CHM 101 RHEMA

1. With the use of VSEPR theory, predict the geometry of Cl_2PF_3. (a) bent (b)seesaw shaped (c) trigonal pyramidal (d) trigonal bipyramidal (e) octahedral

2. An element Z contains 90% $^{16}_8Z$ and 10% $^{18}_8Z$. Its relative atomic mass is (a) 16.0 (b) 16.2 (c) 17.0 (d) 17.2 (e) 18.8

3. CsO_2 is an example of: (a) an oxide (b) a peroxide (c) a superoxide (d) acidic oxide (e) c and d

4. Find the number of molecules in 4.48 cm^3 of carbon dioxide gas at standard temperature and pressure, given that the volume of a gas at STP is 22.4 dm^3/mol, Avogadro constant = 6.022 x 10^{23}. (a) 1.311 x 10^{20} (b) 1204 x 10^{20} (c)3.320 x 10^{20} (d) 0.204 x 10^{20}(e) 0.332 x 10^{20}

5. Calculate the wavelength in nm of the Balmer line of the hydrogen spectrum in which the initial n quantum number is 6 and the final n quantum number is 2 [R_H = 2.179 x 10^{-18}J or 109678 cm^{-1}] (a) 354 (b) 397 (c) 410 (d) 435 (e) 468

6. A moth repellant made from chlorine, carbon and hydrogen has a composition 49.1% C; 2.7%H, and 48.2%C1. Its molecular weight is 147amu. What is the molecular formula? [At. mass (g/mol): H -1.0; C =12.0; Cl = 35.5] (A) C_6H_5Cl (B) $C_6H_4Cl_2$ (C) $C_6H_3Cl_3$ (D) $C_6H_2Cl_4$ (E) $C_5H_3Cl_2$

7. The following are group 1 elements except: (a) Fr (b) Rb (c) Cs (d) Sr (e) K

8. How many moles of hydrogen gas are in 27.0 g hydrogen? [H = 1.008] (A) 46.74 (B) 20.25 (C) 27.25 (D) 19.25 (E) 13.40

9. Natural hydrogen consists of how many isotopes? (a) 1 (b) 2 (c) 3 (d) 4 (e) 5

10. The following are examples of basic oxides except: (a) MgO (b) Na_2O (c) CaO (d)RbO_2 (e) CO_2

11. Element X and Y have an electron configuration of $Is^22s^22p^4$ and $Is^22s^2p^63s^23p'$ respectively. When they combine, the formula of the compound formed is (a) XY (b)YX (c) X_2Y_3 (d) Y_2X_3 (e) Y_4X_3

12. The plum pudding model of an atom is attributed to: (a) J.J. Thompson (b) E. Goldstein (c) J. Chadwick (d) E. Rutherford (d) N. Bohr

13. A quantity of gas weighing 7.10 g at 741 torr and 44 °C occupies a volume of 5.40 L. What is its molar mass? (A) 17.6 g/mol (B) 29.3 g/mol (C) 35.1 g/mol (D) 52.7 g/mol (E) 70.2 g/mol

14. The maximum safe pressure that a certain 4.00 L vessel can hold is 3.50 atm. If the vessel contains 0.410 mol of gas, calculate the maximum temperature (in °C) to which the vessel can be subjected. (A) 134 °C (B) 143 °C (C) 208°C (D)268^0C(E)286°C

15. Cobalt is a metal that is added to steel to improve its resistance to corrosion. Calculate the mass in grams of a sample of cobalt containing 4.00 x 10^{20} atoms. [Co = 58.93 g/mol] (A) 0.0489 g (B) 0.1354 g (C) 0.0391 g (D) 0.0876 g(E) 0.0145 g

16. Calculate the density (in g/L) of ammonia gas at 31°C and 751 mmHg. [At. wt. (g/mol): H=1.0,

N = 14.0; R -0.0821L atm K^{-1} mol^{-1}]. (A) 0.338 (B) 0.576 (C) 0.675 (D) 0.765 (E) 1.350

17. If 0.10 mol of I_2 vapour can effuse from an opening in a heated vessel in 39 s, how long will it take 0.10 mol H_2 to effuse under the same conditions? [H=1.0,1 = 127.0]. (A) 3.5s (B) 3.7s (C) 3,9s (D) 35s (E) 39 s

18. Which of the following gases will diffuse fastest when passing through a porous plug? (a) propane (b) oxygen (c) methane (d) ammonia (e) nitrogen

19. What is the hybrid orbital used by N-atom in ammonia (a) sp (b) sp^2 (c) sp^3 (d) sp^{3}d (e) sp^{3}d^2

20. Using the modern periodic table, to which period, group and block will you find an element with the electron configuration: Is^{2}2s^{2}2p^{6}3s^{2}3p^6? (a) 2, 18, p-block (b) 2,18, s-block (c) 2,10, s-block (d) 3,18, s-block(e) 3,18, p-block.

21. How many electrons are allowed in an atom where n= 5? (a) 18 (b) 32 (c) 2 (d) 50 (e) 12

22. 5 moles of NH_3 are enclosed in a 6 L flask at 23 °C. Calculate the pressure exerted by the gas assuming that the gas behaves like an ideal gas. (a) 13.15 atm (b) 12.15 atm (c) 20.28 atm (d) 25.28 atm (e) 15.12 atm

23. Arrange the following in order of increasing atomic radius: Be, Li, C, O, F (a) Be < Li < C< 0 < F (b) F < C < O < Li < Be (c) F < O < Be < Li < Be (d) F < O < C< Be < Li (e) Li < Be < C< O < F

24. Which orbitals are hybridized to form an octahedral geometry? (a) s and f-orbitals (b) s and p-orbitals (c) s, p and d orbitals (d) p and d-orbitals (e) s and d-orbitals

25. An element X forms the following compounds with chlorine; XC1$_4$, XCl$_3$, XC1$_2$. This illustrates: (a) law of multiple proportions (b) law of chemical composition (c) law if simple proportion (d) law of conservation of mass (e) law of definite proportion

26. Calculate the volume occupied by 35 g of nitrogen gas at 37 °C and 750 mmHg pressure given that N =14 g/mol. (a) 32.24 L (b) 13.93 L (c) 64.48 L (d) 27.60 L (e) 10.93 L

27. Which of the following is an example of an acid salt (a) (NH4)SO$_4$.FeSO$_4$.6H$_2$O (b) ZnSO$_4$ (c) MgSO$_4$ (d) KNO$_3$ (e)KHSO$_4$

28. What is the molecular weight of a pure gaseous compound having a density of 4.95g/L at -35 °C and 1020 torr? (a) 24 (b) 11 (c) 72 (d) 120 (e) 44

29. A gaseous mixture of oxygen, nitrogen and hydrogen exerts a total pressure of 1.50 atm and contains 5.00g of each gas. Find the partial pressure of nitrogen gas in this mixture. [H = 1, N =14, O =16] (a) 0.043 atm (b) 0.053 atm (c) 0.063 atm (d) 0.073 atm (e) 0.083 atm

30. Which element of the periodic table forms the most compounds? (a) C (b) H (c) N (d) S (e) P

31. The following are elements in the p-block except: (a) Rb (b) Si (c) C (d) Ge (e) Te

32. CdH$_2$ is an example of: (a) covalent hydride (b) interstitial hydride (c) ionic hydride (d) b and c (e) all of the above

33. A sample of hydrogen gas collected by the displacement of water occupied 30.0 mL at 24 °C on the day the barometer pressure was 736 torr. What volume would the hydrogen gas occupy if it were dry and at S.T.P? The vapour pressure of water at 24,0 oC is 22.4 torr (a) 32.4 mL (b) 21.6 mL (c) 36.8 mL (d) 25.0 mL (e) 27.6mL

34. Which of the following electron configurations are possible? (I) $Is^1 2s^2 2p^6$ (II) $Is^2 2s^2 2p^6 3s^2 3p^6$ (III) $Is^2 2s^2 2p^5$ (IV) $ls^2 2s^2 2p^6 3s^2 3p^6$ (v) $Is^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$ (a) III and V only (b) III, IV and V only (c) I, n and III only (d) I and II only (e) all of the above

35. The following are examples of representative elements except (a) Te (b) Tc (c) Cs (d) Na (e) Ca

36. An element X has 127 neutrons and 82 electrons, its atomic number is: (a) 209 (b) 45 (c) 105 (d) 82 (e) 127

37. List all the possible subshells and orbitals associated with the principal quantum number n, if n - 5. (a) 4s, 4p, 4d, 4f (b) 4s, 4p, 4d, 4f, 4g (c) 5s, 5p, 5d, 5f, 5g (d) 6s, 6p, 6d, 6f, 6g, 6h (e) none of the above

38. Which of the following is not a variable in describing a gas behaviour? (a) volume (b) mass (c) pressure (d) temperature (e) all of the above.

39. Calculate the number of mol of Na^+ ions present in 30 cm^3 of 1.50 M of NaCl solution (a) 0.031 mol (b) 0.045 mol (c) 0.015 mol (d) 0.025 mol (e) 0.034 mol

40. Calculate the binding energy per nucleon (in MeV) in the He atom ^4_2H which has a mass of 4.00260 amu. Mass of a neutron = 1.008655 amu and mass of 1 hydrogen atom = 1.007825. [1 amu = 931.5MeV]. (a) 7.0745 MeV (b) 28.2980 MeV (c) 27.2980 MeV (d) 8.0745 MeV (e) 6.0745 MeV

41. Beryllium is a silvery-white light metal used in radiation windows of X-ray tubes because of its transparency. What is the mass of 4 Be atom? (Be = 9.01amu) (a) 2.99 x 10^{-23} g (b) 5.98 x 10^{-23}g (c) 2.99 x 10^{-22} g (d) 5.98 x 10^{-22} g (e) 3.50 x 10^{-22}g

42. A nucleus of mass number 81 contains 46 neutrons. An atomic ion of this element has 36 electrons in it. Write the symbol of this ion (A) $^{81}_{36}Br$ (B) $^{81}_{36}Br^-$ (C) $^{81}_{36}Br^+$ (D) $^{81}_{35}Br^+$ (E) $^{81}_{35}Br^-$

43. Calculate the wavelength in nm of the light emitted when an electron drops from the fourth energy level to the second energy level in hydrogen. [Rn = 1.0974 x 10^{-7} m^{-1}] (a) 385 (b) 394 (c) 477 (d) 374 (e) 486

44. An old wooden article shows 2.0 counts per minute per gram. A fresh sample of wood shows 15.2 counts per minute per gram. Calculate the age of the wooden article ($t_{1/2}$ for C^{14} - 5760 years), (a) 30 years (b) 12,693 years (c) 400 years (d) 16,862 years (e) 11,391 years

45. Arrange the following set of elements in order of increasing first ionization energy: Cl, Ar, P, Na, S and Mg. (a) Cl<Ar<P<Na<S<Mg (b) Na<Mg<P<S<Cl<Ar (c) S< P < Mg < Na< Cl< Ar (d) Ar<Cl<P<S<Mg<Na (e) Ar <C <S<P<Mg<Na

46. In the nuclear reaction, supply the missing particle: $^{195}_{79}Au + ? \rightarrow ^{195}_{78}Pt$ (a) α-particle (b) neutron (c) positron (d) negatron (e) gamma ray

47. What is the hybridization about the central selenium atom in selenium hexafluoride? (a) sp (b) sp^2 (c) sp^3 (d) sp^3d (e) sp^3d^2

48. A 200.0 mL flask contains 1.03 mg O_2 and 0.56 mg He at 15 °C. What is the total pressure? [^4_2He, $^{16}_8O$] (a) 0.0038 atm (b) 0.017 atm (c) 0.020 atm (d) 0.037 atm (e) 0.040 arm

49. Balance the equation $^{11}_6C \rightarrow ? + ^{11}_5B$ (a) ^4_2He (b) ^0_1e (c) ^1_1n (d) ^1_1H (e) $_{-1}^0e$

50. What is the number of orbitals in a 5g subshell? (A) 1 (B) 3 (C) 5 (D) 7 (E) 9

51. What is the bond angle in a square planar molecule? (A) 180° (B) 120° (C) 109.5°(D) 107.3°(E)90°

52. Helium gas, He, at 22 °C and 1.00 atm occupied a vessel whose volume was 2.54 L. Calculate the volume this gas would occupy if it was cooled to liquid-nitrogen temperature (-197 °C). (a) 0.33 L (b) 0.56 L (c) 0,65 L (d) 1.30 L (e)1.95L

53. The energy needed to remove a single electron from an isolated gaseous atom is called (a) kinetic energy (b) electronegativity (c) ionization energy (d) electron affinity (e) all of the above

54. The gold foil experiment was conducted by who? (a) E. Goldstein (b) J. Chadwick (c) N. Bohr (d) E. Rutherford (e) J. J. Thompson

55. How many neutrons are present in an atom of $^{197}_{79}Au$?(a)79(b) 197 (c) 118(d)115 (e) 117

56. The spectrum of hydrogen atom is similar to that of: (a) H^+ ion (b) He^+ ion (c) Li^+ ion (d) Na+ ion (e) none of these

57. An atom of calcium $^{40}_{20}Ca$ has how many electrons in the third energy level (a) 2 (b) 8 (c) 10 (d) 18 (e) 40

58. The atoms which have the same mass number, but different atomic numbers are called: (a) isotones (b) isotopes (c) isobars (d) isomers (e) none of the above

59. Complete the nuclear reaction $^{15}_8O \rightarrow ^0_{-1}e + ?$ (a) $^{16}_8O$ (b) $^{14}_8O$ (c) $^{15}_7O$ (d) $^{14}_7N$ (e) $^{17}_7O$

60. How many α and β particles will be emitted by an element $^{218}_{84}A$ in changing to the stable isotope of $^{206}_{82}B$? (a) lα, 2β (b) 2α, 2β (c) 3α, 4β (d) 3α, 2β (e) 3α, 3β

61. The curie is a measure of the: (a) lethal threshold for radiation exposure (b) number of alpha particles emitted by exactly 1 g of a radioactive substance (c) number of disintegrations per second of a radioactive substance (d) total energy absorbed by an object exposed to a radioactive source (e) all of the above

62. What would be the immediate product of a neutron absorption by ^{107}Ag? (a) ^{107}Pd (b) ^{109}In (c) ^{108}Cd (d) ^{108}Ag (e) all of the above

63. When Xenon-123 [$^{123}_{54}Xe$] emits a gamma ray, what is the product? (a) $^{123}_{54}Xe$ (b) $^{123}_{53}I$

(c) $^{119}_{52}$Te (d) $^{123}_{55}$Cs (e) all of the above

64. Predict the geometry of H_2Se molecule using VSEPR theory [$^{79}_{34}Se$, $^{1}_{1}H$}, (a)Linear (b) bent (c) see-saw (d) tetrahedral (e) trigonal pyramid

65. Out of the following pairs of elements which has the same number of electrons in the outermost energy level? (a) helium and lithium (b) boron and carbon (c) carbon and nitrogen (d) lithium and hydrogen (e) sodium and neon

66. With the use of VSEPR theory, predict the geometries of BrF_2^-. (a) Bent (b) See saw (c) Trigonal planar (d) Linear (e) Square planar

67. Write the balanced equation for the nuclear reaction $^{56}_{26}Fe$ (d, a) $^{54}_{25}Mn$, where d represents the deuterium nucleus, (a) $^{56}_{26}Fe + ^{1}_{1}H \rightarrow ^{4}_{2}He + ^{54}_{25}Mn$ (b) $^{4}_{2}He + ^{54}_{25}Mn \rightarrow ^{56}_{26}Fe + ^{2}_{1}H$ (c) $^{56}_{26}Fe + ^{2}_{1}H \rightarrow ^{4}_{2}He + ^{54}_{25}Mn$ (d) $^{4}_{2}He + ^{54}_{25}Mn \rightarrow ^{56}_{26}Fe + ^{1}_{1}H$ (e) $^{4}_{2}He + ^{54}_{25}Mn \rightarrow ^{56}_{26}Fe + ^{1}_{0}H$

68. Starting with a 4.00 mg sample, how much of $^{198}_{79}Au$ remains after 7 days, given that half-life of $^{198}_{79}Au$ is 64.8 hours? (a) 0.15 mg (b) 0.66 mg (c) 0.25 mg (d) 3.15 mg (e) 1.15 mg

69. How many electrons, neutrons and protons are there in $^{70}_{31}Ga$? (a) 31, 39, 31 (b) 30, 38, 32 (c) 39, 31,31 (d) 38, 30, 31 (e)32,38,32

70. The following equilibrium pressures were observed for the reaction $2NO_{2(g)} \rightleftharpoons 2NO_{(g)} + O_2{(g)}$, $P_{NO2} = 0.55$ atm; $P_{NO} = 6.5$ x 10^{-5} atm; $P_{O2} = 4.5$ x 10^{-5} atm. Calculate k_p at this temperature: (a) 9.45 x 10^{-13} (b) 6.30 x 10^{-12} (c) 9.45 x 10^{-12} (d) 6.30 x 10^{-13} (e) 3.15 x 10^{-13}

71. Which of these is not a buffer solution? (a) KF/HF (b) C_5H_5N/ C_5H_5NHCl (c) $NaH2PO4/H_3PO_4$ (d) $Na_2CO_3/NaHCO_3$ (e) $NaClO_4/HClO_4$

72. Determine the mass of carbon (IV) oxide CO_2 produced on burning 215 g of ethyne C_2H_2 [At. wt (g/mol): C = 12, H =1, O =16] (a) 7.45 g (b) 1 6.54 g (c) 8.27 g (d) 14.00 g (e) 12.25 g

73. The osmotic pressure of a solution containing 0.1 g dm"^{3} of a substance is 50.0 torr at 27 °C. Calculate the molar mass of the substance given that the gas constant is 0.0821 L. atm. $K^{-1}mol^{-1}$ (a) 36.33 g/mol (b) 18.66 g/mol (c) 20.55 g/mol (d) 16.02 g/mol (e) 180.16 g/mol

74. Calculate the pH of a buffer solution composed of 0.18 M benzoic acid and 0.20 M sodium benzoate. (Ka - 6.5 x 10^{-5}). (a) 3.74 (b) 4.34 (c) 4.23 (d) 4.41 (e) 4.19

75. Write the equilibrium expression for *the* reaction $SiH4(g) + 2Cl_2(g) \rightleftharpoons SiCl4(g) + 2H2(g)$

(a) $K = \frac{[SiCl_4]^2[H_2]}{[SiH_4]^2[cL_2]}$ (b) $K = \frac{[SiCl_4]^2[H_2]}{[SiH_4][cL_2]^2}$ (c) $K = \frac{[SiCl_4][H_2]^2}{[SiH_4][cL_2]^2}$ (d) $K = \frac{[SiH_4][Cl_2]^2}{[SiCl_4][H_2]^2}$ (e) $K = \frac{[SiH_4]^2[Cl_2]}{[SiCl_4]^2[Hl_2]}$

76. Solution containing a solute (10.0 g) dissolved in benzene (0.1 kg) freezes at 4.2 °C. What is the molality of the solution if the freezing point of benzene is 5.5 °C (k_f= 5.12 °C kg mol^{-1}). (a) 0.15m (b) 015 M (c) 0.25 M (d) 0.25 m (e) 0.32 m

77. At 25 °C, k = 3.7 x 10^9 for the reaction $CO(g) + Cl2(g) \rightleftharpoons COCl_2(g)$, calculate k_p at this

temperature (gas constant is 0.0821 L. atm, $K^{-1}mol^{-1}$). (a) 1.51×10^8 (b) 3.02×10^8 (c) 4.50×10^{10} (d) 6.01×10^{10} (e) 9.00×10^{10}

78. Arrange the following in order of increasing acid strength *HCl, HBr, HF, HClO$_4$* (a) *H Cl > HBr > HF > HClO$_4$* (b) *HCl < HBr < HF < H ClO$_4$* (c) HF < HCK HBr < HClO$_4$ (d) HClO$_4$ < HBr < HCl < HF (e) HF>HCl>HBr>HClO$_4$

79. How many moles of nitrogen gas are mere in 48 g of nitrogen? $[^{14}_7N, ^1_1H]$ (a) 6.86 (b) 3.43 (c) 6.00 (d) 1.71 (e) 3.20

80. What is the molality of a solution prepared by dissolving 25 g of I_2 in 150 g of CCl$_4$ [I=127, C = 12, Cl = 35.5]. (a) 0.19 m (b) 0.17 m (c) 0.39 m (d) 0.66 m (e) 0.46 m

81. Calculate the molality of a solution containing 6.59 g of glycerol ($C_3H_8O_3$) in 75.0 g ethanol (C =12, H=l, O =16). (a) 2.54 m (b) 9.55 m (c) 0.96 m (d) 1.29 m (e) l,54

82. Calculate the mass of carbon in 30 g of the pent-1-ene $[^{14}_7N, ^1_1H, ^{16}_8O, ^{12}_6C]$. (a) 4.29 (b) 5.87 (c) 25.71 (d) 20.48 (e)17.04

83. Which of the following solutions is the most acidic? (a) 0.1 OM CH$_3$COOH; k_a = 1.8 x 10^{-5} (b) 0.10m Cl$_3$CHCO$_2$H; k_a = 5.1 x 10^{-2} (c) 0.10M HCO$_2$H; k_a = 1.8 x 10^{-4} (d) 0.10M Cl$_2$CH$_2$CO$_2$H; k_a = 1.4 x 10^{-3} (e) They have equal acidity.

84. Which of the following is the strongest oxidizing agent? (a) *MnO$^-_4$ in* acid (b) *MnO$^-_4$ in* base (c) *MnO$_2$* in base (d) $Cr_2O^{2-}_4$ in acid (e) $Cr_2O^{2-}_7$ *in* acid

85. What volume of a 0.100 M solution of NaHCO$_3$ contains 0.350 g of NaHCO$_3$? [Na = 23.0; 0 = 16,0; H -1.0] (a) 17.4 mL (b) 41.7 mL (c) 20.9 mL (d) 38.3 mL (e) 59.1 mL

86. Which of the following is the strongest Bronsted acid? (a) H$_3$O$^+$ (b) HF (c) NH$_3$ (d) NaHSO$_4$ (e) NaOH

87. The value of Kp for the dissociation of sulfuryl chloride $SO_2cl_{2(g)} \rightleftharpoons SO_{2(g)} + Cl_{2(g)}$ at 373 K is 2.65. If the partial pressure *of $SO_2Cl_2(_g)$* at 373 K is 0.85 atm, calculate the partial pressures of SO$_2$ and Cl$_2$ at this temperature, (a) 1.09 (b) 1.29 (c) 1.40 (d) 1.35 (e) 1.50

88. Calculate the pH of a buffer solution that is 0.15M chloro acetic acid and 0.10M sodium chloro acetate [ka = 1.3 x 10^{-3}]. (a) 6.82 (b) 5.36 (c) 4.48 (d) 3.31 (e) 2.68

89. Which of the following reaction is a disproportionation reaction? (a) $3K_2MnO_4 + 4HCl \rightarrow 2K^- MnO_4 + MnO_2 + 4KCl + 2H_2O$ (b) $K_2Cr_2O_7 + 14HCl \rightarrow 2CrCl_3 + 3Cl_2 + 2KCl + 7H_2O$ (c) $2KMnO_4 + 3KNO_2 + H_2O \rightarrow 2MnO_2 + 3KNO_3 + 2KOH$ (d) $KIO_3 + Cl_2 + 2KOH \rightarrow KIO_4 + 2KCl + H_2O$ (e) none of the above

90. A solution is prepared by dissolving 50.0 g cesium chloride (CsCl) in 500 g water. The volume of the solution is 63.3ml. Calculate the molarity of the cesium chloride. [Cs = 133.0; Cl = 35.5] (a) 4.95M (b) 5.32M (c) 4.69M (d)5.94M (e)6.49M

91. At a particular temperature, a 3.00 L flask contains 3.50 mol HI, 4.10 mol H_2 and 0.30 mol I_2 in equilibrium. Calculate k_c at this temperature for the reaction. $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}$ (a) 9.27 (b) 0.10 (c) 7.92 (d) 8.54 (e)10.0

92. What is the oxidation state of copper in Cu_3N_2? $[^{64}_{29}Cu, \, ^{14}_{7}N]$ (a) +2 (b) -2 (c) +3 (d) +1 (e) -1

93. Which of the following is the strongest Bronsted base? (a) OH^- (b) S^{2-} (c) O^{2-} (d) H_2O (e) SH_2

94. Identity the oxidizing agent in the redox reaction: $3Mg + N_2 \rightarrow Mg_3N_2$. (a) Mg_3N_2 (b) Mg_3 (c) Mg (d) N_2 (e) Mg and N_2

95. The following is true about this reaction $FeCl_3 + Cl^- \rightleftharpoons FeCl^-_4$ except; (a) $FeCl_3$ is a Lewis base (b) Cl^- is a Lewis acid (c) $FeCl_3$ is a Lewis acid (d) b & c (e) none of these

96. Calculate the pH of a buffer solution that is 0.150 M in formic acid (HCOOH) and 0.100 M in sodium formate (HCOONa). Ka for the formic acid is 1.8×10^{-4}. (a) 3.17 (b) 3.35 (c) 3.57 (d) 2.52 (e) 2.18

97. Which of the following compound can be a Lewis acid? (a) CH_4 (b) CH_3^- (c) BF_3 (d) Cl_2 (e) Cl^-

98. The equation $Cl_{2(g)} + 2NaOH_{(aq)} \rightarrow NaClO_{(aq)} + NaCl_{(aq)} + HaO_{(i)}$ is a typical example of which reaction? (a) displacement redox reaction (b) decomposition redox reaction (c) disproportionation redox reaction (d) combination redox reaction (e) equilibrium reaction

99. Calculate the solubility (in mole per litre) of $Fe(OH)_3$ ($K_{sp}= 4 \times 10^{-38}$) in water, (a) 2.0×10^{-18} (b) 4.0×10^{-18} (c) 2.0×10^{-17} (d) 3.8×10^{-16} (e) 4.0×10^{-17}

100. Calculate the osmotic pressure (in atm) of an aqueous solution containing 15 g of urea in 800 cm^3 of solution at 12 °C. The molar mass of urea is 60 g/mol and the gas constant is 0.0821 L. atm. K^{-1}mol^{-1}. (a) 7.82 (b) 7.05 (c) 7.3 l(d) 0.31(e)2.31

101. Which of these is not an example of auto-ionization reaction? (a) $PCl_5 + PCl_5 \rightleftharpoons [PCl^+_4][PCl^-_6]$ (b) $H_2O + H_2O \rightleftharpoons H_3O^+ + OH^-$ (c) $N_2H_4 + NH_4^+ \rightleftharpoons N_2H_5^+ + NH_3$ (d) $H_2SO_4 + H_2SO_4 \rightleftharpoons H_3SO^-_4$ (e) none of these

102. Calculate the pH of a 0.060 M aqueous solution of methylamine, CH_3NH_2 [C = 12.0; H = 1.0; N = 14.0]. (a) 10.83 (b) U.69(c) 12.31 (d)2.31(e)9.62

103. Which of the following compound can be used as a Lewis base? (a) NH_3 (b) $NaCl$ (c) KH (d) HCl (e) $CaCl_2$

104. Which of the following is the weakest Bronsted acid? (a) H_2CO_3 (b) $Al(OH)_3$ (c) H_2SO_4 (d) $HClO_4$ (e) H_3PO_4

105. How many moles of butane are present in 0.334 g of the compound? $[^1_1H, \, ^{16}_8O, \, ^{12}_6C]$ mol (a) 0.0035 mol (b) 0.0014 mol (c) 0.0058 mol (d) 0.01 1 1 mol (e) 0.0222

106. What is the oxidation state of iron in the compound; $K_4Fe(CN)_6$ (a) +1 (b) +2 (c) +3 (d) +4 (e) +5

107. Calculate the concentration of acetic acid, $C_2H_4O_2$, whose pH is 2.68. (a) 0.65 M (b) 0.52M (c)

0.26 M (d) 0.44M(e)0.36M

108. For a reaction $N_2(g) + 3H_{2(g)} \rightleftharpoons 2NH_{3(g)}$, the value of K.$_p$ at 500°C is 1.50 x 10^{-5}, calculate the value of Kc. (a) 0.5140 (b) 1.3121 (c) 0.4015 (d) 0.0514 (e) 0.0604

109. What is the oxidation state of chlorine in the anion ClO^-_4? (a) +1 (b) +3 (c) +5 (d) +7 (e) +9

110. The equation $Ce^{4+} + e^- \rightarrow Ce^+$ is an example of: (a) a balanced redox reaction (b) a stoichiometric reaction (c) oxidation half reaction (d) reduction half reaction (e) none of the above

111. The hydrogen ion concentration of a fruit juice is 3.3 x 10^{-3} M, What is the pH of the juice? (a) 2.48 (b) 4.52 (c) 3.48 (d) 1.48(e)1.52

112. Write the oxidation half reaction for the redox equation $CN^- + MnO^-_4 \rightarrow CNO^- + MnO_2$ (a)$MnO^-_4 \rightarrow MnO_2$ (b) $CN^- + MnO^-_4 \rightarrow CNO^-$ (c) $CN^- + MnO^-_4 \rightarrow CNO^- + MnO_2$ (d) $CN^- \rightarrow CNO^-$ (e) $MnO^-_4 \rightarrow CNO^- + MnO_2$

113. What is the pH of a 0.8 M NaOH solution that is 5-fold diluted? (a) 13.00 (b) 13.40 (c) 13.20 (d) 12.40 (e) 12.70

114. Identify the reducing agent in the given reaction: $Zn + I_2 \rightarrow ZnI_2$ (a) Zn and l$_2$ (b) Znl$_2$ and I$_2$ (c) ZnI_2 (d) l$_2$(e)Zn

115. A solution is prepared by condensing 4.00 L of a gas measured at 27 °C and 748 mmHg pressure into 58.0g of benzene. Calculate the freezing point of the solution [freezing point of pure benzene = 5 .5 °C; k$_f$= 5.12°C/m]. (a) 8. 60 °C (b) -8.60 °C (c) -6.86 °C (d) -5.12 °C (e) 5. 12 °C

116. Calculate the pH of a 0.050 M Ca(OH)$_2$ solution, (a) 1.40 (b) 13.00 (c) 12.60 (d) 3.20 (e) 11.00

117. Write the solubility expression for the compound calcium phosphate Ca$_3$(PO$_4$)$_2$. (a) $k_{sp} = [3Ca^{2+}] [2PO^{3-}_4]$ (b) $k_{sp} = [Ca^{2+}]^2 [PO^{3-}_4]^3$ (c) $k_{sp} = [Ca^{2+}]3 [PO^{3-}_4]^2$ (d) $k_{sp} = \frac{[Ca^{2+}] [PO^{3-}_4]^2}{[Ca_3] [PO_4]_2}$ (e) $k_{sp} = \frac{[Ca_3] [PO_4]_2}{[Ca^{2+}] [PO^{3-}_4]^3}$

118. A chemical specie that can accept a lone pair of electrons to form a dative bond is referred to as a/an: (a)Lewis acid (b) Bronsted-Lowry base (c) Lewis base (d) Bronsted-Lowry acid (e) Arrhenius acid

119. Which of these factors will not affect a system in chemical equilibrium? (a) change in volume (b) change in temperature (c) change in concentration (d) change in pressure (e) change in catalyst

120. Calculate the freezing point of a solution that contains 2.00 g of ethanol in 50 g of water. Kf for water = 1 .86°C/m (atwt in g/mol: C= 12, H = 1, 0 =16). (a) 2.33°C (b) -2.33 °C (c) -1.33 °C (d) 1.62 °C (e) -1.62 °C

121. Calculate the molar solubility of copper (I) iodate Cu $(IO_3)_2$ in water at 25°C $[k_{sp}$ Cu$(IO_3)_2 = 1.4 \times 10^{-7}]$.

(a) $3.30 \times 10^{-3}M$ (b) $1,65 \times 10^{-4}M$ (c) $1,65 \times 10^{-3}M$(d) 4.95×10^{-3} M (e)$4.95 \times 10^{-4}M$

122. A colligative property depends upon: (a) chemical nature of the particle (b) size of the particle (c) number of particles (d) temperature of the solution (e) all of the above

123. For which one of the following equations will k_p equal k_c? (a) $PCl_{5(g)} \rightleftharpoons PCl_{3(g)} + Cl_{2(g)}$(b) $CoCl_{2(g)} \rightleftharpoons CO_{(g)} + Cl_{2(g)}$ (c) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI_{(g)}(d)3H_{2(g)} + N_{2(g)} \rightleftharpoons 2NH_{3(g)}$ (e)$N_2O_{4(g)} \rightleftharpoons 2NO_{(g)}$

124. Identify the conjugate acid in each of this reaction: $N_2H_4 + NH^+_4 \rightleftharpoons N_2H^+_5 + NH_3$ (a) N_2H_4, NH^+_4 (b) N_2H_4 (c) NH_4^+ (d) $N_2H^+_5$ (e) NH_3

125. A liquid boils when its vapour pressure becomes (a) equal to the atmospheric pressure (b) equal to zero (c) Very high (d) very low (e) equal to one hundred

126. Calculate the concentration of sodium benzoate that must be present in a 0.20 M solution of benzoic acid (C_6H_5COOH) to produce a pH of 4.0. ($Ka = 6.5 \times 10^{-5}$). (a) 1.02 M (b) 2.22 M (c) 0.13M (d) 0.50 M (e) 3.14 M

127. The law of relative lowering of vapour pressure was given by (a) Raoult (b) Le Chatelier (c) Van't Hoff (d) Ostwald (e) Henry

128. When a non-volatile solute is added to a solvent, the freezing point of the solvent (a) decreases (b) increases (c) becomes zero degrees (d) remains the same (e) all of the above

129. Which of the following is a colligative property? (a) molar refractivity (b) optical rotation (c) depression of freezing point (d) viscosity (e) all of the above

130. The following are either an Arrhenius acid or base except: NH_3, HBr, NaOH, Ca(OH)$_2$ (a) Ca(OH)$_2$ (b) HBr (c) NH_3 (d) NaOH (e) none of these