.　　　2 ／　(single-choice) (K=39.1　　Na=23　Ca=40　g/mole)

1.___2.___3.___4.___5.___6.___7.___8.___9.___10.___
11.___12.___13.___14.___15.___16.___17.___18.___19.___20.___

___1. How many liters are there in a cubic centimeter?

A) 10^{-6}　B) 10^{-3}　C) 10^3　D) 10^6　E) 10^9

___2. Which one of the following pairs of substances illustrates the Law of Multiple Proportions?

A) O_3, O_2　B) D_2O, H_2O　C) SiO_2, Sb_2O_3　D) KCl, $MgCl_2$　E) PCl_3, PCl_5

___3. A reaction consumes 5.0 g of A and 6.0 g of B. How many grams of C and D should be

obtained?　　1A　+　3B　→　2C　+　4D

A) 23　　B) 11　　C) 1　　D) 10　　E) Not enough information is given to answer this

question.

___4. Calculate the formula mass of ammonium nitrite.

A) 64.04　B) 80.04　C) 79.04　D) 63.04　E) 71.847

___5. Which of the following is incorrectly labeled?

A) KCl—strong electrolyte　　B) HCl—strong electrolyte

C) HCOOH—weak electrolyte　　D) NH_3—weak electrolyte

E) HNO_2—strong electrolyte

___6. Which of the following species is a weak base in water?

A) KOH　B) $B(OH)_3$　C) NH_3　D) CH_3CO_2H　E) $Mg(OH)_2$

___7. The two particles that comprise the nucleus of an atom are

A) protons and electrons.　　B) neutrons and electrons.

C) alpha particles and neutrons.　　D) protons and neutrons.

E) electrons and gamma rays.

___8. Calculate the wavelength, in nanometers, of an x-ray that has frequency

of　$5.15 \times 10^{16}\,s^{-1}$.

A) 5.83　　B) 17.2　　C) 0.172　　D) 1.72×10^8　E) 583

___9. An AM radio station operates at a frequency of 1080 kHz. What is the wavelength, in meters,

of the radio waves?

A) 360　B) 278　C) 1080　D) 3.60　E) 2.78

___10. In which atom are the 3s and 3p orbitals equal in energy?

A) H　B) He　C) C　D) O　E) none of the above

___11. Select the species below that is not isoelectronic with the Ne atom?

A) F^-　B) O^{2-}　C) Na^+　D) Mg^{2+}　E) Ar

___12. Which one of the following Lewis symbols is incorrect?

A) $\overset{\cdot\cdot}{\underset{\cdot\cdot}{\overset{\cdot}{S}}}\cdot$ B) $:\overset{\cdot\cdot}{\underset{\cdot\cdot}{I}}:$ C) $\cdot\overset{\cdot\cdot}{Si}\cdot$ D) $\dot{Ca}$ E) $\overset{\cdot\cdot}{Se}$
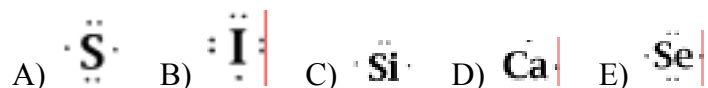
___13. The electron pair geometry around the central iodine in I_3^- is

A) linear. B) trigonal bypyramidal. C) tetrahedral. D) octohedral. E) none of these

___14. A 1.50 g sample of aniline ($C_6H_5NH_2$) requires 844 **J** to vaporize.
What is the ΔH_{vapn} for aniline in k**J**/mol?

A) 13.6   B) 563   C) 52.3   D) 844   E) 0.52

___15. What is the percent by mass of a solution made by dissolving 55.0 g KCl
in 125 g water?

A) 30.6   B) 55.0   C) 68.8   D) 56.0   E) 44.0

___16. For the gaseous system, $2 H_2S + 3 O_2 \Leftrightarrow 2 H_2O + SO_2$,
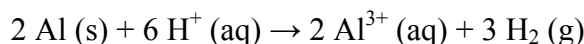
how is K_p related to K_c at a given temperature?

A) less than   B) equal to   C) greater than   D) unrelated to

___17. The conjugate acid of HPO_4^{2-} is

A) PO_4^{3-} B) $H_2PO_4^{2-}$ C) $H_2PO_4^-$ D) H_3PO_4 E) none of these

___18. How many electrons are transferred in the following reaction?

$$2 Al (s) + 6 H^+ (aq) \rightarrow 2 Al^{3+} (aq) + 3 H_2 (g)$$

A) 1   B) 2   C) 3   D) 5   E) 6

___19. Which of the following species cannot function as an oxidizing agent?

A) S(s)   B) $NO_3^-(aq)$ C) $Cr_2O_7^{-2}(aq)$ D) I^- (aq)   E) $MnO_4^-(aq)$

___20. Metals typically have _____ electronegativity values.

A) high   B) low   C) negative   D) no   E) two of these

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1. (3   )A star is estimated to have a mass of 2 x 10^{36} kg. Assuming it to be a sphere of average radius 7.0 x 10^5 km, calculate the average density of the star in units of grams per cubic centimeter.

2. (6   ) Adipic acid is an organic compound composed of 49.31%C,43.79%O, and the rest hydrogen. If the molar mass of adipic acid is 146.1 g/mole, what are the empirical and molecular formulas for adipic acid

3. (6   ) Write the formula for each of the following compounds:
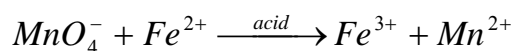   (a) copper(   ) nitrate
   (b) sodium peroxide
   (c) magnesium fluoride

(d) potassium dihydrogen phosphate

(e) lithium sulfite

4. (6   ) Balance equation for the following reaction

$$MnO_4^- + Fe^{2+} \xrightarrow{\ acid\ } Fe^{3+} + Mn^{2+}$$

5. (3   )A reaction rate constant is 0.001min^{-1}. How long will it take for the reaction to go to 38.5% completion?

6. (6   )Titanium metal has a body-centered cubic unit cell. The density of titanium is 4.5 g/cm^3. Calculate a) the edge length of the unit cell and b) a value for the atomic radius of titanium.(Ti=47.88g/mole,unit=pm)

7. (18   )Predict the hybridization of each molecules or ions, and describe the molecular structure and polar molecular (a)CO_2 (b)NH_4^+ (c)XeF_4 (d)ICl_2^- (e) I_3^- (f)BCl_3 (g)SO_2 (h)$AlCl_6^-$ (i)N_2O (j)H_2O

8. (3   )How many bond angle are there in PCl_4^-

9. (9   )One of the emission spectral lines for Be^{3+} has a wavelength of 253.4 nm for an electronic transition that begins in the state with n=5. What is the principal quantum number of the lower-energy state corresponding to this emission?

1_B_ 2_E_ 3_B_ 4_A_ 5_E_

6_C_ 7_D__ 8_A__ 9_B__ 10_A

11_E_ 12_C_ 13_B_ 14_C_ 15_A_

16_A_17_C_ 18_E_ 19_D_ 20_B_

.

1. m=2x1039g v=1.4X10³³cm³

 D=M/V=1.4X10⁶g/cm³

2.   C=49.31/12.01=4.1

   H=6.9/1.008=6.85

  O=43.79/16.01=2.74

 C:O:H=1.5:1:2.5=3:2:5   (C3H5O2)xn=146.1

   N=2   C6H10O4

3. Cu(NO3)2, Na2O2, MgF2, KH2PO4, Li2SO3

4. 2H2O+4Ag(s)+8CN⁻(aq)+ O₂ basic 4Ag(CN)₂⁻(aq)+4OH⁻
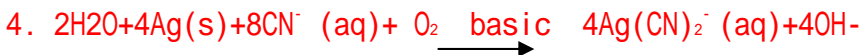
5. 480sec

6.   a. The edge length of the unit cell =328ppm

   b. Atomic radius of titanium =142ppm

7. (a)sp,   ,   ,(b)sp3,   ,   ,(c)sp3d2,   ,   ,(d)sp3d ,T

       ,   ,(e)sp,   ,   ,(f)sp2,   ,   ,(g)sp2,   ,

    ,(h)sp3d2,   ,   ,(i)sp,   ,   ,(j)sp3,   ,

8. 90   120   180

9. E=6.625x10⁻³⁴x3x10⁸/253.4x10⁻⁹=7.8x10⁻¹⁹

  -7.8x10⁻¹⁹=-2,178x10⁻¹⁸(4²/n²-4²/5²)

  n=4