


This is a sample quiz providing quantum chemistry examples. Answers are provided at the end of this handout. *Good luck!*

- What wavelength corresponds to a frequency of 8.22×10^9 Hz?
 - 0.307 m
 - 0.0365 m
 - 0.122 m
 - 0.110 m
 - 27.4 m
- A radio station transmits at 110. MHz ($110. \times 10^6$ Hz). What wavelength is this radio wave?
 - 3.65×10^{-5} m
 - 3.30 m
 - 3.81×10^{-5} m
 - 2.73 m
- Which one of the following is NOT a proper unit for frequency?
 - Hz
 - s^{-1}
 - $m \cdot s^{-1}$
 - $\frac{1}{\text{sec}}$
- Calculate the wavelength of the fourth line in the Balmer series (the $n=6$ to $n=2$ transition) of the hydrogen spectrum ($R = 1.097 \times 10^7 \text{ m}^{-1}$, $E_n = -Rhc/n^2$)
 - 0.1233 m
 - 24.37 m
 - 2.735×10^{-7} m
 - 4.102×10^{-7} m
 - 36.56 m
- What is the relationship between the energy of a photon of light and its frequency?
 - $E = \nu$
 - $E = \frac{h}{\nu}$
 - $E = h\nu$
 - $E = \frac{1}{h\nu}$
 - $E = \frac{\nu}{h}$
- What is the energy needed to raise an electron in the hydrogen atom from the second energy level to the third energy level? ($R = 1.097 \times 10^7 \text{ m}^{-1}$, $E_n = -Rhc/n^2$)
 - 1.52×10^4 J
 - 3.63×10^{-19} J
 - 2.18×10^{-19} J
 - 4.48×10^{-19} J
 - 3.03×10^{-19} J
- What is the de Broglie wavelength of an electron moving at 80.0% the speed of light.
 - 3.03×10^{-12} m
 - 2.42×10^{-12} m
 - 3.30×10^{11} m
 - 1.59×10^{-25} m
- How many orbitals make up the **4d** subshell?
 - 0
 - 1
 - 3
 - 5
 - 7
- The value of ℓ that is related to the following orbital is:



 - 0
 - 1
 - 2
 - 3
 - 4
- The correct electron configuration for nitrogen is
 - $1s^2 2s^2 2p^6 3s^2 3p^2$
 - $1s^2 2s^2 2p^6 2d^4$
 - $1s^2 2s^2 2p^3$
 - $1s^2 2s^2 3s^2 4s^1$
 - $1s^2 1p^5$

11. The electron configuration of the indicated atom in the ground state is correctly written for which atom?
- a) Ga [Ar] 3d¹² 4s²
 b) Ni [Ar] 3d¹⁰
 c) Ni [Ar] 3s² 3p⁸
 d) Fe [Ar] 3d⁶ 4s²
12. Which of the following sets of quantum numbers is possible for a **3d** electron?
- a) $n = 3, l = 3, m_l = -2, m_s = +\frac{1}{2}$
 b) $n = 2, l = 1, m_l = +1, m_s = -\frac{1}{2}$
 c) $n = 3, l = 1, m_l = 0, m_s = -\frac{1}{2}$
 d) $n = 3, l = 2, m_l = -2, m_s = +\frac{1}{2}$
 e) $n = 4, l = 1, m_l = +1, m_s = +\frac{1}{2}$
13. In what section of the periodic table is the **4f** subshell being filled?
- a) period 4
 b) transition elements Y to Cd
 c) noble gases
 d) group IA
 e) lanthanides
14. Which one of the following elements has 3 electrons in a **p** subshell?
- a) Sb b) Na c) Sc d) V e) Nd
15. Which of the following distributions of electrons is correct for three electrons in p-subshell?
- a) $\uparrow \quad \uparrow \quad \uparrow$
 b) $\uparrow\downarrow \quad \uparrow \quad \underline{\quad}$
 c) $\uparrow \quad \uparrow \quad \downarrow$
 d) $\uparrow \quad \uparrow\downarrow \quad \underline{\quad}$
 e) $\uparrow\uparrow \quad \uparrow \quad \underline{\quad}$
16. Which of the following particles would be most paramagnetic?
- a) P b) Ga c) Br d) Cl⁻ e) Na⁺
17. Which of the following correctly represents the ionization of an atom?
- a) Cl(g) + e⁻ → Cl⁻(g)
 b) Na(g) → Na⁺(g) + e⁻
 c) Na(s) - e⁻ → Na⁺(g)
 d) Cl₂(g) → 2 Cl(g)
18. Which of the following is likely to have the largest atomic radius?
- a) H b) Mn c) Cl d) Rb e) Ag
19. Which one of the following isoelectronic species has the smallest radius?
- a) Mg²⁺ b) Na⁺ c) Ne d) F⁻ e) O²⁻
20. Which of the following has the greatest ionization energy?
- a) K b) Ca c) Fe d) Ga e) Br
21. Which of the following has the lowest ionization energy?
- a) Li b) Na c) K d) Rb e) Cs
22. The successive ionization energies for one of the period three elements are listed below. Which element is referred to?
- | | |
|----------------|---------------|
| E ₁ | 577.4 kJ/mol |
| E ₂ | 1,816 kJ/mol |
| E ₃ | 2,744 kJ/mol |
| E ₄ | 11,580 kJ/mol |
| E ₅ | 15,030 kJ/mol |
- a) Na b) Mg c) Al d) Si e) P

Answers:

1.	B	12.	D
2.	D	13.	E
3.	C	14.	A
4.	D	15.	A
5.	C	16.	A

6.	E	17.	B
7.	A	18.	D
8.	D	19.	A
9.	B	20.	E
10.	C	21.	E
11.	D	22.	C