

LITERACY IN CHEMISTRY

The four most common writing prompts for the New York State Chemistry Regents are (*explain*) *why, how (is/should/does), describe, and explain*. It is important that teachers and students construct questions using these prompts and understand what is expected in the written answer for the different prompts. Use the **CHEMISTRY WRITING PROMPTS template** have students construct questions based on specific chemistry topics. Examples of Chemistry Regents questions using these prompts have been grouped together in the **CHEMISTRY WRITING PROMPTS ... handout**. In addition, the prompts are defined – and teachers and students should brainstorm to expand the definitions so that they are certain as to exactly what information would be required to completely address that question.

The Chemistry Regents uses italics to identify the “limiting factor” used in multiple choice questions. The four most common limiting factors on a Chemistry Regents are *not, decrease(s), lowest/lower/least and smallest*. The **CHEMISTRY CONCEPT WINDOW template** is used to get students to write questions about a specific chemistry concept (such as *electronegativity*) using all four limiting factors. The **CHEMISTRY CONCEPT WINDOW handout** contains examples taken from Regents Chemistry examinations.

A very common writing prompt on the Chemistry Regents is to “*explain in terms of ---, why ---*”. Using the **EXPLAIN IN TERMS OF ___, WHY ___ template**, students should learn to identify processes, concepts, or objects from specific chemistry units, then write facts about them, so they can explain why they are correct/true/observed. Specific examples of these types of Regents Chemistry questions are given on the **EXPLAIN IN TERMS OF ___, WHY ___ handout**.

Upon the completion of a chemistry unit it is helpful to have students identify the key concepts, principles, and processes (within the unit). Using the **WHAT’S THE RELATIONSHIP BETWEEN ... template**, students should then pair words together such as “shell” and “bonding” so they can describe/explain the relationship between the words. Once students have covered several units, they can then make connections between key concepts, principles, and processes of different units using the **WHAT’S THE CONNECTION BETWEEN TEMPLATE ...**

There are approximately, 32 different structural formulas of hydrocarbons used on the Chemistry Regents. The **STRUCTURAL FORMULAS OF ORGANIC COMPOUNDS template** allows students to analyze the structure and then write about the compounds in relationship between their naming, classification, isomers, and modification. The **32 MOST RECOGNIZED HYDROCARBON handout** has the structural formulas of the hydrocarbons in size order – 1-5 carbons (as you go down the columns).

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EXPLAIN IN TERMS OF _____, WHY _____

Process/Concept/Object	Why the following is correct/true/observed
atomic structure	cesium has a lower first ionization than rubidium
atomic particles	geranium is chemically similar to silicon a potassium ion is smaller than a potassium atom
Subatomic particles found in the nucleus	S-32 is a stable nuclide
function of a catalyst	the nuclei of carbon-12 and carbon-13 atoms are different
molecular energy	curves on the potential energy diagram for catalyzed and uncatalyzed reactions are different
Le Chatelier's principle	the vapor pressure of propanone increases when its temperature increases
Electrons	the concentration of $\text{NH}_3(\text{g})$ decreases when the temperature of the equilibrium system increases
Energy flow	bonding in NaCl is ionic
Molecular polarity	the temperature of water in the calorimeter increases
Structure and/or distribution of charge	rubbing alcohol, 2-propanol, is soluble in water
Electronegativity	CO ₂ is a nonpolar molecule
Particles	a C=O bond in CO ₂ is more polar than the F-F bond in F ₂
Intermolecular forces	NaCl does not conduct electricity
Bonding	naphthalene sublimates
Composition	ethane is an unsaturated hydrocarbon
equilibrium	sample A represents a pure substance
	the solution is saturated

EXPLAIN IN TERMS OF _____

, WHY _____

Process/Concept/Object	Statement regarding Process/Concept/Object	Why the Statement is Correct/True/Observed

CHEMISTRY CONCEPT WINDOW

<p>... do not/does not/can not/is not/would not ...</p> <p>Explain why naphthalene is not expected to dissolve in water. Which substance can not be decomposed by a chemical change? Which structural formula represents a molecule that is not an isomer of pentane? Hexane (C₆H₁₄) and water do not form a solution, which statement explains this phenomenon? Explain why the sample of iodine-131 would not pose a great risk to people today as the sample of cesium-137 would. Which species does not have a noble gas electron configuration?</p>	<p>... a decrease/decreases (the/when) ...</p> <p>As the temperature of a substances decreases, the average kinetic energy of its particles ... As the pressure on the surface of a liquid decreases, the temperature at which the liquid will boil ... Which phase change represents a decrease in entropy? Explain, in terms of Le Chatelier's principle why the concentration of NH₃(g) decreases when the temperature of the equilibrium system increases.</p>
<p>... has the lowest/lower than/(is/the) least ...</p> <p>Which of these elements has the least attraction for electrons in a chemical bond? According to Table F, which of the following salts is least soluble in water? Based on Reference Table F, which of these saturated solutions has the lowest concentration of dissolved ions? Which of the following Group 2 elements has the lowest first ionization energy? Which sample has the lowest entropy? Which of the following is least soluble in water? Which solution has the lowest pH Which solution has the lowest freezing point? According to Reference Table F, which of these compounds is least soluble in water? Which of these elements has the lowest melting point?</p>	<p>... (the) smallest ...</p> <p>When the equation is balanced using the smallest whole-number coefficients, what is the coefficient of Al? Balance the neutralization equation using the smallest whole-number coefficients.</p>

CHEMISTRY CONCEPT WINDOW

Concept: _____

... do not/does not/can not/is not/would not ...

... a decrease/decreases (the/when) ...

... has the lowest/lower than/(is/the) least ...

... (the) smallest ...

CHEMISTRY WRITING PROMPTS ...

Explain why ...

the number of molecules of $\text{N}_2(\text{g})$ in cylinder B is the same as the number of molecules of $\text{CO}_2(\text{g})$ in cylinder A. N-16 is a poor choice for radioactive dating of a bone. CCl_4 is classified as a nonpolar molecule. NH_3 has stronger intermolecular forces of attraction than Cl_2 . it is better to use the average data from multiple trials rather than data from a trial to calculate the results of a titration. Zinc sulfide is used in luminescent paint. XX does not represent a compound. Na and K have similar chemical properties. Naphthalene is not expected to dissolve in water. the average kinetic energy of sample B is equal to the average kinetic energy of sample C. sample C could represent a mixture of fluorine and hydrogen chloride. Radium forms chemical bonds in the same way as calcium does.

is water flow a crucial factor in deciding whether Yucca Mountain is a suitable burial site? does radium substitute for calcium in bones?

(Explain) Why ...

How is/should/does ...

the bonding between carbon atoms different in unsaturated hydrocarbons and saturated hydrocarbons. the original model be revised based on the results of this experiment? pressure affect the solubility of dissolved $\text{CO}_2(\text{g})$? temperature affect the solubility of dissolved $\text{CO}_2(\text{g})$? this heating curve illustrate that the heat of vaporization is greater than the heat of fusion the radioactive decay of Krypton-85 different from the radioactive decay of Americium-241? this temperature change affect the gas particle motion?

to separate ammonium from hydrogen and nitrogen. the potential energy diagram will change if a catalyst is added.

(Describe) how ...

<p>Describe ...</p> <p>Describe the relationship between ...</p>	<p>this experiment.</p> <p>the effect of increasing the concentration of HCl(aq) on the reaction rate.</p> <p>what happens to entropy during this dissolving process.</p> <p>this observation in terms of heat flow.</p> <p>the solubility of zinc sulfide in water.</p> <p>the strength of the intermolecular forces and the number of carbon atoms in different hydrocarbon molecules.</p>
<p>Explain ...</p> <p>Explain how ...</p> <p>Explain the function ...</p>	<p>your answer in terms of the Periodic Table of the Elements.</p> <p>the production of an emission spectrum in terms of the energy states of an electron.</p> <p>the bonding in KCl is different from the bonding in molecules A, B, and C.</p> <p>the experimental data supports the statement.</p> <p>a catalyst may increase the rate of a chemical reaction.</p> <p>a bright-line spectrum is produced, in terms of excited state, energy transitions, and ground state.</p> <p>of the salt bridge in salt bridge in the voltaic cell.</p> <p>of the salt bridge</p>

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Expand the Definitions

Why: *For what cause, reason, or purpose*

How: *by what means or process*

Describe: *representation in language of the essential qualities*

Explain: *serve as a reason or cause or justification of*

CHEMISTRY WRITING PROMPTS

(Explain) WHY ...

HOW (is/should/does) ...

DESCRIBE ...

EXPLAIN (how/the function) ...

STRUCTURAL FORMULAS OF ORGANIC COMPOUNDS

Carbon (C)	Hydrogen (H)	Oxygen (O)
Molecular Formula	Bonds (single, double, triple)	Functional Group(s)
Straight/Branched/Ring	Class of Organic Compound	Isomer

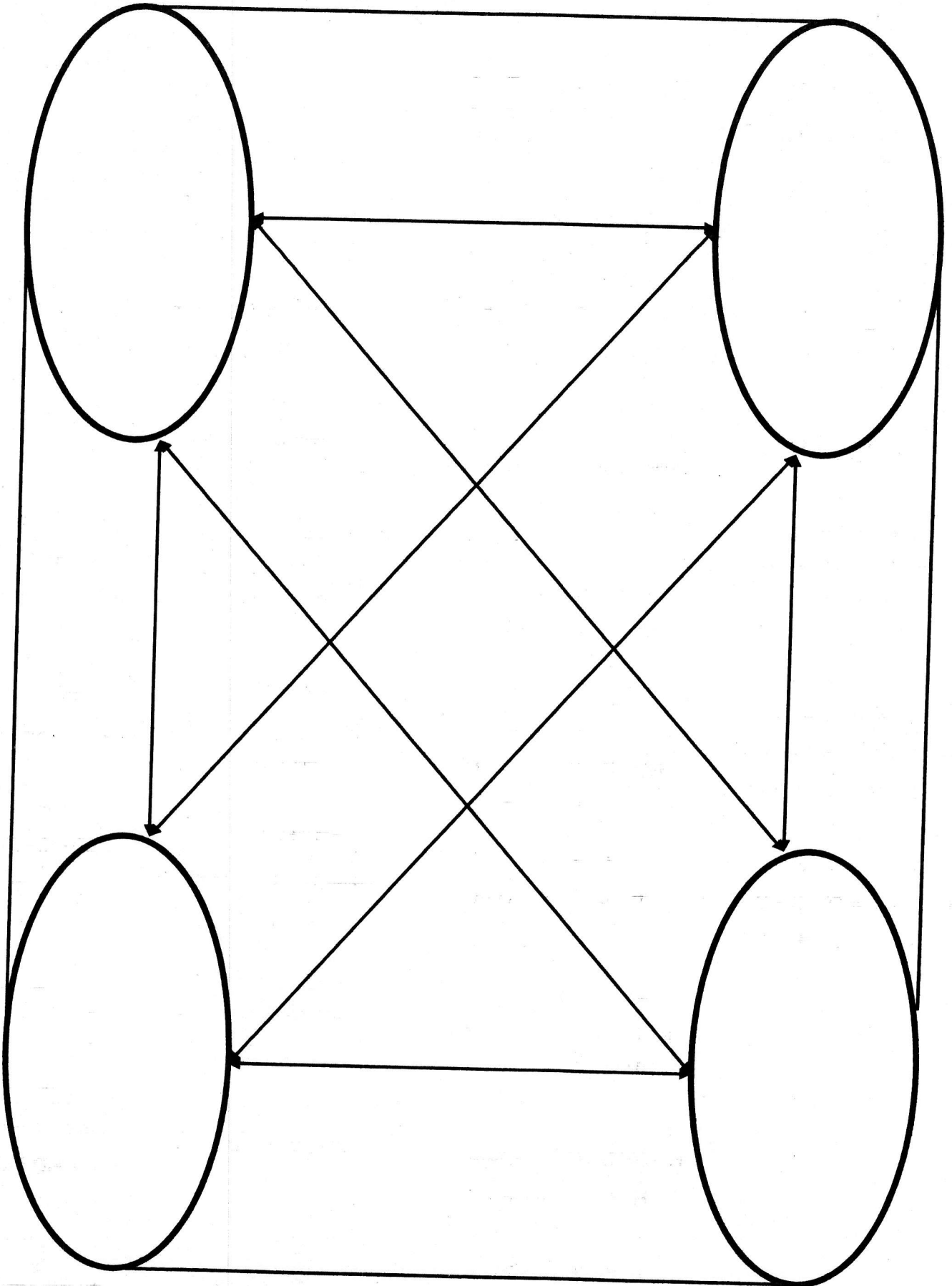
Explain how you would name this compound.

Explain how you classified this compound.

How does the isomer differ the original compound?

Using/removing 1 or 2 oxygen molecules create examples of the different classes of organic compounds.

WHAT'S THE CONNECTION BETWEEN ...



WHAT'S THE RELATIONSHIP BETWEEN ...

and

and

and

and