This print-out should have 25 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering.

001 10.0 points

Balance the equation and identify the type of reaction for

$$? \, P_4(s) + ? \, Ca(s) \rightarrow ? \, Ca_3P_2(s) \, .$$

1. 2; 6; 2 — displacement

2. 1; 6; 2 — synthesis

3. 2; 6; 2 — decomposition

4. 1; 6; 2 — displacement

5. 2; 6; 2 — synthesis

6. 1; 6; 2 — decomposition

002 10.0 points

Iron reacts with oxygen to produce iron(III) oxide. In the balanced equation, the coefficient of the product is

1. 1.

2. 2.

3. 3.

4. 4.

003 10.0 points

Write the formula unit equation for this reaction occurring in water: Potassium sulfate and barium chloride are mixed to form potassium chloride and barium sulfate.

1. $K_2SO_4\,(s) + BaCl_2\,(s) \rightarrow 2\,KCl\,(aq) + BaSO_4\,(s)$

2. $KSO_4\,(aq) + BaCl\,(aq) \rightarrow KCl\,(aq) + BaSO_4\,(s)$

3. $K_2SO_4\,(aq) + BaCl_2\,(aq) \rightarrow 2\,KCl\,(aq) + BaSO_4\,(s)$

4. $2\,K_3SO_4\,(aq) + 3\,BaCl_2\,(s) \rightarrow 6\,KCl\,(aq) + 2\,Ba_3(SO_4)_2\,(s)$

5. $2\,K_3SO_4\,(aq) + 3\,BaCl_2\,(aq) \rightarrow 6\,KCl\,(aq) + 2\,Ba_3(SO_4)_2\,(s)$

6. $K_2SO_4\,(aq) + BaCl_2\,(s) \rightarrow 2\,KCl\,(aq) + BaSO_4\,(s)$

004 10.0 points

When the ions

$$CO_3^{2-}, \; Cl^-, \; NO_3^-, \; Na^+, \; NH_4^+, \; Fe^{2+}$$

are mixed in aqueous solution, what substance is likely to form an insoluble precipitate?

1. NH_4NO_3

2. $FeCO_3$

3. Na_2CO_3

4. NH_4Cl

5. $NaNO_3$

6. $ClNO_3$

005 10.0 points

Which reactants will NOT generate a gaseous product?

1. $NaOH + NH_4Cl$

2. $Na + H_2O$

3. $CaCO_3 + HCl$

4. $Zn + HCl$

5. $Na_2CO_3 + CaCl_2$

006 10.0 points

Which of the following aqueous solutions should NOT form a precipitate with aqueous $Ba(NO_3)_2$?

1. K_2SO_4

2. KOH

3. K_3PO_4

4. K_2CO_3

---

007 10.0 points

Write the complete combustion reaction of liquid octane (C_8H_{18}), a component typical of the hydrocarbons in gasoline. What is the coefficient of water vapor in the balanced equation for the reaction? (Balance the equation with the smallest possible whole number coefficients.)

1. 16

2. 8

3. 3

4. 18

5. 25

6. 24

7. 2

8. 4

9. 15

10. 20

---

008 10.0 points

Zn is an active metal above H on the activity series. When zinc is placed in an acidic solution one of the products produced is

1. H_2.

2. There is no reaction because Zn is above H.

3. $Zn(OH)_2$.

4. H_2O.

---

009 10.0 points

What would be the products for the reaction

$$Br_2 + KI \rightarrow ?$$

(Just identify the correct products for the reaction. You do not need to balance the equation.)

1. $I_2 + KBr$

2. No reaction would occur.

3. $BrI + K^+$

4. $I^{1-} + K^+$

---

010 10.0 points

Which one of the following reactions would you predict would not occur?

1. $Fe + 2\,HCl \rightarrow FeCl_2 + H_2$

2. $Pb + 2\,NaCl \rightarrow PbCl_2 + 2\,Na$

3. $3\,Na + AlCl_3 \rightarrow 3\,NaCl + Al$

4. $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

---

011 10.0 points

Identify the products for the reaction

$$Ca + H_2O(\ell) \rightarrow$$

1. CaOH + H

2. No reaction would occur.

3. $CaH_2 + O^{2-}$

4. $CaH + OH^-$

5. $Ca(OH)_2 + H_2$

---

012 10.0 points

What is the coefficient for oxygen in the balanced chemical equation for the combustion of heptane (C_7H_{16})?

1. 9

2. 1

3. 5

4. 7

5. 13

6. 11

7. None of these

8. 8

---

013 10.0 points

Which of the following aqueous solutions should form a precipitate with aqueous $Fe(NO_3)_3$?

1. KOH

2. K_2SO_4

3. KCl

4. KNO_3

---

014 10.0 points

Which of the displacement reactions below occurs as written (don't worry about balancing)?

1. $Fe^{3+} + Mg \rightarrow Fe + Mg^{2+}$

2. $Ca^{2+} + Au \rightarrow Ca + Au^{+}$

3. $Fe^{3+} + Ag \rightarrow Fe + Ag^{+}$

4. $Na^{+} + Zn \rightarrow Na + Zn^{2+}$

5. None of the reactions occurs as written.

---

015 10.0 points

Give the net ionic equation for the reaction

$$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2\,NaCl$$

1. $Ba^{2+} + 2\,Cl^{-} + 2\,Na^{+} + SO_4^{2-} \rightarrow BaSO_4(s) + 2\,NaCl$

2. $2\,Na^{+} + 2\,Cl^{-} \rightarrow 2\,NaCl$

3. $Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$

---

016 10.0 points

Which would be likely to displace a bromide ion from solution?

1. Neither chlorine nor iodine would displace a bromide ion from solution.

2. chlorine

3. iodine

4. Both could displace a bromide ion from solution.

---

017 10.0 points

The combustion of ammonia produces NO and water. If the chemical reaction for this process is properly balanced using the smallest possible integers, what is the sum of the coefficients for the products?

1. 8

2. 12

3. 9

4. 18

5. 10

---

018 10.0 points

What would be the products for the reaction

$$F_2 + LiBr \rightarrow ?$$

(Just identify the correct products for the reaction. You do not need to balance the equation.)

1. $Br^{1-} + Li^{+}$

2. No reaction would occur.

3. $Br_2 + LiF$

4. $FBr + Li^+$

---

019 10.0 points

In the equation

$$MgCO_3 + H_2SO_4 \rightarrow MgSO_4 + H_2O + CO_2\,,$$

identify the spectator ion(s) for the reaction.

1. Mg^{2+}, H^+, SO_4^{2-}

2. Mg^{2+}, SO_4^{2-}

3. Mg^{2+}, HSO_4^-

4. SO_4^{2-} only

5. CO_3^{2-}, H^+

---

020 10.0 points

Identify the solid product that forms when the following aqueous solutions are mixed:

$$CoCl_2(aq) + Na_2S(aq) \rightarrow$$

1. NaCl

2. CoS and 2NaCl

3. CoS and NaCl

4. CoS

5. No solid products are formed.

---

021 10.0 points

Write the net ionic equation for this reaction occurring in water: Sodium phosphate and calcium chloride are mixed to form sodium chloride and calcium phosphate.

1. No reaction occurs.

2. $2\,PO_4^{3-} + 3\,CaCl_2 \rightarrow 6\,Cl^- + Ca_3(PO_4)_2$

3. $2\,Na_3PO_4 + 3\,Ca^{2+} \rightarrow 6\,Na^+ + Ca_3(PO_4)_2$

4. $2\,PO_4^{3-} + 3\,Ca^{2+} \rightarrow Ca_3(PO_4)_2$

5. $PO_4^{2-} + Ca^{2+} \rightarrow CaPO_4$

---

022 10.0 points

Which one of the following metals would NOT displace hydrogen from a dilute solution of HCl?

1. Al

2. Ag

3. Fe

4. Ni

---

023 10.0 points

The observable reaction product involving a reaction mixture of Na_2SO_3 and HCl is

1. the formation of NaCl precipitate.

2. the formation of SO_2 gas.

3. There is no reaction.

4. the formation of H_2 gas and Na metal.

5. the formation of Cl_2 gas.

---

024 10.0 points

The chemical reaction

$$2\,Bi + 3\,H_2O \rightarrow Bi_2O_3 + 3\,H_2$$

represents a

1. synthesis reaction.

2. single-replacement reaction.

3. double-replacement reaction.

4. decomposition reaction.

025 10.0 points

In the equation

$AlCl_3(aq) + (NH_4)_3PO_4(aq) \rightarrow$
$AlPO_4(s) + 3\ NH_4Cl(aq)$

identify the spectator ion(s) for the reaction.

1. NH_4^+ only

2. Al^{3+}, NH_4^+

3. Al^{3+}, PO_4^{3-}

4. NH_4^+, Cl^-, Al^{3+}, PO_4^{3-}

5. NH_4^+, Cl^-