Scholars Of Calgary Northwest

Chemistry 30, Entire Course, 10 Questions

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1. The $[OH^-_{(aq)}]$ of a solution with a pH = 7.00 is

   A) 1.0×10^{-14} mol/L
   B) 1.0×10^{-7} mol/L
   C) 1.0 mol/L
   D) 0 mol/L

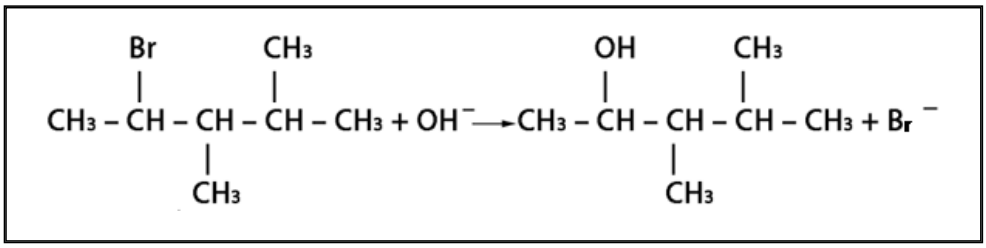
   You didn't answer this question.

   ***Incorrect**. Your answer= , Correct answer=B*

   Explanation: Remembering pH + pOH = 14.00 and that pOH = – log$[OH^-]$ in the same way that pH = – log$[H^+]$ will allow you to calculate the hydroxide ion concentration.

   pOH = 14.00 – pH = 7.00

   means the $[OH^-]$:
   $= 1.0 \times 10^{-pOH} = 1.0 \times 10^{-7}$

2. 

   The example shown is a(n) _____ reaction.

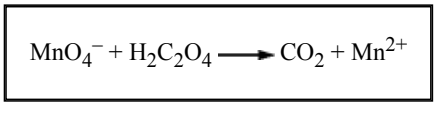
   A) substitution
   B) condensation
   C) addition
   D) elimination

   You didn't answer this question.

   ***Incorrect**. Your answer= , Correct answer=A*

   Explanation:

   In the example given, the bromide is replaced by a hydroxide group. This is, by definition, a substitution.

3. 

   When the above reaction that occurs in acid solution is balanced, the coefficient in front of CO_2 is

A) 4
B) 6
C) 8
D) 10

You didn't answer this question.

***Incorrect**. Your answer= , Correct answer=D*

Explanation:

reduction half reaction: $MnO_4^- \longrightarrow Mn^{2+}$

balance O atoms with H^2O: $MnO_4^- \longrightarrow Mn^{2+} + 4H_2O$

balance H atoms using H^+: $MnO_4^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O$

balance charge by adding e^-: $MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$ (1)

oxidation half reaction: $H_2C_2O_4 \longrightarrow CO_2$

balance the C atoms: $H_2C_2O_4 \longrightarrow 2CO_2$

balance H atoms using H^+: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+$

balance charge using e^-: $H_2C_2O_4 \longrightarrow 2CO_2 + 2H^+ + 2e^-$ (2)

Gain of e^- in reduction must equal the loss of e^- in oxidation
Multiply equation (1) by 2 and equation (2) by 5

$2MnO_4^- + 16H^+ + 10e^- \longrightarrow 2Mn^{2+} + 8H_2O$ (3)

$5H_2C_2O_4 \longrightarrow 10CO_2 + 10H^+ + 10\ e^-$ (4)

Add equations (3) and (4) and cancel any species common to both sides.
$2MnO_4^- + 5H_2C_2O_4 + 6H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

4. In a reaction, $Fe^{2+}_{(aq)}$:

A) will undergo reduction when combined with $Pb_{(s)}$.
B) will act as an oxidizing agent when combined with $Sn_{(s)}$.
C) will always act as an oxidizing agent.
D) will act as an reducing agent when combined with $Ag^+_{(aq)}$.

You didn't answer this question.

***Incorrect**. Your answer= , Correct answer=D*

Explanation:

Refer to the Table of Relative Strengths of Oxidizing and Reducing Agents.

$Fe^{2+}_{(aq)}$ appears twice in the table; once as a RA and further down as an OA, so choice C) is untrue.

To have a spontaneous reaction as a RA, $Fe^{2+}_{(aq)}$ must appear below and in the right hand column relative to the OA, as is the case with $Ag^+_{(aq)}$. Choice D) is correct. $Fe^{2+}_{(aq)}$ as OA is below both $Pb_{(s)}$ and $Sn_{(s)}$ as RA so no reactions will occur.

5. A polystyrene cup, filled with coffee and covered with a vented lid is a(n)

A) closed system.
B) open system.
C) isolated system.
D) thermodynamic system.

You didn't answer this question.

***Incorrect**. Your answer= , Correct answer=B*

Explanation:

This is an example of an open system - where the system and the surroundings are free to exchange material between themselves. If the cup were completely, this would be a closed system as the surroundings and the system would not be free to exchange materials without breaking into the container.

6.

Properties

1 Reacts spontaneously with $Zn^{2+}_{(aq)}$

2 Reacts spontaneously with $Ag_{(s)}$

3 Is an oxidizing **and** a reducing agent

4 Is reduced by $Au_{(s)}$

5 Reacts spontaneously with $K^{+}_{(aq)}$

6 Reacts spontaneously with $Al^{3+}_{(aq)}$

Which property in the list is most appropriate for $Fe^{2+}_{(aq)}$?

You didn't answer this question.

***Incorrect**. Your answer=, Correct answer=3*

Explanation:

Iron may exist in several oxidation states (Fe, Fe^{2+}, Fe^{3+}) and may behave as an OA or RA depending on the other chemicals involved.

If you didn't remember this you could deduce the correct answer.

From the Table of Relative Strengths of Oxidizing and Reducing Agents, $Fe^{2+}_{(aq)}$ as a RA is above $Zn^{2+}_{(aq)}$, $K^{+}_{(aq)}$ and $Al^{3+}_{(aq)}$ as OAs so no spontaneous reactions would occur (1,5,6 are all false), and $Fe^{2+}_{(aq)}$, $Ag_{(s)}$ and $Au_{(s)}$ are all RAs, so no reactions would occur for those either (2,4 are false).

Choice 3 is the only choice left.

7. Given the reaction:

$2Na_2O_{2(s)} + 2H_2O_{(l)} \longrightarrow 4NaOH_{(s)} + O_{2(g)}$
$\Delta H = -109$ kJ

calculate ΔH for the reaction:

$NaOH_{(s)} + \frac{1}{4}O_{2(g)} \longrightarrow \frac{1}{2}Na_2O_{2(s)} + \frac{1}{2}H_2O_{(l)}$

A) –27.3 kJ
B) +54.5 kJ
C) +27.3 kJ
D) +109 kJ

You didn't answer this question.

***Incorrect**. Your answer= , Correct answer=C*

Explanation:

The ΔH for the reaction will be the opposite of the example reaction because it has been reversed. On top of this, the number of moles of reactant and product have been changed, so we need to account for this in order to calculate the final answer.

In the example reaction, ΔH = -109 kJ/mol for the reaction that yields 4 moles of NaOH. The reverse reaction uses just one mole of NaOH, so as we are using a quarter of the amount of substance we will yield a quarter of the energy. To calculate the answer, we first

reverse the sign, then divide the answer by 4. -109 kJ/mol becomes 109 kJ/mol, then dividing by 4 gives a final answer of +27.3 kJ.

8. The carbon-carbon bonds in benzene are

    A) identical to the carbon-carbon bonds in cyclohexane
    B) identical to the carbon-carbon bonds in cyclohexene
    C) a hybrid between a double and a single bond
    D) easily broken in chemical reactions

    You didn't answer this question.

    ***Incorrect**. Your answer= , Correct answer=C*

    Explanation:

    The carbon-carbon bonds in a benzene molecule are formed from six single carbon-carbon bonds and three double carbon-carbon bonds that are delocalized, that is to say they are shared between all of the six carbon atoms in the benzene ring. This gives benzene its unique properties, as the bonds between the carbon atoms are stronger than those between carbon atoms in cyclohexane.

9. When water reacts with an alkene in the presence of a catalyst, what compound is produced?

    A) an alcohol
    B) an aldehyde
    C) a carboxylic acid
    D) a ketone

    You didn't answer this question.

    ***Incorrect**. Your answer= , Correct answer=A*

    Explanation:

    The alkene is reactive due to the strain placed on the double bond by having four electrons in close proximity to one another. Alkenes can react with water in the form of steam, which contains enough thermal energy to initiate the reaction, or else a catalyst can be used to lower the activation energy of the reaction allowing alkanes to react with water in its liquid form. The double bond breaks open, and the lone electron exposed by this break attaches to the hydrogen to form a carbon-hydrogen bond. At the other end of the ethene molecule, the OH- part of the water molecule donates its spare electron to the carbon to form a C-OH bond, which is the alcohol functional group.

10. Which of the following statements best describes what occurs when a bowl of stew is warmed from 5°C to 55°C on a stove?

    A) The potential energy of the stew increases.
    B) The kinetic energy of the stew increases.
    C) The atoms within the stew are rearranged.
    D) Water within the stew changes state.

    You didn't answer this question.

    ***Incorrect**. Your answer= , Correct answer=B*

    Explanation:

    At the molecular level, heat is measured by an increase in the average kinetic energy of the particles being heated. As the stew in the question is heated, the stew particles move around faster and faster and therefore the kinetic energy of the stew increases.

it appears. Of course, they can share their results with you when they're done too.

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