108-1st Chem Exam (A)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) When aqueous solutions of _____ are mixed, a precipitate forms.
   A) Li_2CO_3 and CsI
   B) NaI and KBr
   C) $NiBr_2$ and $AgNO_3$
   D) K_2SO_4 and $CrCl_3$
   E) KOH and $Ba(NO_3)_2$

   Answer: C

2) The net ionic equation for the reaction between aqueous sulfuric acid and aqueous sodium hydroxide is _____.
   A) H^+ (aq) + HSO_4^- (aq) + $2OH^-$ (aq) → $2H_2O$ (l) + SO_4^{2-} (aq)
   B) $2H^+$ (aq) + OH^- (aq) → H_2O(l)
   C) SO_4^{2-} (aq) + $2Na^+$ (aq) → $2Na^+$ (aq) + SO_4^{2-}(aq)
   D) H^+ (aq) + HSO_4^- (aq) + $2Na^+$ (aq) + $2OH^-$ (aq) → $2H_2O$ (l) + $2Na^+$ (aq) + SO_4^{2-}(aq)
   E) $2H^+$ (aq) + SO_4^{2-} (aq) + $2Na^+$ (aq) + $2OH^-$ (aq) → $2H_2O$ (l) + $2Na^+$ (aq) + SO_4^{2-} (aq)

   Answer: B

3) Which one of the following is a triprotic acid?
   A) nitric acid
   B) chloric acid
   C) hydrofluoric acid
   D) phosphoric acid
   E) sulfuric acid

   Answer: D

4) In which reaction does the oxidation number of oxygen increase?
   A) $Ba(NO_3)_2$ (aq) + K_2SO_4 (aq) → $BaSO_4$ (s) + $2KNO_3$ (aq)
   B) MgO (s) + H_2O (l) → $Mg(OH)_2$ (s)
   C) HCl (aq) + NaOH (aq) → NaCl (aq) + H_2O (l)
   D) $2SO_2$ (g) + O_2 (g) → $2SO_3$ (g)
   E) $2H_2O$ (l) → $2H_2$ (g) + O_2 (g)

   Answer: E

5) Which solution contains the largest number of moles of chloride ions?
   A) 10.0 mL of 0.500 M $BaCl_2$
   B) 30.00 mL of 0.100 M $CaCl_2$
   C) 25.00 mL of 0.400 M KCl
   D) 4.00 mL of 1.000 M NaCl
   E) 7.50 mL of 0.500 M $FeCl_3$

   Answer: E

6) A 0.355 M K_2SO_4 solution can be prepared by _____.

    A) dissolving 46.7 g of K_2SO_4 in water and diluting to a total volume of 250.0 mL

    B) diluting 46.7 mL of 1.90 M K_2SO_4 solution to 250.0 mL

    C) dilution of 500.0 mL of 1.00 M K_2SO_4 to 1.00 L

    D) dilution of 1.00 mL of 0.355 M K_2SO_4 to 1.00 L

    E) dissolving 46.7 g of K_2SO_4 in water and diluting to 500.0 mL, then diluting 25.0 mL of this solution to a total volume of 500.0 mL

Answer: B

7) Which of these metals is the <u>most</u> easily oxidized?

    A) Li   B) Cu   C) Au   D) Pt   E) Hg

Answer: A

8) Oxidation is the _____ and reduction is the _____.

    A) gain of electrons, loss of electrons

    B) gain of oxygen, loss of mass

    C) loss of electrons, gain of electrons

    D) gain of oxygen, loss of electrons

    E) loss of oxygen, gain of electrons

Answer: C

9) The molarity of an aqueous solution containing 75.3 g of glucose ($C_6H_{12}O_6$) in 35.5 mL of solution is _____.

    A) 14.8   B) 481   C) 11.8   D) 2.12   E) 0.0118

Answer: C

10) Which species is oxidized in the reaction below?

$Au(s) + 3NO_3^-(aq) + 6H^+(aq) \rightarrow Au^{3+}(aq) + NO(g) + 3H_2O\ (l)$

    A) H^+ B) N^{+5} C) Au   D) O^{2-} E) H_2O

Answer: C

11) If an unknown sample contains 39.04% sulfuric acid by mass, then a 0.9368 g of that sample would require _____ mL of 0.2389 M NaOH for neutralization.

    A) 7.80   B) 15.61   C) 31.22   D) 39.98   E) 79.96

Answer: C

12) Which hydroxides are strong bases?

    $Sr(OH)_2$ KOH   NaOH $Ba(OH)_2$

    A) KOH, $Ba(OH)_2$

    B) KOH, NaOH, $Ba(OH)_2$

    C) $Sr(OH)_2$, KOH, NaOH, $Ba(OH)_2$

    D) KOH, NaOH

    E) None of these is a strong base.

Answer: C

13) What are the spectator ions in the reaction between KOH (aq) and HNO_3 (aq)?

    A) K^+ and H^+

    B) H^+ and NO_3^-

    C) OH^- only

    D) H^+ and OH^-

    E) K^+ and NO_3^-

Answer: E

14) Which of the following are combination reactions?
1) CH_4 (g) + O_2 (g) → CO_2 (g) + H_2O (l)
2) CaO (s) + CO_2 (g) → $CaCO_3$ (s)
3) Mg (s) + O_2(g) → MgO (s)
4) $PbCO_3$ (s) → PbO (s) + CO_2 (g)

    A) 4 only   B) 2, 3, and 4   C) 1, 2, 3, and 4   D) 1, 2, and 3   E) 2 and 3

Answer: E

15) Which of the following are combustion reactions?
1) CH_4 (g) + O_2 (g) → CO_2 (g) + $2H_2O$ (l)
2) CaO (s) + CO_2 (g) → $CaCO_3$ (s)
3) $PbCO_3$ (s) → PbO (s) + CO_2 (g)
4) CH_3OH (l) + O_2 (g) → CO_2 (g) + $2H_2O$ (l)

    A) 1, 3, and 4   B) 1, 2, 3, and 4   C) 2, 3, and 4   D) 3 and 4   E) 1 and 4

Answer: E

16) Which of the following are decomposition reactions?
1) CH_4 (g) + O_2 (g) → CO_2 (g) + H_2O (l)
2) CaO (s) + CO_2 (g) → $CaCO_3$ (s)
3) Mg (s) + O_2(g) → MgO (s)
4) $PbCO_3$ (s) → PbO (s) + CO_2 (g)

    A) 2 and 3   B) 4 only   C) 1, 2, and 3   D) 2, 3, and 4   E) 1, 2, 3, and 4

Answer: B

17) How many oxygen atoms are contained in 2.74 g of $Al_2(SO_4)_3$?

    A) 7.22×10^{24} B) 12   C) 6.02×10^{23} D) 8.01×10^{-3} E) 5.79×10^{22}
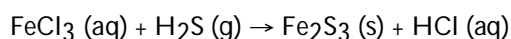
Answer: E

18) A nitrogen oxide is 63.65% by mass nitrogen. The molecular formula could be _____.

    A) NO_2

    B) N_2O

    C) NO

    D) N_2O_4

    E) either NO_2 or N_2O_4

Answer: B

19) When the following equation is balanced, the coefficient of H_2S is _____.

      $FeCl_3$ (aq) + H_2S (g) → Fe_2S_3 (s) + HCl (aq)

    A) 3   B) 4   C) 5   D) 1   E) 2

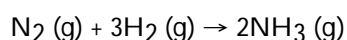Answer: A

20) Calculate the percentage by mass of carbon in CO_2.

A) 37.53   B) 72.71   C) 75.10   D) 27.29   E) 73.05

Answer: D

21) A 1.038 g sample of unknown containing C, H, and O yielded 2.48 g of CO_2 and 0.510 g of H_2O during combustion analysis. Determine the empirical formula of the compound.

A) $C_2H_6O_2$ B) C_6H_6O C) C_3H_3O D) CH_3O E) $C_6H_6O_2$

Answer: C

22) Under appropriate conditions, nitrogen and hydrogen undergo a combination reaction to yield ammonia:

$$N_2 \text{ (g)} + 3H_2 \text{ (g)} \rightarrow 2NH_3 \text{ (g)}$$
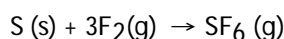
If the reaction yield is 81.4 %, how many moles of N_2 are needed to produce 8.50 mol of NH_3 when H_2 is excess in this reaction?

A) 6.92   B) 10.4   C) 15.7   D) 5.22   E) 20.9

Answer: D

23) Sulfur and fluorine react in a combination reaction to produce sulfur hexafluoride:

$$S \text{ (s)} + 3F_2\text{(g)} \rightarrow SF_6 \text{ (g)}$$

The maximum amount of SF_6 that can be produced from the reaction of 32.1 g of sulfur with 114 g of fluorine is _____ g.

A) 146   B) 219   C) 48.7   D) 584   E) 438

Answer: A

24) What is the empirical formula of a compound that contains 29% Na, 41% S, and 30% O by mass?

A) $NaSO_3$ B) $NaSO$ C) $NaSO_2$ D) $Na_2S_2O_6$ E) $Na_2S_2O_3$

Answer: E

25) A molecule of water contains hydrogen and oxygen in a 1:8 ratio by mass. This is a statement of _____.

A) the law of multiple proportions
B) the law of conservation of energy
C) the law of constant composition
D) the law of conservation of mass
E) none of the above

Answer: C

26) Which one of the following is not true concerning cathode rays?

A) They are made up of electrons.
B) They travel in straight lines in the absence of electric or magnetic fields.
C) They impart a negative charge to metals exposed to them.
D) The characteristics of cathode rays depend on the material from which they are emitted.
E) They originate from the negative electrode.

Answer: D

27) The charge on an electron was determined in the _____.
    A) Rutherford gold foil experiment
    B) cathode ray tube, by J. J. Thomson
    C) atomic theory of matter
    D) Millikan oil drop experiment
    E) Dalton atomic theory

    Answer: D

28) In the Rutherford nuclear-atom model, _____.
    A) the three principal subatomic particles (protons, neutrons, and electrons) all have essentially the same mass
    B) mass is spread essentially uniformly throughout the atom
    C) the light subatomic particles, protons and neutrons, reside in the nucleus
    D) the three principal subatomic particles (protons, neutrons, and electrons) all have essentially the same mass <u>and</u> mass is spread essentially uniformly throughout the atom
    E) the heavy subatomic particles, protons and neutrons, reside in the nucleus

    Answer: E

29) Which of the following atoms has the smallest number of neutrons?
    A) carbon-12   B) carbon-13   C) bromine-79   D) carbon-14   E) chlorine-35

    Answer: A

30) Which combination of protons, neutrons, and electrons is correct for the isotope of copper, $^{63}_{29}$Cu?

    A) 34 p$^+$, 34 n°, 29 e$^-$
    B) 29 p$^+$, 29 n°, 63 e$^-$
    C) 63 p$^+$, 29 n°, 63 e$^-$
    D) 34 p$^+$, 29 n°, 34 e$^-$
    E) 29 p$^+$, 34 n°, 29 e$^-$

    Answer: E

31) Silver has two naturally occurring isotopes with the following isotopic masses:

$$^{107}_{47}\text{Ag} \qquad ^{107}_{47}\text{Ag}$$
$$106.90509 \qquad 108.9047$$

    The average atomic mass of silver is 107.8682 amu. The fractional abundance of the lighter of the two isotopes is _____.
    A) 0.75783   B) 0.51835   C) 0.24221   D) 0.90474   E) 0.48168

    Answer: B

32) Elements _____ exhibit similar physical and chemical properties.
    A) on opposite sides of the periodic table
    B) with similar atomic masses
    C) with similar chemical symbols
    D) in the same period of the periodic table
    E) in the same group of the periodic table

    Answer: E

33) Of the choices below, which one is <u>not</u> an ionic compound?
    A) NaCl   B) MoCl$_6$ C) PCl$_5$ D) RbCl   E) PbCl$_2$

    Answer: C

34) Which formula/name pair is <u>incorrect</u>?
    A) $Mg(MnO_4)_2$ magnesium permanganate
    B) $Mn(NO_3)_2$ manganese(II) nitrate
    C) Mg_3N_2 magnesium nitrite
    D) $Mg(NO_3)_2$ magnesium nitrate
    E) $Mn(NO_2)_2$ manganese(II) nitrite

   Answer: C

35) Methane and ethane are both made up of carbon and hydrogen. In methane, there are 12.0 g of carbon for every 4.00 g of hydrogen, a ratio of 3:1 by mass. In ethane, there are 24.0 g of carbon for every 6.00 g of hydrogen, a ratio of 4:1 by mass. This is an illustration of the law of _____.
    A) conservation of matter
    B) multiple proportions
    C) octaves
    D) constant composition
    E) conservation of mass

   Answer: B

36) 1.55 kg/m^3 is equivalent to _____ g/L.
    A) 1.55×10^6 B) 1.55×10^3 C) 1.55 D) 1.55×10^{-3} E) 1.55×10^{-6}

   Answer: C

37) The correct result (indicating the proper number of significant figures) of the following problem is _____.

$$\frac{(0.002843)\,(12.80184)}{0.00032}$$

    A) 113.7   B) 113.736   C) 113.74   D) 113.73635   E) 1.1×10^2

   Answer: E

38) There should be _____ significant figures in the answer to the following computation.

$$\frac{(10.07 + 7.395)}{2.5}$$

    A) 1   B) 2   C) 3   D) 4   E) 5

   Answer: B

39) Which one of the following is an extensive property?
    A) temperature
    B) boiling point
    C) volume
    D) freezing point
    E) density

   Answer: C

40) A student performs an experiment to determine the density of a sugar solution. She obtains the following results: 1.71 g/mL, 1.73 g/mL, 1.67 g/mL, 1.69 g/mL. If the actual value for the density of the sugar solution is 1.40 g/mL, which statement below best describes her results?
    A) Her results are accurate, but not precise.
    B) Her results are neither precise nor accurate.
    C) Her results are precise, but not accurate.
    D) Her results are both precise and accurate
    E) It isn't possible to determine with the information given.

   Answer: C