

1968

- a) iron(III) ions are reduced by iodide ions.
- b) hydrogen sulfide is bubbled through a solution of silver nitrate.
- c) potassium permanganate solution is added to concentrated hydrochloric acid.
- d) concentrated (15M) ammonia solution is added in excess to a solution of copper(II) nitrate.
- e) magnesium metal is added to dilute nitric acid, giving as one of the products a compound in which the oxidation number for nitrogen is -3.
- f) excess water is added to solid calcium hydride.
- g) excess silver acetate is added to a solution of trisodium phosphate.
- h) solid sodium cyanide is added to water.

1969

- a) solid potassium hydride is added to anhydrous ethyl alcohol.
- b) lithium metal is burned in air.
- c) aluminum metal is added to a solution of copper(II) chloride.
- d) liquid phosphorus trichloride is poured into a large excess of water.
- e) manganese(II) nitrate solution is mixed with sodium hydroxide solution.
- f) equal volumes of dilute equimolar solutions of sodium carbonate and hydrochloric acid are mixed.
- g) solid sodium carbide is added to an excess of water.
- h) an excess of sodium hydroxide solution is added to a solution of aluminum chloride.

1970

- a) a mixture of solid calcium oxide and solid tetraphosphorus decaoxide is heated.
- b) solid barium peroxide is added to cold dilute sulfuric acid.
- c) dilute acetic acid solution is added to solid magnesium carbonate.
- d) the hydrocarbon hexane is burned in excess oxygen.
- e) solid magnesium nitride is added to excess deuterium oxide.
- f) gaseous hydrofluoric acid reacts with solid silicon dioxide
- g) potassium dichromate solution is added to an acidified solution of sodium sulfite.
- h) dilute hydrochloric acid is added to a solution of diamminesilver(I) nitrate

1971

- a) equimolar amounts of trisodium phosphate and hydrogen chloride, both in solution, are mixed.
- b) propene gas is mixed with bromine vapor.
- c) solid aluminum nitrate is dissolved in water.
- d) solutions of potassium iodide, potassium iodate, and dilute sulfuric acid are mixed.
- e) a solution of tin(II) sulfate is added to a solution of iron(III) sulfate.
- f) a suspension of copper(II) hydroxide is treated with an excess of ammonia water.
- g) a saturated solution of calcium hydroxide is added to a solution of magnesium chloride.
- h) solid silver sulfide is warmed with dilute nitric acid

1972

- a) hydrogen gas is passed over hot copper(II) oxide.
- b) solid zinc sulfide is heated in an excess of oxygen.
- c) a limited amount of liquid bromine is added to an excess of benzene.
- d) a solution of diamminesilver(I) chloride is treated with dilute nitric acid.
- e) metallic copper is heated with concentrated sulfuric acid.
- f) sulfur dioxide gas is bubbled into an excess of a saturated solution of calcium hydroxide.
- g) manganese(IV) oxide is added to warm, concentrated hydrobromic acid.
- h) hydrogen sulfide gas is added to a solution of cadmium nitrate.

1973

- a) chlorine gas is bubbled into cold dilute sodium hydroxide.
- b) solid iron(III) oxide is heated in excess carbon monoxide.
- c) solid magnesium carbonate is heated.
- d) trisodium phosphate crystals are added to water.
- e) gaseous diborane, B_2H_6 , is burned in excess oxygen.
- f) small chunks of solid sodium are added to water.
- g) hydrogen peroxide solution is added to acidified potassium iodide solution.
- h) pure methyl alcohol and pure acetic acid are mixed.
- i) an excess of concentrated ammonia solution is added to freshly precipitated copper(II) hydroxide.

1974

- a) a sample of pure 2-butene is treated with hydrogen bromide gas.
- b) water is added to a sample of pure phosphorus tribromide.
- c) hydrogen peroxide is added to an acidified solution of potassium dichromate.
- d) calcium metal is added to a dilute solution of hydrochloric acid.
- e) a solution of sulfuric acid is added to a solution of barium hydroxide until the same number of moles of each compound has been added.
- f) excess dilute nitric acid is added containing the tetraamminecadmium(II) ion.
- g) sulfur dioxide gas is bubbled through an acidified solution of potassium permanganate.
- h) pellets of aluminum metal are added to a solution containing an excess of sodium hydroxide.
- i) a solution of sodium hydroxide is added to a solution of sodium dihydrogen phosphate until the same number of moles of each compound had been added.

1975

- a) a solution containing tin(II) ions is added to an acidified solution of potassium dichromate.
- b) liquid bromine is added to a solution of potassium iodide.
- c) an excess of ammonia gas is bubbled through a solution saturated with silver chloride.
- d) water is added to a sample of pure sodium hydride.
- e) an excess of chlorine gas is added to pure acetylene.
- f) a dilute solution of sulfuric acid is electrolyzed between platinum electrodes.
- g) excess oxygen gas is mixed with ammonia gas in the presence of platinum.

- h) dilute nitric acid is added to crystals of pure calcium oxide.
- i) a solution of sodium hydroxide is added to a solution of calcium hydrogen carbonate until the number of moles of sodium hydroxide added is twice the number of moles of the calcium salt.

1976

- a) solid calcium oxide is exposed to a stream of carbon dioxide gas.
- b) dinitrogen trioxide gas is bubbled into water.
- c) sodium hydrogen carbonate is dissolved in water.
- d) pellets of lead are dropped into hot sulfuric acid.
- e) potassium permanganate solution is added to a solution of oxalic acid, $\text{H}_2\text{C}_2\text{O}_4$, acidified with a few drops of sulfuric acid.
- f) magnesium turnings are added to a solution of iron(III) chloride.
- g) ethyl acetate is treated with a solution of sodium hydroxide.
- h) a suspension of zinc hydroxide is treated with concentrated sodium hydroxide solution.

1977

- a) dilute sulfuric acid is added to a solution of barium acetate.
- b) ammonium chloride crystals are added to a solution of sodium hydroxide.
- c) solid phosphorus pentachloride is added to excess water.
- d) a solution of hydrogen peroxide is catalytically decomposed.
- e) powdered iron is added to a solution of iron(III) sulfate.
- f) chlorine gas is bubbled into a solution of sodium bromide.
- g) a precipitate is formed when solutions of trisodium phosphate and calcium chloride are mixed.
- h) benzene is treated with bromine in the presence of a catalyst.

1978

- a) gaseous silane, SiH_4 , is burned in oxygen.
- b) equal volumes of 0.1M hydrochloric acid and 0.1M sodium monohydrogen phosphate are mixed.
- c) hydrogen sulfide gas is bubbled through a solution of lead(II) nitrate.
- d) solid zinc strips are added to a solution of copper(II) sulfate.
- e) solid lithium oxide is added to excess water.
- f) copper(II) sulfide is oxidized by dilute nitric acid
- g) silver chloride is dissolved in excess ammonia solution.
- h) propene reacts with water in the presence of a catalyst.

1979

- a) a solution of copper(II) sulfate is electrolyzed using inert electrodes.
- b) hydrogen sulfide gas is bubbled through excess potassium hydroxide solution.
- c) solutions of silver nitrate and sodium chromate are mixed.
- d) sodium hydroxide solution is added to a precipitate of aluminum hydroxide in water.
- e) solid sodium sulfite is added to water.
- f) a solution of formic acid, HCOOH , is oxidized by an acidified solution of potassium dichromate.

- g) ammonia gas and carbon dioxide gas are bubbled into water.
- h) concentrated hydrochloric acid solution is added to solid manganese(IV) oxide and the reactants are heated.

1980

- a) solutions of sodium fluoride and dilute hydrochloric acid are mixed.
- b) a saturated solution of barium hydroxide is mixed with a solution of iron(III) sulfate.
- c) a solution of ammonium sulfate is added to a potassium hydroxide solution.
- d) carbon dioxide gas is bubbled through a concentrated solution of sodium hydroxide.
- e) solid copper is added to a dilute nitric acid solution.
- f) chlorine gas is bubbled into a cold solution of dilute sodium hydroxide.
- g) a solution of potassium permanganate is mixed with an alkaline solution of sodium sulfite.
- h) methyl iodide is heated with a solution of sodium hydroxide.

1981

- a) magnesium metal is burned in nitrogen gas.
- b) sulfur dioxide gas is passed over solid calcium oxide.
- c) lead foil is immersed in silver nitrate solution.
- d) a solution of ammonium sulfate is added to a saturated solution of barium hydroxide.
- e) acetic acid solution is added to a solution of sodium hydrogen carbonate.
- f) solid sodium dichromate is added to an acidified solution of sodium iodide.
- g) a drop of potassium thiocyanate is added to a solution of iron(III) chloride.
- h) ethanol is completely burned in air.

1982

- a) hydrogen gas is passed over hot iron(III) oxide.
- b) solutions of potassium iodide and potassium iodate are mixed in acid solution.
- c) dilute sulfuric acid is added to solid calcium fluoride.
- d) solid ammonium carbonate is heated.
- e) methane gas is heated with an excess of chlorine gas.
- f) a concentrated solution of ammonia is added to a suspension of zinc hydroxide.
- g) hydrogen peroxide is added to an acidified solution of sodium bromide.
- h) dilute hydrochloric acid is added to a dilute solution of mercury(I) nitrate.

1985

- a) sodium metal is added to water.
- b) dilute sulfuric acid is added to a solution of lithium hydrogen carbonate.
- c) ethanol and formic acid (methanoic acid) are mixed and warmed.
- d) excess concentrated potassium hydroxide solution is added to a precipitate of zinc hydroxide.
- e) the gases boron trifluoride and ammonia are mixed.
- f) a solution of tin(II) chloride is added to a solution of iron(III) sulfate.
- g) phosphorus(V) oxytrichloride is added to water.

h) an acidified solution of potassium permanganate is added to a solution of sodium sulfite.

1986

a) a piece of lithium metal is dropped into a container of nitrogen gas.

b) dilute hydrochloric acid is added to a solution of potassium sulfite.

c) solid sodium oxide is added to water.

d) a solution of sodium sulfide is added to a solution of zinc nitrate.

e) a solution of ammonia is added to a dilute solution of acetic acid.

f) a piece of iron is added to a solution of iron(III) sulfate.

g) ethene (ethylene) gas is bubbled through a solution of bromine.

h) chlorine gas is bubbled into a solution of potassium iodide.

1987

a) solid calcium is added to warm water.

b) powdered magnesium oxide is added to a container of carbon dioxide gas.

c) gaseous hydrogen sulfide is bubbled through a solution of nickel(II) nitrate.

d) excess concentrated sodium hydroxide solution is added to solid aluminum hydroxide.

e) solid silver is added to a dilute nitric acid (6M) solution.

f) excess potassium hydroxide solution is added to a solution of potassium dihydrogen phosphate.

g) hydrogen peroxide solution is added to a solution of iron(II) sulfate.

h) propanol is burned completely in air.

1988

a) a solution of potassium iodide is added to an acidified solution of potassium dichromate.

b) a solution of sodium hydroxide is added to a solution of ammonium chloride.

c) a strip of magnesium is added to a solution of silver nitrate.

d) solid potassium chlorate is heated in the presence of manganese dioxide as a catalyst.

e) dilute hydrochloric acid is added to a solution of potassium carbonate.

f) sulfur trioxide gas is added to excess water.

g) dilute sulfuric acid is added to a solution of barium chloride.

h) a concentrated solution of ammonia is added to a solution of copper(II) chloride.

1989

a) solutions of zinc sulfate and sodium phosphate are mixed.

b) solutions of silver nitrate and lithium bromide are mixed.

c) a stream of chlorine gas is passed through a solution of cold, dilute sodium hydroxide.

d) excess hydrochloric acid solution is added to a solution of potassium sulfite.

e) a solution of tin(II) chloride is added to an acidified solution of potassium permanganate.

f) a solution of ammonium thiocyanate is added to a solution of iron(III) chloride.

g) samples of boron trichloride gas and ammonia gas are mixed.

h) carbon disulfide vapor is burned in excess oxygen.

1990

- a) solutions of sodium iodide and lead nitrate are mixed.
- b) a solution of ammonia is added to a solution of ferric chloride.
- c) a solution of hydrogen peroxide is heated.
- d) solutions of silver nitrate and sodium chromate are mixed.
- e) hydrogen sulfide gas is bubbled through a solution of potassium hydroxide.
- f) solid dinitrogen pentoxide is added to water.
- g) a piece of solid bismuth is heated strongly in oxygen.
- h) a strip of copper metal is added to a concentrated solution of sulfuric acid.

1991 C

- a) solid aluminum oxide is added to a solution of sodium hydroxide.
- b) solid calcium oxide is heated in the presence of sulfur trioxide gas.
- c) equal volumes of 0.1-molar sulfuric acid and 0.1-molar potassium hydroxide are mixed.
- d) calcium metal is heated strongly in nitrogen gas.
- e) solid copper(II) sulfide is heated strongly in oxygen gas.
- f) a concentrated solution of hydrochloric acid is added to powdered manganese dioxide and gently heated.
- g) a concentrated solution of ammonia is added to a solution of zinc iodide.
- h) a solution of copper(II) sulfate is added to a solution of barium hydroxide.

1992 C

- a) an excess of sodium hydroxide solution is added to a solution of magnesium nitrate.
- b) solid lithium hydride is added to water.
- c) solutions of ammonia and hydrofluoric acid are mixed.
- d) a piece of aluminum metal is added to a solution of silver nitrate.
- e) a solution of potassium iodide is electrolyzed.
- f) solid potassium oxide is added to water.
- g) an excess of nitric acid solution is added to a solution of tetraamminecopper(II) sulfate.
- h) carbon dioxide gas is bubbled through water contain a suspension of calcium carbonate.

1993 C

- a) A strip of copper is immersed in dilute nitric acid.
- b) Potassium permanganate solution is added to an acidic solution of hydrogen peroxide.
- c) Concentrated hydrochloric acid is added to solid manganese (II) sulfide.
- d) Excess chlorine gas is passed over hot iron filings.
- e) Water is added to a sample of solid magnesium nitride.
- f) Excess sulfur dioxide gas is bubbled through a dilute solution of potassium hydroxide.
- g) Excess concentrated ammonia solution is added to a suspension of silver chloride.
- h) Solution of tri-potassium phosphate and zinc nitrate are mixed.

1994 C

- a) Excess sodium cyanide solution is added to a solution of silver nitrate.
- b) Solutions of manganese(II) sulfate and ammonium sulfide are mixed.
- c) Phosphorus(V) oxide powder is sprinkled over distilled water.
- d) Solid ammonium carbonate is heated.
- e) Carbon dioxide gas is bubbled through a concentrated solution of potassium hydroxide.
- f) A concentrated solution of hydrochloric acid is added to solid potassium permanganate.
- g) A small piece of sodium metal is added to distilled water.
- h) A solution of potassium dichromate is added to an acidified solution of iron(II) chloride.

1995 C

- a) Ethanol is burned in oxygen.
- b) Solid barium oxide is added to distilled water.
- c) Chlorine gas is bubbled into a cold, dilute solution of potassium hydroxide.
- d) A solution of iron(II) nitrate is exposed to air for an extended period of time.
- e) Excess concentrated sulfuric acid is added to solid calcium phosphate.
- f) Hydrogen sulfide gas is bubbled into a solution of mercury(II) chloride.
- g) Solid calcium hydride is added to distilled water.
- h) A bar of zinc metal is immersed in a solution of copper(II) sulfate.

1996 C

- a) solid calcium carbonate is strongly heated.
- b) a piece of nickel metal is immersed in a solution of copper(II) sulfate.
- c) equal volumes of equimolar solutions of disodium hydrogen phosphate and hydrochloric acid are mixed.
- d) chlorine gas is bubbled into a solution of sodium bromide.
- e) ammonia gas is bubbled into a solution of ethanoic (acetic) acid.
- f) solid ammonium carbonate is added to a saturated solution of barium hydroxide.
- g) drops of liquid dinitrogen trioxide are added to distilled water.
- h) solutions of potassium permanganate and sodium oxalate are mixed.

1997 C

- a) excess potassium hydroxide solution is added to a solution of aluminum nitrate.
- b) a solution of sodium bromide is added to an acidified solution of potassium bromate.
- c) sulfur dioxide gas is bubbled into distilled water.
- d) phosphine (phosphorus trihydride) gas is bubbled into liquid boron trichloride.
- e) hydrogen gas is passed over hot iron(II) oxide powder.
- f) solid potassium amide is added to distilled water.
- g) a strip of magnesium metal is heated strongly in pure nitrogen gas.
- h) a solution of nickel chloride is added to a solution of sodium sulfide.

1998 C

- a) Solutions of tin(II) chloride and iron(III) chloride are mixed.
- b) Solutions of cobalt(II) nitrate and sodium hydroxide are mixed.
- c) Ethene gas is burned in air.
- d) Equal volumes of equimolar solutions of phosphoric acid and potassium hydroxide are mixed.
- e) Solid calcium sulfite is heated in a vacuum.
- f) Excess hydrochloric acid is added to a solution of diamminesilver(I) nitrate.
- g) Solid sodium oxide is added to distilled water.
- h) A strip of zinc is added to a solution of 6.0-molar hydrobromic acid.

2000 C

- (a) A small piece of calcium metal is added to hot distilled water.
- (b) Butanol is burned in air.
- (c) Excess concentrated ammonia solution is added to a solution of nickel(II) sulfate.
- (d) A solution of copper(II) chloride is added to a solution of sodium sulfide.
- (e) A solution of tin(II) nitrate is added to a solution of silver nitrate.
- (f) Excess hydrobromic acid solution is added to a solution of potassium hydrogen carbonate.
- (g) Powdered strontium oxide is added to distilled water.
- (h) Carbon monoxide gas is passed over hot iron(III) oxide.

2001 C

- (a) Sulfur dioxide gas is bubbled into distilled water.
- (b) A drop of potassium thiocyanate solution is added to a solution of iron(III) nitrate.
- (c) A piece of copper wire is placed in a solution of silver nitrate.
- (d) Solutions of potassium hydroxide and propanoic acid are mixed.
- (e) A solution of iron(II) chloride is added to an acidified solution of sodium dichromate.
- (f) Chlorine gas is bubbled through a solution of potassium bromide.
- (g) Solutions of strontium nitrate and sodium sulfate are mixed.
- (h) Powdered magnesium carbonate is heated strongly.

2002 C

- (a) A solution of sodium iodide is added to a solution of lead(II) acetate.
- (b) Pure solid phosphorus (white form) is burned in air.
- (c) Solid cesium oxide is added to water.
- (d) Excess concentrated hydrochloric acid is added to a 1.0 M solution of cobalt(II) chloride.
- (e) Solid sodium hydrogen carbonate (sodium bicarbonate) is strongly heated.
- (f) An excess of hydrochloric acid is added to solid zinc sulfide.
- (g) Acidified solutions of potassium permanganate and iron(II) nitrate are mixed together.
- (h) A solution of potassium hydroxide is added to solid ammonium chloride.

2003 C

- (a) A solution of potassium phosphate is mixed with a solution of calcium acetate.
- (b) Solid zinc carbonate is added to 1.0 M sulfuric acid.

- (c) A solution of hydrogen peroxide is exposed to strong sunlight.
- (d) A 0.02 M hydrochloric acid solution is mixed with an equal volume of 0.01 M calcium hydroxide.
- (e) Excess concentrated aqueous ammonia is added to solid silver chloride.
- (f) Magnesium ribbon is burned in oxygen.
- (g) A bar of strontium metal is immersed in a 1.0 M copper(II) nitrate solution.
- (h) Solid dinitrogen pentoxide is added to water.

2004 C

- (a) A solution of copper(II) sulfate is spilled onto a sheet of freshly polished aluminum metal.
- (b) Dimethyl ether is burned in air.
- (c) A 0.1 M nitrous acid solution is added to the same volume of a 0.1 M sodium hydroxide solution.
- (d) Hydrogen iodide gas is bubbled into a solution of lithium carbonate.
- (e) An acidic solution of potassium dichromate is added to a solution of iron(II) nitrate.
- (f) Excess concentrated aqueous ammonia is added to a solution of nickel(II) bromide.
- (g) A solution of sodium phosphate is added to a solution of aluminum nitrate.
- (h) Concentrated hydrochloric acid is added to a solution of sodium sulfide.

2005 C

- (a) A strip of zinc is placed in a solution of nickel(II) nitrate.
- (b) Solid aluminum hydroxide is added to a concentrated solution of potassium hydroxide.
- (c) Ethyne (acetylene) is burned in air.
- (d) Solid calcium carbonate is added to a solution of ethanoic (acetic) acid.
- (e) Lithium metal is strongly heated in nitrogen gas.
- (f) Boron trifluoride gas is added to ammonia gas.
- (g) Sulfur trioxide gas is bubbled into a solution of sodium hydroxide.
- (h) Equal volumes of 0.1 M solutions of lead(II) nitrate and magnesium iodide are combined.

2006 C

- (a) Solid potassium chlorate is strongly heated.
- (b) Solid silver chloride is added to a solution of concentrated hydrochloric acid.
- (c) A solution of ethanoic (acetic) acid is added to a solution of barium hydroxide.
- (d) Ammonia gas is bubbled into a solution of hydrofluoric acid.
- (e) Zinc metal is placed in a solution of copper(II) sulfate.
- (f) Hydrogen phosphide (phosphine) gas is added to boron trichloride gas.
- (g) A solution of nickel(II) bromide is added to a solution of potassium hydroxide.
- (h) Hexane is combusted in air.

Beginning with the 2007 examination, the numerical problems, 1, 2, and 3, are Part A (*part A*). Students may use a calculator for this part (55 minutes). Part B (40 minutes) is the three reactions question (predict the products of a reaction, balance, and answer a short question regarding the reaction) and the two theory questions. A laboratory question could be in either part A or B. NO calculator is allowed in part B.

2007 part B, question #4

For each of the following three reactions, in part (i) write a balanced equation for the reaction and in part (ii) answer the question about the reaction. In part (i), coefficients should be in terms of lowest whole numbers. Assume that solutions are aqueous unless otherwise indicated. Represent substances in solutions as ions if the substances are extensively ionized. Omit formulas for any ions or molecules that are unchanged by the reaction. You may use the empty space at the bottom of the next page for scratch work, but only equations that are written in the answer boxes provided will be graded.

- (a) A solution of sodium hydroxide is added to a solution of lead(II) nitrate.
- Balanced equation:
 - If 1.0 L volumes of 1.0 M solutions of sodium hydroxide and lead(II) nitrate are mixed together, how many moles of product(s) will be produced? Assume the reaction goes to completion.
- (b) Excess nitric acid is added to solid calcium carbonate.
- Balanced equation:
 - Briefly explain why statues made of marble (calcium carbonate) displayed outdoors in urban areas are deteriorating.
- (c) A solution containing silver(I) ion (an oxidizing agent) is mixed with a solution containing iron(II) ion (a reducing agent).
- Balanced equation:
 - If the contents of the reaction mixture described above are filtered, what substance(s), if any, would remain on the filter paper.

2007 part B, form B, question #4

- (a) Solid ammonium carbonate decomposes as it is heated.
- Balanced equation:
 - Predict the algebraic sign of ΔS° for the reaction. Explain your reasoning.
- (b) Chlorine gas, an oxidizing agent, is bubbled into a solution of potassium bromide.
- Balanced equation:
 - What is the oxidation number of chlorine before the reaction occurs? What is the oxidation number of chlorine after the reaction occurs?
- (c) A small piece of sodium is placed in a beaker of distilled water.
- Balanced equation:
 - The reaction is exothermic, and sometimes small flames are observed as the sodium reacts with the water. Identify the product of the reaction that burns to produce the flames.

2008 part B, question #4

- (a) Aqueous sodium hydroxide is added to a saturated solution of aluminum hydroxide, forming a complex ion.
- Balanced equation:
 - If the resulting mixture is acidified, would the concentration of the complex ion increase, decrease, or remain the same? Explain.

(b) Hydrogen chloride gas is oxidized by oxygen gas.

(i) Balanced equation:

(ii) If three moles of hydrogen chloride gas and three moles of oxygen gas react as completely as possible, which reactant, if any, is present in excess? Justify your answer.

(c) Solid potassium oxide is added to water.

(i) Balanced equation:

(ii) If a few drops of phenolphthalein are added to the resulting solution, what would be observed? Explain.

2008 part B, form B, question #4

(a) Chlorine gas, an oxidizing agent, is bubbled into a solution of potassium bromide at 25°C.

(i) Balanced equation:

(ii) Predict the sign of ΔS° for the reaction at 25°C. Justify your prediction.

(b) Solid strontium hydroxide is added to a solution of nitric acid.

(i) Balanced equation:

(ii) How many moles of strontium hydroxide would react completely with 500. mL of 0.40 M nitric acid?

(c) A solution of barium chloride is added drop by drop to a solution of sodium carbonate, causing a precipitate to form.

(i) Balanced equation:

(ii) What happens to the pH of the sodium carbonate solution as the barium chloride is added to it?

2009 part B, question #4

(a) A sample of solid iron(III) oxide is reduced completely with solid carbon.

(i) Balanced equation:

(ii) What is the oxidation number of carbon before the reaction, and what is the oxidation number of carbon after the reaction is complete?

(b) Equal volumes of equimolar solutions of ammonia and hydrochloric acid are combined.

(i) Balanced equation:

(ii) Indicate whether the resulting solution is acidic, basic, or neutral. Explain.

(c) Solid mercury(II) oxide decomposes as it is heated in an open test tube in a fume hood.

(i) Balanced equation:

(ii) After the reaction is complete, is the mass of the material in the test tube greater than, less than, or equal to the mass of the original sample? Explain.

2009 part B, form B, question #4

(a) A barium nitrate solution and a potassium fluoride solution are combined and a precipitate forms.

(i) Balanced equation:

(ii) If equimolar amounts of barium nitrate and potassium fluoride are combined, which reactant, if any, is the limiting reactant? Explain.

(b) A piece of cadmium metal is oxidized by adding it to a solution of copper(II) chloride.

(i) Balanced equation:

(ii) List two visible changes that would occur in the reaction container as the reaction is proceeding.

(c) A hydrolysis reaction occurs when solid sodium sulfide is added to distilled water.

(i) Balanced equation:

(ii) Indicate whether the pH of the resulting solution is less than 7, equal to 7, or greater than 7. Explain.

2010 part B, question #4

(a) A 0.2 M potassium hydroxide solution is titrated with a 0.1 M nitric acid solution.

(i) Balanced equation:

(ii) What would be observed if the solution was titrated well past the equivalence point using bromthymol blue as the indicator? (Bromthymol blue is yellow in acidic solution and blue in basic solution.)

(b) Propane is burned completely in excess oxygen gas.

(i) Balanced equation:

(ii) When the products of the reaction are bubbled through distilled water, is the resulting solution neutral, acidic, or basic? Explain.

(c) A solution of hydrogen peroxide is heated, and a gas is produced.

(i) Balanced equation:

(ii) Identify the oxidation state of oxygen in hydrogen peroxide.

