1) Global warming is thought to be caused by the increase of one particular gas. Name the gas.
A) oxygen  
B) carbon monoxide  
C) carbon dioxide  
D) nitrogen  
E) helium  
Answer: C

2) How many grams of LiCl can be formed from 1.0 moles of Li? Assume an excess of chlorine.

\[ 2 \text{Li}(s) + \text{Cl}_2(g) \rightarrow 2 \text{LiCl}(s) \]
A) 42.44 g LiCl  
B) 6.93 g LiCl  
C) 84.88 g LiCl  
D) 61.0 g LiCl  
E) 15.1 g LiCl  
Answer: A

3) How many grams of LiCl can be formed when 13.88 g of Li are reacted with 17.75 g of Cl2? Assume an excess of chlorine.

\[ 2 \text{Li}(s) + \text{Cl}_2(g) \rightarrow 2 \text{LiCl}(s) \]
A) 42.44 g LiCl  
B) 21.22 g LiCl  
C) 58.3 g LiCl  
D) 61.0 g LiCl  
E) 15.1 g LiCl  
Answer: B

4) Which substance is the limiting reactant when 2.0 mole of sulfur reacts with 4 mole of oxygen and 5.0 mole of sodium hydroxide according to the following chemical equation:

\[ 2 \text{S}(s) + 3 \text{O}_2(g) + 4 \text{NaOH}(aq) \rightarrow 2 \text{Na}_2\text{SO}_4(aq) + 2 \text{H}_2\text{O}(l) \]
A) S(s)  
B) O2(g)  
C) NaOH(aq)  
D) None of these substances is the limiting reactant.  
Answer: A

5) Which substance is the limiting reactant when 2.0 g of sulfur reacts with 3.0 g of oxygen and 4.0 g of sodium hydroxide according to the following chemical equation:

\[ 2 \text{S}(s) + 3 \text{O}_2(g) + 4 \text{NaOH}(aq) \rightarrow 2 \text{Na}_2\text{SO}_4(aq) + 2 \text{H}_2\text{O}(l) \]
A) S(s)  
B) O2(g)  
C) NaOH(aq)  
D) None of these substances is the limiting reactant.  
Answer: C
6) Determine the percent yield of a reaction that produces 28.65 g of Fe when 50.00 g of Fe₂O₃ react with excess Al according to the following reaction.

\[
\text{Fe}_2\text{O}_3(s) + 2 \text{Al}(s) \rightarrow \text{Al}_2\text{O}_3(s) + 2 \text{Fe}(s)
\]

A) 61.03 %
B) 28.65 %
C) 57.30 %
D) 20.02 %
E) 81.93 %
Answer: E

7) A solution is prepared by mixing 50.0 mL of 0.100 M HCl and 10.0 mL of 0.200 M NaCl. What is the molarity of chloride ion in this solution?

A) 0.183
B) 8.57
C) 3.50
D) 0.0500
E) 0.117
Answer: E

8) What is the molarity of a NaOH solution if 28.2 mL of a 0.355 M H₂SO₄ solution is required to neutralize a 25.0-mL sample of the NaOH solution?

A) 0.801
B) 0.315
C) 0.629
D) 125
E) 0.400
Answer: A

9) How many milliliters of 0.5 M NaCl solution are needed to prepare 5.85 g NaCl?

A) 100
B) 200
C) 400
D) 600
E) 800
Answer: B

10) During dilution, the
A) amount of solute remained the same.
B) volume of solution remained the same.
C) amount of solvent remained the same.
D) volume of solution remained the same.
Answer: A

11) HBr, HCl, HClO₄, KBr, and NaCl are all classified as
A) acids.
B) nonelectrolytes.
C) strong electrolytes.
D) weak electrolytes.
Answer: C

12) H₃PO₄, H₂S, HClO₂, HBr, are all classified as
A) acids.
B) nonelectrolytes.
C) strong electrolytes.
D) weak electrolytes.
Answer: A

13) Which is a strong acid H₃PO₄, H₂S, HClO₂, HBr,
A) H₃PO₄
B) H₂SO₄
C) HClO₂
D) HBr.
Answer: D

14) Identify HBr.
A) strong electrolyte, weak acid
B) weak electrolyte, weak acid
C) strong electrolyte, strong acid
D) weak electrolyte, strong acid
E) nonelectrolyte
Answer: C

15) Which will not conduct electricity when dissolved in water? Acetic acid (CH₃CO₂H), formic acid (HCO₂H), ammonia (NH₃), and ethanol (CH₃CH₂OH)
A) Acetic acid (CH₃CO₂H),
B) formic acid (HCO₂H),
C) ammonia (NH₃)
D) ethanol (CH₃CH₂OH)
Answer: D

16) In the reaction AgNO₃(aq) + HI(aq) → AgI(s) + HNO₃(aq) the spectator ions are
A) Ag⁺ and NO₃⁻
B) Ag⁺ and I⁻
C) H⁺ and I⁻
D) H⁺ and NO₃⁻
Answer: D

17) Which one of the following compounds is insoluble in water?
A) NaClO₄
B) KNO₃
C) PbCl₂
D) NaCl
Answer: C

18) How many of the following compounds are **soluble** in water?
A) 2
B) 3
C) 4
D) 5
E) 6
Answer: D

19) Give the net ionic equation for the reaction (if any) that occurs when aqueous solutions of $\text{H}_2\text{SO}_4$ and KOH are mixed.

A) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(l)$
B) $2 \text{K}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{s})$
C) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) + 2 \text{K}^+(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{H}_2\text{O}(l) + \text{K}_2\text{SO}_4(\text{s})$
D) $\text{H}_2\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2(\text{OH})_2(l)$
E) No reaction occurs.
Answer: A

20) Give the net ionic equation for the reaction (if any) that occurs when aqueous solutions of $\text{HClO}_4$ and NH$_3$ are mixed.

A) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(l)$
B) $\text{H}^+(\text{aq}) + \text{NH}_3(\text{aq}) \rightarrow \text{NH}_4^+(\text{s})$
C) $\text{HClO}_4(\text{aq}) + \text{NH}_3(\text{aq}) \rightarrow \text{NH}_4\text{ClO}_4(\text{s})$
D) $\text{H}^+(\text{aq}) + \text{ClO}_4^-(\text{aq}) + \text{NH}_3 \rightarrow \text{NH}_4^+(\text{aq}) + \text{NO}_3^-(\text{aq})$
E) No reaction occurs.
Answer: B

21) Determine the oxidation state of hydrogen in H$_2$.

A) +5
B) +3
C) 0
D) +2
E) +4
Answer: C

22) Determine the oxidation state of P in PO$_3^{3-}$.

A) +3
B) +6
C) +2
D) 0
E) -3
Answer: A

23) Determine the oxidation state of C in CO$_3^{2-}$.

A) +4
B) +2
C) -2
24) Determine the oxidation state of C in C\(_2\)O\(_4\)\(^{-2}\).
A) +3  
B) +1  
C) -1  
D) -3  
E) +6

25) What is the oxidation number of the chromium atom in K\(_2\)CrO\(_4\)?
A) -2  
B) +2  
C) +6  
D) +7
Answer: C

26) Identify the oxidizing agent and reducing agent?

\[ 4\text{Fe}(s) + 3\text{O}_2(g) \rightarrow 2\text{Fe}_2\text{O}_3 \]

<table>
<thead>
<tr>
<th>oxidizing agent</th>
<th>reducing agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Fe</td>
<td>O</td>
</tr>
<tr>
<td>B) O</td>
<td>Fe</td>
</tr>
<tr>
<td>C) Fe</td>
<td>Fe(_2)O(_3)</td>
</tr>
<tr>
<td>D) O</td>
<td>Fe(_2)O(_3)</td>
</tr>
</tbody>
</table>

Answer: B

27) Which is reduced in the following reaction?

\[ \text{Cu}^{2+} + \text{Mg} (s) \rightarrow \text{Cu} + \text{Mg} (aq)^{2+} \]

A) Mg  
B) Cu\(_{\text{aq}}^{2+}\)  
C) Cu  
D) Mg \(_{\text{aq}}^{2+}\)

Answer: B