Chemistry 212
Fall 2017
Exam IV - A

Name_____

MULTIPLE CHOICE. (1 point each) Choose the one alternative that best completes the statement or answers the question.

1) Which of the following elements is the most electronegative? 1) _____

A) Si B) Te C) S D) Cs E) Ru

2) Which of the following is a correct set of quantum numbers for an electron in a 3*d* orbital? 2) _____

A) $n = 3$, $l = 3$, $m_l = +2$
B) $n = 3$, $l = 2$, $m_l = 3$
C) $n = 3$, $l = 0$, $m_l = -1$
D) $n = 3$, $l = 1$, $m_l = +3$
E) $n = 3$, $l = 2$, $m_l = -2$

3) Select the correct electron configuration for Te ($Z = 52$). 3) _____

A) [Kr]$5s^2 4f^{14}$
B) [Kr]$5s^2 5p^6 4d^8$
C) [Kr]$5s^2 4d^{10} 5p^6$
D) [Kr]$5s^2 4d^{10} 5p^4$
E) [Kr]$5s^2 5d^{10} 5p^4$

4) Which of the following molecules has a net dipole moment (is polar)? 4) _____

A) SF_2 B) $BeCl_2$ C) KrF_2 D) CCl_4 E) CO_2

5) When two atoms form a covalently-bonded diatomic molecule, the distance between the nuclei at which the potential energy is at a minimum is called 5) _____

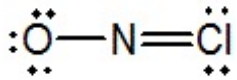
A) the bond length.
B) the covalent radius.
C) the bond energy.
D) the covalent diameter.
E) the molecular diameter.

6) Who proposed the principle that states that one cannot simultaneously know the exact position and velocity of a particle? 6) _____

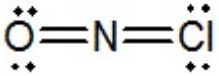
A) Compton
B) Planck
C) de Broglie
D) Heisenberg
E) Einstein

7) Select the correct Lewis structure for NOCl, a reactive material used as an ionizing solvent. 7) _____

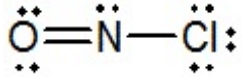
A)



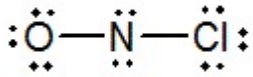
B)



C)



D)



E) None of these choices are correct.

8) Which of the following elements has the largest atomic size? 8) _____

A) Ba B) Rn C) S D) Po E) Ca

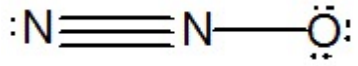
9) Which scientist first proposed that particles of matter could have wave properties? 9) _____

A) Einstein
B) Compton
C) Planck
D) de Broglie
E) Heisenberg

10) In the nitrate ion (NO_3^-), nitrogen and oxygen are held together by 10) _____

A) covalent bonds.
B) ionic interactions.
C) electronegativity.
D) dative bonds.
E) network bonds.

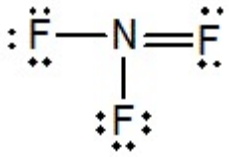
11) What is the molecular shape of N_2O as predicted by the VSEPR theory? 11) _____



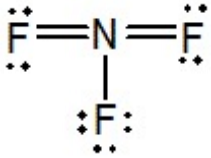
A) bent
B) trigonal planar
C) linear
D) angular
E) trigonal pyramidal

12) Select the correct Lewis structure for nitrogen trifluoride, NF_3. 12) _____

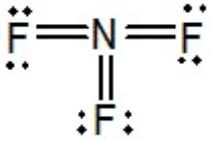
A)



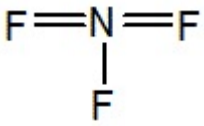
B)



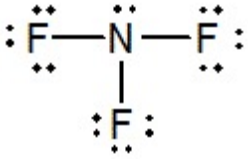
C)



D)



E)



13) According to the Heisenberg uncertainty principle, if the uncertainty in the speed of an electron is 3.5×10^3 m/s, the uncertainty in its position (in m) is at least (mass of electron = 9.11×10^{-31} kg) 13) _____

A) 6.6×10^{-8} m.
B) 66 m.
C) 1.7×10^{-8} m.
D) 17 m.
E) None of these choices are correct.

14) Select the strongest bond in the following group. 14) _____

A) C–O B) C–S C) C=C D) C≡N E) C–F

15) What is the molecular shape of BCl_3 as predicted by the VSEPR theory? 15) _____

A) tetrahedral
B) bent
C) trigonal pyramidal
D) trigonal planar
E) linear

16) What is the molecular shape of HOF as predicted by the VSEPR theory? 16) _____

A) tetrahedral
B) trigonal pyramidal
C) bent
D) trigonal
E) linear

17) If the energy of a photon is 1.32×10^{-18} J, what is its wavelength in nm? 17) _____

A) 150. nm
B) 1.99×10^{15} nm
C) 1.50×10^{-7} nm
D) 1.99×10^{24} nm
E) None of these choices are correct.

18) Predict the smallest actual bond angle in BrF_3 using the VSEPR theory. 18) _____

A) between 109° and 120°
B) between 90° and 109°
C) less than 90°
D) more than 120°
E) exactly 120°

19) According to VSEPR theory, a molecule with the general formula AX_2 will have a _____ molecular shape. 19) _____

A) trigonal planar
B) linear
C) tetrahedral
D) triangular
E) bent

20) Which of the following is an ionic compound? 20) _____

A) I_2 B) KI C) NH_3 D) CCl_4 E) H_2S

21) What is the correct order of decreasing size of the following ions? 21) _____

A) $K^+ > Cl^- > Ca^{2+} > P^{3-}$
B) $P^{3-} > Cl^- > K^+ > Ca^{2+}$
C) $K^+ > Cl^- > P^{3-} > Ca^{2+}$
D) $Ca^{2+} > K^+ > Cl^- > P^{3-}$
E) None of these choices are correct.

22) What is the molecular shape of ClF_4^- as predicted by the VSEPR theory? 22) _____

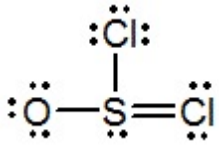
A) octahedral
B) tetrahedral
C) square planar
D) see-saw
E) square pyramidal

23) The FM station KDUL broadcasts music at 99.1 MHz. Find the wavelength of these waves. 23) _____

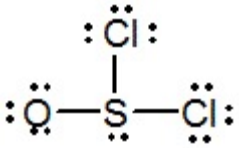
A) 3.03 m
B) 0.330 m
C) 5.33×10^{2} m
D) 1.88×10^{-2} m
E) $> 10^{3}$ m

24) Thionyl chloride is used as an oxidizing and chlorinating agent in organic chemistry. Select the best Lewis structure for $SOCl_2$. 24) _____

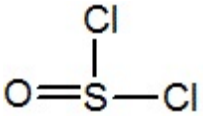
A)



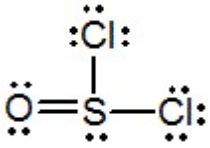
B)



C)



D)



E) None of these choices are correct.

25) Which of the following contains covalent bonds? 25) _____

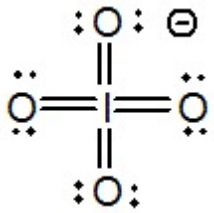
A) Cu B) LiBr C) Mg D) BaO E) IBr

26) Select the correct formula for a compound formed from calcium and chlorine. 26) _____

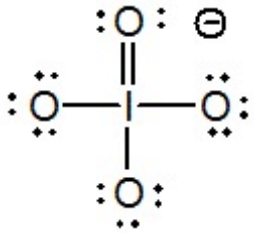
A) Ca_2Cl B) $CaCl_2$ C) CaCl D) Ca_2Cl_2 E) $CaCl_3$

27) Select the Lewis structure in which formal charges are minimized for the periodate anion, IO_4^-. 27) _____

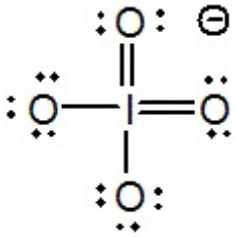
A)



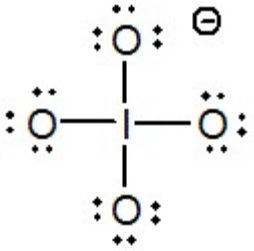
B)



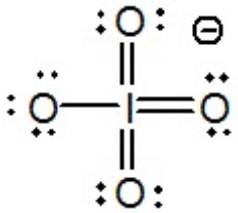
C)



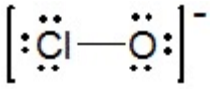
D)



E)



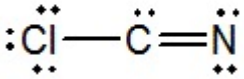
28) The formal charges on Cl and O in the structure shown for the ClO^- ion are, respectively 28) _____



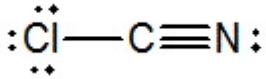
A) –2 and 1
B) 1 and –2
C) 0 and –1
D) –1 and 0
E) None of these choices are correct.

29) Select the best Lewis structure for ClCN. 29) _____

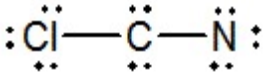
A)



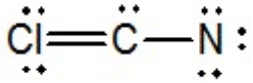
B)



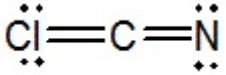
C)



D)



E)



30) What is the molecular shape of SCl_3F as predicted by the VSEPR theory? 30) _____

A) bent
B) see-saw
C) trigonal pyramidal
D) linear
E) T-shaped

31) In a single atom, what is the maximum number of electrons which can have quantum number $n = 4$? 31) _____

A) 36
B) 16
C) 32
D) 18
E) None of these choices are correct.

32) Select the element whose Lewis symbol is correct. 32) _____

A) B)  C)  D) E)

33) Which of the following elements has the largest first ionization energy? 33) _____

A) Br B) Na C) Ca D) Te E) Cl

Answer Key
Testname: 212E4F17

1) C
2) E
3) D
4) A
5) A
6) D
7) C
8) A
9) D
10) A
11) C
12) E
13) C
14) D
15) D
16) C
17) A
18) C
19) B
20) B
21) B
22) C
23) A
24) D
25) E
26) B
27) E
28) C
29) B
30) B
31) C
32) C
33) E