



CHEM 130

Self Assessment Study Guide Chemistry 30

Revised: May 2003

Using this Study Guide

1. Students should study the following objectives to be able to successfully challenge the Chemistry 120 course at SAIT.
2. The questions on the assessment will be multiple-choice
3. Students will be allowed to use a calculator
4. For the exam, students will be provided with a data booklet, which contains a Periodic Table of Elements, Chemistry notation, tables of constants, table of solubility, and acid-base indicators and strengths
5. Textbook for Chem 120/130: Nelson Chemistry. This can be purchased in the bookstore. The public library also may have materials that can be used
6. Students will have 3 hours to complete the assessment.
7. Websites that may help you:

www.learning.gov.ab.ca- diploma exams can be found here
www.library.thinkquest.org
www.webelements.com
www.studentacademy.com

Course Content

Below is a list of the learning outcome(s) and the objectives used to achieve these learning outcome(s) for this course...

Organic Chemistry

Learning Outcome:

The student will investigate the diverse forms of organic compounds and compare them to inorganic matter

Objectives:

1. Compare organic and inorganic compounds in terms of the presence of carbon, bonding and related properties and natural sources
 2. Describe the composition and structural formulas for aliphatic and aromatic hydrocarbons
 3. Provide names and formulas for examples of the organic compounds described above
 4. Define and give examples of structural isomerism
 5. Identify alcohols, aldehyde, ketones, carboxylic acids, halogenated hydrocarbons, amines, amides, and esters from their IUPAC names and the functional groups in their structural formulas
 6. Compare hydrocarbon cracking and reforming
 7. Define and give examples of addition, substitution, elimination, esterification and combustion reactions of hydrocarbons including chemical equations
 8. Define and outline structures and provide examples of monomers, polymers, and polymerization in living and nonliving systems
 9. Compare reactions of organic compounds in living and nonliving systems
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Energy and Change

Learning Outcome:

The student will demonstrate knowledge of thermochemistry as energy changes in physical, chemical and nuclear reactions.

Objectives:

1. Explain what is meant by the energy change of a system in terms of heating and cooling, thermal equilibrium, temperature change, phase change, forces between particles, particle movement and heat content
 2. Perform calculations involving specific heat capacities
 3. Distinguish among open, closed, and isolated systems
 4. Draw and interpret heating and cooling curves of a pure substance
 5. Explain and compare phase, chemical, and nuclear changes in terms of changes in potential energy
 6. Provide simple, qualitative explanations based on intermolecular forces, chemical bonds and nuclear forces for the energy changes that occur during phase, chemical and nuclear changes to matter
 7. Recognize nuclear fission and fusion reactions
 8. Write balanced equations interpreting the change in enthalpy
 9. Explain that catalysts provide an alternative pathway for chemical changes without affecting the net amount of energy produced or absorbed
 10. Calculate molar enthalpy and total energy change of physical and chemical changes
 11. Use the law of conservation of energy to analyze calorimetric evidence
 12. Explain endothermic and exothermic reactions using potential energy
 13. Use Hess's law to derive equations for energy changes
 14. Use a standard heats of formation table to predict the heat of reaction for a chemical change
 15. Explain how energy stored as potential energy in the chemical bonds of fossil fuels originates in the Sun and is converted by the process of photosynthesis in living plants
 16. Compare the combustion of fuels to cellular respiration
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Change and Systems

Learning Outcome:

Examine and quantify changes in electrochemical systems including oxidation-reduction reactions and the energy and matter involved

Objectives:

1. Define the following terms using both historical and modern theoretical definitions: oxidizing agent, reducing agent, oxidation number, half-reaction
 2. Differentiate between oxidation and reduction half-reactions
 3. Identify electron transfer, oxidizing agents and reducing agents in oxidation-reduction reaction and half-reaction equations
 4. Write balanced oxidation-reduction equations using a table of redox half-reaction equations
 5. Determine the oxidation numbers of atoms in a molecule or ion
 6. Write balanced oxidation-reduction equations using oxidation numbers
 7. Calculate an unknown value using redox stoichiometry
 8. Describe oxidation-reduction in simple biochemical processes and compare oxidation-reduction reactions in living and non-living systems.
 9. Define the terms related to batteries, voltaic cells, and electrolytic cells
 10. Using diagrams of batteries and voltaic cells, identify the parts
 11. Write balanced cathode, anode and net reaction equations for voltaic and electrolytic cells
 12. Identify the flow of electrons, the migration of anions and cations, mass and colour changes, formation of gases, and precipitates, at the electrodes of a voltaic cell
 13. Use cell notation and diagrams to communicate standard parts and operation of a cell
 14. Define standard reduction potential and reference half-cell
 15. Calculate standard cell potential using reduction potentials from a redox table
 16. Compare voltaic and electrolytic cells
 17. Perform calculations to determine quantities of mass, volume, concentration, current and time in single electrochemical and single electrolytic cells
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Chemical Systems and Equilibrium

Learning Outcome:

The student will demonstrate knowledge of chemical systems at equilibrium including acids and bases.

Objectives:

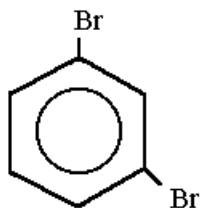
1. State the criteria that apply to a system at equilibrium and write and interpret chemical reaction equations for chemical systems at equilibrium
2. Relate the reversibility of reactions in electrochemical cells to equilibrium
3. Write chemical reaction equations for chemical systems at equilibrium
4. Use the equilibrium law to write the mathematical expression for K
5. Analyze evidence to obtain an equilibrium constant
6. Calculate equilibrium constants/concentrations for simple homogenous chemical systems
7. Calculate the ion concentrations
8. Predict if reactants or products are favoured in a reversible reaction
9. Use Le Chatelier's principle to predict, qualitatively, shifts in equilibrium caused by changes in temperature, pressure, volume, or concentration
10. Explain the effects of catalysts
11. Explain the pH/pOH scale in terms of logarithms
12. Calculate hydrogen and hydroxide ion concentrations using K_w
13. Predict qualitative changes in pH and pOH when a solution is diluted
14. Compare strong and weak acids and strong and weak bases using equilibrium principles
15. Perform various calculations to determine using the masses of solute, volumes and concentrations of solutions or the pH, pOH, ions and K values
16. State the limitations and restricted use of the Arrhenius acid-base definitions
17. Explain acidic and basic solutions using reactions with water to form hydronium or hydroxide ions
18. Write theoretical definitions of acid, base, and amphiprotic using Bronsted-Lowry concepts
19. Identify conjugate acid-base pairs
20. Describe acid-base indicators using Bronsted-Lowry and equilibrium concepts
21. Predict acid-base reactions using a table of relative acid-base strengths
22. Define and recognize examples of polyprotic acids and bases
23. State the empirical properties of a buffer
24. Calculate unknown quantities using acid-base stoichiometry
25. Perform a titration

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Sample Questions

1. What is the term for a family of compounds that are saturated hydrocarbons?
 - a. alkanes
 - b. alkenes
 - c. alkynes
 - d. arenes
 - e. none of the above
2. What is the current definition of organic chemistry?
 - a. the study of compounds containing carbon
 - b. the study of compounds having a "vital force"
 - c. the study of compounds that are biologically active
 - d. the study of compounds isolated from living systems
 - e. none of the above
3. Which of the following molecular formulas corresponds to an alkane?
 - a. C₈H₈
 - b. C₈H₁₄
 - c. C₈H₁₆
 - d. C₈H₁₈
 - e. C₈H₂₀
4. What is the IUPAC name for: CH₃-CH₂-CH₂-CH₂-CH-CH₂-CH₃?
 - a. nonane
 - b. isoheptane
 - c. 3-ethylheptane
 - d. 5-ethylheptane
 - e. 1,1-diethylpentane
5. Which of the following is a balanced equation for the complete combustion of ethane?
 - a. $2 \text{C}_2\text{H}_6 + 5 \text{O}_2 \xrightarrow{\text{spark}} 4 \text{CO} + 6 \text{H}_2\text{O}$
 - b. $2 \text{C}_2\text{H}_6 + 7 \text{O}_2 \xrightarrow{\text{spark}} 4 \text{CO}_2 + 6 \text{H}_2\text{O}$
 - c. $\text{C}_2\text{H}_6 + \text{O}_2 \xrightarrow{\text{spark}} 2 \text{CO} + 3 \text{H}_2$
 - d. $\text{C}_2\text{H}_6 + 2 \text{O}_2 \xrightarrow{\text{spark}} 2 \text{CO}_2 + 3 \text{H}_2$
 - e. $\text{C}_2\text{H}_6 + \text{O}_2 \xrightarrow{\text{spark}} \text{no reaction}$
6. Which of the following molecular formulas corresponds to an alkene?
 - a. C₁₀H₁₀
 - b. C₁₀H₁₈
 - c. C₁₀H₂₀
 - d. C₁₀H₂₂
 - e. C₁₀H₂₄

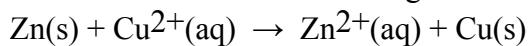
7. What is the IUPAC name for $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH=CH-CH}_2\text{-CH}_3$?
- octene
 - 3-octene
 - 4-octene
 - 5-octene
 - none of the above
8. What is the IUPAC name for $\text{CH}_3\text{-C}\equiv\text{C-CH}_2\text{-CH}_2\text{-CH}_3$?
- hexyne
 - 1-hexyne
 - 2-hexyne
 - 3-hexyne
 - none of the above
9. How many different isomers are there for dimethylbenzene, $\text{C}_6\text{H}_4(\text{CH}_3)_2$?
- 0
 - 2
 - 3
 - 4
 - none of the above
10. What is the IUPAC name of the following?
- dibromobenzene
 - 1,2-dibromobenzene
 - 1,3-dibromobenzene
 - 1,5-dibromobenzene
 - none of the above



11. Which of the following classes of compounds has a carbonyl group?
- alcohol
 - amine
 - ketone
 - organic halide
 - phenol
12. What is the class of compound for $\text{C}_6\text{H}_5\text{-OH}$?
- organic halide
 - alcohol
 - phenol
 - ether
 - amine

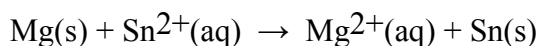
13. What is the systematic name for $\text{CH}_3\text{-CCl}_2\text{-CH}_3$?
- 1,1-dichloropropane
 - 1,2-dichloropropane
 - 1,3-dichloropropane
 - 2,2-dichloropropane
 - 3,3-dichloropropane
14. What is the IUPAC name of the following: $\text{CH}_3\text{-C-H}$?
- "ethanal"
 - "ethanone"
 - "methanal"
 - "methyl aldehyde"
 - "methyl ketone"
15. What is the common name of the following: $\text{CH}_3\text{-C-OH}$?
- acetaldehyde
 - acetic acid
 - acetone
 - ethanol
 - methyl formate
16. What is the term for the electrode in an electrochemical cell at which reduction occurs?
- anode
 - cathode
 - oxidation electrode
 - reduction electrode
 - salt bridge
17. Which of the following nonmetals in the free state has an oxidation number of zero?
- Ar
 - F_2
 - P_4
 - S_8
 - all of the above
18. What is the oxidation number of nitrogen in NH_3 ?
- 0
 - 1
 - 2
 - 3
 - none of the above
19. What is the oxidation number of sulfur in SO_3^{2-} ?
- 2
 - +2
 - +4
 - +6
 - none of the above

20. What substance is reduced in the following redox reaction?



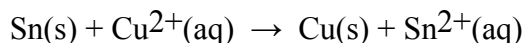
- a. Zn
- b. Cu^{2+}
- c. Zn^{2+}
- d. Cu
- e. none of the above

21. Which of the substances listed below is the strongest reducing agent given the following spontaneous redox reaction?



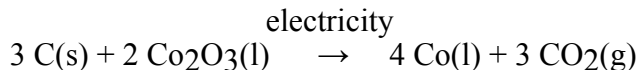
- a. Mg
- b. Sn^{2+}
- c. Mg^{2+}
- d. Sn
- e. none of the above

22. Which of the statements listed below is true regarding the following redox reaction occurring in a spontaneous electrochemical cell?



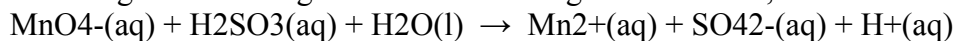
- a. Sn is reduced at the anode
- b. Cu^{2+} is oxidized at the cathode
- c. electrons flow from the Cu electrode to the Sn electrode
- d. anions in the salt bridge flow from the Cu half-cell to the Sn half-cell
- e. none of the above

23. Which of the statements listed below is true regarding the following redox reaction occurring in a nonspontaneous electrochemical cell?



- a. oxidation half-reaction: $\text{Co}^{3+} + 3 \text{e}^- \rightarrow \text{Co}$
- b. reduction half-reaction: $\text{C} + 2 \text{O}_2^- \rightarrow \text{CO}_2 + 4 \text{e}^-$
- c. O_2^- is produced at the anode
- d. Co metal is produced at the cathode
- e. none of the above

24. After balancing the following redox reaction using half-reactions, what is the coefficient of H^+ ?



- a. 1
- b. 20
- c. 4
- d. 16
- e. none of the above

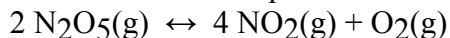
25. After balancing the following redox reaction using oxidation numbers, what is the coefficient of OH-?
$$\text{CrO}_4^{2-}(\text{aq}) + \text{S}^{2-}(\text{aq}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Cr}_2\text{O}_3(\text{s}) + \text{S}(\text{s}) + \text{OH}^-(\text{aq})$$
- 1
 - 2
 - 3
 - 10
 - none of the above
26. After balancing the following redox reaction, what is the coefficient of H₂O?
$$\text{MnO}_2(\text{s}) + \text{O}_2(\text{g}) + \text{OH}^-(\text{aq}) \rightarrow \text{MnO}_4^-(\text{aq}) + \text{H}_2\text{O}(\text{l})$$
- 1
 - 2
 - 6
 - 12
 - none of the above
27. What equilibrium constant applies to a reversible reaction involving a gaseous mixture at equilibrium?
- general equilibrium constant, K_{eq}
 - ionization equilibrium constant, K_{i}
 - ionization equilibrium constant, K_{w}
 - solubility product equilibrium constant, K_{sp}
 - none of the above
28. What is the term for a reaction that proceeds by releasing heat energy?
- endothermic reaction
 - exothermic reaction
 - isothermal reaction
 - all of the above
 - none of the above
29. Which principle states that a reversible reaction at equilibrium will shift to relieve the stress by a change in concentration, temperature, or pressure?
- equilibrium principle
 - shift principle
 - stress principle
 - Le Chatelier's principle
 - none of the above
30. If the heat of reaction is endothermic, which of the following is always true?
- the reaction rate is fast
 - the reaction rate is slow
 - the energy of the reactants is greater than the products
 - the energy of the reactants is less than the products
 - none of the above

31. What is the general equilibrium constant expression, K_{eq} , for the following reversible reaction:



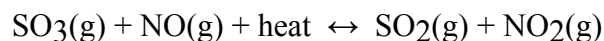
- a. $K_{eq} = [A]^2[B]^3 / [C]^0$
- b. $K_{eq} = [A]^2[B]^3 / [C]^1$
- c. $K_{eq} = [C]^0 / [A]^2[B]^3$
- d. $K_{eq} = [C]^1 / [A]^2[B]^3$
- e. none of the above

32. What is the equilibrium constant expression for the following reaction?



- a. $K_{eq} = [N_2O_5]^2 / [NO_2]^4[O_2]$
- b. $K_{eq} = [N_2O_5]^2 / [NO_2]^4[O_2]^2$
- c. $K_{eq} = [NO_2]^4[O_2] / [N_2O_5]^2$
- d. $K_{eq} = [NO_2]^4[O_2]^2 / [N_2O_5]^2$
- e. none of the above

33. Which of the changes listed below will shift the equilibrium to the left for the following reversible reaction?



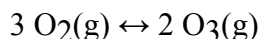
- a. increase $[NO]$
- b. decrease $[SO_2]$
- c. decrease temperature
- d. increase pressure
- e. add a catalyst

34. What is the equilibrium constant expression, K_{sp} , for slightly soluble silver sulfate in aqueous solution?



- a. $K_{sp} = [Ag^+][SO_4^{2-}]$
- b. $K_{sp} = [Ag^+]^2[SO_4^{2-}]$
- c. $K_{sp} = [Ag^+][SO_4^{2-}]^2$
- d. $K_{sp} = [Ag^+]^2[SO_4^{2-}] / [Ag_2SO_4]$
- e. $K_{sp} = [Ag^+][SO_4^{2-}]^2 / [Ag_2SO_4]$

35. Ultraviolet light converts oxygen in the upper atmosphere to ozone. Calculate the equilibrium constant for the reaction given the equilibrium concentrations at 20°C: $[O_2] = 9.38 \times 10^{-3}$ and $[O_3] = 3.40 \times 10^{-15}$.



- a. $K_{eq} = 4.11 \times 10^{-28}$
- b. $K_{eq} = 1.40 \times 10^{-23}$
- c. $K_{eq} = 3.62 \times 10^{-13}$
- d. $K_{eq} = 2.43 \times 10^8$
- e. $K_{eq} = 7.14 \times 10^{22}$

36. A 0.750 M sample of phosphorus pentachloride decomposes to give phosphorus trichloride and chlorine gases. If the equilibrium concentration of PCl_5 is 0.650 M, what is the equilibrium constant for the reaction?

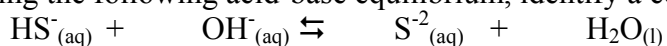


- $K_{\text{eq}} = 0.0133$
 - $K_{\text{eq}} = 0.0154$
 - $K_{\text{eq}} = 0.133$
 - $K_{\text{eq}} = 0.154$
 - $K_{\text{eq}} = 65.0$
37. What is the term for the energy necessary for reactants to achieve the transition state and overcome the energy barrier for forming products?
- activation energy
 - collision energy
 - heat of reaction
 - energy barrier
 - none of the above
38. Which of the following increases the collision frequency of molecules?
- increasing the concentration
 - decreasing the temperature
 - adding a catalyst
 - all of the above
 - none of the above
39. Which of the following factors influences the rate of a chemical reaction?
- concentration
 - temperature
 - catalyst
 - all of the above
 - none of the above
40. If the concentration of reactants increase, which of the following is true?
- the amount of product decreases
 - the heat of reaction increases
 - the rate of reaction increases
 - all of the above
 - none of the above
41. If the temperature of a reaction increases, which of the following is true?
- the amount of product decreases
 - the heat of reaction increases
 - the rate of reaction increases
 - all of the above
 - none of the above

42. What is the term for a substance that acts as a proton donor in one reaction and as a proton acceptor in another?
- amphiprotic
 - Arrhenius acid
 - Arrhenius base
 - Bronsted-Lowry acid
 - Bronsted-Lowry base
43. What is the term for a substance that yields hydroxide ions in water?
- Arrhenius acid
 - Arrhenius base
 - Bronsted-Lowry acid
 - Bronsted-Lowry base
 - none of the above
44. What is the term for a substance that accepts a proton in an acid-base reaction?
- Arrhenius acid
 - Arrhenius base
 - Bronsted-Lowry acid
 - Bronsted-Lowry base
 - none of the above
45. A hydronium ion is a hydrogen ion bonded to which of the following?
- hydrogen atom
 - hydroxide ion
 - hydrogen molecule
 - water molecule
 - none of the above
46. What is the term for the process of a polar molecular compound dissolving in water and forming positive and negative ions?
- dissociation
 - hydration
 - ionization
 - solvation
 - none of the above
47. What is the term for a solution whose concentration has been established accurately to three or four significant digits?
- neutralization solution
 - reference solution
 - standard solution
 - titration solution
 - QA or QC solution

48. Given an aqueous solution in which the $[H^+] = 5.0 \times 10^{-3}$, what is the molar hydroxide ion concentration?
- $[OH^-] = 2.0 \times 10^{-10}$
 - $[OH^-] = 2.0 \times 10^{-11}$
 - $[OH^-] = 2.0 \times 10^{-12}$
 - $[OH^-] = 5.0 \times 10^{-11}$
 - $[OH^-] = 5.0 \times 10^{-12}$
49. What is the pH of an aqueous solution if the $[H^+] = 0.000\ 042\ M$?
- 0.62
 - 4.38
 - 4.62
 - 5.38
 - 9.62
50. If a solution is a poor conductor of electricity, which of the following is true?
- The solution is highly ionized.
 - The solution is slightly ionized.
 - The solution is highly reactive.
 - The solution is slightly reactive.
 - The solution does not contain any ions.
51. Nitrous acid is a weak acid, sodium hydroxide is a strong base, and sodium nitrite is a soluble salt. Using Arrhenius theory, which of the following is the net ionic equation for:
- $$HNO_2(aq) + NaOH(aq) \rightarrow NaNO_2(aq) + H_2O(l)$$
- $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
 - $NO_2^-(aq) + Na^+(aq) \rightarrow NaNO_2(aq)$
 - $HNO_2(aq) + OH^-(aq) \rightarrow NO_2^-(aq) + H_2O(l)$
 - $H_3O^+(aq) + OH^-(aq) \rightarrow H_2O(l) + H_2O(l)$
 - $H^+(aq) + NO_2^-(aq) + NaOH(aq) \rightarrow Na^+(aq) + NO_2^-(aq) + H_2O(l)$
52. If 20.0 mL of 0.500 M KOH is titrated with 0.250 M HNO₃, how many milliliters of nitric acid are required to neutralize the base?
- 10.0 mL
 - 20.0 mL
 - 25.0 mL
 - 40.0 mL
 - 50.0 mL
53. What is the molarity of a nitric acid solution if 25.00 mL of HNO₃ is required to neutralize 0.424 g of sodium carbonate (105.99 g/mol)?
- $$2 HNO_3(aq) + Na_2CO_3(aq) \rightarrow 2 NaNO_3(aq) + H_2O(l) + CO_2(g)$$
- 0.0800 M
 - 0.100 M
 - 0.160 M
 - 0.200 M
 - 0.320 M

54. Using the following acid-base equilibrium, identify a conjugate acid-base pair.

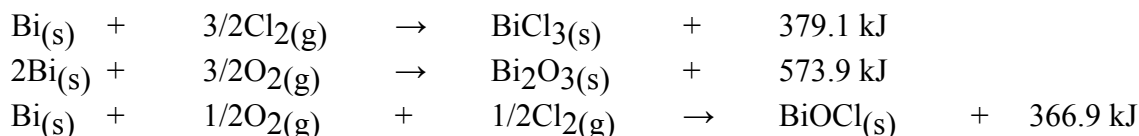


- HS-(aq) and OH-(aq)
 - S²⁻(aq) and H₂O(l)
 - OH-(aq) and S²⁻(aq)
 - HS-(aq) and S²⁻(aq)
55. A human body loses about 360 kJ of heat every hour. Assuming that an average human body is equivalent to about 60 kg of water, what temperature decrease in oC would this heat transfer cause?
- 1.4
 - 4.1
 - 5.5
 - 3.4
 - 3.6
56. An experiment produces evidence that the evaporation of 4.00 g of liquid butane C₄H₁₀ (l) requires a gain in enthalpy of 1.67 kJ. Find the molar enthalpy of vaporization in kJ/mol for butane from this evidence.
- 24.3
 - 43.1
 - 54.5
 - 33.4
 - 13.6
57. A 500 kg steel boiler is used to convert 200 kg of water into steam. Calculate the total energy required in MJ to heat both the steel and its contents from 20.0oC to 100.0oC. The specific heat of steel is 0.528 J/goC.
- 541
 - 411
 - 550
 - 345
 - 632
58. Find the temperature increase in oC expected for 1.00 L of water when it absorbs all of the energy from the combustion of 1.00 g of acetylene, C₂H₂(g).
- 11.8
 - 14.1
 - 15.5
 - 13.4
 - 13.6
59. The energy stored in hydrocarbons can be released by combustion. When one mole of each of the following fuels is burned to form gaseous products, which fuel releases the greatest amount of energy?
- Butane
 - Ethane
 - Pentane
 - Propane

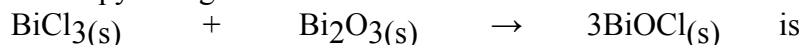
60. A group of students are interested in determining experimentally the molar heat of reaction of wax with oxygen. Their experiment should be based upon the processes of
- Calorimetry and combustion
 - Formation and summation
 - Formation and summation
 - Kinetic and potential energy
 - Molar fusion and additivity

61. A 225.0 g sample of a liquid hydrocarbon requires the addition of 9.54 kJ of heat to increase its temperature from 20.5oC to 45.0oC. What is the specific heat capacity of this hydrocarbon?
- 1.18 J/g.oC
 - 1.73 J/g.oC
 - 1.88 J/g.oC
 - 17.3 J/g.oC

62. Use the following information to answer the following question



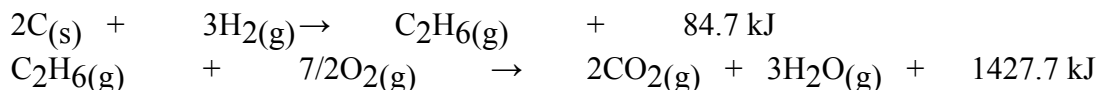
The enthalpy change for



- +1319.9 kJ
 - +586.1 kJ
 - 147.7 kJ
 - 2053.7 kJ
63. Use the following information to answer the next question
- $$2\text{C}_6\text{H}_6(\text{l}) + 15\text{O}_2(\text{g}) \rightarrow 12\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g}) \quad \Delta H_c = -6338.6 \text{ kJ}$$
- The heat released when 6.50 g sample of oxygen consumed is
- 85.8
 - 172
 - 1290
 - 0.00
 - 0.36
64. If 5.74 kJ of energy are required to melt 50.0 g of sodium metal at 98.0oC, the molar heat of fusion for sodium metal is
- +1.25 x 10⁵ kJ/mol
 - +114.8 kJ/mol
 - +2.64 kJ/mol
 - +8.71 J/mol

65. A chemical reaction occurs in a calorimeter. The temperature of the calorimeter decreases from 36.50°C to 19.75°C. Assuming all the heat is lost by a 1350 g sample of water in the calorimeter, what quantity of energy did the water lose?
- 111 kJ
 - 206 kJ
 - 22.6 kJ
 - 94.7 kJ

66. Use the following information to answer this question:



The molar heat of combustion of ethane is

- 84.7 kJ/mol
 - + 84.7 kJ/mol
 - + 1427.7 kJ/mol
 - 1427.7 kJ/mol
67. Use the following information to answer this question:
The molar heat of combustion for ethylene glycol, C₂H₄(OH)₂(l), is -1181.2 kJ/mol when the products of combustion are gases.

The molar heat of formation of ethylene glycol is

- +590.6 kJ/mol
 - 1181.2 kJ/mol
 - 331.2 kJ/mol
 - 500.7 kJ/mol
68. Calculate the molar heat of combustion for dodecane, when 0.50 mol of an alkane undergoes combustion and approximately 4.0 x 10³ kJ of heat are released.
- 4250 kJ/mol
 - 5500 kJ/mol
 - 6750 kJ/mol
 - 8000 kJ/mol

69. An exothermic reaction may be defined as a reaction in which
- Energy is released by the reaction
 - Energy is absorbed from the surroundings
 - The energy is written on the reactant side of the equation
 - The H value is positive

70. Use the following information to answer this question



If one mole of water is decomposed, the *H* is

- +285.8 kJ
- +571.6 kJ
- 285.8 kJ
- 571.6 kJ

71. The combustion of a 5.00g sample of cellulose in a calorimeter causes 2.35 kg of water to increase in temperature from 20.4oC to 24.5oC. What is the heat produced by this reaction?
- 19.4 kJ
 - 40.4 kJ
 - 8.07 kJ
 - 85.9 kJ

72. The reaction which occurs in the catalytic converters of some automobiles is
- $$2\text{CO}(\text{g}) + 2\text{NO}(\text{g}) \rightarrow \text{N}_2(\text{g}) + 2\text{CO}_2(\text{g})$$

The enthalpy change for this reaction is

- 1188.4 kJ
 - 373.2 kJ
 - 385.6 kJ
 - 746.4 kJ
73. Mohawk markets a gasoline containing ethanol. Calculate the heat of combustion for ethanol, in KJ/mol. $\text{C}_2\text{H}_5\text{OH}(\text{l}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\text{g})$
- 1235.2
 - 1114.1
 - 1645.5
 - 1893.4
 - 1573.6

Answers

- | | | | | | |
|-----|---|-----|---|-----|---|
| 1. | a | 24. | c | 49. | b |
| 2. | a | 25. | d | 50. | b |
| 3. | d | 26. | b | 51. | c |
| 4. | c | 27. | a | 52. | d |
| 5. | b | 28. | b | 53. | e |
| 6. | c | 29. | d | 54. | d |
| 7. | b | 30. | d | 55. | a |
| 8. | c | 31. | d | 56. | a |
| 9. | c | 32. | c | 57. | a |
| 10. | c | 33. | c | 58. | a |
| 11. | c | 34. | b | 59. | c |
| 12. | c | 35. | b | 60. | a |
| 13. | d | 36. | b | 61. | b |
| 14. | a | 37. | a | 62. | c |
| 15. | b | 38. | a | 63. | a |
| 16. | b | 39. | d | 64. | c |
| 17. | e | 40. | c | 65. | d |
| 18. | d | 41. | c | 66. | d |
| 19. | c | 42. | a | 67. | c |
| 20. | b | 43. | b | 68. | d |
| 21. | a | 44. | d | 69. | a |
| 22. | d | 45. | d | 70. | a |
| 23. | d | 46. | c | 71. | b |
| | | 47. | c | 72. | d |
| | | 48. | c | 73. | a |