $1 \text{ \AA} = 10^{-10} \text{ m}$, $1 \text{ }\mu\text{m} = 10^{-6} \text{ m}$

Exercise 3

A- Which atomic orbitals are likely to describe the behaviour of an electron of the nitrogen atom in the $n=2$ level?

- Give the quantum numbers for each orbital.
- What is the maximum number of electrons that each sub-layer can contain?
- What is the maximum number of electrons that can be contained in the $n=2$ level.

B- Give all the possible sets of four quantum numbers for an electron belonging to a 5g orbital.

Exercise 4

1-What is the maximum number of electrons that can occupy the "s", "p" and "d" orbitals?

2-What is the maximum number of electrons that can occupy the main electron layers K, L, M and N?

Exercise 5

1- The following sets of quantum numbers characterise an electron. Are they possible or not?

	n	l	m	ms
(a)	3	1	-1	+1/2
(b)	5	0	0	-1/2
(c)	1	2	1	-1/2
(d)	2	1	2	+1/2
(e)	3	0	0	+1/2
(f)	2	0	0	-1/2
(i)	-1	1	0	+1/2
(j)	4	3	-2	0
(k)	2	1	0	-1/2

- Identify the sublayers (atomic orbitals) for the correct cases.