NAME _____

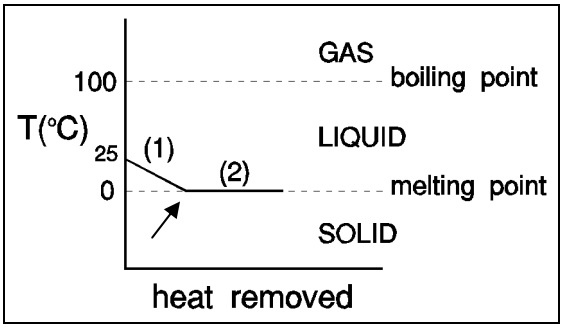
CHEMISTRY 101 SPRING 2010

EXAM 2 FORM D SECTION 503 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. Consider this illustration. Which statement is FALSE?



(a) At the intersection where Step 1 and Step 2 meet, the substance is a solid.
(b) For Step 2: heat = Ht. of fusion x mass
(c) The substance may be water.
(d) For Step 1: heat = Sp.Ht. x mass x ΔT
(e) The substance is being cooled to a solid at its freezing point.

3&4. Assign oxidation numbers to each element in this reaction. The reducing agent is:

$$16\ H^+ + 2\ MnO_4^- + 10\ SO_4^{2-} \rightarrow 2\ Mn^{2+} + 5\ S_2O_8^{2-} + 8\ H_2O$$

(a) H^+ (b) MnO_4^- (c) SO_4^{2-} (d) Mn^{2+} (e) $S_2O_8^{2-}$

5&6. Which statement is FALSE?

(a) When water freezes, heat is released.
(b) An endothermic reaction requires heat.
(c) A thermometer placed into a liquid will reach thermal equilibrium with the liquid.
(d) Specific heat values are used to calculate the heat involved in changing phase.
(e) The heat of vaporization has units of J/g.

7&8. Determine the oxidation number of P in the hydrogen phosphate ion, HPO_4^{2-}.

(a) +2 (b) +3 (c) +5 (d) +7 (e) +8

9&10. In Bronsted-Lowry Theory of acids and bases, the conjugate base of HPO_4^{2-} is:

(a) H_2O (b) OH^- (c) H_3PO_4 (d) $H_2PO_4^-$ (e) PO_4^{3-}

11&12. Consider this acid-base net ionic equation: $2H^+(aq) + Cu(OH)_2(s) \rightarrow Cu^{2+}(aq) + 2H_2O(\ell)$

Which of the following statements is TRUE?

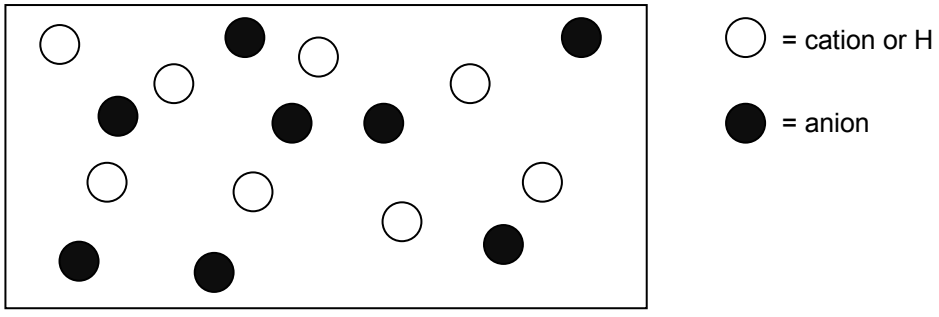
(a) The acid is a weak acid.
(b) The base is a weak electrolyte.
(c) The salt is insoluble.
(d) The spectator ion could have been a NO_3^- ion.
(e) The reaction is called a precipitation reaction.

13&14. 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.

$$NH_4NO_3 \rightarrow N_2O + H_2O$$

(a) 3 (b) 4 (c) 5 (d) 7 (e) 9

15&16. Here is a particle view of a substance in water. Pick the compound that is represented by this particle view.



(a) HF (b) CuS (c) KOH (d) NH_3 (e) AgOH

17&18. What mass of SiF_4 could be produced by the reaction of 15 g of HF with an excess of SiO_2? The **unbalanced** equation for the reaction is:

$$SiO_2 + HF \rightarrow SiF_4 + H_2O \quad \text{(UNBALANCED)}$$

(a) 19.5 g (b) 1.21 g (c) 3.02 g (d) 10.4 g (e) 15.0 g

19&20. The pH of a 5.40×10^{-5} M solution of $HClO_3$ is

(a) 3.29 (b) 4.27 (c) 5.70 (d) 3.58 (e) 1.00

21&22. What concentration of HI will be made when 75.0 mL of 3.00 M HI is diluted to 500.0 mL?

(a) 1.47 M (b) 2.15 M (c) 21.0 M (d) 0.350 M (e) 0.450 M

23&24. If 10.5 grams of potassium arsenate, K_3AsO_4, are dissolved in 100.00 g of water, what is the percent K_3AsO_4 by mass in the solution?

(a) 8.5% (b) 10.3% (c) 9.50% (d) 8.2% (e) 7.5%

25&26. What is the percentage yield of elemental sulfur if 3.00 grams of sulfur are obtained from the reaction of 4.00 grams of H_2S with an excess of SO_2?

$$2\ H_2S\ +\ SO_2\ \rightarrow\ 2\ H_2O\ +\ 3\ S$$

(a) 53.2% (b) 48.9% (c) 83.7% (d) 28.4% (e) 45.6%

27&28. Consider the reaction: $KMnO_4\ +\ 5\ FeCl_2\ +\ 8\ HCl\ \rightarrow\ MnCl_2\ +\ 5\ FeCl_3\ +\ 4\ H_2O\ +\ KCl$

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

(a) $KMnO_4$ (b) $FeCl_2$ (c) HCl (d) $MnCl_2$ (e) $FeCl_3$

29&30. Gold can be dissolved from gold-bearing ore by treating the rock with sodium cyanide in the presence of oxygen gas, according to:

$$4\ Au + 8\ NaCN + O_2 + 2\ H_2O \rightarrow 4\ NaAu(CN)_2 + 4\ NaOH$$

If 20.0 mL of 0.0750 M NaCN are required to react with all the gold in 1550 g of rock, what is the percentage of gold in the ore sample?

(a) 0.0162% (b) 0.0361% (c) 0.176% (d) 0.00953% (e) 0.0582%

31&32. If 2.00 g of HBr was dissolved in enough water to give a pH of 1.33, what was the volume of the final solution?

(a) 761 mL (b) 349 mL (c) 1220 mL (d) 231 mL (e) 529 mL

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PART 2

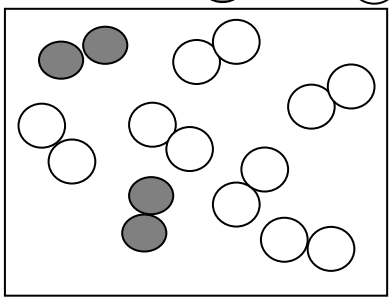
Please read and sign: "On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam." _____

(5 pts) **33.** A 13.8 g chunk of zinc is heated to 98.8°C. It is then immersed in 45.0 g water originally at 25.0°C. The final temperature of both the iron and the water is 27.1°C. Calculate the specific heat of iron. The specific heat of water is 4.18 J/g•°C.

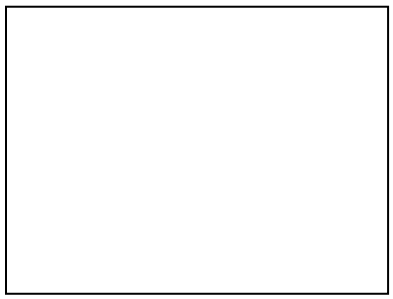
34. Consider this reaction: $N_2 + O_2 \rightarrow NO_2$.

(2 pts) (a) Balance the equation.

(3 pts) (b) If you had 2 moles of N_2 and 6 moles of O_2, draw the particle view that would represent the final situation. Let ● = N and ○ = O



Initial system



Final system

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

OVER ⇒

35. Consider the precipitation reaction between aqueous solutions of potassium carbonate and chromium(III) 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) (b) What is/are the spectator ion/s, if any?

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

SCRAP PAPER OR COMMENTS ON EXAM

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