Birzeit University
Chemistry Department
CHEM 141

Work sheet in chapters 7, 8, 9 and 10 **1st Sem. 2024-2025**
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Please read each question carefully before you answer, and choose the best fit answer.

1. An element with the general electron configuration for its outermost electrons of ns^2np^1 would be in which element group?

A) 2A **B) 3A** C) 4A D) 5A E) 8A

2. In what row and group of the periodic table would you find the element with the electron configuration $[Kr]5s^24d^{10}5p^2$?

A) row 4, group 4A B) row 4, group 5A **C) row 5, group 4A**
D) row 5, group 5A E) none of the above

3. The shape of an atomic orbital is associated with

A) the principal quantum number (*n*).
B) the angular momentum quantum number (*l*).
C) the magnetic quantum number (m_l).
D) the spin quantum number (m_s).
E) the magnetic and spin quantum numbers, together.

4. How many electrons are in the 4*p* orbitals of selenium (Se)?

A) 0 B) 2 **C) 4** D) 5 E) 6

5. Select the correct set of quantum numbers (n, l, m_l, m_s) for the first electron removed in the formation of a cation for strontium, Sr.

A) 5, 1 , 0, $-\frac{1}{2}$ B) 5, 1, 0, $\frac{1}{2}$ C) 5, 0, 1, $\frac{1}{2}$ D) 5, 1, 1, $\frac{1}{2}$ **E) 5, 0, 0, $-\frac{1}{2}$**

6. Which two electron configurations represent elements that would have similar chemical properties?

(1) $1s^22s^22p^4$ (2) $1s^22s^22p^5$ (3) $[Ar]4s^23d^5$ (4) $[Ar]4s^23d^{10}4p^5$

A) (1) and (2) B) (1) and (3) C) (2) and (3) **D) (2) and (4)** E) (3) and (4)

7. Which of the following make an *isoelectronic pair*: Cl^-, O^{2-}, F, Ca^{2+}, Fe^{3+}?

A) Ca^{2+} and Fe^{3+} B) O^{2-} and F C) F and Cl^- **D) Cl^- and Ca^{2+}**
E) None of the above.

8. The electron configuration of a copper(I) ion is

A) $[Ar]4s^23d^8$ B) $[Ar]4s^13d^9$ **C) $[Ar]3d^{10}$** D) $[Ar]4s^23d^64p^2$ E) [Kr]

9. Which of the atoms listed below has the smallest radius?

A) Al **B) P** C) As D) Te E) Na

10. Which of the following reactions represents the second ionization energy of nitrogen?

A) $N^{2+}(g) \rightarrow N^{3+}(g) + e^-$
B) $N^{2+}(g) + e^- \rightarrow N^+(g)$
C) $N(g) \rightarrow N^{2+}(g) + 2e^-$
D) $N^-(g) + e^- \rightarrow N^{2-}(g)$
E) $N^+(g) \rightarrow N^{2+}(g) + e^-$

11. The successive ionization energies of a certain element are IE_1 = 577.9 kJ/mol, IE_2 = 1820 kJ/mol, IE_3= 2750 kJ/mol, IE_4 = 11,600 kJ/mol, and IE_5 = 14,800 kJ/mol. This pattern of ionization energies suggests that the unknown element is

A) K **B) Al** C) Cl D) Se E) Kr

12. The electron affinity of fluorine is essentially equal to

A) the negative of the ionization energy F.
B) **the ionization energy F^-.**
C) the negative of the ionization energy F^-.
D) the ionization energy Ne.
E) the negative of the ionization energy Ne.

13. Which one of the following statements about atomic structure and quantum numbers is <u>incorrect</u>?

A) In a given atom, the maximum number of electrons having principal quantum number n = 3, is 18.
B) The number of orbitals in a given *f* subshell is 7.
C) For n = 4, the largest possible value of l is 3.
D) For n = 4, the largest possible value of m_l is 2.
E) The following set of quantum numbers for a single orbital is not allowed: n = 3, l = 1, m_l = -2.

14. The Lewis dot symbol for the <u>calcium ion</u> is

A) $:Ca:^{2+}$ B) —Ca— C) $:\ddot{Ca}:^{2+}$ **D) Ca^{2+}** E) Ca

15. Which of the atoms listed below is the *most* electronegative?

A) Li B) Cs **C) P** D) As E) Ge

16. The electron dot formula for O_2 shows

A) a single covalent bond **B) a double covalent bond** C) an ionic bond
D) a total of 8 x 2 = 16 electron dots E) a total of 32 electron dots

17. Which one of these polar covalent bonds would have the greatest *percent ionic character*?

A) H—Br B) H—Cl **C) H—F** D) H—I

18. A radio wave has a frequency of 8.6×10^8 Hz. What is the energy of one photon of this radiation?

A) 7.7×10^{-43} J
B) 2.3×10^{-34} J
C) 5.7×10^{-25} J
D) 1.7×10^{-16} J
E) $> 10^{-15}$ J

19. The number of lone electron pairs in the NO_2^- ion is ___.

A) 4 B) 5 **C) 6** D) 7 E) 8

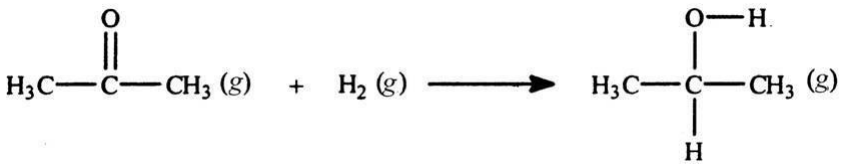
20. The number of resonance structures for the sulfur dioxide molecule that satisfy the octet rule is

A) 1 **B) 2** C) 3 D) 4 E) None of these

21. The electron group shape of $BrCl_3$ is

A) Tetrahedral B) Trigonal bipyramidal C) T-shape D) Sea-saw
E) **Distorted trigonal bipyramidal**

22. Calculate (in kJ) the standard enthalpy change $\Delta H°$ for the reaction written below, using the bond energies given.



Bond:	C=O	H-H	C-H	O-H	C-C	C-O
Bond energy(kJ/mol):	745	436	414	464	347	351

A) -484 kJ B) -366 kJ **C) -48 kJ** D) +48 kJ E) +366 kJ

23. What is the wavelength of light having a frequency of 4.8×10^{14} s^{-1} ($c=3.0 \times 10^8$ m/s)?

A) 0.0016 nm B) 1600 m **C) 630 nm** D) 1600 nm E) 6.3×10^{-7} nm

24. Select the arrangement of electromagnetic radiation which starts with the lowest energy and increases to greatest energy.

A) radio, infrared, ultraviolet, gamma rays
B) radio, ultraviolet, infrared, gamma rays
C) gamma rays, infrared, radio, ultraviolet
D) gamma rays, ultraviolet, infrared, radio
E) infrared, ultraviolet, radio, gamma rays

25. According to VSEPR theory, a molecule with the general formula AX_2E_3 will have a molecular shape.

A) bent **B) linear** C) trigonal planar D) T-shaped E) trigonal pyramidal