Chem. 1A Exam 1 Practice Problems: This is not a "practice test", these are sample questions that will verify your readiness to take the exam. If you can complete these problems without help from your text and notes, then you are likely ready to take the exam. The problems in the set are NOT the exam questions, however the are very similar in context and difficlty.

1) A physical change
   A) occurs when propane is burned for heat.
   B) occurs when iron rusts.
   C) occurs when glucose is converted into energy within your cells.
   D) occurs when sugar is heated into caramel.
   E) occurs when water is evaporated.

2) How many significant figures are in the measurement, 0.0005890 g?
   A) 4   B) 8   C) 6   D) 7   E) 5

3) What answer should be reported, with the correct number of significant figures, for the following calculation?
   (433.621 - 333.9) × 11.900
   A) 1.187×10^3
   B) 1.1868×10^3
   C) 1.18680×10^3
   D) 1.19×10^3
   E) 1.186799×10^3

4) What does it mean to be an exact number? Give an example of an exact number.

5) What is the volume (in cm^3) of a 63.4 g piece of metal with a density of 12.86 g/cm^3?
   A) .425
   B) 19.5
   C) 6.65
   D) 4.93
   E) none of the above

6) If 1.4% of the mass of a human body is calcium, how many kilograms of calcium are there in a 185-pound man?
   A) 5.7 kg Ca   B) 1.2 kg Ca   C) 5.7×10^2 kg   D) 1.2×10^2 kg Ca

7) A fishing boat accidentally spills 3.0 barrels of diesel oil into the ocean. Each barrel contains 42 gallons. If the oil film on the ocean is 2.5×10^2 nm thick, how many square meters will the oil slick cover?
   A) 1.9×10^6 m^2 B) 1.9×10^{-3} m^2 C) 1.9×10^7 m^2 D) none of these

8) How many protons (p) and neutrons (n) are in an atom of $^{90}_{38}Sr$?

   A) 90 p, 38 n   B) 38 p, 52 n   C) 38 p, 90 n   D) 52 p, 38 n

9) What does "X" represent in the following symbol?
   $^{235}_{92}X$
   A) copper   B) niobium   C) tin   D) uranium   E) palladium

10) Which of the following represent isotopes?
    A: $^{32}_{15}X$ B: $^{32}_{16}X$ C: $^{31}_{15}X$ D: $^{34}_{17}X$
    A) C and D   B) A and D   C) A and C   D) A and B

11) Calculate the atomic mass of silver if silver has 2 naturally occurring isotopes with the following masses and natural abundances:

Ag-107   106.90509 amu   51.84%
Ag-109   108.90476 amu   48.46%

   A) 108.00 amu   B) 107.79 amu   C) 108.32 amu   D) 108.19 amu   E) 107.90 amu

12) How many electrons are in the ion, Cu^{2+}?
   A) 27   B) 64   C) 31   D) 29

13) What mass (in kg) does 5.84 moles of titanium (Ti) have?
   A) 0.352 kg   B) 0.632 kg   C) 0.280 kg   D) 0.122 kg   E) 0.820 kg

14) A covalent bond is best described as
   A) a bond between two polyatomic ions.
   B) the transfer of electrons.
   C) a bond between a metal and a polyatomic ion.
   D) the sharing of electrons between atoms.
   E) a bond between a metal and a nonmetal.

15) Identify the compound with ionic bonds.
   A) H_2O B) Ne   C) KBr   D) CO   E) O_2

16) Identify the compound with covalent bonds.
   A) KBr   B) CH_4 C) NaCl   D) Ne   E) Mg

17) What is the empirical formula for $C_4H_{10}O_2$?
   A) CHO_2 B) C_2H_5O C) CH_2O D) CHO   E) C_2H_4O

18) Give the name for SnO.
   A) tin (III) oxide   B) tin (II) oxide   C) tin (IV) oxide   D) tin (I) oxide

19) Write the formula for strontium nitride.
   A) $Sr(NO_3)_2$ B) Sr_3N_2 C) SrN   D) Sr_2N_3 E) $Sr(NO_2)_2$

20) Determine the name for $TiCO_3$. Remember that titanium forms several ions.
   A) titanium (II) carbonate
   B) titanium (II) carbonite
   C) titanium carbonite
   D) titanium carbide
   E) titanium (I) carbonate

21) Determine the name for $CoCl_2·6H_2O$. Remember that Co forms several ions.
   A) cobalt (II) chloride heptahydrate
   B) cobalt (I) chloride
   C) cobalt (I) chloride heptahydrate
   D) cobalt (II) chloride hexahydrate
   E) cobalt chloride hydrate

22) What is the charge on the Cr ions in Cr_2O_3?
   A) 1+   B) 2-   C) 2+   D) 3+

23) Write the name for FeS.
    A) iron (I) sulfide   B) iron (I) sulfate   C) iron sulfide   D) iron (II) sulfate   E) iron (II) sulfide

24) Write the formula for copper (II) sulfate pentahydrate.
    A) $Cu_2SO_3 \cdot H_5$ B) $CuS \cdot 5H_2O$ C) $Cu_2S \cdot H_2O$ D) $CuSO_4 \cdot 5H_2O$ E) $(CuSO_4)_5$

25) Determine the name for H_2CO_3.
    A) carbonous acid
    B) hydrocarbonic acid
    C) dihydrogen carbonate
    D) hydrocarbide acid
    E) carbonic acid

26) Determine the name for aqueous HBr.
    A) hydrobromous acid
    B) hydrogen bromate
    C) hydrobromic acid
    D) bromic acid
    E) bromous acid

27) Give the name for H_2SO_4.
    A) persulfuric acid
    B) sulfuric acid
    C) sulfurous acid
    D) hyposulfurous acid
    E) persulfurous acid

28) Determine the name for N_2O_5.
    A) nitrogen oxide
    B) dinitrogen pentoxide
    C) nitrogen (IV) oxide
    D) nitrogen (II) oxide
    E) nitrogen tetroxide

29) Calculate the mass percent composition of sulfur in $Al_2(SO_4)_3$.
    A) 35.97 %   B) 9.372 %   C) 42.73 %   D) 21.38 %   E) 28.12 %

30) How many atoms of oxygen are contained in 47.6 g of $Al_2(CO_3)_3$? The molar mass of $Al_2(CO_3)_3$ is 233.99 g/mol.
    A) 3.68×10^{23} O atoms
    B) 1.23×10^{23} O atoms
    C) 1.10×10^{24} O atoms
    D) 2.87×10^{25} O atoms
    E) 2.96×10^{24} O atoms

31) How many SO_3 ions are contained in 99.6 mg of Na_2SO_3? The molar mass of Na_2SO_3 is 126.05 g/mol.
    A) 2.10×10^{21} SO_3 ions
    B) 4.76×10^{20} SO_3 ions
    C) 1.52×10^{27} SO_3 ions
    D) 9.52×10^{20} SO_3 ions
    E) 1.05×10^{21} SO_3 ions

32) Determine the molecular formula of a compound that has a molar mass of 92.0 g/mol and an empirical formula of NO_2.

    A) NO_2 B) N_2O_3 C) N_3O_6 D) N_2O_4 E) N_2O_5

33) Determine the empirical formula for a compound that is 36.86% N and 63.14% O by mass.

    A) N_2O_3 B) N_2O C) NO   D) NO_2 E) NO_3

34) Write a **balanced** equation to show the reaction of gaseous ethane with gaseous oxygen to form carbon monoxide gas and water vapor.

    A) $2\ CH_3\ (g) + 5\ O\ (g) \rightarrow 2\ CO\ (g) + 3\ H_2O\ (g)$
    B) $2\ C_2H_6\ (g) + 7\ O_2\ (g) \rightarrow 4\ CO_2\ (g) + 6\ H_2O\ (g)$
    C) $C_2H_6\ (g) + 7\ O\ (g) \rightarrow 2\ CO_2\ (g) + 3\ H_2O\ (g)$
    D) $C_2H_6\ (g) + 5\ O\ (g) \rightarrow 2\ CO\ (g) + 3\ H_2O\ (g)$
    E) $2\ C_2H_6\ (g) + 5\ O_2\ (g) \rightarrow 4\ CO\ (g) + 6\ H_2O\ (g)$

35) Balance the following equation.

_____ $C_{10}H_{12}$ +   _____ O_2 $\rightarrow$ _____ H_2O +   _____ CO_2

36) Methane and oxygen react to form carbon dioxide and water. What mass of water is formed if 0.80 g of methane reacts with 3.2 g of oxygen to produce 2.2 g of carbon dioxide?

    A) 4.0 g   B) 1.8 g   C) 3.7 g   D) 2.2 g

37) Combustion analysis of 1.200 g of an unknown compound containing carbon, hydrogen, and oxygen produced 2.086 g of CO_2 and 1.134 g of H_2O. What is the empirical formula of the compound?

    A) $C_3H_8O_2$ B) $C_2H_5O_2$ C) C_2H_5O D) $C_2H_{10}O_3$

38) Nitrogen dioxide reacts with water to form nitric acid and nitrigen monoxide. How many moles of NO are formed from 8.44 moles of NO_2 if there is excess moles of water present?

    A) 1.83 moles NO   B) 2.81 moles NO   C) 25.3 moles NO   D) 5.63 moles NO   E) 8.44 moles NO

39) How many moles of nitrogen are formed when 58.6 g of potassium nitrate decomposes to form potassium oxide, molecular nitrogen and molecular oxygen? The molar mass of potassium nitrate is is 101.11 g/mol.

    A) 0.290 mol N_2 B) 0.724 mol N_2 C) 0.580 mol N_2 D) 18.5 mol N_2 E) 1.73 mol N_2

40) Two samples of calcium fluoride are decomposed into their constituent elements. The first sample produced 0.154 g of calcium and 0.146 g of fluorine. If the second sample produced 294 mg of fluorine, how many g of calcium were formed?

    A) 2.80×10^2 g   B) 3.09×10^2 g   C) 0.280 g   D) 0.309 g   E) 3.13 g

41) Nitrogen dioxide reacts with water to form nitric acid and nitrigen monoxide. How many grams of water are required to form 75.9 g of HNO_3? Assume that there is excess NO_2 present.

    A) 21.7 g H_2O B) 26.5 g H_2O C) 43.4 g H_2O D) 10.9 g H_2O E) 38.0 g H_2O

42) Carbonic acid can form water and carbon dioxide upon heating. How much carbon dioxide is formed from 6.20 g of carbonic acid?

$$H_2CO_3 \rightarrow H_2O + CO_2$$

    A) 4.40 g   B) 8.80 g   C) 6.20 g   D) 2.20 g

43) Give the percent yield when 28.16 g of CO_2 are formed from the combustion of 4.000 moles of C_8H_{18} with 4.000 moles of O_2.

    A) 25.00%   B) 12.50%   C) 20.00%   D) 50.00%

44) Lithium and nitrogen react in a combination reaction to produce lithium nitride: In a particular experiment, 3.50-g samples of each reagent are reacted. The theoretical yield of lithium nitride is _____ g.

    A) 17.6   B) 8.7   C) 5.85   D) 2.93   E) 3.52

45) Which of the following solutions will have the highest concentration of chloride ions?
    A) 0.10 M sodium chloride
    B) 0.05 M calcium chloride
    C) 0.10 M magnesium chloride
    D) 0.10 M aluminium chloride
    E) All of these solutions have the same concentration of chloride ions.

46) How many liters of a 0.0550 M KCl solution contain 0.163 moles of KCl?
    A) 2.96 L   B) 1.48 L   C) 3.37 L   D) 1.12 L   E) 8.97 L

47) Determine the molarity of a solution formed by dissolving 468 mg of MgI_2 in enough water to yield 50.0 mL of solution.
    A) 0.0107 M   B) 0.0337 M   C) 0.0297 M   D) 0.0651 M   E) 0.0936 M

48) How many milliliters of a 0.266 M $LiNO_3$ solution are required to make 150.0 mL of 0.075 M $LiNO_3$ solution?
    A) 23.6 mL   B) 18.8 mL   C) 35.1 mL   D) 42.3 mL   E) 53.2 mL

49) A solution is prepared by mixing 50.0 mL of 0.100 M HCl and 10.0 mL of 0.200 M NaCl. What is the molarity of chloride ion in this solution?
    A) 0.117   B) 3.50   C) 0.0500   D) 8.57   E) 0.183

50) According to the following reaction, what mass of $PbCl_2$ can form from 235 mL of 0.110 M KCl solution? Assume that there is excess $Pb(NO_3)_2$.

$$2\ KCl(aq) + Pb(NO_3)_2\ (aq) \rightarrow PbCl_2(s) + 2\ KNO_3(aq)$$

    A) 3.59 g   B) 5.94 g   C) 1.80 g   D) 7.19 g   E) 1.30 g

51) What volume of 0.305 M $AgNO_3$ is required to react exactly with 155.0 mL of 0.274 M Na_2SO_4 solution?
    A) 345 mL   B) 139 mL   C) 173 mL   D) 278 mL   E) 581 mL

52) Which of the following is **NOT** a strong electrolyte?
    A) $NaC_2H_3O_2$ B) LiOH   C) $MgCO_3$ D) Li_2SO_4 E) $CaCl_2$

53) Identify sugar.
    A) weak electrolyte, weak acid
    B) nonelectrolyte
    C) weak electrolyte, strong acid
    D) strong electrolyte, weak acid
    E) strong electrolyte, strong acid

54) Which of the following solutions will have the highest electrical conductivity?
    A) 0.10 M sodium iodide
    B) 0.10 M lithium bromide
    C) 0.050 M ammonium chloride
    D) 0.045 M aluminum sulfate
    E) 0.10 M potassium fluoride

55) How many of the following compounds are **insoluble** in water?

    potassium acetate   calcium sulfate strontium sulfide aluminum phosphate

    A) 3   B) 1   C) 4   D) 0   E) 2

56) Which of the following pairs of aqueous solutions will form a precipitate when mixed?
    A) $Hg_2(NO_3)_2$ + LiI
    B) NaCl + Li_3PO_4
    C) $AgC_2H_3O_2$ + $Cu(NO_3)_2$
    D) NH_4NO_3 + Li_2CO_3
    E) None of the above solution pairs will produce a precipitate.

57) Identify the spectator ions in the following molecular equation.

$$KBr(aq) + AgNO_3(aq) \rightarrow AgBr(s) + KNO_3(aq)$$
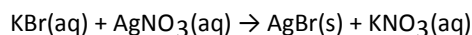
    A) K^+ and NO_3^-

    B) K^+ and Br^-

    C) Ag^+ and Br^-

    D) Ag^+ and NO_3^-

    E) There are no spectator ions in this reaction.

58) What reagent could **not** be used to separate Br^- from CO_3^{2-} when added to an aqueous solution containing both?
    A) $Ca(NO_3)_2$ *(aq)*   B) $AgNO_3$ *(aq)*   C) $Fe(NO_3)_2$*(aq)*   D) $Cu(NO_3)_2$ *(aq)*

59) Give the **complete ionic equation** for the reaction (if any) that occurs when aqueous solutions of $MgSO_3$ and HI are mixed.
    A) $Mg^{2+}(aq) + 2\ I^-(aq) \rightarrow MgI_2(s)$
    B) $2\ H^+(aq) + SO_3^{2-}(aq) + Mg^{2+}(aq) + 2\ I^-(aq) \rightarrow H_2SO_3(s) + MgI_2(aq)$
    C) $2\ H^+(aq) + SO_3^{2-}(aq) \rightarrow H_2SO_3(s)$
    D) $2\ H^+(aq) + SO_3^{2-}(aq) \rightarrow H_2O(l) + SO_2(g)$
    E) No reaction occurs.

60) Identify the polyprotic acid.
    A) H_2SO_4 B) HCl   C) $Li(OH)_2$ D) NaOH   E) NaCl

61) Which of the following is an oxidation-reduction reaction?
    A) $Pb(C_2H_3O_2)_2(aq) + 2\ NaCl(aq) \rightarrow PbCl_2(s) + 2\ NaC_2H_3O_2(aq)$
    B) $Mg(s) + 2\ HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
    C) $NaI(aq) + AgNO_3(aq) \rightarrow AgI(s) + NaNO_3(aq)$
    D) $HCl(aq) + LiOH(aq) \rightarrow LiCl(aq) + H_2O(l)$
    E) All of the above are oxidation-reduction reactions.
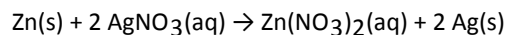
62) Determine the oxidation state of S in $MgSO_4$.

    A) -2   B) +2   C) -4   D) +4   E) +6
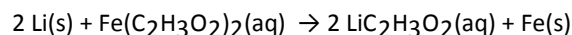
63) Identify the oxidation state of H in $H_2(g)$.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$
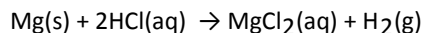
    A) 0   B) +1   C) -2   D) +2   E) -1

64) What element is undergoing oxidation (if any) in the following reaction?

$$Zn(s) + 2\ AgNO_3(aq) \rightarrow Zn(NO_3)_2(aq) + 2\ Ag(s)$$

    A) N
    B) Zn
    C) O
    D) Ag
    E) This is not an oxidation-reduction reaction.

65) Determine the reducing agent in the following reaction.

$$2\ Li(s) + Fe(C_2H_3O_2)_2(aq) \rightarrow 2\ LiC_2H_3O_2(aq) + Fe(s)$$

    A) H   B) O   C) C   D) Li   E) Fe

66) What is the concentration of $FeCl_3$ in a solution prepared by dissolving 20.0 g of $FeCl_3$ in enough water to make 275 mL of solution?

    A) 2.23×10^3 M   B) 0.448 M   C) 4.48×10^{-4} M   D) 2.23 M

67) What is the concentration (M) of sodium ions in 4.57 L of a .398 M Na_3P solution?

68) A $FeCl_3$ solution is 0.175 M. How many mL of a 0.175 M $FeCl_3$ solution are needed to make 450. mL of a solution that is 0.300 M in Cl^- ion?

    A) 257 mL
    B) 771 mL
    C) 0.771 mL
    D) It is not possible to make a more concentrated solution from a less concentrated solution.

69) When 31.2 mL of 0.500 M $AgNO_3$ is added to 25.0 mL of 0.300 M NH_4Cl, how many grams of AgCl are formed?

    A) 2.24 g   B) 1.07 g   C) 6.44 g   D) 3.31 g

70) How many milliliters of 0.550 M hydriodic acid are needed to react with 15.00 mL of 0.217 M CsOH?

    A) 38.0 mL   B) 0.169 mL   C) 0.0263 mL   D) 5.92 mL

71) The titration of 80.0 mL of an unknown concentration H_3PO_4 solution requires 126 mL of 0.218 M KOH solution. What is the concentration of the H_3PO_4 solution (in M)?

    A) 0.138 M   B) 0.0461 M   C) 1.03 M   D) 0.114 M   E) 0.343 M

1) E
2) A
3) D
4) An exact number has an infinite number of significant figures even though we typically don't write many of them out. If there are 26 people in a classroom, there are exactly 26.00000.... people in that room. There is no possibility of a half person, so this is an exact whole number with no ambiguity.
5) D
6) B
7) A
8) B
9) D
10) C
11) D
12) A
13) C
14) D
15) C
16) B
17) B
18) B
19) B
20) A
21) D
22) D
23) E
24) D
25) E
26) C
27) B
28) B
29) E
30) C
31) B
32) D
33) A
34) E
35) $C_{10}H_{12} + 13 O_2 \rightarrow 6 H_2O + 10 CO_2$
36) B
37) A
38) B
39) A
40) D

41) D
42) A
43) A
44) C
45) D
46) A
47) B
48) D
49) A
50) A
51) D
52) C
53) B
54) D
55) E
56) A
57) A
58) B
59) D
60) A
61) B
62) E
63) A
64) B
65) D
66) B
67) 1.19
68) A
69) B
70) D
71) D