SAT CHEMISTRY PRACTICE PAPER 5
SET 1

1. Two systems at different temperatures come in contact. The heat will flow from the system at

A. 30°C to a system at 317 K

B. 40°C to a system at 323 K

C. 50°C to a system at 303 K

D. 60°C to a system at 358 K

E. 70°C to a system at 370 K

2. How many joules of heat are released by a 150-gram sample of water that that cools from 25°C to 5°C? (c for H_2O is 4.18 J/gK)

A. 78,375 joules

B. 83.6 joules

C. 720 joules

D. 627 joules

E. 12,540 joules

3. Calculate the number of joules required to completely evaporate 18 grams of water at 98°C. (H_v = 2259 J/g and c = 4.18 J/gK)

A. 40,812 joules

B. 40,512 joules

C. 150 joules

D. 40,662 joules

E. 6.12 × 10^6 joules

4. Which process below has been described correctly for a temperature above 274K?

A. $H_2O(l) \rightarrow H_2O(s)$ is exothermic and spontaneous.

B. $H_2O(l) \rightarrow H_2O(s)$ is endothermic and spontaneous.

C. $H_2O(g) \rightarrow H_2O(l)$ is endothermic and spontaneous.

D. $H_2O(s) \rightarrow H_2O(l)$ is endothermic and spontaneous.

E. $H_2O(s) \rightarrow H_2O(l)$ is exothermic and spontaneous.

5. Based on Gibbs Free Energy equation $\Delta G = \Delta H - T\Delta S$, a process will occur spontaneously when

A. ΔG is positive and ΔS is positive

B. ΔH is positive and ΔT is negative

C. ΔH is negative and ΔS is positive

D. ΔH is negative and ΔS is negative

E. ΔG is positive and ΔS is negative

6. The overall reaction: A + B + 1.5C →D has three individual reactions that take place,

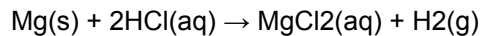Step 1: A + 2B → E

Step 2: F → B + C
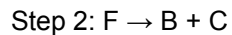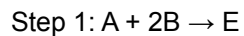
Step 3: ?

What is the reaction that takes place in Step 3?

A. D + F → C + E

B. E + 5/2C → D + F

C. D + 3/2C → A + E

D. B + C → F + E

E. A + B + 1.5C → D

7. Calculate the heat for the overall reaction:

$Mg(s) + 1/2O_2 →$ MgO(s) given the heats of reaction below:

Mg(s) + 2HCl(aq) → MgCl2(aq) + H2(g)

ΔH = -143 kJ

MgO(s) + 2HCl(aq) → MgCl2(aq) + H2O(g)

ΔH = -216 kJ

H2(g) + 1 /2O2 → H2O(l)
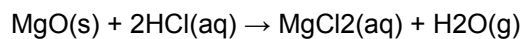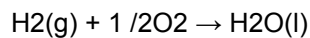
ΔH = -285 kJ

A. -644 kJ

B. -212 kJ

C. +644 kJ

D. -74 kJ

E. +74 kJ

SET 2

1. A stronger base

A. is also a stronger acid

B. is also a stronger electrolyte

C. tastes sour

D. yields fewer OH^{1-} ions in solution

E. is easier to neutralize

2. When HCl(aq) reacts with Zn(s) the prod ucts formed are

A. water and a salt

B. an acid and a base

C. a salt and hydrogen gas

D. a nonmetal oxide

E. a metal oxide

3. A substance is added to a solution containing two drops of phenolphthalein. The solution then turns pink. Which substance would produce this color change?

A. HCl

B. H_2CO_3

C. KOH

D. CH_3CH_2OH

E. CH_3OH

4. Litmus is red when the H1+ concentration in the solution is

A. 1×10^{-11} M

B. 1×10^{-9} M

C. 1×10^{-7} M

D. 1×10^{-5} M

E. 1×10^{-14} M

5. A substance is dissolved in water and the only positive ions in the solution are H1+ ions. This substance is

A. KOH

B. NaH

C. H_2SO_4

D. NH_3

E. CH_4

6. Which is true about a solution that is acidic?

A. $[H^{1+}]$ equals zero.

B. $[OH^{1-}]$ equals $[H^{1+}]$.

C. $[H^{1+}]$ is less than $[OH^{1-}]$.

D. $[H^{1+}]$ is greater than $[OH^{1-}]$.

E. $K_w = 1 \times 10^{-7}$.

7. According to the Bronsted-Lowry theory, a base can

A. donate a proton

B. yield H^{1+} ions

C. donate an electron pair

D. accept an electron pair

E. accept a proton

8. What volume of 0.200 M NaOH(aq) is needed to neutralize 40.0 mL of a 0.100 M HCl(aq)?

A. 100.0 mL

B. 80.0 mL

C. 40.0 mL

D. 20.0 mL

E. 10.0 mL

9. As an acidic solution is titrated with drops of base, the pH value of the solution will

A. increase

B. decrease

C. remain the same

D. approach zero

E. none of the above

10. Which pH value demonstrates a solution with the greatest concentration of OH^{1-} ions?

A. 1

B. 7

C. 10

D. 12

E. 14

11. The reaction: HI(aq) + LiOH(aq) →H$_2$O(l) + LiI(aq) is classified as

A. a single replacement

B. a neutralization reaction

C. the process of hydrolysis

D. a synthesis reaction

E. an oxidation-reduction reaction

12. How many times stronger is an acid with a pH of 2 than an acid with a pH of 5?

A. A pH of 2 is three times as strong.

B. A pH of 2 is one thousand times as strong.

C. A pH of 2 is three times as weak.

D. A pH of 2 is one thousand times as weak.

E. A pH of 5 is three thousand times as strong.

13. Which substance below is expected to be the strongest electrolyte?

A. Chlorous acid

B. Water

C. Acetic acid

D. Hydrofluoric acid

E. Hypochlorous acid

14. Which of the following statements is true?

A. NaCl is a neutral salt.

B. KC$_2$H$_3$O$_2$ is an acidic salt.

C. KOH is an acid.

D. HCl and KOH react to form hydrogen gas and water.

E. NaBr is basic salt.

15. Which pairing is not a set of conjugates?

A. OH^{1-} and H_2O

B. $HC_2H_3O_2$ and $C_2H_3O_2^{1-}$

C. HCl and Cl^{1-}

D. NH_3 and NH_4^{1+}

E. H_2SO_4 and SO_4^{2-}

16. Which reaction below is incorrect based upon the reactants given?

A. $HF + LiOH \rightarrow H_2O + LiF$

B. $2HCl + Zn \rightarrow H_2O + ZnCl_2$

C. $SO_2 + H_2O \rightarrow H_2SO_3$

D. $K_2O + H_2O \rightarrow 2KOH$

E. All of the above reactions are correct.

17. Which compound below is not correctly paired with its name?

A. KOH is potassium hydroxide.

B. H_2SO_3 is sulfurous acid.

C. HI is hydroiodic acid.

D. $HClO_2$ is chloric acid

E. H_3PO_4 is phosphoric acid.

SET 3

1. The oxidation number for hydrogen in NaH is

A. 1+

B. 2+

C. 0

D. 1-

E. 2-

2. Of the compounds below, in which one does chlorine have the highest oxidation number?

A. HCl

B. $KClO_3$

C. $HClO_2$

D. $KClO_4$

E. $CaCl_2$

3. In the reaction Al + Fe^{3+} →Al^{3+} + Fe, the oxidizing agent is

A. Al

B. Fe

C. Al^{3+}

D. Fe^{3+}

E. none of the above

4. In the chemical cell reaction 2Cr + $3Ni^{2+}$ → $2Cr^{3+}$ + 3Ni, which species is reduced?

A. Cr

B. Ni^{2+}

C. Cr^{3+}

D. Ni

E. none of the above

5. When Fe^{2+} is oxidized to Fe^{3+}, the Fe^{2+} ion

A. loses 1 electron

B. loses 1 proton

C. gains 1 electron

D. gains 1 proton

E. gains 1 neutron

6. Which half reaction demonstrates conservation of mass and conservation of charge?

A. $Cl_2 + e^- \rightarrow Cl^{1-}$

B. $Cl_2 + 2e^- \rightarrow Cl^{1-}$

C. $Cl_2 \rightarrow 2Cl^{1-} + e^-$

D. $Cl_2 + e^- \rightarrow 2Cl^{1-}$

E. $Cl_2 + 2e^- \rightarrow 2Cl^{1-}$

7. When the equation $Co + Ni^{2+} \rightarrow Co^{3+} + Ni$ is balanced, the sum of the coeffcients is

A. 2

B. 3

C. 5

D. 10

E. 15

8. What is the purpose of the salt bridge in an electrochemical cell?

A. It allows ion migration.

B. It allows neutron migration.

C. It allows electron migration.

D. It prevents ion migration.

E. It prevents neutron migration.

9. Making reference to electronegativity values, which substance is most easily reduced?

A. Br_2

B. Cl_2

C. F_2

D. I_2

E. At_2

10. When nonspontaneous redox reactions occur by use of an external current, the process is called

A. neutralization

B. esterification

C. electrolysis

D. hydrolysis

E. voltaic ion