Quiz

|  |
| --- |
| **Note:** It is recommended that you save your response as you complete each question. |

**Question 1** (8.5 points)

 

Identify the acid or base behavior of each substance in these reactions:



Question 1 options:

|  |  |
| --- | --- |
|  | H3O+ acts as an acid, Cl- acts as a base, H2O acts an acid, HCl acts as a base. |
|  | H3O+ acts as an base, Cl- acts as a acid, H2O acts an acid, HCl acts as a base. |
|  | H3O+ acts as an acid, Cl- acts as a base, H2O acts an base, HCl acts as a acid. |
|  | H3O+ acts as an base, Cl- acts as a acid, H2O acts an base, HCl acts as an acid. |

Save

**Question 2** (8.5 points)

 

Acetic acid, shown below, has 4 hydrogen atoms-one bonded to an oxygen and three bonded to a carbon. When this molecule behaves as an acid, it donates only the hydrogen bonded to the oxygen. The hydrogens bonded to the carbon remain intact. Why?



Question 2 options:

|  |  |
| --- | --- |
|  | The oxygen is much better at accommodating a negative charge than is carbon. |
|  | The hydrogen attached to the oxygen extends farther away from the center of the molecule. |
|  | The carbon is bonded to three hydrogens while the oxygen is bonded to only one hydrogen. |
|  | The oxygen within acetic acid has two lone pairs of electrons that help to destabilize the oxygen-hydrogen bond. |

Save

**Question 3** (8.5 points)

 

Qualitatively, what happens to the hydroxide ion concentration if you decrease the hydronium ion concentration?

Question 3 options:

|  |  |
| --- | --- |
|  | The concentration of hydroxide decreases to neutralize the excess hydronium. |
|  | The concentration of OH- stays the same but the ratio OH-/H3O+ changes. |
|  | The concentration of OH- increases but the ratio stays the same. |
|  | The concentration of OH- increases. |
|  | None of these |

Save

**Question 4** (8.5 points)

 

Qualitatively, what happens to the hydronium ion concentration if you increase the hydroxide ion concentration?

Question 4 options:

|  |  |
| --- | --- |
|  | The concentration of hydroxide decreases to neutralize the excess hydronium. |
|  | The concentration of H3O+ stays the same but the ratio changes. |
|  | The concentration of H3O+ increases but the ratio stays the same. |
|  | The concentration of H3O+ increases to neutralize the excess hydroxide. |
|  | None of these |

Save

**Question 5** (8.5 points)

 

When a hydronium ion concentration equals 1 × 10-4 moles per liter, what is the pH of the solution? Is the solution acidic or basic?

Question 5 options:

|  |  |
| --- | --- |
|  | The pH is of this solution is 4 and it is acidic. |
|  | The pH is of this solution is 8 and it is basic. |
|  | The pH is of this solution is 6 and it is acidic. |
|  | The pH is of this solution is 10 and it is basic. |

Save

**Question 6** (8.5 points)

 

How does a base like NH3 raise the hydroxide ion concentration?

Question 6 options:

|  |  |
| --- | --- |
|  | The NH3 molecule removes a proton from a water molecule. |
|  | The NH3 molecule releases a proton that has to be neutralized by a water molecule. |
|  | The NH3 molecule is not a base and therefore does not change the hydroxide ion concentration. |
|  | The NH3 molecule releases reacts with a hydronium molecule, altering the number of hydroxide ions in the process. |
|  | None of these |

Save

**Question 7** (8.5 points)

 

Which of the following statements about buffers is untrue?

Question 7 options:

|  |  |
| --- | --- |
|  | The pH of a buffer solution cannot change. |
|  | Addition of small amounts of acid to a buffer changes the pH. |
|  | Addition of small amounts of base to a buffer changes the pH. |
|  | A salt from the reaction of a strong acid and a strong base can be used to make a buffer. |
|  | None of these are true. |

Save

**Question 8** (8.5 points)

 

Carbon dioxide reacts with water to form \_\_\_\_\_\_\_\_.

Question 8 options:

|  |  |
| --- | --- |
|  | carbon dioxide and water |
|  | carbonic acid |
|  | sodium bicarbonate |
|  | hydrated carbon |

Save

**Question 9** (8.5 points)

 

The overall rate at which humans are producing carbon dioxide is \_\_\_\_\_\_\_\_.

Question 9 options:

|  |  |
| --- | --- |
|  | increasing |
|  | decreasing |
|  | some years increasing and other years decreasing |
|  | remaining about the same |

Save

**Question 10** (8.5 points)

 

What is a reduction?

Question 10 options:

|  |  |
| --- | --- |
|  | the gain of electrons |
|  | the reduction of the number of electrons |
|  | the loss of an electron from the valence shell |
|  | the reaction of oxygen with a reductant |
|  | the formation of red compounds in the presence of an oxidant |

Save

**Question 11** (8.5 points)

 

The zinc within a copper penny does not oxidize because \_\_\_\_\_\_\_\_.

Question 11 options:

|  |  |
| --- | --- |
|  | zinc is an inert metal |
|  | it is not exposed to oxygen |
|  | of an impossible build up of charge |
|  | of a lack of water |

Save

**Question 12** (8.5 points)

 

The following set of redox reactions takes place when iron is dipped into a solution of copper ions.

Fe  Fe2+ + 2e-

Cu2+ + 2e-  Cu

Which of the following describes what is happening with the electrons in the solution?

Question 12 options:

|  |  |
| --- | --- |
|  | The iron metal is releasing electrons and they are traveling to the copper ions. |
|  | The copper is releasing electrons and they are traveling to the iron ions. |
|  | The iron ions are gaining electrons from the copper metal. |
|  | The copper ions are releasing electrons and they are traveling to the iron metal. |
|  | None of these |

Save

**Question 13** (8.5 points)

 

Which of the following statements best describes a cathode?

Question 13 options:

|  |  |
| --- | --- |
|  | the negatively charged electrode of a battery or electrochemical apparatus |
|  | the place where oxidation is taking place in a battery or electrochemical apparatus |
|  | the place from which electrons are flowing away from |
|  | All of these |
|  | None of these |

Save

**Question 14** (8.5 points)

 

In a battery, the following two oxidation-reduction reactions are taking place:



Which reaction is taking place at the cathode?

Question 14 options:

|  |  |
| --- | --- |
|  | rxn A |
|  | rxn B |
|  | Both reactions are happening at both the anode and cathode. |
|  | Both reactions are happening are happening at the electrode. |
|  | The reaction takes place at the electrode, not the cathode. |

Save

**Question 15** (8.5 points)

 

In a battery, the following two oxidation-reduction reactions are taking place:



What is undergoing reduction?

Question 15 options:

|  |  |
| --- | --- |
|  | Zn |
|  | ZnO |
|  | MnO2 |
|  | H2O |
|  | OH- |

Save

**Question 16** (8.5 points)

 

In one type of fuel cell the following oxidation-reduction reactions are taking place:

2 H2 + O2  2 H2O

What is the fuel ?

Question 16 options:

|  |  |
| --- | --- |
|  | H2 |
|  | O2 |
|  | H2O |
|  | All of these |
|  | None of these |

Save

**Question 17** (8.5 points)

 

*Thin-film photovoltaic cells* are \_\_\_\_\_\_\_\_.

Question 17 options:

|  |  |
| --- | --- |
|  | composed of crystalline silicon |
|  | easy to mass produce |
|  | sensitive to only narrow regions of the visible spectrum |
|  | very expensive to produce |
|  | None of these |

Save

**Question 18** (8.5 points)

 

Sodium metal is \_\_\_\_\_\_\_\_.

Question 18 options:

|  |  |
| --- | --- |
|  | oxidized in the production of aluminum |
|  | reduced in the production of aluminum |
|  | both oxidized and reduced in the production of aluminum |
|  | neither oxidized nor reduced in the production of aluminum |

Save

**Question 19** (8.5 points)

 

Which of the following metals would be the easiest to reduce to its native form from an ore?

Question 19 options:

|  |  |
| --- | --- |
|  | Zn |
|  | Ni |
|  | Fe |
|  | Ti |
|  | K |

Save

**Question 20** (8.5 points)

 

How many electrons are transferred from iron atoms to oxygen atoms in the formation of two units of iron hydroxide, Fe(OH)2?

Question 20 options:

|  |  |
| --- | --- |
|  | 4 electrons |
|  | 8 electrons |
|  | 16 electrons |
|  | 12 electrons |

Save

**Question 21** (8.5 points)

 

How do you make a proton out of a hydrogen atom?

Question 21 options:

|  |  |
| --- | --- |
|  | remove an electron from a hydrogen atom |
|  | remove a proton from a helium nucleus |
|  | let the hydrogen atoms undergo fusion |
|  | let the hydrogen atoms combine to form a hydrogen molecule and eject an electron |
|  | let the hydrogen atoms combine to form a hydrogen molecule and eject a proton |

Save

**Question 22** (8.5 points)

 

According to the following reaction, which molecule is acting as a base?



Question 22 options:

|  |  |
| --- | --- |
|  | H2SO4 |
|  | H2O |
|  | H3O+ |
|  | HSO4- |
|  | None of these |

Save

**Question 23** (8.5 points)

 

According to the following reaction, which molecule is acting as an acid?



Question 23 options:

|  |  |
| --- | --- |
|  | H2O |
|  | NH3 |
|  | OH- |
|  | NH4+ |
|  | None of these |

Save

**Question 24** (8.5 points)

 

For the following reaction, identify whether the compound in bold is behaving as an acid or a base.



Question 24 options:

|  |  |
| --- | --- |
|  | acid |
|  | base |
|  | neither |
|  | both |
|  | None of these |

Save

**Question 25** (8.5 points)

 

For the following acid-base reaction, identify what compound is formed in the space marked.



Question 25 options:

|  |  |
| --- | --- |
|  | KNO3 |
|  | H3ONO3 |
|  | KOH2 |
|  | KOH2NO3 |
|  | None of these |

Save

**Question 26** (8.5 points)

 

What is the main characteristic of a strong acid?

Question 26 options:

|  |  |
| --- | --- |
|  | It is completely dissociated in water. |
|  | It readily gives up its proton to a base. |
|  | It is corrosive. |
|  | It will damage your skin. |
|  | All of these |

Save

**Question 27** (8.5 points)

 

What is the hydronium ion concentration in an aqueous solution where the pH = 5?

Question 27 options:

|  |  |
| --- | --- |
|  | The hydronium ion concentration equals 1 × 10-9. |
|  | The hydronium ion concentration equals 1 × 10-7. |
|  | The hydronium ion concentration equals 1 × 10-5. |
|  | The hydronium ion concentration equals 1 × 10-3. |

Save

**Question 28** (8.5 points)

 

Hydrogen chloride is added to a buffer solution of ammonia, NH3, and ammonium chloride, NH4Cl. What is the effect on the concentration of ammonia? What is the effect on the concentration of ammonium chloride?

Question 28 options:

|  |  |
| --- | --- |
|  | HCl reacts with both the ammonia and ammonium chloride, so the concentration of both decreases. |
|  | HCl reacts with only the ammonium chloride, so the concentration of the ammonium chloride decreases and the concentration of ammonia increases. |
|  | HCl reacts with both the ammonia and ammonium chloride, so the concentration of both increases. |
|  | HCl reacts with only the ammonia, so the concentration of the ammonium chloride increases and the concentration of ammonia decreases. |

Save

**Question 29** (8.5 points)

 

What would be the best explanation for the fact that most natural water has a pH of about 5.6?

Question 29 options:

|  |  |
| --- | --- |
|  | Carbon dioxide reacts with water to form an acid. |
|  | Air contains acid rain particles. |
|  | Minerals that are dissolved in water are often acidic. |
|  | Many salts that dissolve in natural waters make the water basic. |
|  | None of these |

Save

**Question 30** (8.5 points)

 

Which of the following statements is untrue about oxidation and reduction processes?

Question 30 options:

|  |  |
| --- | --- |
|  | An oxidation can happen without a reduction. |
|  | It involves the exchange of electrons. |
|  | Often ions are generated or consumed. |
|  | Electrons are often involved in oxidation and reduction reactions. |
|  | All of these are true. |

Save

**Question 31** (8.5 points)

 

Which of the following species is the reducing agent?

2 CuBr  2Cu + Br2

Question 31 options:

|  |  |
| --- | --- |
|  | Cu |
|  | CuBr |
|  | Cu+ |
|  | Br- |
|  | Br2 |

Save

**Question 32** (8.5 points)

 

Hydrogen sulfide, H2S, burns in the presence of oxygen, O2, to produce water, H2O, and sulfur dioxide, SO2. Through this reaction, is sulfur oxidized or reduced?

2 H2S + 3 O2  2 H2O + 2 SO2

Question 32 options:

|  |  |
| --- | --- |
|  | Sulfur is reduced. |
|  | Sulfur is oxidized |
|  | Sulfur is both oxidized and reduced. |
|  | Sulfur is neither oxidized nor reduced. |