

Homework 05 - H Atom and Electron Configuration

Question 1

1 pts

Which of the following experiments provided evidence that the electrons in atoms are arranged in distinct energy levels?

- the observation of line spectra from gas discharge tubes
- the results of the Millikan oil-drop experiment
- the existence of elements with non-integer atomic weights
- the scattering of alpha particles by a metal foil

Question 2

1 pts

Assume n_1 and n_2 are two adjacent energy levels of an atom. The emission of radiation with the longest wavelength would occur for which two values of n_1 and n_2 ?

- 7,6
- 4,3
- 2,1
- 8,7

Question 3

1 pts

Use the Rydberg formula for atomic hydrogen to calculate the wavelength of the photon emitted in the transition of an electron from $n=4$ to $n=2$.

- 486 nm
- 8.63 nm
- 205 nm
- 94.9 nm

Question 4

1 pts

What is the name given to the spectroscopic series to which the transition described in question 3 belongs?

- Balmer series
- Brackett series
- Paschen series
- Lyman series

Question 5

1 pts

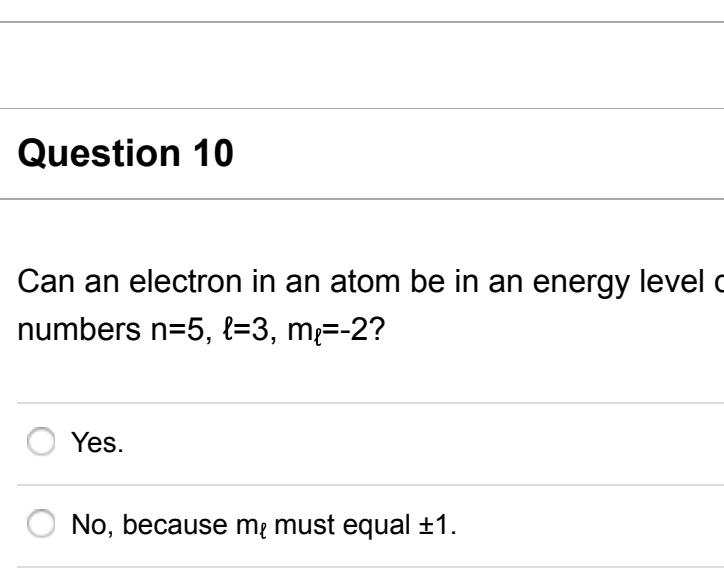
In what region of light will the photons emitted in question 3 lie?

- ultraviolet
- visible, yellow
- visible, red
- visible, blue

Question 6

1 pts

The graph below shows the radial distribution plots for the 1s wavefunctions for H and He⁺. Which plot (A or B) is the 1s wavefunction for the He⁺ ion?



- B
- There is no way to know.
- A

Question 7

1 pts

What is the maximum number of electrons that can have the quantum number $n=2$ in an atom?

- 6
- 18
- 8
- 2

Question 8

1 pts

The three quantum numbers for an electron in a hydrogen atom in a certain state are $n=4$, $\ell=2$, and $m_\ell=1$. The electron is located in what type of orbital?

- 3d
- 4p
- 3p
- 4d

Question 9

1 pts

The number that describes the main energy level of an electron in an atom is...

- the atomic number, Z .
- the angular momentum quantum number, ℓ .
- the magnetic quantum number, m_ℓ .
- the principal quantum number, n .

Question 10

1 pts

Can an electron in an atom be in an energy level described by the set of quantum numbers $n=5$, $\ell=3$, $m_\ell=-2$?

- Yes.
- No, because m_ℓ must equal ± 1 .
- No, because ℓ must equal $n-1$.
- No, because m_ℓ cannot be negative.

Question 11

1 pts

An electron in a 3d orbital could have which of the following quantum numbers?

- $n=3$, $\ell=3$, $m_\ell=1$
- $n=3$, $\ell=2$, $m_\ell=-3$
- $n=3$, $\ell=2$, $m_\ell=0$
- $n=3$, $\ell=1$, $m_\ell=-1$

Question 12

1 pts

How many p electrons does Se (atomic number 34) possess?

- 16
- 34
- 4
- 18

Question 13

1 pts

For which H-atom wavefunction are you most likely to find the electron farthest from the nucleus?

- 4p
- 2p
- 3p
- 2s

Question 14

1 pts

The transition metals are elements with partially filled...

- p subshells.
- s subshells.
- f subshells.
- d subshells.

Question 15

1 pts

Which element is predicted to have the ground-state electron configuration shown below? $[\text{Ne}] 3s^2 3p^4$

- silicon
- sulfur
- aluminum
- chlorine

Question 16

1 pts

Which of the following is the valence electronic structure for a halogen?

- ns^2
- $ns^2 np^6$
- $ns^2 np^5$
- $ns^2 nd^{10}$

Question 17

1 pts

In the Aufbau order of occupancy of electronic energy levels, the level occupied just after 5p is...

- 4d
- 3f
- 6s
- 5d

Question 18

1 pts

The electron configuration for the Mn atom is...

- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^5$
- $1s^2 2s^2 2p^6 3s^2 3p^3$
- $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$

Question 19

1 pts

The ground state electron configuration of a neutral silver atom is $[\text{Kr}] 5s^1 4d^{10}$ instead of $[\text{Kr}] 5s^2 4d^9$. This observation can be explained (theoretically) by the fact that...

- the magnetism measurement shows one unpaired electron.
- only one electron can occupy a 5s orbital.
- an enhanced stability is associated with filled sets of equivalent orbitals.
- the 4d subenergy level has higher energy than the 5s subenergy level.

Question 20

1 pts

Which of the following atoms has the largest radius?

- N
- F
- Br
- Cl

Question 21

1 pts

As an atom's radius decreases...

- its ionization energy does not change.
- its ionization energy decreases.
- its ionization energy will either increase or decrease depending on whether you are going up a column or across a row.
- its ionization energy increases.

Question 22

1 pts

Which of the following would be expected to have the highest first ionization energy?

- Cl
- Na
- Xe
- Ar
- Si

Question 23

1 pts

How many s electrons does P (atomic number 15) possess?

- 2
- 4
- 5
- 6

Question 24

1 pts

How many values of the quantum number ℓ are possible when $n=5$?

- 5
- 4
- 7
- 6

Question 25

1 pts

How many values of m_ℓ are allowed for an electron in a 5f subshell?

- 5
- 6
- 7
- 4

Question 26

1 pts

How many values of m_ℓ are allowed for an electron in a 2s subshell?

- 4
- None of these.
- 1
- 3

Question 27

1 pts

How many subshells are there in the shell with $n=3$?

- 4
- 2
- 1
- 3

Question 28

1 pts

The diameter of the electron density of an atom is roughly...

- None of these.
- 0.1 - 0.5 nm
- 10 - 50 nm
- 1 - 5 nm

Question 29

1 pts

For which of the following elements would the size of the neutral atom (atomic radius) be the largest?

- Ca
- Sr
- Rb
- Na

Question 30

1 pts

Write an equation that represents the second ionization energy of nickel.

- $\text{Ni}(\text{g}) \rightarrow \text{Ni}^+(\text{g}) + e^-$
- $\text{Ni}(\text{g}) \rightarrow \text{Ni}^{2+}(\text{g}) + 2e^-$
- $\text{Ni}^+(\text{g}) \rightarrow \text{Ni}^{2+}(\text{g}) + e^-$
- $\text{Ni}(\text{g}) \rightarrow \text{Ni}^{2+}(\text{g}) + e^-$