Review for the General Chemistry Final Exam
First Semester Part 2 of 3

Part 3. Atomic Structure

39. The number of neutrons in the nucleus of a specific atom is equal to its

(A) atomic mass.
(B) mass number.
(C) atomic number.
(D) mass number minus the atomic number.

40. An atom of strontium–90 ($^{90}_{38}Sr$) contains

(A) 38 electrons, 38 protons, 52 neutrons.
(B) 38 electrons, 38 protons, 90 neutrons.
(C) 52 electrons, 52 protons, 38 neutrons.
(D) 52 electrons, 38 protons, 38 neutrons.

41. Which of these atoms has the greatest number of neutrons in its nucleus?

(A) $^{56}_{25}Mn$ (B) $^{52}_{26}Fe$ (C) $^{55}_{26}Fe$
(D) $^{57}_{27}Co$ (E) $^{56}_{28}Ni$

42. An atom has a valence shell electron configuration of ns^1. To which group of elements in the periodic table does it belong?

(A) transition metals (C) alkaline earth metals
(B) alkali metals (D) rare earth metals

43. Which electron configuration is ***impossible***?

(A) $1s^2\ 2s^2\ 2p^6\ 3s^2$ (C) $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6$
(B) $1s^2\ 2s^2\ 2p^6\ 2d^2$ (D) $1s^2\ 2s^2\ 2p^5\ 3s^1$

44. The number of unpaired electrons in the ground state of Mn^0 is

(A) one (B) three
(C) five (D) seven

45. The maximum number of electrons that can occupy an orbital labeled d_{xy} is

(A) l (B) 2
(C) 3 (D) 4

46. The element **X** occurs naturally to the extent of 20.0% ^{12}**X** and 80.0% ^{13}**X**. The atomic mass of **X** is nearest

(A) 12.2 (B) 12.5
(C) 12.8 (D) 13.0

47. Which electron transition is associated with the largest *emission* of energy?

(A) $n = 2$ to $n = 1$ (C) $n = 2$ to $n = 4$
(B) $n = 2$ to $n = 3$ (D) $n = 3$ to $n = 2$

48. Which is an acceptable set of quantum numbers for a 3*d* electron?

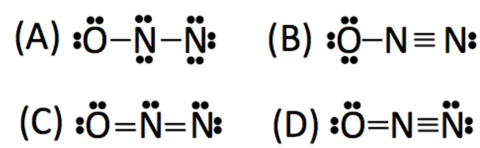
	n	l	m_l	m_s
(A)	3	3	1	$+1/2$
(B)	3	2	1	$+1/2$
(C)	2	2	-1	$-1/2$
(D)	2	3	2	$-1/2$

Part 4. Bonding

49. A compound consisting of an element having a low ionization potential and a second element having a high electron affinity is likely to have

(A) covalent bonds.
(B) metallic bonds.
(C) coordinate covalent bonds,
(D) ionic bonds.

50. An acceptable Lewis dot structure for N_2O is



51. Solid potassium fluoride consists of potassium ions and fluoride ions. What is the best experimental evidence for this statement?

(A) Molten potassium fluoride conducts an electric current.
(B) A water solution of potassium fluoride can be electrolyzed.
(C) Potassium and fluorine have electron configurations best suited to form ions that in turn form a more stable solid than atoms of each.
(D) Potassium fluoride is classified as a regular or cubic crystal.
(E) When the solid is heated the kinetic energy becomes large enough to overcome the directive forces that hold the components together.

52. In which pair of compounds should the first member be more covalent than the second member?

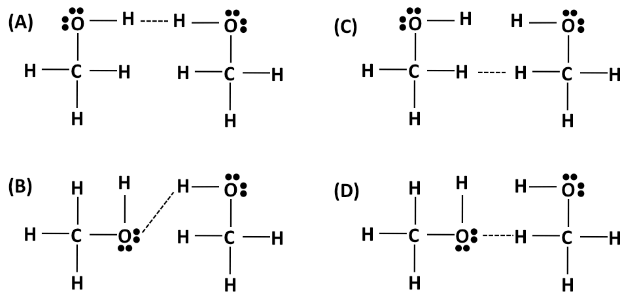
(A) $NaCl$, $AlCl_3$ (C) LiF, BF_3
(B) SnI_4, SnF_4 (D) SnF_4, CF_4

53. The compound of which two elements is most likely to involve covalent bonding, given their electronegativities shown in the table

Q	**R**	**T**	**X**	**Z**
0.9	1.0	2.8	3.0	4.0

(A) **Q** and **Z** (D) **R** and **X**
(B) **R** and **T** (E) **R** and **Z**
(C) **T** and **X**

54. Which best represents hydrogen bonding in liquid methanol (CH_3OH)?



55. Consider the boiling point of a series of hydrogen compounds given here. The abnormally high boiling point for water is due to

H_2O	100 ^oC
H_2S	-60 ^oC
H_2Se	-41 ^oC
H_2Te	-2 ^oC

(A) extensive hydrogen bonding.
(B) its low dipole moment.
(C) the extreme stability of the compound.
(D) the high electronegativity of hydrogen.

56. Which contains both covalent and ionic bonds?

(A) NH_4NO_3 (C) $BaCl_2$
(B) NF_3 (D) CH_2O

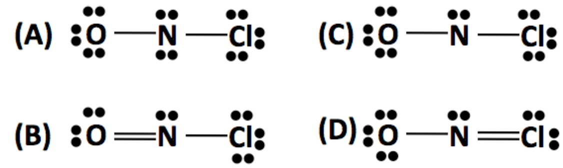
57. According to modern bonding theory the number of sigma (σ) and pi (π) bonds in the ethylene molecule $H_2C{=}CH_2$ is

(A) 1 σ and 4 π (D) 1 π and 5 σ
(B) 1 σ and 5 π (E) 2 π and 4 σ
(C) 1 π and 4 σ

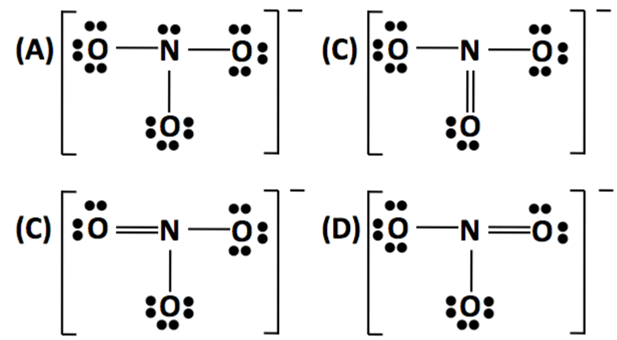
58. The best ***theoretical*** explanation for the assertion that the formula of hydrogen sulfide gas is H_2S is that

(A) At STP the weight of 22.4 L of hydrogen sulfide gas is 34 g, of which 32 g is sulfur.
(B) Sulfur and hydrogen atoms combine in a ratio of two to one.
(C) Free hydrogen gas consists of H_2 molecules, but sulfur is solid.
(D) When hydrogen sulfide is burned in air or oxygen, H_2O and SO_2 are formed.
(E) The sulfur atom has six electrons in its outer level, and obtains the two electrons needed for a stable arrangement by combining with two hydrogen atoms.

59. Which is the best Lewis structure for NOCl?



60. Which is the ***least*** significant contributing structure to the resonance hybrid of the nitrate ion?



Part 5. Structure

61. The fact that H_2O has a dipole moment suggests that the water molecule is

(A) dimeric. (C) symmetrical.
(B) bent. (D) nonpolar.

62. Which pair is geometrically similar?

(A) SO_2 and CO_2 (C) CO_2 and OF_2
(B) PH_3 and BF_3 (D) SO_2 and O_3

63. The shape that most closely describes the NF_3 molecule is

(A) octahedral. (C) trigonal pyramidal.
(B) trigonal planar. (D) tetrahedral.

64. The geometry for SeF_3^+ is

(A) trigonal pyramidal. (C) square planar.
(B) tetrahedral. (D) rectangular planar.

65. Which is planar?

(A) NH_3 (B) SO_3^{2-}
(C) CO_3^{2-} (D) H_3O^+

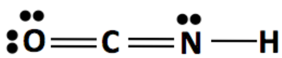
66. Which concept describes the formation of four equivalent, single, covalent bonds by carbon in compounds like methane, CH_4?

(A) hydrogen bonding
(B) hybridization
(C) sigma bonding
(D) coordinate covalent bonding

67. Sulfur dioxide can be described by two resonance structures. This implies that

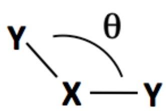
(A) the two bonds in SO_2 are of equal length, and the electronic distribution in the two SO bonds is identical.
(B) the single bond is longer than the double bond and the electronic distribution in the two SO bonds is different.
(C) an electron pair in the SO_2 molecule alternates back and forth between the two sulfur–oxygen electron pairs so that the two different bonds seem to exchange positions.
(D) the SO_2 molecule revolves so that the two different bonds seem to exchange positions.

68. The molecule OCNH has been detected in gas clouds between stars. What is the predicted C—N—H bond angle?



(A) 60° (B) 90°
(C) 109° (D) 120°

69. Which bond angle, (θ), would result in the greatest dipole moment for a triatomic molecule?



(A) θ = 90° (B) θ = 120°
(C) θ = 150° (D) θ = 180°

Answers

39. D
40. A

41. A
42. B
43. B
44. C
45. B

46. C
47. A
48. B
49. D
50. B

51. A
52. B
53. C
54. B
55. A

56. A
57. D
58. E
59. B
60. A

61. B
62. D
63. C
64. A
65. C

66. B
67. A
68. D
69. A

Please notify Dr Mattson (brucemattson@creighton.edu) of any mistakes or problems with this review.