**Practice Final #1 Chemistry 30**

1. Consider the energy diagram given below

Reaction #1

|  |  |  |
| --- | --- | --- |
| Ep  (kJ) | -100  -175  -250 | 2XY2(g)    2X(g) + 4Y(g)    X2Y4(g) |

Reaction coordinate

The minimum energy that the reactants must achieve before the reaction can proceed is \_\_\_\_\_ kJ. This energy is called the activation energy.

|  |  |
| --- | --- |
| a | -100 |
| b | +100 |
| c | -175 |
| d | +150 |

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Use the following information to answer the next **three questions.**

2 (CH3)2CO (l) + 8 O2 (g) → 6 CO2 (g) + 6 H2O (g) ∆H° = -3315.6 kJ

1. The molar amount of acetone, (CH3)2CO (l), that must be burned to raise the temperature of 300 g of water from 22.0°C to 45.0°C is
2. 1.74 mol
3. 3.49 mol
4. 3.41 mol
5. 1.67 mol
6. The molar heat of combustion of acetone is
7. 3315.6 kJ/mol
8. 1657.8 kJ/mol
9. -1657.8 kJ/mol
10. -3315.6 kJ/mol
11. Rewrite the above reaction with the molar heat of combustion as part of the reaction.
12. 2 (CH3)2CO (l) + 8 O2 (g) → 6 CO2 (g) + 6 H2O (g) + 3315.6 kJ
13. 2 (CH3)2CO (l) + 8 O2 (g) + 3315.6 kJ → 6 CO2 (g) + 6 H2O (g)
14. (CH3)2CO (l) + 4 O2 (g) → 3 CO2 (g) + 3 H2O (g) + 1657.8 kJ
15. (CH3)2CO (l) + 4 O2 (g) + 1657.8 kJ → 3 CO2 (g) + 3 H2O (g)

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1. Which of the following equations represents the balanced chemical equation for the decomposition of calcium oxide and the energy transfer during the reaction?
2. 2 CaO (s) + 634.9 kJ → 2 Ca (s) + O2 (g)
3. CaO (s) + 634.9 kJ → Ca (s) + O2 (g)
4. 2 CaO (s) → 2 Ca (s) + O2 (g) + 634.9 kJ
5. CaO (s) → Ca (s) + O2 (g) + 634.9 kJ
6. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

From the list below choose statement(s) that is/are true for cellular respiration.

The order of your answers is not significant

1. CO2 (g) is a reactant
2. CO2 (g) is a product
3. Liquid water is a reactant
4. Liquid water is a product
5. Water vapour is a reactant
6. Water vapour is a product
7. The reaction is endothermic
8. The reaction is exothermic
9. The energy value is negative
10. The energy value is positive

1. In an experiment carried out in a standard high school laboratory, 12.0 grams of NaOH (s) is dissolved in water to make 500 mL solution.

Determine the experimental molar heat of solution for sodium hydroxide given the following observation table.

|  |  |  |
| --- | --- | --- |
|  | Initial Temperature (°C) | Final Temperature (°C) |
| Trial 1 | 22.3 | 28.7 |
| Trial 2 | 22.4 | 27.1 |
| Trial 3 | 21.8 | 28.4 |
| Trial 4 | 22.1 | 28.3 |

1. -44.7 kJ/mol
2. -41.7 kJ/mol
3. -2.09 kJ/mol
4. -2.23 kJ/mol
5. Numerical response question. Left justify the answer in the boxes provided.

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| --- | --- | --- | --- |
|  |  |  |  |

Given the theoretical molar heat of solution is -44.5 kJ/mol, and using the experimental value calculated in the previous question, the percent error for this experiment is ± \_\_\_ %. Round the answer to the nearest tenth.

Remember that this is a linked question to #&

If they chose B ..... answer is 6.3

C ... answer is 26.3

D .... answer is 42.7

1. Consider the energy diagram given below

Reaction #2

|  |  |
| --- | --- |
| Ep  (kJ) | R2W2(g)    2RW(g)    2R(g) + W2(g) 4Y(g)2R(g) |

Reaction coordinate

In chemical reactions existing bonds break and then reform. In the diagram above, the chemical(s) with the maximum potential energy is/are \_\_\_\_\_\_\_\_\_\_\_\_\_ and the chemical(s) with the maximum kinetic energy is/are \_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| a | R2W2(g) | RW(g) |
| b | R2W2(g) | R(g) + W2(g) |
| c | RW(g) | R2W2(g) |
| d | R(g) + W2(g) | RW(g) |

1. Consider the energy diagram for both a **catalyzed** reaction (path 1🡪 3 🡪4) and an **uncatalyzed** reaction (path 1 🡪 2 🡪 4) given below

Reaction #3

|  |  |
| --- | --- |
| -100  -125  -190  Ep  (kJ)  -300 | #2    #3    #4  #1 |

Reaction coordinate

The uncatalyzed reaction diagrammed above is \_\_\_\_\_\_\_\_\_\_\_\_ with a ∆ H of \_\_\_\_\_ kJ and the catalyzed reaction is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with a ∆ H of \_\_\_\_\_ kJ.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | Endothermic | +110 | Endothermic | +110 |
| b | Exothermic | -75 | Endothermic | +175 |
| c | Endothermic | +200 | Endothermic | +175 |
| d | Exothermic | -110 | Exothermic | -125 |

1. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Consider the following balanced reaction.

2CH3OH(l) + 3O2(g) 🡪 2CO2(g) + 4H2O(g) ∆H = -1275.8 kJ

When \_\_\_\_\_ g of methanol (CH3OH(l)) burns 400 g of water will be heated by 75.0 oC

1. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Use the following equation to answer this question.

C2H5OH(l) + 3O2(g) ---> 2CO2(g) + 3H2O(g)

If 1.75 g of ethanol liquid, C2H5OH(l), burns the energy released is \_\_\_\_\_\_\_ kJ.

1. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Use the following information to answer the next question.

C25H52(s) + 38O2(g) ----> 25CO2(g) + 26H2O(l) ∆H = -15 500 kJ

C(s) + O2(g) 🡪 CO2(g) ∆H = -393.5 kJ

2H2(g) + O2(g) 🡪 2H2O(l) ∆H = -571.6 kJ

The molar enthalpy of formation for paraffin wax,

25C(s) + 26H2(g) 🡪 C25H52(s), is -\_\_\_\_\_\_\_\_  . Round to the nearest hundredth.

1. The reactants of Photosynthesis and the products of Cellular Respiration respectively are.
2. CO2(g), H2O(l) and CO2(g), H2O(g)
3. CO2(g),H2O(g) and CO2(g), H2O(l)
4. CO2(g), H2O(l) and CO2(g), H2O(l)
5. CO2(g), H2O(g) and CO2(g), H2O(g)
6. During the reaction represented below, the products have \_\_i­­\_\_ potential energy than the reactants because the reaction is \_\_\_\_ii\_\_\_\_.

2C(s) + 2H2(g) 🡪 C2H4(g)

i ii

1. More Exothermic
2. More Endothermic
3. Less Exothermic
4. Less Endothermic
5. Use the following information to answer the next question.

Simple sugars are found in a variety of fruits and natural occurring substances. One such sugar is glucose, C6H12O6(s).

If 1.50 g of glucose is burned in a calorimeter that contains 100 g of water, and the temperature in the calorimeter rises from 22.0oC to 25.0 oC, then the experimental molar enthalpy of combustion of glucose is \_\_\_\_\_\_\_ 

1. -8.38 X 10-1
2. -2.87 X 102
3. -1.51 X 102
4. -1.26 X 103 kJ/mol
5. Consider the two reactions given below.
6. Cl-(aq) + 2ClO3-(aq) 🡪 3ClO2-(aq)
7. CH4(g) + 2O2(g) 🡪 CO2(g) + 2H2O(g)

The two oxidizing agents are \_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| a | Cl-(aq) | CH4(g) |
| b | H2O(g) | O2(g) |
| c | O2(g) | ClO3-(aq) |
| d | ClO2-(aq) | CO2(g) |

1. When a metal undergoes oxidation, its oxidation number will \_\_\_\_\_\_ because it will \_\_\_\_\_\_\_\_ electrons.

|  |  |  |
| --- | --- | --- |
| a | Increase | Gain |
| b | Decreases | Lose |
| c | Increases | Lose |
| d | Decreases | Gain |

1. Consider the following statements about oxidation and reduction.
2. A process involving the gain of electrons
3. A process involving the loss of electrons
4. A process where an elemental metal is produced from a compound
5. A process where oxygen combines with a metal.

Statement I is the \_\_\_\_\_\_\_\_\_\_\_\_\_definition of ­­­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_ while statement IV is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ definition of \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | Operational | Reduction | Theoretical | Oxidation |
| b | Theoretical | Reduction | Operational | Oxidation |
| c | Operational | Oxidation | Theoretical | Reduction |
| d | Theoretical | Oxidation | Operational | Reduction |

1. Ag+(aq) + e-‑  🡪 Ag(s) is chosen to have an electrical potential of 0 V instead of 2H+(aq) + 2e- 🡪 H2(g) . Under these new conditions the electrical potential for the reduction of AgI(s) will be \_\_\_\_\_\_\_
2. -0.15 V
3. -0.95 V
4. 0.65 V
5. 0.95 V
6. Select the cell with the highest standard cell potential.
7. Gold –copper cell
8. Zinc – tin cell
9. Mercury-iron cell
10. Aluminium-cobalt cell
11. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Using the information given below, list the oxidizing agents from strongest to weakest.

Sk­­­­­2+ (aq) + Ab (s) → Sk (s) + Ab2+ (aq)

Ab (s) + Bc2+ (aq) → Ab2+ (aq) + Bc (s)

Bc (s) + Sk2+ (aq) → non spontaneous

Sk (s) + Mn2+ (aq) → non spontaneous

Mn (s) + Ab2+ (aq) → non spontaneous

Key: 1. Ab (s) 2. Ab2+ (aq)

3. Bc (s) 4. Bc2+ (aq)

5. Mn (s) 6. Mn2+ (aq)

7. Sk (s) 8. Sk2+ (aq)

1. Numerical response question. Left justify the answer in the boxes provided.

|  |  |  |  |
| --- | --- | --- | --- |
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Use the following information to answer the next question.

The oxidation numbers for chlorine in the chemical species given below will \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_\_ and \_\_\_\_\_\_.

|  |  |  |  |
| --- | --- | --- | --- |
| ClO3-(aq) | Cl2(g) | ClO-(aq) | ClO4-(aq) |

1. Consider the unbalance skeletal half reaction given below

CrO4-(aq) 🡪 Cr2O72-(aq)

Chromium acts as the \_\_\_\_\_\_\_\_\_\_\_ agent. If balanced with the lowest whole numbers possible, the half reaction will have \_\_\_\_ electrons, \_\_\_\_ H+(aq) and \_\_\_\_ water molecules.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| a | Oxidizing | 5 | 6 | 3 |
| b | Oxidizing | 2 | 2 | 1 |
| c | Reducing | 5 | 6 | 3 |
| d | Reducing | 2 | 2 | 1 |

1. The cathode of an electrochemical cell is the site at which \_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| a | Reduction occurs |
| b | Cations gain electrons |
| c | Oxidation occurs |
| d | Electrons are lost |

1. Calcium chloride is widely used as a road salt in winter climates to depress the freezing point of ice.

Which of the following half reactions represents the reaction at the anode?

|  |  |
| --- | --- |
| a | Ca(s) 🡪 Ca2+(aq) + 2e- |
| b | 2Cl-(aq) 🡪 Cl2(g) + 2e- |
| c | 2H2O(l) 🡪 O2(g) + 4H+(aq) + 4e- |
| d | 2H2O(l) + 2e- 🡪 H2(g) + 2OH-(aq) |

1. Numerical response question. Left justify the answer in the boxes provided.

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|  |  |  |  |

Below is a list of statements about electrochemical cells.

|  |  |
| --- | --- |
| 1 | Reduction occurs at the anode |
| 2 | The oxidizing agent reacts at the cathode |
| 3 | Anions leave the anode and pass through the external circuit |
| 4 | Anions move through the electrolyte toward the anode |
| 5 | Electrons move through the external circuit toward the cathode |
| 6 | The cell is primarily endothermic |
| 7 | The cell is primarily exothermic |
| 8 | The strongest reducing agent is oxidized at the anode. |
| 9 | The strongest oxidizing agent is oxidized at the cathode. |

The statements above that apply to **both** electrolytic and voltaic cells are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_\_. Answers will be accepted in any order.

1. Below is a diagram of an electrochemical cell using a beaker and a porous cup.

e-

|  |  |
| --- | --- |
| Brǿnsted  Ni  0.10  NiSO4(aq) | Cd  0.10  CdSO4(aq) |
|  |

The **oxidation** half-reaction that occurs during the operation of this electrochemical cell is \_\_\_\_i\_\_\_ and the reaction occurs at the ­­­\_\_\_\_\_ii\_\_\_\_.

|  |  |  |
| --- | --- | --- |
|  | **i** | **ii** |
| a | Ni(s) 🡪 Ni2+(aq) + 2e- | Cathode |
| b | Ni(s) 🡪 Ni2+(aq) + 2e- | Anode |
| c | Cd(s) 🡪 Cd2+(aq) + 2e- | Cathode |
| d | Cd(s) 🡪 Cd2+(aq) + 2e- | Anode |

1. *Use the following information to answer the next question.*

|  |
| --- |
| Some of the SO2(g) produced from the burning of coal and natural gas can react with NO2(g) in the atmosphere according to the equation.  SO2(g) + NO2(g) ⇄ NO(g) + SO3(g) H = -40.8 kJ  Several factors can influence the equilibrium concentrations of these gases.   1. An increase in temperature 2. A decrease in temperature 3. Increase concentration of SO2(g) 4. Increase concentration of SO3(g) 5. Increase concentration of NO2(g) 6. An increase in pressure 7. An increase in volume 8. Addition of a catalyst |

List in **ascending order**, the factors that will cause the equilibrium concentration of NO(g) in the reaction to increase while the Kc remains unchanged.

Record all **three digits** of your answer in **lowest to highest order** in the boxes provided below.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

1. *Use the following information to answer the next question.*

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| --- |
| Citric acid, H3C6H5O7(aq), is a weak, polyprotic acid that is found in fruits such as oranges and lemons. Citric acid reacts with water, as represented by the following Brønsted–Lowry equations.   1. H3C6H5O7 (aq) + H2O(l) ⇄ H2C6H5O7 –(aq) + H3O+(aq) *K*a = 7.4 × 10–4 2. H2C6H5O7 –(aq) + H2O(l) ⇄ HC6H5O7 2–(aq) + H3O+(aq) *K*a = 1.7 × 10–5 3. HC6H5O7 2– (aq) + H2O(l) ⇄ C6H5O7 3–(aq) + H3O+(aq) *K*a = 4.0 × 10–7   The chemical species that are present in this equilibrium system are:   1. H3C6H5O7 (aq) 2. H2O(l) 3. H2C6H5O7 –(aq) 4. H3O+(aq) 5. HC6H5O7 2– (aq) 6. C6H5O7 3–(aq) |

Identify the following chemical species, in order:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
| Acid in reaction A |  | Conjugate base of the acid in reaction A |  | Base in reaction B |  | Amphiprotic species in reaction C |

Record all **four digits** of your answer in the numerical response in the boxes provided below.

|  |  |  |  |
| --- | --- | --- | --- |
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1. Use the following information to answer this question.

|  |  |  |  |  |  |  |  |  |  |
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| A technician placed an amount of the colourless gas, dinitrogen tetraoxide, into a flask. He closed the flask and allowed the reaction to reach equilibrium. The dinitrogen tetraoxide partially decomposed to form brown-coloured nitrogen dioxide gas, according to the following balanced chemical equation.  N2O4(g) ⇄ 2NO2(g)  The data collected during the experiment were recorded below.   |  |  |  | | --- | --- | --- | |  | **N2O4(g)** | **NO2(g)** | | **Initial Concentration (mol/L)** | 0.798 | 0.000 | | **Final Concentration (mol/L)** | 0.694 | 0.208 | |

The value of the equilibrium constant in this system as *a.bc x* 10-*d*

Record the values of *a, b, c* and *d*  in the boxes provided below.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

1. Use the following information to answer this question.

|  |
| --- |
| The ester ethyl ethanoate can be produced in the following equilibrium mixture:  CH3COOH(aq) + C2H5OH(aq) ⇄ H2O(l) + CH3COOC2H5(aq) |

At a certain temperature, Kc for this equilibrium is 6.86. If the initial concentration of the acid is 1.00 mol/L and initial concentration of the alcohol is 0.950 mol/L, what mass of ester will be present at equilibrium in a 1.00 L solution? Express the answer to the nearest tenth.

Record your answer in the boxes provided below.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

1. *Use the following information to answer the next question.*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| The following equilibrium system is used to produce hydrogen gas for further chemical reactions in a oil refinery.  CH4(g) + H2O(g) + heat ⇄ CO(g) + 3 H2(g)   |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | H2O(g)  concentration Mol / L |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | CO(g) |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | CH4(g) |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | H2(g) |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  |  |  |  |   W X Y  Time (minutes) |

The equilibrium shift at time “X” was caused by

1. Addition of heat
2. Addition of hydrogen gas to the system
3. Addition of neon gas to the system while a constant volume is maintained
4. Pressure increased by decreasing the volume
5. *Use the following information to answer the next question.*

|  |
| --- |
| HF(aq) + H2O(l) ⇄ H3O+(aq) + F–(aq) |

The equilibrium law expression for the equation above is**i** , and at equilibrium the amount of products present is **ii** the amount of reactants present.

The statement above is completed by the information in row

|  |  |  |
| --- | --- | --- |
| **Row** | i | ii |
| **A** |  | less than |
| **B** |  | greater than |
| **C** |  | less than |
| **D** |  | greater than |

1. *Use the following information to answer the next* ***two questions.***

|  |
| --- |
| Equally concentrated solutions of HNO3(aq), CH3COOH(aq), HOOCCOOH(aq), and Na2S(aq) were titrated with either a strong acid or strong base, and the titration curves were plotted. One of the titration curves is illustrated below.  Titration curve    144  pH  0  50  25  Volume of acid added (mL) |

The titration curve represents the titration of

* 1. HNO3(aq)
  2. CH3COOH(aq)
  3. HOOCCOOH(aq)
  4. Na2S(aq)

1. The most suitable indicator for the titration is
   1. phenolphthalein
   2. methyl violet
   3. chlorophenol red
   4. methyl orange

*Use the following information to answer the next question.*

|  |
| --- |
| When hydrogen sulfide gas is released into the atmosphere, is dissolves in atmospheric water to from aqueous hydrosulfuric acid. The ionization of aqueous hydrosulfuric acid is shown below:  H2S(aq) + H2O(l) ⇄ HS–(aq) +H3O+(aq) |

1. The concentration of a sample of aqueous hydrosulfuric acid is 0.065 mol/L. The hydronium ion concentration is i , and the pOH of the solution is ii ,

|  |  |  |
| --- | --- | --- |
| **Row** | i | ii |
| **A** | 6.5 x 10-2 mol/L | 1.19 |
| **B** | 6.5 x 10-2 mol/L | 12.81 |
| **C** | 7.6 x 10-5 mol/L | 4.12 |
| **D** | 7.6 x 10-5 mol/L | 9.88 |

*Use the diagram below to answer the next question*

1. The IUPAC name for the structural diagram above is
   1. 2-methyl-3-ethylpentane
   2. 3-ethyl-2-methylpentane
   3. 3-ethyl-4-methylpentane
   4. 3-isopropylpentene
2. Methylbenzene, commonly known as Toluene, is a solvent used in glues and lacquers. It is toxic to humans but it is preferred to benzene as a solvent because benzene is both toxic and carcinogenic. All of the following apply to toluene **except**
   1. Aliphatic
   2. Aromatic
   3. Stable
   4. Unsaturated

*Use the information below to answer the next question*

Ethyl benzoate has a pleasant cherry like odour. It is formed by the reaction shown below.

C6H5COOH(aq) + C2H5OH(l) 🡨 🡪 C6H5OOC2H5(l) + H2O(l)

1. *Ethyl* benzoate is \_\_\_i\_\_\_\_, and the reactant molecules use to form Ethyl benzoate are \_\_\_\_\_ii\_\_\_\_ and \_\_\_\_\_iii\_\_\_\_\_ respectively.

The statement above is completed by the information in row

|  |  |  |  |
| --- | --- | --- | --- |
| **Row** | *i* | *ii* | *iii* |
| **A.** | a carboxylic acid | an ester | an alcohol |
| **B.** | a carboxylic acid | an alcohol | an ester |
| **C.** | an ester | an aldehyde | a carboxylic acid |
| **D.** | an ester | a carboxylic acid | an alcohol |

1. Ethene is the organic compound with the formula C2H4. Ethene is used widely in industry and also has a role in biology as a hormone.

H H

C = C

H H

When ethene has water added, it forms \_\_\_\_\_\_\_\_\_\_\_\_\_, while when hydrogen is added it forms \_\_\_\_\_\_\_\_\_\_

* 1. Ethanol, ethyne
  2. Ethanal, ethyne
  3. Ethanol, ethane
  4. Ethanal, ethane

*Use the information below to answer the next question*

Polystyrene is a polymer used in packaging, refrigerator doors, cups, ice buckets and coolers. It was discovered in 1839 by Eduard Simon, an apothecary in Berlin.

H

C C n

H H

1. Which of the following structural diagrams represents the monomer used in the manufacture of polystyrene

Br

Br

OHH

*Use the following information to answer the next question*

**Organic Compounds**

1. 2-bromobutane **4.** pentane-3-ol
2. 2-methylbutane **5.** 3-ethylpentane
3. cyclohexene **6.** 2-methyl-1-phenylpropane
4. The organic compound(s) that **do not** contain branches off the parent chain are
   1. 1, 3, and 4
   2. 2, 5, and 6
   3. 3, and 4
   4. 3 only

*Use the following information to answer the next question.*

1. The IUPAC name of the following compound is
   1. Hexene
   2. Hexadiene
   3. Hex-2,5-diene
   4. Hex-1,5-diene

*Use the following information to answer the next question*

An economically important reaction involving the fossil fuel propane is represented by the following equation

C3H8(g) + 5 O2(g) 🡪 3 CO2(g) + 4 H2O(g)

1. The above reaction can be classified as both \_\_\_\_\_\_\_i\_\_\_\_\_\_\_ and \_\_\_\_\_\_ii\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| **Row** | *i* | *ii* |
| **A.** | Combustion | Endothermic |
| **B.** | Combustion | Exothermic |
| **C.** | Single Replacement | Endothermic |
| **D.** | Single Replacement | Exothermic |

**Numerical Response**:

1. Consider two organic molecules: Bromobenzene, and Ethylbenzene

The descriptions numbered below that apply to both Bromobenzene and Ethylbenzene are \_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_.

**Descriptions**

**1.** Saturated **6.** Alkanes

**2.** Unsaturated **7**. Alkenes

**3.** Cyclic **8.** Contains only single bonds

**4.** Aliphatic **9.** Contains bonds that are not single bonds

**5**. Aromatic

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

***Numerical response.***

1. The compounds numbered below that can be classified as organic compounds are \_\_\_\_\_\_, \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_.

**Compounds Containing Carbon**

**1.** CH4(g) **5.** CH3CH2OH(l)

**2.** HCN(g) **6.** CH3CH2CHCH2(l)

**3.** MgCO3(s) **7.** SiC(s)

**4.** HCOOCH2CH3(l)

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

Numerical response

1. The line diagrams below represent organic compounds. The compounds that are s**tructural isomers** of each other are \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_.

**Line Diagrams for some Organic Compounds**

**1. 4.**

**2 . 5.**

**3.** **6.**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |

|  |
| --- |
| The equilibrium law expression for the industrial processing of ethanol is:  Under certain condition, the Kc = 400. At equilibrium a 5.00 x 103 L reaction vessel contains 115 mol of C2H4(g) and 110 mol of H2O(g). |

1. What is the equilibrium concentration of ethanol under these conditions?
   1. 75.0 mol/L
   2. 5.06 x 106 mol/L
   3. 0.202 mol/L
   4. 1.50 x 10-2 mol/L

*Answers:*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1. *D* | 1. *A* | *3 Cc* | *4.C* | *5. B* | *6. (1378)* | *7. A* | *8.*  *(0.4)* | *9. B* | *10.A* |
| *11.*  *(6.32)* | *12.*  *(46.9)* | *13. (1.77)* | *14.C* | *15.B* | *16. C* | *17. C* | *18. C* | *19. B* | *20. B* |
| *21. D* | *22.*  *(4862)* | *23*  *(5017)* | *24.B* | *25. A* | *26. B* | *27. (2458)* | *28. D* | *29. (35)* | *30. (1325)* |
| *31. (6232)* | *32.*  *(58.4)* | *33. D* | *34. A* | *35. C* | *36. A* | *37. D* | *38. B* | *39. A* | *40.D* |
| *41. C* | *42. C* | *43. A* | *44. D* | *45. B* | *46. (2359)* | *47. (1456)* | *48. (146))* | *49. C* |  |