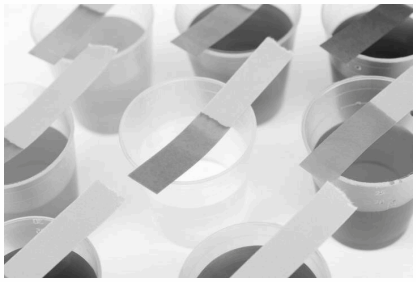
Chemistry 221 Exam II Review
Chapters 3, 4 and 5



Chemistry 221
Professor Michael Russell

Last update: 4/29/24

MAR

____ $H_2S(g)$ + ____ $SO_2(g)$ → ____ $S(s)$ + ____ $H_2O(g)$

Which statement regarding this reaction is true?

A. 3 moles of S are produced per mole of H_2S.
B. 1 mole of SO_2 is consumed per mole of H_2S.
C. 1 mole of H_2O is produced per mole of H_2S.
D. The total number of moles of products is always equal to the total number of moles of reactants used.
E. None of these statements are true.

MAR

What is the balanced equation for the combustion of butane, C_4H_{10}?

A. $C_4H_{10}(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$
B. $2\ C_4H_{10}(g) + 13\ O_2(g) \rightarrow 8\ CO_2(g) + 10\ H_2O(g)$
C. $C_4H_{10}(g) + 13\ O_2(g) \rightarrow 4\ CO_2(g) + 5\ H_2O(g)$
D. $C_4H_{10}(g) + 9\ O_2(g) \rightarrow 4\ CO_2(g) + 10\ H_2O(g)$

MAR

In the reaction of 2.0 mol of CCl_4 with an excess of HF, 1.7 mol of CCl_2F_2 is obtained.

$$CCl_4(l) + 2\ HF(g) \rightarrow CCl_2F_2(l) + 2\ HCl(g)$$

Which statement is true here?

A. The theoretical yield for CCl_2F_2 is 1.7 mol.
B. The actual yield for CCl_2F_2 is 1.0 mol.
C. The percent yield for the reaction is 85%.
D. Theoretical yield cannot be determined unless the exact amount of HF used is known.
E. Infinite diversity in infinite combinations (IDIC)

MAR

Burning sulfur in an atmosphere of fluorine produces the very stable compound SF_6.

$$S_8(s) + 24\ F_2(g) \rightarrow 8\ SF_6(g)$$

If you wish to produce 2.50 moles of SF_6, you will need to use:

A. 0.313 moles of S_8 and 7.50 moles of F_2.
B. 1.00 moles of S_8 and 24.0 moles of F_2.
C. 0.125 moles of S_8 and 3.00 moles of F_2.
D. 8.00 moles of S_8 and 24.0 moles of F_2.
E. More information is required to answer this question.

MAR

Ammonia is prepared by the reaction:

$$N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$$

If 10.0 mol of N_2 are mixed with 25.0 mol of H_2, the amount of NH_3 produced will be:

A. 20.0 mol NH_3
B. 16.7 mol NH_3
C. 37.5 mol NH_3
D. 25.0 mol NH_3
E. 35.0 mol NH_3

MAR

A compound with C, H and O is found through combustion analysis of a 0.255 g sample to give 0.561 g CO_2 and 0.306 g H_2O; it also has a molar mass of 60.1 g/mol. What is the molecular formula?

A. CH_3CO_2H
B. $C_4H_9O_3$
C. C_3H_6O
D. $C_9H_7O_3$
E. C_3H_8O

MAR

Which of the following is the only insoluble salt in water?

A. NH_4NO_3
B. NaOH
C. PbI_2
D. K_2CO_3
E. LiCl

MAR

Which of the compounds below is *not* an acid in aqueous solution?

A. CH_3CO_2H
B. H_3PO_4
C. NH_3
D. HCl
E. $HClO_4$

MAR

Which equation below best represents the balanced, net ionic equation for the reaction of magnesium carbonate with nitric acid?

A. $MgCO_3(s) + 2\ HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + CO_2(g) + H_2O(l)$
B. $MgCO_3(s) + 2\ H^+(aq) \rightarrow Mg^{2+}(aq) + CO_2(g) + H_2O(l)$
C. $Mg^{2+}(aq) + 2\ NO_3^-(aq) \rightarrow Mg(NO_3)_2(s)$
D. $MgCO_3(s) + 2\ HNO_3(aq) \rightarrow Mg(NO_3)_2(aq) + H_2CO_3(aq)$
E. More information is required to answer this question.

MAR

Which equation below best represents the balanced net ionic equation for the reaction of potassium hydroxide and iron(II) chloride to give iron(II) hydroxide and potassium chloride?

A. $2\ KOH(aq) + FeCl_2(aq) \rightarrow Fe(OH)_2(s) + 2\ KCl(aq)$
B. $2\ KOH(aq) + FeCl_2(aq) \rightarrow Fe(OH)_2(aq) + 2\ KCl(aq)$
C. $2\ OH^-(aq) + Fe^{2+}(aq) \rightarrow Fe(OH)_2(s)$
D. $K^+(aq) + Cl^-(aq) \rightarrow KCl(aq)$
E. More information is required to answer this question.

MAR

Which of the following statements is correct regarding the reaction of Zn with VO_2^+?

$Zn(s) + 4\ H^+(aq) + 2\ VO_2^+(aq) \rightarrow Zn^{2+}(aq) + 2\ VO^{2+}(aq) + 2\ H_2O(l)$

A. Zn is oxidized and VO_2^+ is the reducing agent.
B. Zn is reduced and VO_2^+ is the reducing agent.
C. Zn is oxidized and VO_2^+ is the oxidizing agent.
D. Zn is reduced and VO_2^+ is the oxidizing agent.
E. This is not a redox reaction.

MAR

Assume you dissolve 6.73 g Na_2CO_3 in enough water to make 250. mL of solution. (Molar mass of Na_2CO_3 = 106 g/mol.) What is the concentration of the sodium carbonate?

A. 26.9 M
B. 0.0635 M
C. 0.254 M
D. 0.762 M
E. 42 M

MAR

60.0 mL of 0.25 M HCl are added to a 500. mL volumetric flask; water is added to the mark on the flask. What is the concentration of HCl in the diluted solution?

A. 0.015 M
B. 0.025 M
C. 0.030 M
D. 0.060 M
E. 0.050 M

MAR

What is the pH of dilute nitric acid with a concentration of 0.030 M?

A. 0.030
B. 1.52
C. 1.82
D. 2.50
E. 3.00

MAR

What mass of Na_2CO_3 (molar mass = 106.0 g/mol) is required for complete reaction with 25.0 mL of 0.155 M HNO_3?

$Na_2CO_3(aq) + 2\ HNO_3(aq) \rightarrow 2\ NaNO_3(aq) + CO_2(g) + H_2O(l)$

A. 0.410 g
B. 205 g
C. 0.205 g
D. 0.122 g
E. 37 kg

MAR

A piece of copper (5.00 g) is heated for 2.0 seconds, and 100. J of heat energy is transferred to the copper. The temperature increases from 20.0 °C to 71.9 °C. Calculate the specific heat capacity of copper.

A. 0.278 J/g•K
B. 0.385 J/g•K
C. 1.93 J/g•K
D. 2.60 J/g•K
E. -0.977 J/g•K

MAR

When 108 grams of water at 22.5 °C are mixed with 65.1 grams of water at an unknown temperature, the final temperature of the mixture is 47.9 °C. What was the initial temperature of the other sample of water?

A. 8.9 °C
B. 79.7 °C
C. 67.0 °C
D. 90.0 °C
E. 274 °C

MAR

The standard molar enthalpy of combustion for propane is -2044 kilojoules.

$C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(l)$

What is the standard enthalpy change for the combustion of 3.000 mol of propane (C_3H_8)?

A. -6132 kJ
B. -2044 kJ
C. -4088 kJ
D. +2044 kJ
E. +6132 kJ

MAR

Calculate the enthalpy for the reaction

$SiH_4(g) + 2\ O_2(g) \rightarrow SiO_2(g) + 2\ H_2O(g)$

using these values:

$\Delta H^\circ_f[SiH_4(g)] = +34.3$ kJ/mol;

$\Delta H^\circ_f[SiO_2(g)] = -910.9$ kJ/mol; and

$\Delta H^\circ_f[H_2O(g)] = -241.8$ kJ/mol

A. -1187.0 kJ/rxn
B. -1428.8 kJ/rxn
C. -1360.2 kJ/rxn
D. -2218.7 kJ/rxn
E. Not enough information

MAR

Which equation below defines the standard molar enthalpy of formation of gaseous methanol, CH_3OH?

A. $CH_4(g) + ½\ O_2(g) \rightarrow CH_3OH(g)$
B. $C(s) + 2\ H_2(g) + ½\ O_2(g) \rightarrow CH_3OH(g)$
C. $CO(g) + 2\ H_2(g) \rightarrow CH_3OH(g)$
D. $H_2O(g) + C(s) + H_2(g) \rightarrow CH_3OH(g)$
E. You'll go blind if you drink methanol! Who cares! :)

MAR

Calculate the standard molar enthalpy of formation for $FeCl_2(s)$ using the following:

$½\ Cl_2(g) + FeCl_2(s) \rightarrow FeCl_3(s)$ $\quad \Delta H^\circ_r = -57.7$ kJ/rxn

$Fe(s) + {}^3/_2\ Cl_2(g) \rightarrow FeCl_3(s)$ $\quad \Delta H^\circ_f = -399.5$ kJ/rxn

A. -57.7 kJ/mol
B. -341.8 kJ/mol
C. -284.1 kJ/mol
D. -457.2 kJ/mol
E. 42 kJ/mol

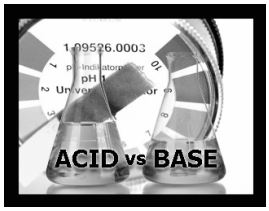
MAR

End of Review - *good luck with your studying!*

Need more practice?

- *Practice Problem Sets (online)*
- *Concept Guides (Companion and online)*
- *Chapter Guides (online)*
- *End of Chapter Problems in Textbook (every other question has answer at end)*

Good luck with your studying!



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