NAME ____

CHEMISTRY 101 SPRING 2010

EXAM 2 FORM A SECTION 502 DR. KEENEY-KENNICUTT

Directions:
(1) Put your name on PART 1 and your name and signature on PART 2 of the exam where indicated.
(2) Sign the Aggie Code on PART 2 of this exam.
(3) Each multiple choice question is actually 2 questions on your scanning sheet. If you are sure of an answer, **put the same answer down for both questions** for 5 pts. If you cannot decide between two answers, put your BEST answer down for the ODD/FIRST question for 3 pts and your SECOND BEST answer down for the EVEN/SECOND question for 2 pts. If there is an ambiguous multiple choice question, use the last page to explain your answer.
(4) Do NOT write on the envelope.
(5) When finished, put everything in the envelope and wait to be excused. At the table, take everything out of the envelope. You can pick up the multiple choice part with the answers outside my office after 2:30pm.
(6) There are a total of 34 questions (18 actual questions).

PART 1

1&2. In Bronsted-Lowry Theory of acids and bases, an acid is defined as:

(a) a proton donor (b) a hydroxide donor (c) an electron-pair acceptor
(d) a water-former (e) a proton acceptor

3&4. Determine the oxidation number of bromine in the perbromate ion, BrO_4^-.

(a) +2 (b) +4 (c) +6 (d) +7 (e) +8

5&6. Assign oxidation numbers to each element in this **unbalanced** reaction. The oxidation agent is:

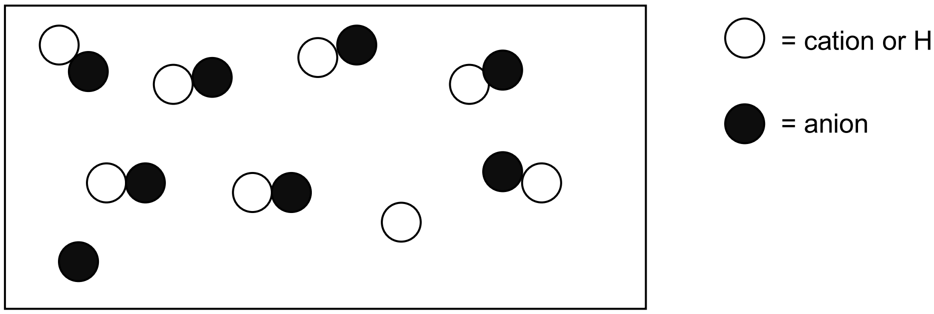
$$P_4 + NO \rightarrow P_4O_6 + N_2$$

(a) P_4 (b) NO (c) P_4O_6 (d) N_2 (e) this is not a redox reaction

7&8. Which statement is FALSE?

(a) Energy is the capacity to do work.
(b) An exothermic reaction releases heat.
(e) When two objects come into contact, they will in time be at the same temperature.
(d) A joule is a unit of energy.
(c) Heat flows from a cold object to a hot one.

9&10. Here is a particle view of a substance in water. Pick the compound that is represented by this particle view.



(a) NaCl (b) NaOH (c) AgOH (d) HF (e) $LiCH_3COO$

11&12. Balance the equation with the SMALLEST WHOLE NUMBER COEFFICIENTS possible. Choose the number that is the SUM of the coefficients in the balanced equation. Don't forget coefficients of one.

$$Na_2SO_3 + HCl \rightarrow NaCl + H_2O + SO_2$$

(a) 5 (b) 7 (c) 9 (d) 12 (e) 15

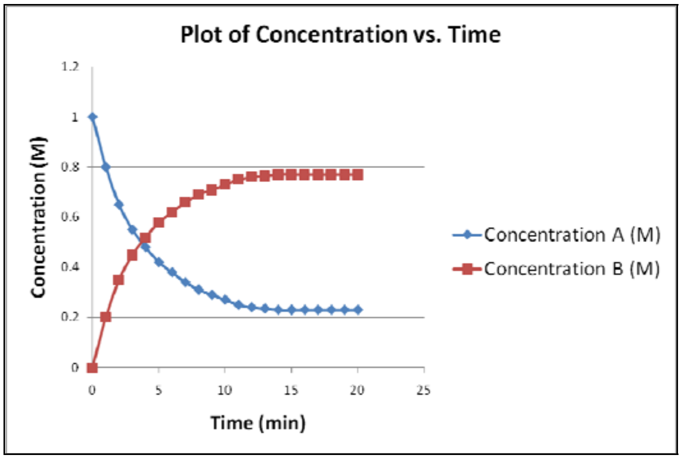
13&14. Consider this acid-base net ionic equation: $CH_3COOH(aq) + OH^-(aq) \rightarrow CH_3COO^-(aq) + H_2O(\ell)$

Which of the following statements is TRUE?

(a) The acid is a strong acid.
(b) The base is insoluble.
(c) The spectator ion could have been a NO_3^- ion.
(d) The salt is a weak electrolyte.
(e) The spectator ion could have been a Na^+ ion.

15&16. Consider this graph representing A $\rightleftarrows$ B. Which is the FALSE statement?

(a) A and B reach equilibrium after 15 minutes.
(b) The reaction is reactant-favored.
(c) After about 15 minutes, the concentrations of A and B seem to be about constant.
(d) After about 15 minutes, A is becoming B just as fast as B is converting to A.
(e) Even after 15 minutes, the system is very dynamic.



17&18. The pH of a 0.0177 M solution of $HClO_3$ is

(a) 4.03 (b) 1.04 (c) 1.75 (d) 1.00 (e) 2.15

19&20. How many moles of NH_3 will be produced when 8.94 moles of H_2O are also produced according to the following equation?

$$Ce_2O_3 + 6\,NH_4Cl \rightarrow 2\,CeCl_2 + 3\,H_2O + 6\,NH_3$$

(a) 4.47 mol (b) 13.4 mol (c) 6.00 mol (d) 17.9 mol (e) 2.24 mol

21&22. How many grams of patassium chloride are in 775 mL of a solution which is 35.5% KCl by weight and has a density of 1.28 g/mL?

(a) 215 g (b) 275 g (c) 352 g (d) 640 g (e) 972 g

23&24. Carbon tetrachloride, a valuable commercial solvent, can be produced by the gas phase reaction of methane with chlorine gas.

$$CH_4 + 4\ Cl_2 \rightarrow CCl_4 + 4\ HCl$$

Assuming this process is 64% efficient, how many kilograms of chlorine are required for the production of 15 kg of CCl_4, assuming excess CH_4?

(a) 43 kg (b) 18 kg (c) 67 kg (d) 83 kg (e) 96 kg

25&26. Consider the reaction: $2\ KCrO_2 + 3\ H_2O_2 + 2\ KOH \rightarrow 2\ K_2CrO_4 + 4\ H_2O$

If 20.0 g of each reactant were used for this reaction, the limiting reactant would be:

(a) $KCrO_2$ (b) H_2O_2 (c) KOH (d) K_2CrO_4 (e) H_2O

27&28. How many milliliters of a 1.40 M NaOH solution are required to make 250. mL of 0.100 M NaOH solution?

(a) 14.7 mL (b) 3500 mL (c) 17.9 mL (d) 35.0 mL (e) 25.0 mL

29&30. If 6.00 g of HBr was dissolved in enough water to give a pH of 1.78, what was the volume of the solution?

(a) 4.47 L (b) 1.30 L (c) 2.59 L (d) 5.95 L (e) 3.22 L

31&32. A 2.00 g sample of calcite ore containing $CaCO_3$ reacted totally with 15.22 mL of 2.30 M hydrochloric acid until no more carbon dioxide gas was evolved according to:

$$CaCO_3 + HCl \rightarrow H_2O + CaCl_2 + CO_2 \quad \text{(UNBALANCED)}$$

What percentage of the sample was $CaCO_3$?

(a) 96.2% (b) 71.9% (c) 63.1% (d) 87.6% (e) 43.8%

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SPRING 2010 Section 502

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PART 2

Please read and sign: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam." ____

33. Consider the precipitation reaction between aqueous solutions of sodium phosphate and calcium nitrate. If you have problems with the nomenclature, make something up and go with that to get partial credit.

(4 pts) (a) What is the balanced formula unit equation? Include the phase for every compound.

(2 pts) (c) What is/are the spectator ion/s, if any?

(2 pts) (d) What is the net ionic equation? Include the charge for every ion.

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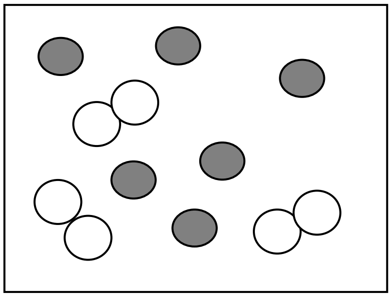
34. Consider this reaction: $S + O_2 \rightarrow SO_3$.

(2 pts) (a) Balance the equation.

(3 pts) (b) If you had 6 moles of S and 3 moles of O_2, draw the particle view that would represent the final situation. Let (shaded circle) = S and (open circle) = O



Initial system

Final system

(2 pts) (c) What is the limiting reactant? ________________________

(5 pts) **35.** Given: benzene (C_6H_6): m.p. 5.5°C, b.p. 80.0°C

heat of fusion = 127 J/g at 5.5°C

heat of vaporization = 395 J/g at 80.°C

specific heat (g) = 1.04 J/g°C

specific heat (ℓ) = 1.74 J/g°C

specific heat (s) = 0.89 J/g°C

Calculate the amount of heat that must be absorbed to convert 425 g of solid benzene at 5.5°C to liquid benzene at 70.0°C (in kJ).

SCRAP PAPER OR COMMENTS ON EXAM