Quantum Mechanics

Activity 1: Matching Pairs: Quantum Numbers

This activity presents learners with 8 different statements that must be matched by meaning. Learners tap on the statements to select them and then tap on the Check Match button. The order of the statements is randomized. A mis-matched pair restarts the *game* and re-randomizes the order of the statements. The statements are ...

Question Group 1:

Question 1:

Describes the shape of the orbitals.

Quantum number **n**

Quantum number $\mathbf{m_l}$

Describes the spatial orientation of orbitals.

Quantum number $\mathbf{m_s}$

Describes the energy of the electron shell.

Describes the direction which an electron spins.

Quantum number **l**

Question Group 2:

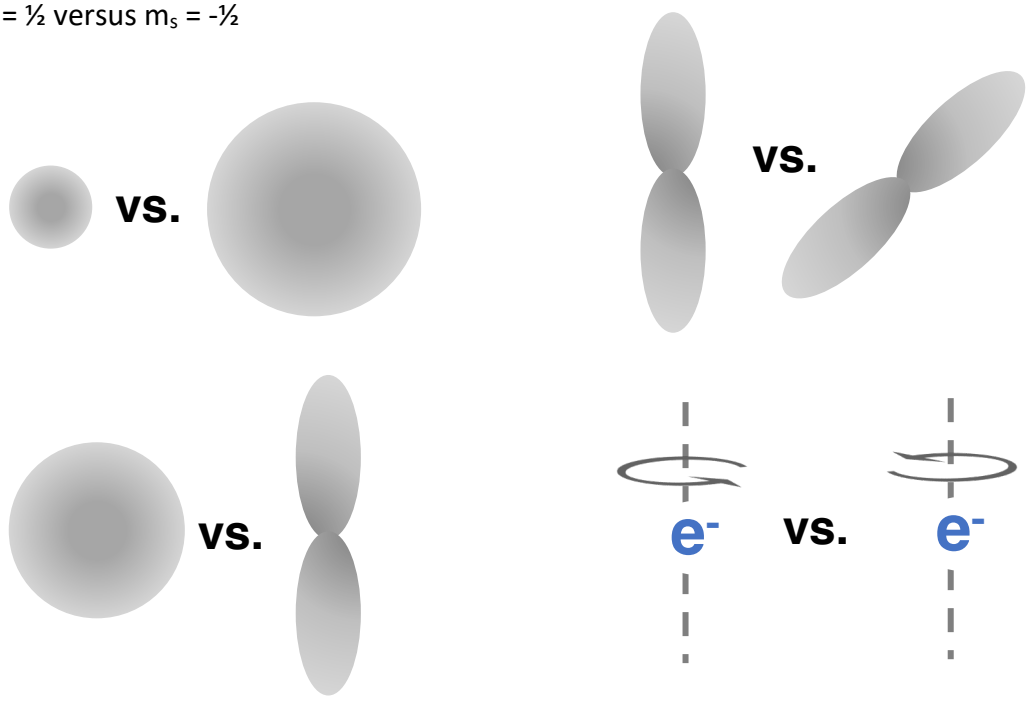
Question 2:

n = 1 versus n = 2

l = 0 versus l = 1

$m_l = 0$ versus $m_l = 1$

$m_s = ½$ versus $m_s = -½$



Activity 2: Law Breakers
Question Group 3
Question 3
Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 2$	$n = 2$	$n = 2$
$l = 1$	$l = -1$	$l = -1$
$m_l = -1$	$m_l = 1$	$m_l = -1$
$m_s = +1/2$	$m_s = -1/2$	$m_s = -1/2$

Question 4
Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 2$	$n = 2$	$n = 2$
$l = -1$	$l = 1$	$l = -1$
$m_l = -1$	$m_l = -1$	$m_l = 1$
$m_s = -1/2$	$m_s = +1/2$	$m_s = -1/2$

Question 5
Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 2$	$n = 2$	$n = 2$
$l = -1$	$l = -1$	$l = 1$
$m_l = 1$	$m_l = -1$	$m_l = -1$
$m_s = -1/2$	$m_s = -1/2$	$m_s = +1/2$

Question Group 4

Question 6

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 3$	$n = 3$
$l = 3$	$l = -2$	$l = 2$
$m_l = -2$	$m_l = 2$	$m_l = -2$
$m_s = +1/2$	$m_s = +1/2$	$m_s = -1/2$

Question 7

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 3$	$n = 3$
$l = 2$	$l = 3$	$l = -2$
$m_l = -2$	$m_l = -2$	$m_l = 2$
$m_s = -1/2$	$m_s = +1/2$	$m_s = +1/2$

Question 8

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 3$	$n = 3$
$l = -2$	$l = 2$	$l = 3$
$m_l = 2$	$m_l = -2$	$m_l = -2$
$m_s = +1/2$	$m_s = -1/2$	$m_s = +1/2$

Question Group 5

Question 9

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 5$	$n = 4$	$n = 4$
$l = 4$	$l = 3$	$l = 3$
$m_l = -3$	$m_l = -3$	$m_l = -3$
$m_s = +1/2$	$m_s = -1$	$m_s = +2$

Question 10

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 4$	$n = 5$	$n = 4$
$l = 3$	$l = 4$	$l = 3$
$m_l = -3$	$m_l = -3$	$m_l = -3$
$m_s = +2$	$m_s = +1/2$	$m_s = -1$

Question 11

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 4$	$n = 4$	$n = 5$
$l = 3$	$l = 3$	$l = 4$
$m_l = -3$	$m_l = -3$	$m_l = -3$
$m_s = -1$	$m_s = -2$	$m_s = +1/2$

Question Group 6

Question 12

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 4$	$n = 5$	$n = 5$
$l = 4$	$l = -4$	$l = 3$
$m_l = -3$	$m_l = 3$	$m_l = -3$
$m_s = -1/2$	$m_s = 1/2$	$m_s = 1/2$

Question 13

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 5$	$n = 4$	$n = 5$
$l = 3$	$l = 4$	$l = -4$
$m_l = -3$	$m_l = -3$	$m_l = 3$
$m_s = 1/2$	$m_s = -1/2$	$m_s = 1/2$

Question 14

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 5$	$n = 5$	$n = 4$
$l = -4$	$l = 3$	$l = 4$
$m_l = 3$	$m_l = -3$	$m_l = -3$
$m_s = 1/2$	$m_s = 1/2$	$m_s = -1/2$

Question Group 7

Question 15

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 3$	$n = 4$
$l = 4$	$l = 1$	$l = 2$
$m_l = -4$	$m_l = 2$	$m_l = 0$
$m_s = +2$	$m_s = -1/2$	$m_s = -1/2$

Question 16

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 4$	$n = 3$	$n = 3$
$l = 2$	$l = 4$	$l = 1$
$m_l = 0$	$m_l = -4$	$m_l = 2$
$m_s = -1/2$	$m_s = +2$	$m_s = -1/2$

Question 17

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 4$	$n = 3$
$l = 1$	$l = 2$	$l = 4$
$m_l = 2$	$m_l = 0$	$m_l = -4$
$m_s = -1/2$	$m_s = -1/2$	$m_s = +2$

Question Group 8

Question 18

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 2$	$n = 3$	$n = 4$
$l = 0$	$l = -2$	$l = 1$
$m_l = -1$	$m_l = 1$	$m_l = 0$
$m_s = -1/2$	$m_s = +1/2$	$m_s = -1/2$

Question 19

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 4$	$n = 2$	$n = 3$
$l = 1$	$l = 0$	$l = -2$
$m_l = 0$	$m_l = -1$	$m_l = 1$
$m_s = -1/2$	$m_s = -1/2$	$m_s = +1/2$

Question 20

Consider the set of quantum number values shown below. Identify any set that represents non-allowed quantum numbers. Select all that apply.

$n = 3$	$n = 4$	$n = 2$
$l = -2$	$l = 1$	$l = 0$
$m_l = 1$	$m_l = 0$	$m_l = -1$
$m_s = +1/2$	$m_s = -1/2$	$m_s = -1/2$

Activity 3: Two Truths and a Lie
Question Group 9
Question 21
Consider the three statements. Two are true. One is false. Select the false statement.

When all the d orbitals at a given energy level are full, there a total of 10 electrons in those orbitals.
A larger orbital has the capacity to hold more electrons than a smaller orbital.
There are four different types of orbitals in the fourth principal energy level (n = 4).

Question 22
Consider the three statements. Two are true. One is false. Select the false statement.

Every single p orbital can hold a maximum of six electrons.
There are four different types of orbitals in the fourth principal energy level (n = 4).
The second principal energy level (n=2) does not have any d orbitals.

Question 23
Consider the three statements. Two are true. One is false. Select the false statement.

For any given energy level, the maximum number of electrons present in f orbitals is 14.
The second principal energy level (n=2) does not have any d orbitals.
A larger orbital has the capacity to hold more electrons than a smaller orbital.

Question Group 10
Question 24
Consider the three statements. Two are true. One is false. Select the false statement.

For any given energy level, the maximum number of electrons present in f orbitals is 14.
There are two different types of orbitals in the second principal energy level (n = 2).
For any given energy level, the maximum number of electrons present in p orbitals is 10.

Question 25
Consider the three statements. Two are true. One is false. Select the false statement.

When all the p orbitals at a given energy level are full, there a total of six electrons in those orbitals.
For any given energy level, the maximum number of electrons present in d orbitals is 14.

There are three different types of orbitals in the third principal energy level (n = 3).

Question 26
Consider the three statements. Two are true. One is false. Select the false statement.

For any given energy level, the maximum number of electrons present in p orbitals is 6.
There are five different d orbitals in the fourth principal energy level (n=3)
For any given energy level, the maximum number of electrons present in f orbitals is 10.

Question Group 11
Question 27
Consider the three statements. Two are true. One is false. Select the false statement.

There are three different p orbitals in the fourth principal energy level (n=4)
The fourth principal energy level (n=4) has more d orbitals than the third principal energy level (n=3).
When all the f orbitals at a given energy level are full, there a total of 14 electrons in those orbitals.

Question 28
Consider the three statements. Two are true. One is false. Select the false statement.

Every single d orbital can hold a maximum of two electrons.
There are three different p orbitals in the fourth principal energy level (n=4)
The third principal energy level (n=3) does not have any d orbitals.

Question 29
Consider the three statements. Two are true. One is false. Select the false statement.

The third principal energy level (n=3) has more p orbitals than the second principal energy level (n=2).
When all the d orbitals at a given energy level are full, there a total of 10 electrons in those orbitals.
The third principal energy level (n=3) has the capacity to hold up to 18 electrons.

Question Group 12
Question 30

Consider the three statements. Two are true. One is false. Select the false statement.

There are 4 different d orbitals in the fourth principal energy level (n=4)
The second principal energy level (n=2) has the capacity to hold up to 8 electrons.
Every single p orbital can hold a maximum of two electrons.

Question 31
Consider the three statements. Two are true. One is false. Select the false statement.

The third principal energy level (n=3) has the capacity to hold up to 18 electrons.
There are 10 different d orbitals in the fifth principal energy level (n=5)
There are four different types of orbitals in the fourth principal energy level (n = 4).

Question 32
Consider the three statements. Two are true. One is false. Select the false statement.

There are four different types of orbitals in the fourth principal energy level (n = 4).
When all the f orbitals at a given energy level are full, there a total of 14 electrons in those orbitals.
There are 10 different d orbitals in the third principal energy level (n=3)