# How to *PASS* the Chemistry Regents

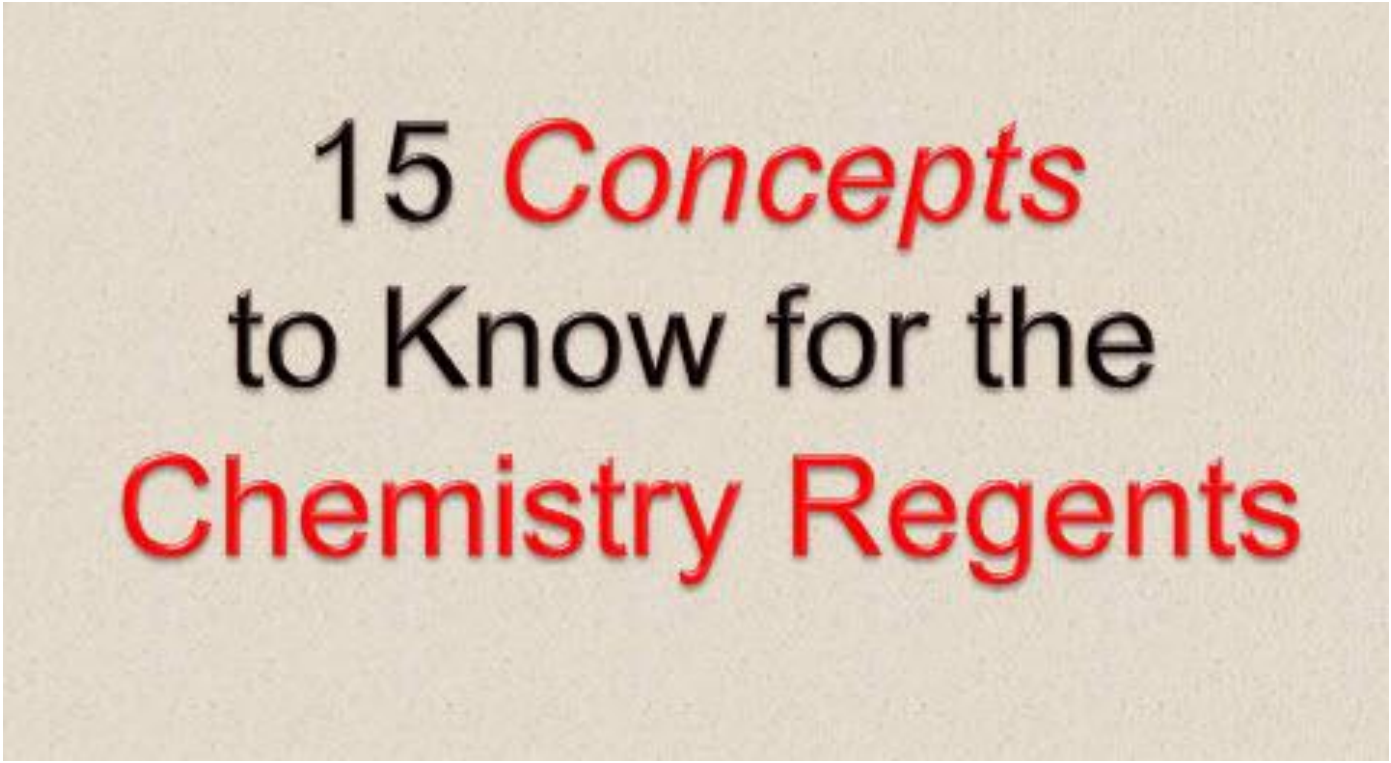
## A Study Guide using the January, 2013 Chemistry Regents

by Guy Hauptman of
www.chemvideotutor.com

**Contains both multiple choice and short answer questions, answers with explanations, reference tables, and corresponding "Way #'s" from "100 Ways to *Pass* the Chemistry Regents!"**

(Get the FREE Review Sheet by clicking HERE!)


**Before reading any further,**
**make sure to sign up for my online video series:**

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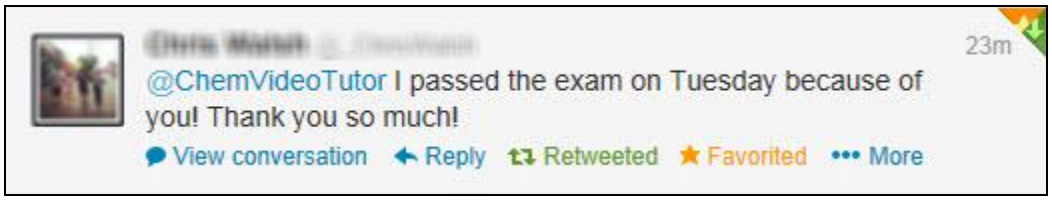
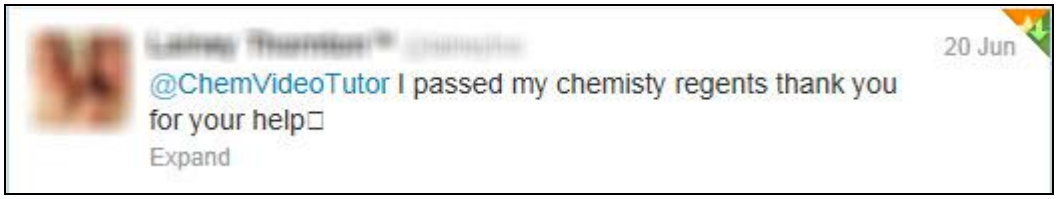
## Disclaimers

1. Guy Hauptman, www.chemvideotutor.com and/or its affiliates are in no way connected or affiliated with the New York State Education Department Board of Regents, or those who make the Chemistry Regents Exam.

2. Additionally, although the Chemistry Regents has a strong tendency to repeat certain questions and concepts, past performance does not guarantee future results. So, while I am confident that the materials I have put together in this ebook, my review sheet and my videos will definitely help you perform well on the Chemistry Regents, individual results can and will vary, including the possibility of not passing the Chemistry Regents, for which I cannot assume responsibility.

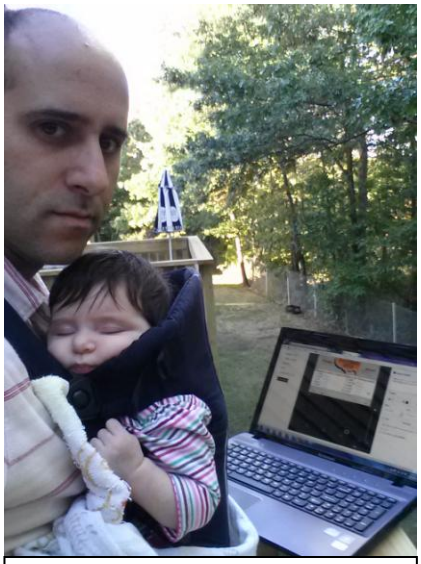




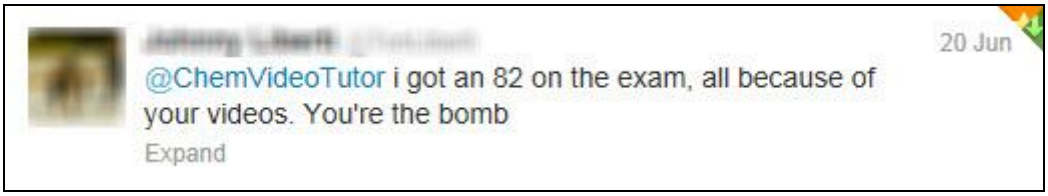

## About the Author

Guy Hauptman is a New York State certified teacher licensed to teach Chemistry and Biology. Guy has taught both subjects for over 10 years now in New York City public and private high schools. During that time, he has also tutored students publicly and privately, on an individual level as well as through Regents Crash Courses. After getting married to a wonderful wife and having 2 beautiful daughters, Guy's time availability was curtailed tremendously. As a result, Guy created "**100 Ways to *PASS* the Chemistry Regents**!", an online video tutorial program that covers 100 of the easiest and most commonly asked concepts on the Chemistry Regents, allowing him to combine his passions of making videos and helping students understand chemistry.

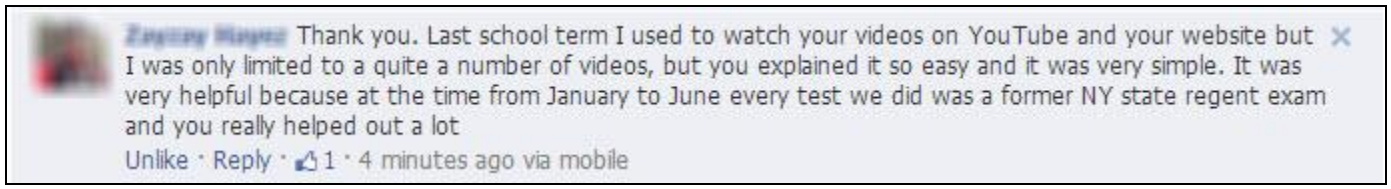


That's me multi-tasking!

**Now, students can learn at their own pace, on their own time, yet still gain the knowledge necessary to pass the Chemistry Regents!**




**"If at any point while you're using this study guide you have any questions, please don't hesitate to contact me. You can best reach me on Twitter (@AChemVideoTutor), on my Facebook Page, or by subscribing to my Youtube Channel! Even if you don't have any questions, I'd love for you to come by and say hello! If you want to reach me in private you can email me at chemvideotutor@gmail.com."**

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## How to Use this Study Guide:

Out of the **85** questions on the January, 2013 Chemistry Regents Exam, there were **63** that corresponded to at least 1 of the "**100 Ways to *PASS* the Chemistry Regents!**".

Considering you usually need about 50 points to pass the Chemistry Regents with a **65**, if you were to correctly answer the 63 questions that corresponded to the **"100 Ways"** you would have passed with a **74!**

**63 Ways = *PASS* with at least a 74!**
*** = Top 50 most asked Chemistry Regents concepts (42)**

This means that there are 13 points of "insurance" built into my system, for this exam.

Although every Chemistry Regents may vary in the number of **"Ways"** covered, ***every Chemistry Regents exam I have gone through contained at least 60 "Ways",*** which can help more than ensure a passing grade.


So, on the following pages, I have provided you with ***only*** those 68 questions that correspond to a **"Way"** along with which **"Way #"** the question corresponds to as well as the actual **"Way"** Topic, Concept and Explanation so that you can answer the question correctly.

I have also provided some additional information such as a reference table you may need to refer to or some other piece of information that will assist you in answering the question correctly.

Finally, while going through just this *one* exam may be helpful, I highly recommend that you go through **at least 4 exams** with my reference sheets to really drive home the repetitive nature of the Chemistry Regents; or you can just watch "**100 Ways to *PASS* the Chemistry Regents!**".

# January, 2013 Chemistry Regents

| Question | Topic | 100 Ways to *PASS* the Chemistry Regents |
|---|---|---|
| 1 | Atomic Concepts | Way # 21* |
| 2 | Atomic Concepts | Way # 19* |
| 3 | Atomic Concepts | Way # 18* |
| 4 | Atomic Concepts | Way # 26* |
| 5 | Atomic Concepts | Way # 22* |
| 6 | Formula Writing | Way # 56 |
| 7 | Periodic Table | Way # 49 |
| 8 | Periodic Table | Way # 38 |
| 9 | Bonding | Way # 43* |
| 10 | Bonding | Way # 46* |
| 11 | Solid, Liquid, Gas | Way # 11 |
| 12 | Atomic Concepts | |
| 13 | Matter | Way # 2* |
| 14 | Periodic Table | Way # 35 |
| 15 | Heat | |
| 16 | Heat | Reference Tables B and T (Heat) |
| 17 | Kinetics & Equlibrium | Way # 73 |
| 18 | Solutions | Way # 67 |
| 19 | Matter | |
| 20 | Solid, Liquid, Gas | |
| 21 | Solid, Liquid, Gas | |
| 22 | Bonding | Way # 40* |
| 23 | Kinetics & Equlibrium | Way # 81* |
| 24 | Organic Chemistry | Way # 95 |
| 25 | RedOx | Way # 90* |
| 26 | Acids and Bases | Way # 89 |
| 27 | Acids and Bases | Way # 82* |
| 28 | Nuclear Chemistry | Way # 29* |
| 29 | Nuclear Chemistry | |
| 30 | Nuclear Chemistry | Way # 32 |
| 31 | Atomic Concepts | Way # 25* |
| 32 | Acids and Bases | Way # 86* |
| 33 | Formula Writing | Way # 59* |
| 34 | Chemistry Math | Way # 64* |
| 35 | Formula Writing | |
| 36 | Formula Writing | |
| 37 | Formula Writing | Periodic Table of Elements, Table E |
| 38 | Bonding | Way # 52* |
| 39 | Periodic Table | Way # 39* |
| 40 | Bonding | Way # 47 |
| 41 | Nuclear Chemistry | Way # 28 |
| 42 | Solid, Liquid, Gas | Reference Table T (Combined Gas Law) |
| 43 | Heat | |
| 44 | RedOx | Way # 91 |



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# January, 2013 Chemistry Regents

| Question | Topic | 100 Ways to *PASS* the Chemistry Regents |
|---|---|---|
| 45 | Solid, Liquid, Gas | |
| 46 | Organic Chemistry | Way # 99* |
| 47 | Formula Writing | |
| 48 | Nuclear Chemistry | Way # 30* |
| 49 | Lab Techniques | |
| 50 | Acids and Bases | Way # 84* |
| 51 | Periodic Table | Way # 50* |
| 52 | Kinetics & Equlibrium | Way # 78 |
| 53 | Kinetics & Equlibrium | Way # 77* |
| 54 | Kinetics & Equlibrium | Way # 74* |
| 55 | Chemistry Math | Way # 60* |
| 56 | Chemistry Math | Way # 60* |
| 57 | Chemistry Math | Way # 60* |
| 58 | Periodic Table | Way # 39* |
| 59 | Organic Chemistry | Way # 97* |
| 60 | Chemistry Math | Way # 63* |
| 61 | Formula Writing | Way # 55* |
| 62 | Chemistry Math | Way # 70 |
| 63 | Kinetics & Equlibrium | Way # 76 |
| 64 | Solutions | |
| 65 | Solutions | Way # 69 |
| 66 | Formula Writing | Periodic Table of Elements |
| 67 | Matter | Way # 5* |
| 68 | Solutions | Way # 71* |
| 69 | Matter | Way # 2* |
| 70 | RedOx | Way # 93* |
| 71 | RedOx | |
| 72 | RedOx | |
| 73 | Atomic Concepts | Way # 24 |
| 74 | Atom | Way # 23 |
| 75 | Atom | Way # 23 |
| 76 | Chemistry Math | Way # 66 |
| 77 | Acids and Bases | Way # 82* |
| 78 | Acids and Bases | Way # 87* |
| 79 | Chemistry Math | Reference Table T (Percent Error) |
| 80 | Heat | Way # 13* |
| 81 | Heat | Way # 14* |
| 82 | Heat | Reference Tables B and T (Heat) |
| 83 | Organic Chemistry | |
| 84 | Organic Chemistry | Way # 98* |
| 85 | Kinetics & Equlibrium | Way # 80* |
| | | 63 Ways = *PASS* with at least a 74! |
| | | * = Top 50 most asked Chemistry Regents concepts (42) |

Click HERE to get the "100 Ways to *PASS* the Chemistry Regents!" Review Sheet!

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 21:**

1 Which particles have approximately the same mass?

(1) alpha particle and beta particle
(2) alpha particle and proton
(3) neutron and positron
(4) neutron and proton

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 21 | Atom | Sub-atomic particle mass | Table O, top numbers | 1:59 |



Straight from the review sheet: find the **masses** for each particle by looking at the **top numbers** in **Table O of the Chemistry Reference Tables,** making the correct answer **choice 4**.

**Table O**
**Symbols Used in Nuclear Chemistry**

| Name | Notation | Symbol |
|---|---|---|
| alpha particle | $^{4}_{2}\mathrm{He}$ or $^{4}_{2}\alpha$ | $\alpha$ |
| beta particle | $^{0}_{-1}\mathrm{e}$ or $^{0}_{-1}\beta$ | $\beta^-$ |
| gamma radiation | $^{0}_{0}\gamma$ | $\gamma$ |
| neutron | $^{1}_{0}\mathrm{n}$ | n |
| proton | $^{1}_{1}\mathrm{H}$ or $^{1}_{1}\mathrm{p}$ | p |
| positron | $^{0}_{+1}\mathrm{e}$ or $^{0}_{+1}\beta$ | $\beta^+$ |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 19:**

2 Which phrase describes an atom?

(1) a negatively charged nucleus surrounded by positively charged protons
(2) a negatively charged nucleus surrounded by positively charged electrons
(3) a positively charged nucleus surrounded by negatively charged protons
(4) a positively charged nucleus surrounded by negatively charged electrons

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 19 | Atom | Nucleus and nuclear charge | contains positive protons (atomic number) & neutral neutrons | 1:52 |



Straight from the review sheet: the **nucleus is positively charged**, thanks to the protons. **Electrons are negative and surround the nucleus,** making the correct answer **choice 4**.

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 18:**

3 An orbital is defined as a region of the most probable location of

(1) an electron
(2) a neutron
(3) a nucleus
(4) a proton

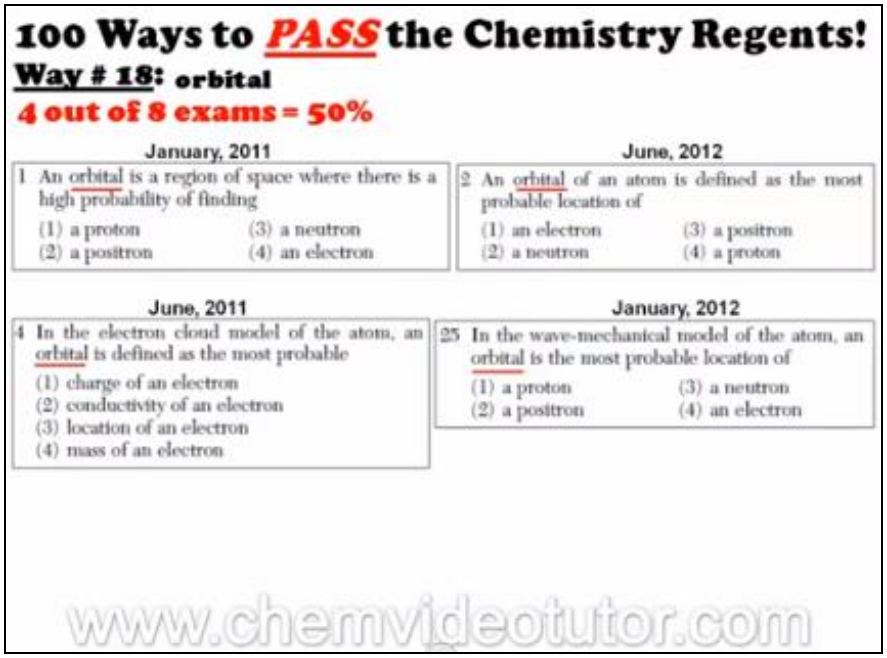
## 100 Ways to *PASS* the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 18 | Atom | orbital | the most probable location of an electron | 0:21 |



Straight from the review sheet: an **orbital** is **the most probable location of an electron**, making the correct answer **choice 1**.

**CLICK HERE to watch the video for Way # 18!**



**PHYSICAL SETTING**

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 26:**

4 The bright-line spectrum of an element in the gaseous phase is produced as
(1) protons move from lower energy states to higher energy states
(2) protons move from higher energy states to lower energy states
(3) electrons move from lower energy states to higher energy states
(4) electrons move from higher energy states to lower energy states

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 26 | Atom | Electron movement | low to high, energy absorbed;<br>high to low, energy released as light (spectra) | 2:25 |



Straight from the review sheet: a **spectra** is produced when **electrons move from high to low**, making the correct answer **choice 4.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 22:**

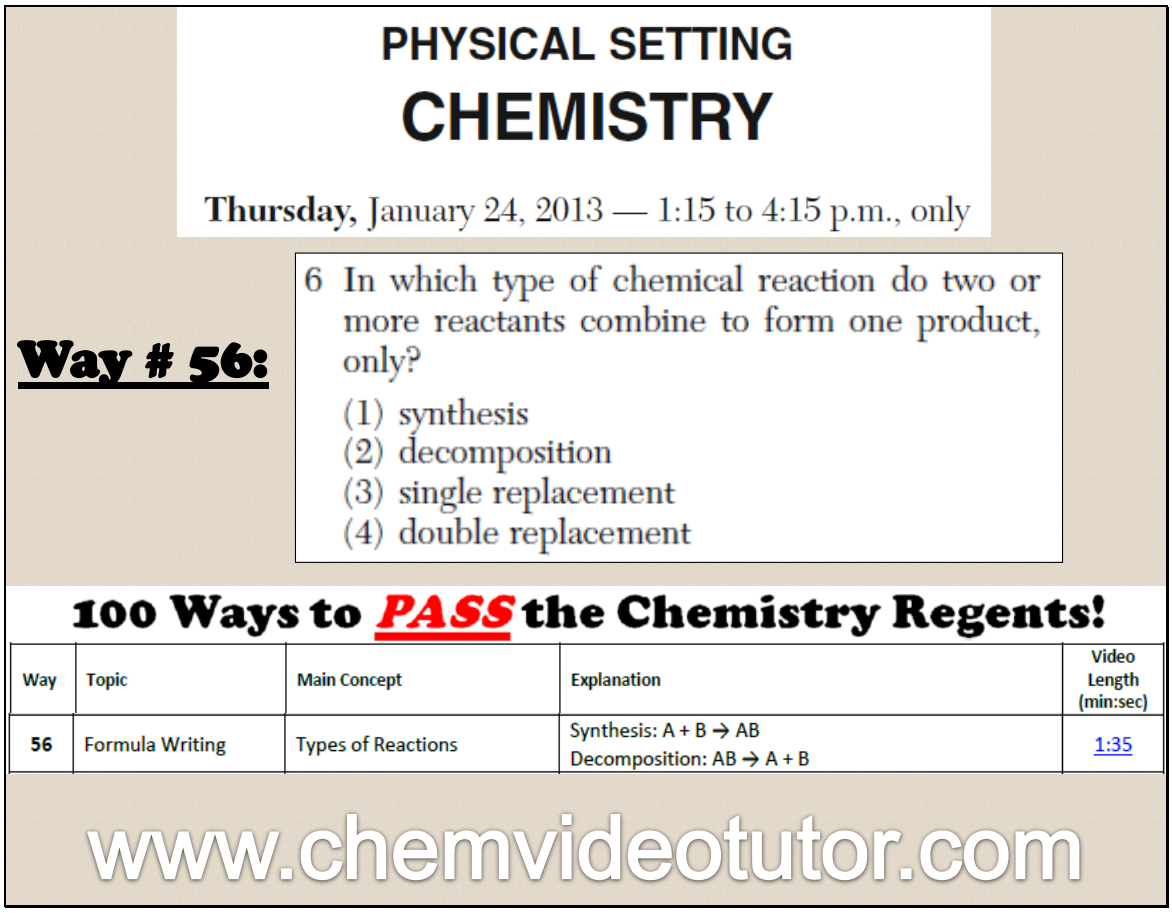
5 An atom of lithium-7 has an equal number of
(1) electrons and neutrons
(2) electrons and protons
(3) positrons and neutrons
(4) positrons and protons

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 22 | Atom | All ATOMS are electrically neutral | number of protons = number of electrons | 1:49 |



Straight from the review sheet: Since all **ATOMS** are electrically neutral, the number of **protons** (+) **MUST equal** the number of **electrons** (–), making the correct answer **choice 2**.



PHYSICAL SETTING

CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 56:**

6 In which type of chemical reaction do two or more reactants combine to form one product, only?

(1) synthesis
(2) decomposition
(3) single replacement
(4) double replacement

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 56 | Formula Writing | Types of Reactions | Synthesis: A + B → AB<br>Decomposition: AB → A + B | 1:35 |

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Straight from the review sheet: **two or more reactants** (A + B) **combine to form** (→) **one product** (AB), which is known as a **synthesis** reaction, making the correct answer **choice 1**.

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 49:**

7 Which statement explains why neon is a Group 18 element?

(1) Neon is a gas at STP.
(2) Neon has a low melting point.
(3) Neon atoms have a stable valence electron configuration.
(4) Neon atoms have two electrons in the first shell.

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 49 | Bonding | Stable octet | 8 valence electrons; Group 18 - generally unreactive | 1:51 |



Straight from the review sheet: **Group 18 elements are generally unreactive** due to their stable electron configurations, usually 8 valence (outermost) electrons, known as a **stable octet**, making the correct answer **choice 3**.

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 38:**

8 Which element has chemical properties that are most similar to the chemical properties of fluorine?

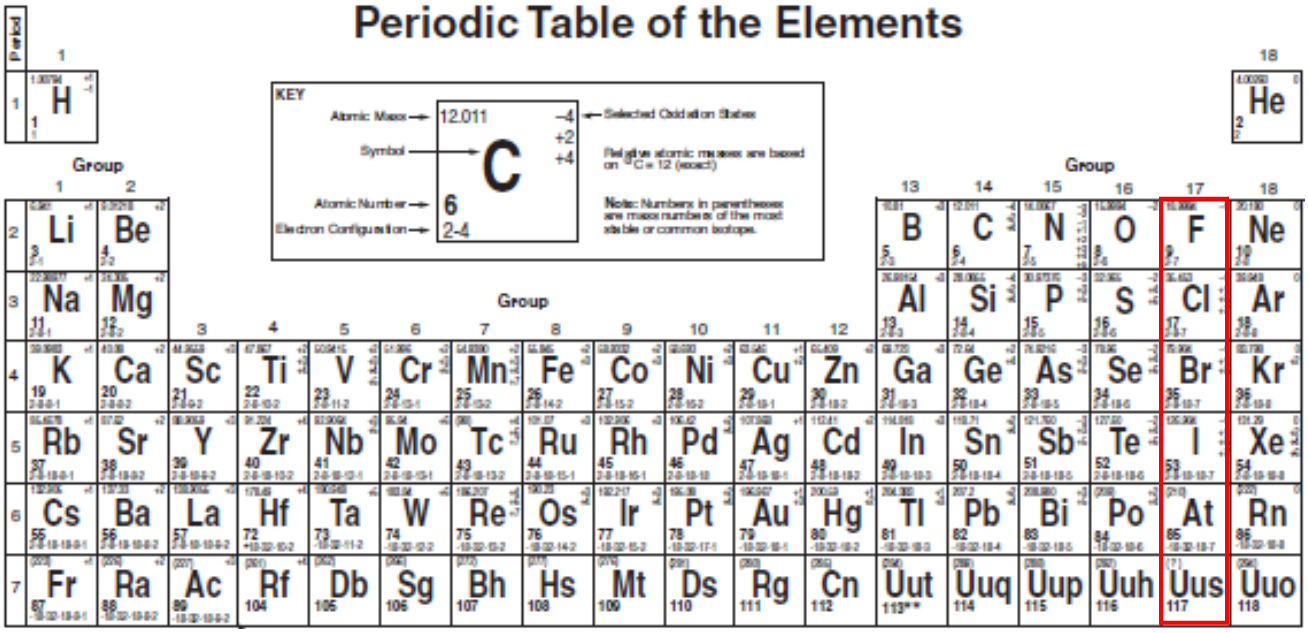
(1) boron (3) neon
(2) chlorine (4) oxygen

## 100 Ways to PASS the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 38 | Periodic Table | Similar properties | same group (Groups 1, 2, 13 - 18), same number of valence electrons | 1:35 |



Straight from the review sheet: Since **elements in the same group** have the same number of valence electrons, **their properties will be similar**, making the correct answer **choice 2**.



PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 43:**

9 What occurs as two atoms of fluorine combine to become a molecule of fluorine?

(1) A bond is formed as energy is absorbed.
(2) A bond is formed as energy is released.
(3) A bond is broken as energy is absorbed.
(4) A bond is broken as energy is released.

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 43 | Bonding | Break a bond / Form a bond | energy is absorbed / energy is released | 0:57 |



Straight from the review sheet: When a **bond is formed**, **energy is released**, making the correct answer **choice 2.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 46:**

10 What is the number of pairs of electrons that are shared between the nitrogen atoms in a molecule of $N_2$?

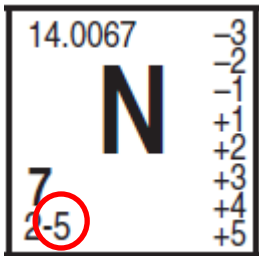
(1) 1 (3) 3
(2) 2 (4) 6

**100 Ways to *PASS* the Chemistry Regents!**

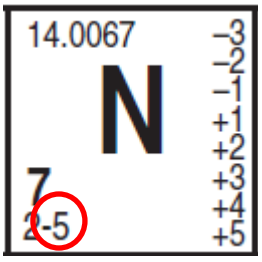
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 46 | Bonding | covalent bond | when 2 nonmetals share a pair of electrons; X–X or X - X | 1:25 |



Since **nitrogen** is a Group 15 element with 5 valence electrons, **each nitrogen would need 3 more electrons** to become stable octets. Therefore, they will **share 3 pairs of electrons** creating a TRIPLE covalent bond, making the correct answer **choice 3**.







PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 11:**

11 Which set of values represents standard pressure and standard temperature?

(1) 1 atm and 101.3 K
(2) 1 kPa and 273 K
(3) 101.3 kPa and 0°C
(4) 101.3 atm and 273°C

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 11 | Gas, Liquid, Solid | Avogadro's Hypothesis | 2 different gases, at the same temperature, pressure & volume will have the same number of atoms/molecules | 2:09 |



Often times, questions dealing with Avogadro's Hypothesis place a gas at **STP, or Standard Temperature and Pressure**. This question simply wants you to know what the values are for STP, which can both be found on **Table A of the Chemistry Reference Tables**, making the correct answer **choice 3**.

## Table A
## Standard Temperature and Pressure

| Name | Value | Unit |
|---|---|---|
| Standard Pressure | 101.3 kPa<br>1 atm | kilopascal<br>atmosphere |
| Standard Temperature | 273 K<br>0°C | kelvin<br>degree Celsius |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 2:**

13 A substance is classified as either an element or a
(1) compound
(2) solution
(3) heterogeneous mixture
(4) homogeneous mixture

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 2 | Matter | Matter | a substance (element or compound) or mixture of substances (aq) | 2:44 |



Straight from the review sheet: a substance is classified as either an element or a **compound**, making the correct answer **choice 1.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 35:**

14 A solid element that is malleable, a good conductor of electricity, and reacts with oxygen is classified as a

(1) metal (3) noble gas
(2) metalloid (4) nonmetal

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 35 | Periodic Table | Properties of metals/nonmetals | good conductors of electricity, malleable (bendable)/ poor conductors of electricity, brittle (break easily) | 1:47 |



Straight from the review sheet: **metals** are **good conductors of electricity** and are **malleable**, making the correct answer **choice 1.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 73:**

17 What is required for a chemical reaction to occur?

(1) standard temperature and pressure
(2) a catalyst added to the reaction system
(3) effective collisions between reactant particles
(4) an equal number of moles of reactants and products

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 73 | Kinetics/Equilibrium | Chemical reactions<br>Faster reaction rate | require effective collisions<br>increase temperature: more effective collisions, more energy | 1:14 |



Straight from the review sheet:

**all chemical reactions require effective collisions** between reactant particles, making the correct answer **choice 3.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 67:**

18 Which compound is soluble in water?

(1) PbS (3) $Na_2S$

(2) BaS (4) $Fe_2S_3$

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 67 | Solutions | Table F | soluble or insoluble; aqueous (aq) = dissolved in water | 2:41 |



According to **Table F** of the Chemistry Reference Tables, any compound containing **sulfide ($S^{2-}$)** will be insoluble **except when combined with a group 1 element**, such as Na, making the correct answer **choice 3.**

**Table F**
**Solubility Guidelines for Aqueous Solutions**

| Ions That Form *Soluble* Compounds | Exceptions |
|---|---|
| Group 1 ions ($Li^+$, $Na^+$, etc.) | |
| ammonium ($NH_4^+$) | |
| nitrate ($NO_3^-$) | |
| acetate ($C_2H_3O_2^-$ or $CH_3COO^-$) | |
| hydrogen carbonate ($HCO_3^-$) | |
| chlorate ($ClO_3^-$) | |
| halides ($Cl^-$, $Br^-$, $I^-$) | when combined with $Ag^+$, $Pb^{2+}$, or $Hg_2^{2+}$ |
| sulfates ($SO_4^{2-}$) | when combined with $Ag^+$, $Ca^{2+}$, $Sr^{2+}$, $Ba^{2+}$, or $Pb^{2+}$ |

| Ions That Form *Insoluble* Compounds* | Exceptions |
|---|---|
| carbonate ($CO_3^{2-}$) | when combined with Group 1 ions or ammonium ($NH_4^+$) |
| chromate ($CrO_4^{2-}$) | when combined with Group 1 ions, $Ca^{2+}$, $Mg^{2+}$, or ammonium ($NH_4^+$) |
| phosphate ($PO_4^{3-}$) | when combined with Group 1 ions or ammonium ($NH_4^+$) |
| sulfide ($S^{2-}$) | when combined with Group 1 ions or ammonium ($NH_4^+$) |
| hydroxide ($OH^-$) | when combined with Group 1 ions, $Ca^{2+}$, $Ba^{2+}$, $Sr^{2+}$, or ammonium ($NH_4^+$) |

*compounds having very low solubility in $H_2O$

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 40:**

22 Which atom has the *weakest* attraction for electrons in a chemical bond?

(1) a boron atom
(2) a calcium atom
(3) a fluorine atom
(4) a nitrogen atom

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 40 | Periodic Table | Electronegativity | attraction for electrons (Table S); (metals) weak 0.0 - 4.0 strong (nonmetals) | 1:51 |



Straight from the review sheet: **weakest attraction for electrons** would make the answer **a metal** and the only metal listed is calcium, making the correct answer **choice 2.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday**, January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 81:**

23 Which statement describes a chemical reaction at equilibrium?

(1) The products are completely consumed in the reaction.
(2) The reactants are completely consumed in the reaction.
(3) The concentrations of the products and reactants are equal.
(4) The concentrations of the products and reactants are constant.

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 81 | Kinetics/Equilibrium | Equilibrium | The RATE of the forward reaction is EQUAL to the RATE of the reverse reaction<br>The CONCENTRATIONS are CONSTANT | 1:25 |



Straight from the review sheet: Since none of the choices say that the RATES are EQUAL, then the only other option is that the **CONCENTRATIONS are CONSTANT**, making the correct answer **choice 4.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 95:**

24 Which element has atoms that can bond to each other in rings and networks?

(1) aluminum
(2) carbon
(3) hydrogen
(4) oxygen

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 95 | Organic Chemistry | Organic | carbon | 0:48 |



Since **carbon can form 4 bonds**, it has the ability to form rings, networks and long chains, making the correct answer **choice 2.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 90:**

25 In an oxidation-reduction reaction, the total number of electrons lost is

(1) equal to the total number of electrons gained
(2) equal to the total number of protons gained
(3) less than the total number of electrons gained
(4) less than the total number of protons gained

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| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 90 | Electrochemistry | REDOX Reactions | REDuction = gain electrons, - OXidation = lose electrons, + look for an element by itself | 2:19 |



In ANY reaction, matter must be conserved. Therefore, the **total number of electrons lost MUST EQUAL the total number of electrons gained**, making the correct answer **choice 2.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 89:**

26 Which compounds are electrolytes?

(1) $C_2H_5OH$ and $H_2SO_4$

(2) $C_2H_5OH$ and $CH_4$

(3) KOH and $H_2SO_4$

(4) KOH and $CH_4$

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 89 | Acid/Base | Electrolyte | a substance that conducts electricity when dissolved in water (aq)<br>Examples: acids (Table K), bases (Table L), salts (M/NM) | 1:28 |



Straight from the review sheet: Examples of **electrolytes** include **acids (Table K), bases (Table L) or salts**, which are compounds containing a metal/nonmetal combination. After consulting **Table's K and L** of the Chemistry Reference Table, you will find **KOH and $H_2SO_4$**, making the correct answer **choice 3.**

**Table K**
**Common Acids**

| Formula | Name |
|---|---|
| HCl(aq) | hydrochloric acid |
| $HNO_2$(aq) | nitrous acid |
| $HNO_3$(aq) | nitric acid |
| $H_2SO_3$(aq) | sulfurous acid |
| $H_2SO_4$(aq) | sulfuric acid |
| $H_3PO_4$(aq) | phosphoric acid |
| $H_2CO_3$(aq) or $CO_2$(aq) | carbonic acid |
| $CH_3COOH$(aq) or $HC_2H_3O_2$(aq) | ethanoic acid (acetic acid) |

**Table L**
**Common Bases**

| Formula | Name |
|---|---|
| NaOH(aq) | sodium hydroxide |
| KOH(aq) | potassium hydroxide |
| $Ca(OH)_2$(aq) | calcium hydroxide |
| $NH_3$(aq) | aqueous ammonia |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 82:**

27 Which compounds yield hydrogen ions as the only positive ions in an aqueous solution?

(1) $H_2CO_3$ and $HC_2H_3O_2$

(2) $H_2CO_3$ and $NaHCO_3$

(3) $NH_3$ and $HC_2H_3O_2$

(4) $NH_3$ and $NaHCO_3$

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 82 | Acid/Base | Arrhenius Acid | Table K; $H^+(aq)$ or $H_3O^+(aq)$; the only positive ion in a solution | 2:08 |



Straight from the review sheet: According to a Swedish chemist named Arrhenius, **an acid will produce hydrogen ions (H+) as the only postive ions in an aqueous solution**. A list of the acids commonly used on the Chemistry Regents can be found in **Table K** of the Chemistry Reference Table, making the correct answer **choice 1.**

**Table K**
**Common Acids**

| Formula | Name |
|---|---|
| $HCl(aq)$ | hydrochloric acid |
| $HNO_2(aq)$ | nitrous acid |
| $HNO_3(aq)$ | nitric acid |
| $H_2SO_3(aq)$ | sulfurous acid |
| $H_2SO_4(aq)$ | sulfuric acid |
| $H_3PO_4(aq)$ | phosphoric acid |
| $H_2CO_3(aq)$ or $CO_2(aq)$ | carbonic acid |
| $CH_3COOH(aq)$ or $HC_2H_3O_2(aq)$ | ethanoic acid (acetic acid) |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 29:**

28 Nuclei of U-238 atoms are

(1) stable and spontaneously absorb alpha particles
(2) stable and spontaneously emit alpha particles
(3) unstable and spontaneously absorb alpha particles
(4) unstable and spontaneously emit alpha particles

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 29 | Nuclear | Decay Mode | Table N | 2:23 |



Straight from the review sheet: Anything listed in **Table N** of the Chemistry Reference Tables is a radioisotope and has an **unstable** nucleus. Since U-238 is found in Table N, its atoms are unstable and they will **spontaneously (naturally) emit (give off) alpha particles (decay mode)**, making the correct answer **choice 4.**

## Table N
## Selected Radioisotopes

| Nuclide | Half-Life | Decay Mode | Nuclide Name |
|---|---|---|---|
| $^{238}U$ | $4.47 \times 10^{9}$ y | $\alpha$ | uranium-238 |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 32:**

30 The dating of geological formations is an example of a beneficial use of

(1) isomers
(2) electrolytes
(3) organic compounds
(4) radioactive nuclides

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 32 | Nuclear | Radioisotopes | I-131 - thyroid disorders; C-14 - fossils; Co-60 - treat cancer; U-238 - Earth | 1:07 |



Straight from the review sheet: U-238 is a radioisotope, or **a radioactive nuclide**, that is used to date geological formations such as the Earth, thanks to its extremely long half life (See Table N below), making the correct answer **choice 4.**

## Table N
## Selected Radioisotopes

| Nuclide | Half-Life | Decay Mode | Nuclide Name |
|---|---|---|---|
| $^{238}U$ | $4.47 \times 10^{9}$ y | $\alpha$ | uranium-238 |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 25:**

31 Which electron configuration represents a selenium atom in an excited state?

(1) 2-7-18-6 (3) 2-8-18-6

(2) 2-7-18-7 (4) 2-8-18-7

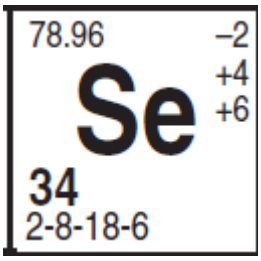
## 100 Ways to PASS the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 25 | Atom | Electron configuration | ground state: lower left corner of boxes in Periodic Table of Elements<br>excited state: when electrons move to further shells; no change in electron # | 3:13 |



Straight from the review sheet: When an atom enters the **excited state, electrons jump from lower energy levels, or shells, to higher ones**. While doing so, **there is no change in the total number of electrons**. According to the Periodic Table of Elements, which represents elements when they are in the ground state, **selenium has an electron configuration of 2-8-18-6, adding up to a total of 34 electrons**. The only other electron configuration that has 34 electrons and is **different from the ground state is 2-7-18-7**, making the correct answer **choice 2.**

Electron Configuration →



PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 86:**

32 When the hydronium ion concentration of a solution is increased by a factor of 10, the pH value of the solution

(1) decreases 1 pH unit
(2) decreases 10 pH units
(3) increases 1 pH unit
(4) increases 10 pH units

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 86 | Acid/Base | pH Scale | 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14; a change by 1 = a change by 10x acid ($H_3O^+$) hydronium base ($OH^-$) hydroxide | 3:25 |



Straight from the review sheet: Since **hydronium ions represent acids**, and **acids have a pH less than 7**, then when the hydronium ion concentration **increases by a factor of 10**, the **pH value will decrease by 1,** making the correct answer **choice 1.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 59:**

33 In the formula $XF_2$, the element represented by $X$ can be classified as a

(1) Group 1 metal
(2) Group 2 metal
(3) Group 1 nonmetal
(4) Group 2 nonmetal

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 59 | Formula Writing | Reverse Criss-Cross | tells you what group number an element is located in on the Periodic Table; (+, -) | 2:12 |



Straight from the review sheet: **Reverse Criss-Cross** means to **take the subsrcipts from a formula and turn them into oxidation states for the opposite elements**. So in the formula $XF_2$, or $\mathbf{X_1F_2}$, the subscript 1 from the X will become a -1 oxidation state for F and the subscript 2 from the F will become a +2 oxidation state for the X like this: $\mathbf{X^{+2}F^{-1}}$. Elements that have **+2 oxidation states** tend to be **metals from Group 2** of the Periodic Table of Elements, making the correct answer **choice 2.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

34 Which compound has the *smallest* percent composition by mass of chlorine?

(1) HCl (3) LiCl
(2) KCl (4) NaCl

## Way # 64:

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 64 | Chemistry Math | % Composition | Table T: Percent Composition | 4:08 |



While percent composition involves math, this question in particular does not. Simply see which element (H, K, Li or Na) has the ***highest*** atomic mass so that when it bonds with chlorine (Cl), it will give Cl the ***smallest*** percentage of mass. Since **K** has the highest atomic mass, **Cl will have the smallest percent composition by mass** when bonding with K, making the correct answer **choice 2**.

Atomic Mass →

| 1.00794 | 6.941 | 22.98977 | 39.0983 |
|---|---|---|---|
| +1, −1 | +1 | +1 | +1 |
| **H** | **Li** | **Na** | **K** |
| 1 | 3 | 11 | 19 |
| 1 | 2-1 | 2-8-1 | 2-8-8-1 |

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 52:**

38 Which statement explains why a molecule of $CH_4$ is nonpolar?

(1) The bonds between the atoms in a $CH_4$ molecule are polar.

(2) The bonds between the atoms in a $CH_4$ molecule are ionic.

(3) The geometric shape of a $CH_4$ molecule distributes the charges symmetrically.

(4) The geometric shape of a $CH_4$ molecule distributes the charges asymmetrically.

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 52 | Bonding | Molecular Polarity | polar molecules: asymmetrical ($HCl$, $H_2O$, $NH_3$)<br>nonpolar molecules: symmetrical ($CX_2$, $CX_4$, $X_2$) | 2:31 |



Straight from the review sheet: **nonpolar molecules have a symmetrical shape or charge distribution**, making the correct answer **choice 3.**

**PHYSICAL SETTING**

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 39:**

39 Which atom in the ground state has the same electron configuration as a calcium ion, $Ca^{2+}$, in the ground state?

(1) Ar
(2) K
(3) Mg
(4) Ne

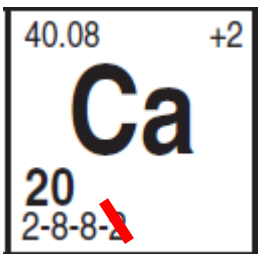
**100 Ways to *PASS* the Chemistry Regents!**

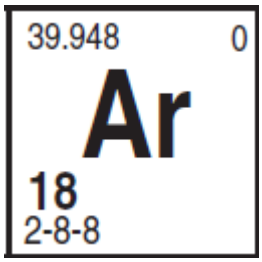
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 39 | Periodic Table | Atomic radius:<br>Ionic radius: | (Table S); distance from nucleus to outermost shell of electrons<br>metals lose electrons (+), get smaller; nonmetals gain electrons (-), get bigger | 2:54 |



Straight from the review sheet: **metals tend to lose electrons**, turning their atomic radii into a smaller ionic radii. **A calcium atom will lose its 2 valence (outermost) electrons and become a Ca+2 ion**. As a result, its **electron configuration will change from 2-8-8-2 to 2-8-8**, which is the same electron configuration as an atom of **Argon (Ar)** in the ground state, making the correct answer **choice 1.**

Electron Configuration →



PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 47:**

40 In the compound $KHSO_4$, there is an ionic bond between the

(1) $KH^+$ and $SO_4^{2-}$ ions

(2) $KHSO_3^+$ and $O^{2-}$ ions

(3) $K^+$ and $HS^-$ ions

(4) $K^+$ and $HSO_4^-$ ions

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 47 | Bonding | Ionic & Covalent | metal, nonmetal, nonmetal | 1:40 |



Straight from the review sheet: When compounds contain more than 2 elements in them, there could be a combination of different bond types present. **In the compound $KHSO_4$, both ionic and covalent bonds exist with the ionic bond forming between the metal, $K^+$, and the covalently bonded nonmetals, $HSO_4^-$**, making the correct answer **choice 4.**

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PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 28:**

41 Given the balanced equation representing a reaction:

$$^{27}_{13}Al + ^{4}_{2}He \rightarrow ^{30}_{15}P + ^{1}_{0}n$$

Which type of reaction is represented by this equation?

(1) combustion
(2) decomposition
(3) saponification
(4) transmutation

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 28 | Nuclear | Transmutation | an atom of an element is converted to an atom of a different element; natural (spontaneous) = by itself; artificial (bombard) = not by itself | 1:53 |



Straight from the review sheet: A **transmutation** is when **one atom (Al) turns into an atom of a different element (P) by nuclear decay**. In this case, the transmutation is occurring artificially since the Al is being bombarded with an alpha particle (He) and therefore, it won't happen by itself, or spontaneously, making the correct answer **choice 4.**

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# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 91:**

44 Which metal will spontaneously react with $Zn^{2+}(aq)$, but will *not* spontaneously react with $Mg^{2+}(aq)$?

(1) Mn(s) (3) Ni(s)
(2) Cu(s) (4) Ba(s)

## 100 Ways to PASS the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 91 | Electrochemistry | Relative Activity | Table J: The higher the element, the more ACTIVE it is; (SPONTANEOUS) | 2:24 |



Straight from the review sheet: According to Table J of the Chemistry Reference Tables, the higher an element, the more active it is, allowing it to react spontaneously. **In order for a metal to react spontaneously with $Zn^{+2}$ but not spontaneously with $Mg^{+2}$ means that the metal will need to be higher than Zn but lower than Mg on Table J**, making the correct answer **choice 1.**

**Table J**
**Activity Series****

| Most Active | Metals | Nonmetals | Most Active |
|---|---|---|---|
| | Li | $F_2$ | |
| | Rb | $Cl_2$ | |
| | K | $Br_2$ | |
| | Cs | $I_2$ | |
| | Ba | | |
| | Sr | | |
| | Ca | | |
| | Na | | |
| | Mg | | |
| | Al | | |
| | Ti | | |
| | Mn | | |
| | Zn | | |
| | Cr | | |
| | Fe | | |
| | Co | | |
| | Ni | | |
| | Sn | | |
| | Pb | | |
| | $H_2$ | | |
| | Cu | | |
| | Ag | | |
| Least Active | Au | | Least Active |

**Activity Series is based on the hydrogen standard. $H_2$ is *not* a metal.

PHYSICAL SETTING

# CHEMISTRY

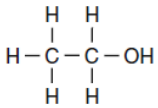
**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

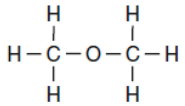
## Way # 99:

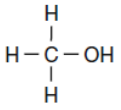
Which compounds have the same molecular formula?

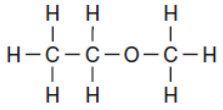
(1) *A* and *B*
(2) *A* and *C*
(3) *D* and *B*
(4) *D* and *C*

46 Given the formulas of four organic compounds:


(A)


(C)


(B)


(D)

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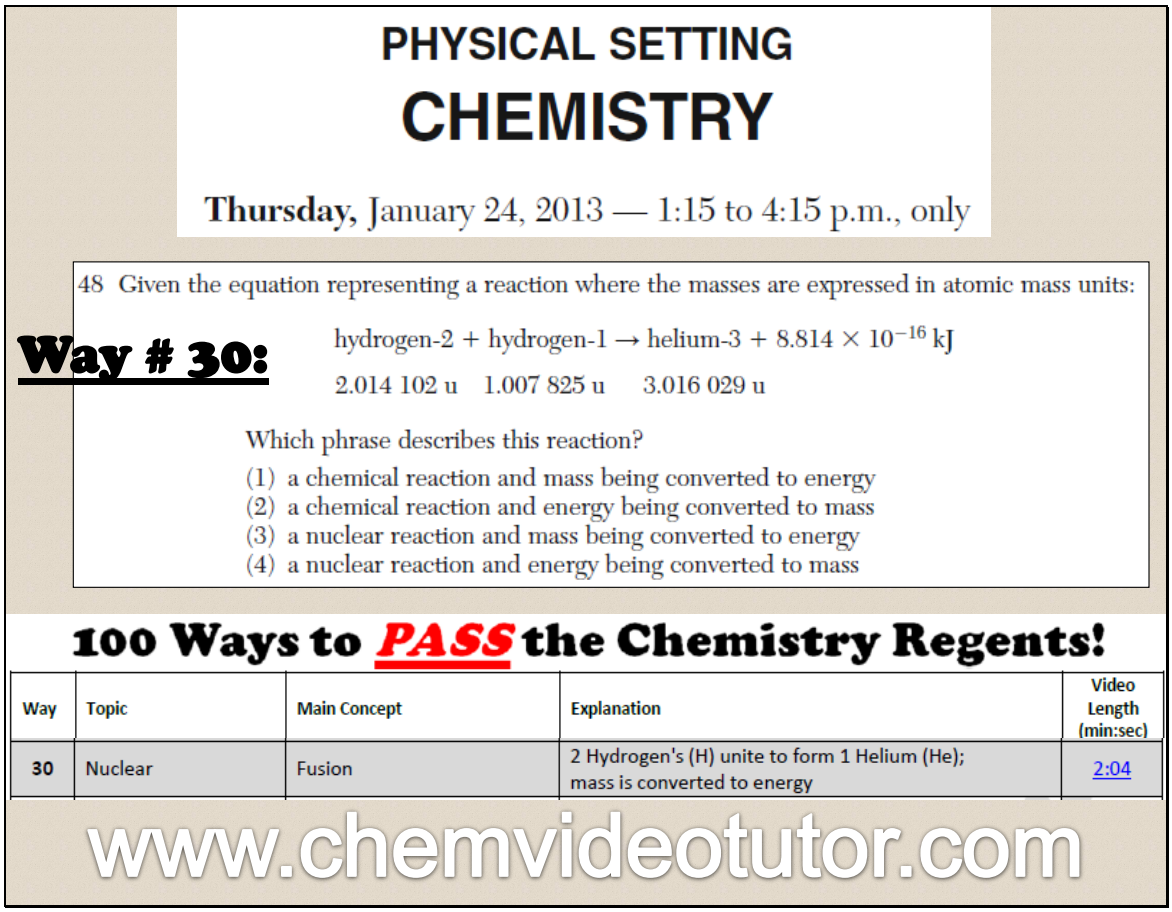
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 99 | Organic Chemistry | Isomers | same molecular formulas, different structural formulas | 2:13 |



Straight from the review sheet: A molecular formula simply represents the total number of atoms for each element in a compound. For example, since **choice A has 2 C's, 6 H's and 1 O, it's molecular formula is $C_2H_6O$**. The only other compound that has 2 C's, 6 H's and 1 O is choice C, making the correct answer **choice 2. Compounds that have the same molecular formula but different structural formulas are called isomers**.



PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

48 Given the equation representing a reaction where the masses are expressed in atomic mass units:

hydrogen-2 + hydrogen-1 → helium-3 + $8.814 \times 10^{-16}$ kJ

2.014 102 u  1.007 825 u  3.016 029 u

Which phrase describes this reaction?

(1) a chemical reaction and mass being converted to energy
(2) a chemical reaction and energy being converted to mass
(3) a nuclear reaction and mass being converted to energy
(4) a nuclear reaction and energy being converted to mass

**Way # 30:**

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 30 | Nuclear | Fusion | 2 Hydrogen's (H) unite to form 1 Helium (He); mass is converted to energy | 2:04 |



Straight from the review sheet: **A fusion reaction is a type of nuclear reaction where 2 hydrogen's unite to form 1 helium**, which is exactly what this reaction is illustrating. The 8.814 x 10-16 kJ refers a small amount of **mass that was converted** into an enormous amount of **energy**, making the correct answer **choice 3.**

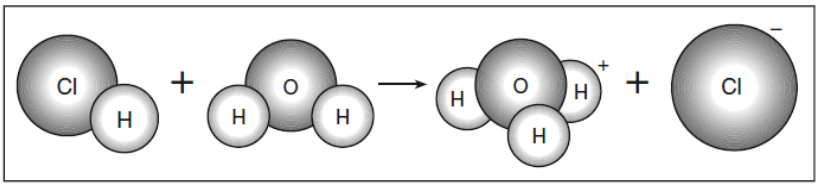
**PHYSICAL SETTING**

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 84:**

50 Given the diagram representing a reaction:




According to one acid-base theory, the water acts as

(1) a base because it accepts an $H^+$
(2) a base because it donates an $H^+$
(3) an acid because it accepts an $H^+$
(4) an acid because it donates an $H^+$

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 84 | Acid/Base | Acid-Base Theory: Acid<br>Base | an $H^+$ donor<br>an $H^+$ acceptor | 2:52 |



Straight from the review sheet: Since the water ($H_2O$, 2nd from left) turns into a hydronium ion ($H_3O^+$, 2nd from right), **it accepted an $H^+$** from the HCl, **making it a base,** making the correct answer **choice 1.**

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 50:**

51 Draw a Lewis electron-dot diagram for an atom of silicon. [1]

## 100 Ways to PASS the Chemistry Regents!

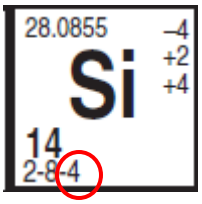
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 50 | Bonding | Dot diagrams | valence electrons for atoms, stable octets for molecules/compounds | 4:01 |



Straight from the review sheet: A **Lewis-electron-dot diagram** for silicon will have **4 dots** around the letters Si, which **represents the number of valence (outermost) electrons an atom has**.

**51** [1] Allow 1 credit.

**Examples of 1-credit responses:**

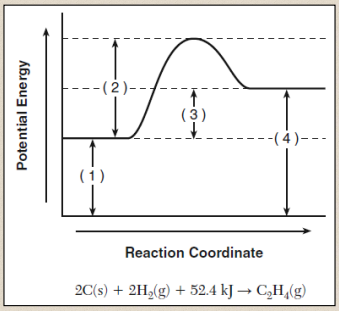
PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 78:**

The potential energy diagram and balanced equation shown below represent a reaction between solid carbon and hydrogen gas to produce 1 mole of $C_2H_4(g)$ at 101.3 kPa and 298 K.




52 State what interval 3 represents. [1]

**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 78 | Kinetics/Equilibrium | Heat of Reaction | ΔH = PE of products - PE of reactants | 1:59 |



Straight from the review sheet: Interval (1) represents the Potential Energy of the reactants. Interval (4) represents the Potential Energy of the products. Therefore, **interval (3)** represents t**he difference between the potential energy of the products and the potential energy of the reactants, which is called the heat of reaction.**

**52** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Interval 3 represents the difference in potential energy between the products and the reactants.

Interval 3 represents the heat of reaction, +52.4 kJ.

$\Delta H$

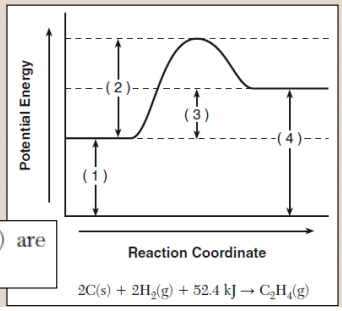
PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 77:**

The potential energy diagram and balanced equation shown below represent a reaction between solid carbon and hydrogen gas to produce 1 mole of $C_2H_4(g)$ at 101.3 kPa and 298 K.




$2C(s) + 2H_2(g) + 52.4\ kJ \rightarrow C_2H_4(g)$

53 Determine the net amount of energy absorbed when 2.00 moles of $C_2H_4(g)$ are produced. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 77 | Kinetics/Equilibrium | Table I | A minus sign indicates an exothermic reaction | 3:09 |



The way to read the reaction in this question is as follows:

2 moles of carbon (2C) react with 2 moles of hydrogen ($2H_2$) along with the absorption of 52.4kJ of heat energy to produce 1 mole of $C_2H_4$.

Basically, **for every 1 mole of $C_2H_4$ produced, 52.4kJ of heat energy is absorbed**. Therefore, if 2 moles of $C_2H_4$ are produced (**double the amount**), then **104.8 kJ** of heat energy will be absorbed as well (**double the amount**).

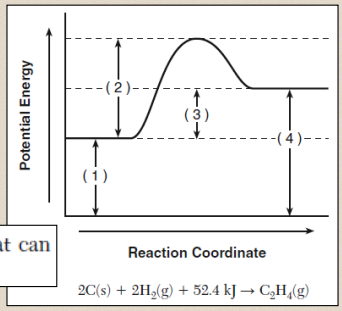
**53** [1] Allow 1 credit for 104.8 kJ. Significant figures do *not* need to be shown.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 74:**

The potential energy diagram and balanced equation shown below represent a reaction between solid carbon and hydrogen gas to produce 1 mole of $C_2H_4(g)$ at 101.3 kPa and 298 K.




$2C(s) + 2H_2(g) + 52.4\ kJ \rightarrow C_2H_4(g)$

54 Identify *one* change in the reaction conditions, other than adding a catalyst, that can increase the rate of this reaction. [1]

## 100 Ways to PASS the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 74 | Kinetics/Equilibrium | faster reaction rate | increase concentration | 3:19 |



Straight from the review sheet: Although only "Way # 74" was listed here as to how to answer this question correctly, "Way #'s 73 and 75" can also be used. Therefore, **increasing the concentration, temperature, or surface area** of a reactant will all **increase the rate of this reaction**.

| | | | | |
|---|---|---|---|---|
| 73 | Kinetics/Equilibrium | Chemical reactions<br>Faster reaction rate | require effective collisions<br>increase temperature: more effective collisions, more energy | 1:14 |
| 74 | Kinetics/Equilibrium | faster reaction rate | increase concentration | 3:19 |
| 75 | Kinetics/Equilibrium | faster reaction rate | increase surface area, (POWDER) | 1:08 |

**54** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Increase the temperature.

Increase the pressure.

Increase the concentration of $H_2(g)$.

Increase the surface area of the carbon.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 60:

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below.

55 On the grid *in your answer booklet*, mark an appropriate scale on the axis labeled "Atomic Radius (pm)." [1]

**Data Table**

| Atomic Number | Atomic Radius (pm) |
|---|---|
| 11 | 160. |
| 12 | 140. |
| 13 | 124 |
| 14 | 114 |
| 15 | 109 |
| 16 | 104 |
| 17 | 100. |
| 18 | 101 |

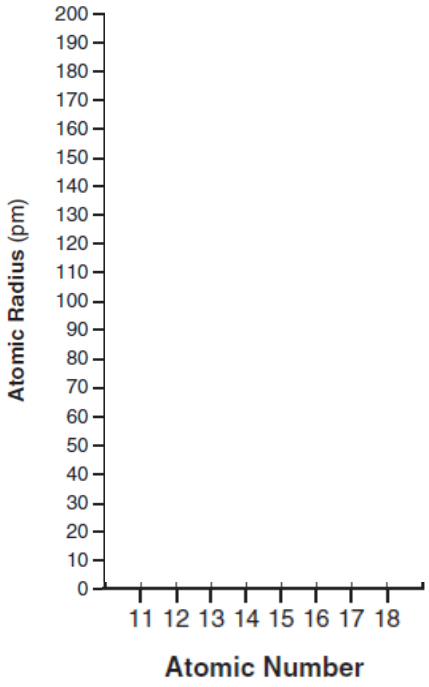
**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 60 | Chemistry Math | Graphing | ensure scale has equal intervals; plot points correctly | 3:00 |



Straight from the review sheet: "Mark an appropriate scale" means make sure you **use equal intervals** when making your scales.

**55** [1] Allow 1 credit for marking an appropriate scale. An appropriate scale is linear and allows a trend to be seen.



# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 60:

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below.

56 On the grid *in your answer booklet*, plot the data from the data table. Circle and connect the points. [1]

Data Table

| Atomic Number | Atomic Radius (pm) |
|---|---|
| 11 | 160. |
| 12 | 140. |
| 13 | 124 |
| 14 | 114 |
| 15 | 109 |
| 16 | 104 |
| 17 | 100. |
| 18 | 101 |

## 100 Ways to PASS the Chemistry Regents!

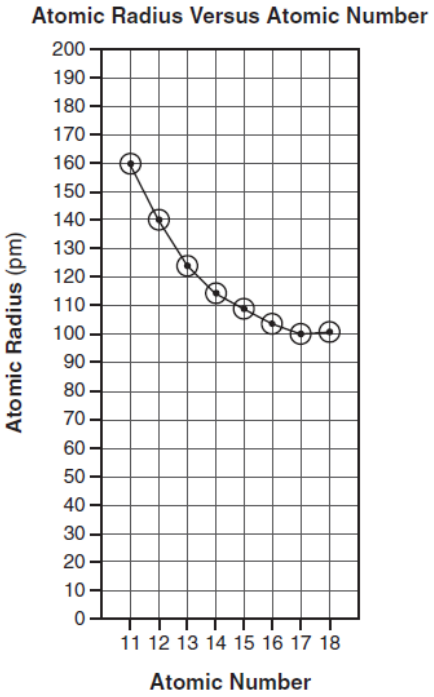
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 60 | Chemistry Math | Graphing | ensure scale has equal intervals; plot points correctly | 3:00 |



Straight from the review sheet: The point comes from **plotting your data**. You actually don't need to circle or connect the points.

**56** [1] Allow 1 credit for plotting all eight points correctly ± 0.3 grid space. Plotted points do *not* need to be circled or connected.

**Example of a 2-credit response for questions 55 and 56:**



# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 60:

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below.

Data Table

| Atomic Number | Atomic Radius (pm) |
|---|---|
| 11 | 160. |
| 12 | 140. |
| 13 | 124 |
| 14 | 114 |
| 15 | 109 |
| 16 | 104 |
| 17 | 100. |
| 18 | 101 |

57 State the general relationship between the atomic number and the atomic radius for the Period 3 elements. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 60 | Chemistry Math | Graphing | ensure scale has equal intervals; plot points correctly | 3:00 |



Straight from the review sheet: You can either look at the data from the table or at the graph you just plotted and see that **as the atomic number increases, the atomic radius decreases**.

**57** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

As atomic number increases, there is a decrease in atomic radius.

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 39:

58 Explain, in terms of electrons, the change in radius when a sodium atom becomes a sodium ion. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 39 | Periodic Table | Atomic radius:<br>Ionic radius: | (Table S); distance from nucleus to outermost shell of electrons<br>metals lose electrons (+), get smaller; nonmetals gain electrons (-), get bigger | 2:54 |



Straight from the review sheet: When a metal atom, such as sodium, **becomes an ion, it loses electrons, making its radius smaller**.

**58** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The radius of a sodium ion is smaller because the sodium atom lost one electron.

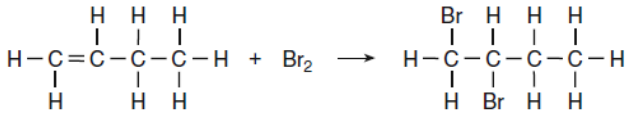
An $Na^+$ ion is smaller because it has one fewer electron shell.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

**Way # 97:**

The equation below represents the reaction between 1-butene and bromine to form the compound 1,2-dibromobutane, $C_4H_8Br_2$.



59 Explain, in terms of bonding, why the hydrocarbon reactant is an unsaturated hydrocarbon. [1]

## 100 Ways to PASS the Chemistry Regents!

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 97 | Organic Chemistry | Saturated hydrocarbons<br>Unsaturated hydrocarbons | single bonds only between carbon atoms<br>double or triple bonds between carbon atoms | 2:57 |



Straight from the review sheet: The **hydrocarbon reactant** (before the arrow) refers to a compound containing **carbon and hydrogen only.** It is **unsaturated** because it contains a **double (=)** bond **between carbon atoms.**

**59** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Each reactant hydrocarbon molecule has a double carbon-carbon bond.

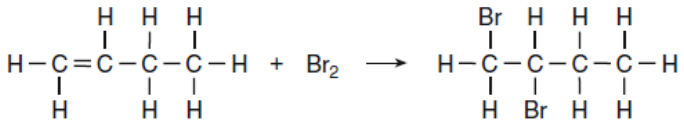
There is a multiple carbon-carbon bond in each molecule.

More hydrogen atoms can be bonded with this hydrocarbon.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The equation below represents the reaction between 1-butene and bromine to form the compound 1,2-dibromobutane, $C_4H_8Br_2$.



**Way # 63:**

60 Determine the gram-formula mass of 1-butene. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 63 | Chemistry Math | Formula Mass | the sum of the atomic masses of the atoms | 3:15 |



Straight from the review sheet: The gram-formula mass is calculated by adding up the masses of all of the atoms in a compound.

**1-butene (1st reactant on left) has 4 C's and 8 H's.**

Each carbon has an atomic mass of 12, so **12 x 4 = 48**.

Each hydrogen has an atomic mass of 1, so **1 x 8 = 8**.

**48 + 8 = 56 grams**.

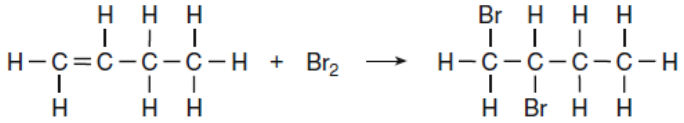
**60** [1] Allow 1 credit for 56 g/mol. Significant figures do *not* need to be shown.

**PHYSICAL SETTING**

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The equation below represents the reaction between 1-butene and bromine to form the compound 1,2-dibromobutane, $C_4H_8Br_2$.



**Way # 55:**

61 Write the empirical formula for the product. [1]

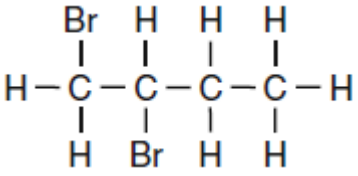
**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 55 | Formula Writing | From molecular formula to empirical formula | divide by the greatest common factor | 2:34 |



Straight from the review sheet: If you count the number of C's, H's and Br's in the structural formula for the product (after the arrow), you will get the molecular formula of $C_4H_8Br_2$. To go from the molecular formula to the empirical formula, **divide $C_4H_8Br_2$ by the greatest common factor**, which in this case, is 2.

**Structural Formula**



**Molecular Formula**

$$\frac{C_4H_8Br_2}{2}$$

**Empirical Formula**

$$= \mathbf{C_2H_4Br}$$

61 [1] Allow 1 credit for $C_2H_4Br$. The order of the elements can vary.

**PHYSICAL SETTING**

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Ammonium chloride is dissolved in water to form a 0.10 M $NH_4Cl(aq)$ solution. This dissolving process is represented by the equation below.

$$NH_4Cl(s) + \text{heat} \xrightarrow{H_2O} NH_4^+(aq) + Cl^-(aq)$$

## Way # 70:

62 Determine the number of moles of $NH_4Cl(s)$ used to produce 2.0 liters of this solution. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 70 | Solutions | Molarity | moles of solute / liters of solution; Table T: Concentration | 2:07 |



Straight from the review sheet: Refer to **Table T** of the Chemistry Reference Tables under the section labeled "**Concentration**" and you will find the **formula for Molarity**:

$$\text{molarity} = \frac{\text{moles of solute}}{\text{liter of solution}} \qquad \textbf{0.10 M} = \frac{\textbf{moles}}{\textbf{2.0 liters}}$$

Since they give you the **molarity (0.10 M)** and **volume (2.0 liters)** already in the question, you would need to solve for the number of moles by **cross-multiplying these two numbers together** to get **0.2 moles**.

62 [1] Allow 1 credit for 0.20 mol. Significant figures do *not* need to be shown.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Ammonium chloride is dissolved in water to form a 0.10 M $NH_4Cl(aq)$ solution. This dissolving process is represented by the equation below.

$$NH_4Cl(s) + \text{heat} \xrightarrow{H_2O} NH_4^+(aq) + Cl^-(aq)$$

## Way # 76:

63 State evidence that indicates the dissolving of ammonium chloride is an endothermic process. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 76 | Kinetics/Equilibrium | Exothermic<br>Endothermic<br>Entropy | heat is released, → energy (kJ)<br>heat is absorbed, energy (kJ) →<br>disorder; (s) → (l) → (g), entropy increases | 1:27 |



Straight from the review sheet: An **endothermic** reaction, or process, is when **heat is absorbed**. The way to indicate that a reaction is endothermic is by **writing the heat energy before the arrow**, on the reactants side.

**63** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The process requires heat to dissolve $NH_4Cl$.

Energy is absorbed as $NH_4Cl$ dissolves.

The energy term is positive on the left side of the equation arrow.

The heat of reaction is positive.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Ammonium chloride is dissolved in water to form a 0.10 M $NH_4Cl(aq)$ solution. This dissolving process is represented by the equation below.

$$NH_4Cl(s) + \text{heat} \xrightarrow{H_2O} NH_4^+(aq) + Cl^-(aq)$$

## Way # 69:

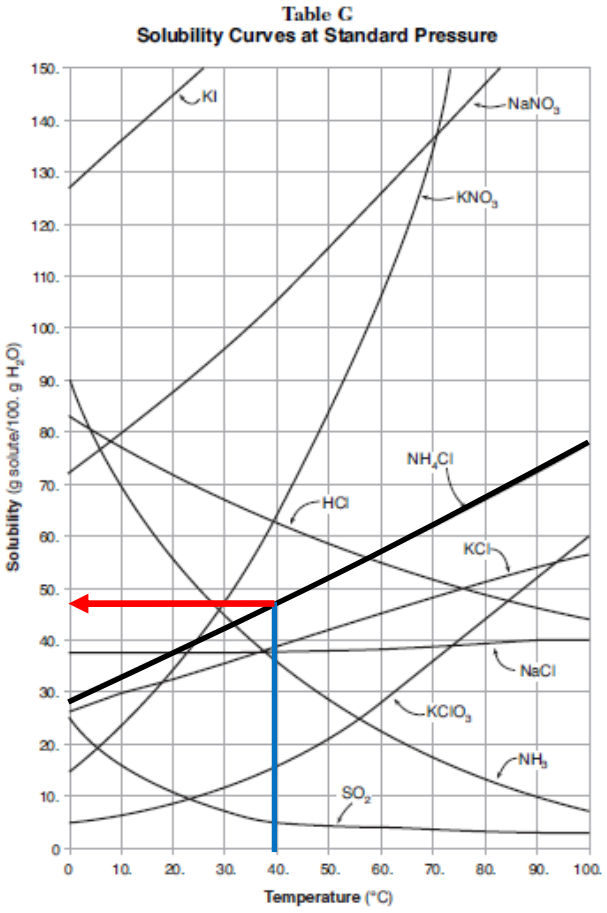
65 Determine the minimum mass of $NH_4Cl(s)$ required to produce a saturated solution in 100. grams of water at 40.°C. [1]

**100 Ways to *PASS* the Chemistry Regents!**

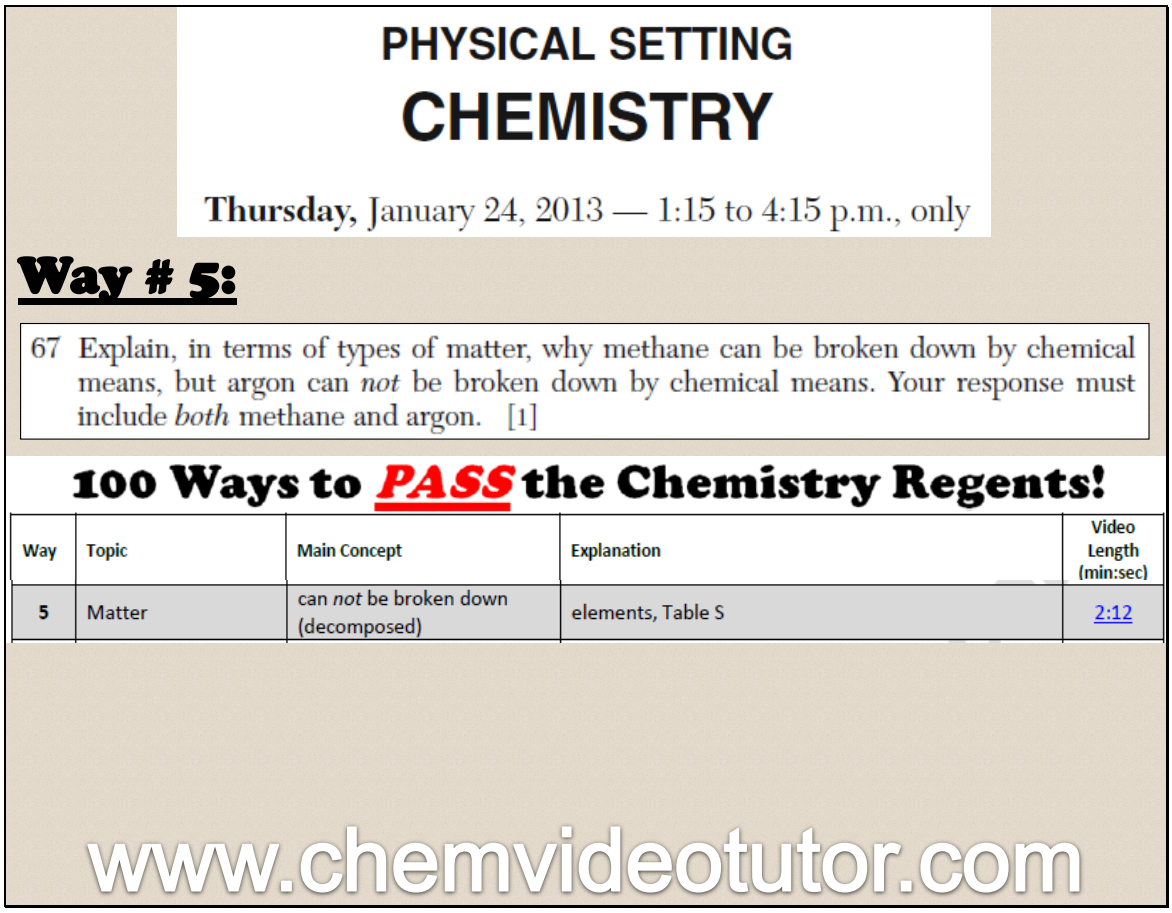
| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 69 | Solutions | Table G | unsaturated "below the line", saturated "on the line", superaturated "above the line" watch out for multiples of 100! | 2:57 |



Straight from the review sheet: When referring to **Table G** of the Chemistry Reference Tables, **a saturated solution** is when the coordinates of **temperature** and **solubility** fall "**on the line**" of a particular solute, in this case, **$NH_4Cl$**. So, at **40°C**, **approximately 46 - 48 grams** of **$NH_4Cl$** will saturate 100 grams of $H_2O$.




**65** [1] Allow 1 credit for 47 g ± 1 g.




Straight from the review sheet: **Argon is an element** since it can *not* be broken down by chemical means; meanwhile, **methane is a compound** since it can be broken down by chemical means.

**67** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Methane is a compound consisting of two elements, so it can be broken down by chemical means, but argon is an element, which cannot be broken down.

Methane is a compound and argon is an element.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Nitrogen gas and oxygen gas make up about 99% of Earth's atmosphere. Other atmospheric gases include argon, carbon dioxide, methane, ozone, hydrogen, etc.

The amount of carbon dioxide in the atmosphere can vary. Data for the concentration of $CO_2(g)$ from 1960 to 2000 are shown in the table below.

**Atmospheric Concentration of $CO_2(g)$**

| Year | Concentration (ppm) |
|---|---|
| 1960 | 316.9 |
| 1980 | 338.7 |
| 2000 | 369.4 |

## Way # 71:

68 Show a numerical setup for calculating the mass of carbon dioxide in a 100.0-gram sample of air taken in 1980. [1]

**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 71 | Solutions | parts per million | (mass of solute / mass of solution) x 1,000,000; Table T: Concentration | 3:23 |



Straight from the review sheet: Since the atmospheric concentrations of $CO_2$ in this table are measured in **parts per million (ppm)**, we'll refer to that formula on **Table T** of the Chemistry Reference Tables:

$$\text{parts per million} = \frac{\text{mass of solute}}{\text{mass of solution}} \times 1\,000\,000$$

After plugging in the values from the question into the formula, the correct numerical set up should look like this:

$$\textbf{338.7 ppm} = \frac{\textbf{x}}{\textbf{100.0 g}} \textbf{ x } \textbf{1 000 000}$$

68 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$$338.7 \text{ ppm} = \frac{x}{100.0\,\text{g}} \times 10^6$$

$$\frac{(338.7)(100)}{1\,000\,000}$$

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Nitrogen gas and oxygen gas make up about 99% of Earth's atmosphere. Other atmospheric gases include argon, carbon dioxide, methane, ozone, hydrogen, etc.

The amount of carbon dioxide in the atmosphere can vary. Data for the concentration of $CO_2(g)$ from 1960 to 2000 are shown in the table below.

**Atmospheric Concentration of $CO_2(g)$**

| Year | Concentration (ppm) |
|---|---|
| 1960 | 316.9 |
| 1980 | 338.7 |
| 2000 | 369.4 |

**Way # 2:**

69 Explain why the atmosphere is classified as a mixture. [1]

**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 2 | Matter | Matter | a substance (element or compound) or mixture of substances (aq) | 2:44 |



Straight from the review sheet: Since **argon** (element), **carbon dioxide** (compound), **methane** (compound), **ozone** (element), and **hydrogen** (element) **are all substances** physically combined in the same container (Earth's atmosphere), **the atmosphere is classified as a mixture of substances.**

69 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The gases in a mixture can be separated by physical means.

The gases in the atmosphere are separate elements or compounds that are not chemically combined with each other.

The proportions of the gases in the atmosphere can vary.

more than one substance

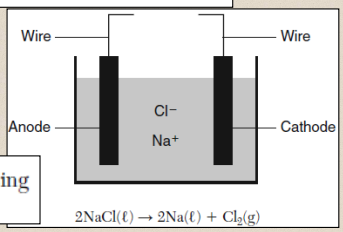
# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

Metallic elements are obtained from their ores by reduction. Some metals, such as zinc, lead, iron, and copper, can be obtained by heating their oxides with carbon.

More active metals, such as aluminum, magnesium, and sodium, can *not* be reduced by carbon. These metals can be obtained by the electrolysis of their molten (melted) ores. The diagram below represents an incomplete cell for the electrolysis of molten NaCl. The equation below represents the reaction that occurs when the completed cell operates.

## Way # 93:




70 Identify the component required for the electrolysis of molten NaCl that is missing from the cell diagram. [1]

**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 93 | Electrochemistry | Electrolytic cell | converts electrical energy (battery) to chemical energy | 1:24 |



Straight from the review sheet: Considering the objective in this question is the **electrolysis** of molten NaCl, this diagram represents an **electrolytic cell**. Since an **electrolytic cell converts electrical energy to chemical energy**, **a power source** of some sort, such as **a battery, is required**.

**70** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

source of electrical energy

battery

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The element boron, a trace element in Earth's crust, is found in foods produced from plants. Boron has only two naturally occurring stable isotopes, boron-10 and boron-11.

## Way # 24:

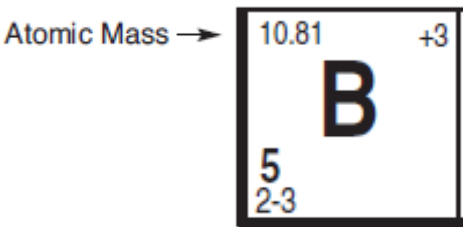
73 Compare the abundance of the two naturally occurring isotopes of boron. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| **24** | Atom | Atomic Mass | weighted average of the naturally occurring isotopes of an element | 2:38 |



Straight from the review sheet: According to the Periodic Table of Elements, boron's atomic mass is 10.81 atomic mass units (amu). This means that **the boron-11 isotope is more abundant** than the boron-10 isotope **since the average (10.81) is more heavily weighted towards 11** than it is to 10.




**73** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Boron-11 is about four times more abundant than boron-10.

The B-10 is less abundant.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The element boron, a trace element in Earth's crust, is found in foods produced from plants. Boron has only two naturally occurring stable isotopes, boron-10 and boron-11.

## Way # 23:

74 Write an isotopic notation of the heavier isotope of the element boron. Your response must include the atomic number, the mass number, and the symbol of this isotope. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 23 | Atom | Isotopes | same number of protons (atomic number), different number of neutrons | 1:31 |



Of the two isotopes of boron, boron-10 and boron-11, **boron-11 is the heavier isotope**. The **symbol is a capital B**. The **11** represents the **mass number** which gets written at the **top left** of the symbol and the **atomic number 5** gets written at the **bottom left**. The atomic number 5 gets written at the bottom left.

$$^{11}_{5}\mathrm{B}$$

74 [1] Allow 1 credit for $^{11}_{5}\mathrm{B}$.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The element boron, a trace element in Earth's crust, is found in foods produced from plants. Boron has only two naturally occurring stable isotopes, boron-10 and boron-11.

## Way # 23:

75 State, in terms of subatomic particles, *one* difference between the nucleus of a carbon-11 atom and the nucleus of a boron-11 atom. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 23 | Atom | Isotopes | same number of protons (atomic number), different number of neutrons | 1:31 |



While carbon-11 and boron-11 have the same mass number (11), they both have **different numbers of protons and neutrons**: carbon-11 has 6 protons and 5 neutrons (11 - 6 = **5**), meanwhile boron-11 has 5 protons and 6 neutrons (11 - 5 = **6**).

**75** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The carbon-11 nucleus has one more proton than the nucleus of boron-11.

A B-11 atom has a different number of neutrons than a C-11 atom.

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 66:

76 One sample of a green vegetable contains 0.0035 gram of boron. Determine the total number of moles of boron in this sample. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 66 | Chemistry Math | Mole Calculation | Table T: Mole Calculations | 2:12 |



**Table T** of the Chemistry Reference Tables has the following formula called **Mole Calculation**:

| Mole Calculations | $\text{number of moles} = \frac{\text{given mass}}{\text{gram-formula mass}}$ | $\frac{\text{0.0035 grams}}{\text{10.81 grams/mole}}$ | 10.81 +3 B 5 2-3 |
|---|---|---|---|

To solve for the number of moles, **divide the given mass** (0.0035 grams) **by the gram-formula mass of boron**, which is the same as its atomic mass (10.81) and you will get **0.0003237742 moles.**

**76** [1] Allow 1 credit for 0.000 32 mol *or* $3.2 \times 10^{-4}$ mol. Significant figures do *not* need to be shown.

PHYSICAL SETTING

# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

## Way # 82:

77 Write the chemical formula for the acetic acid. [1]

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| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 82 | Acid/Base | Arrhenius Acid | Table K; $H^+(aq)$ or $H_3O^+(aq)$; the only positive ion in a solution | 2:08 |



Straight from the review sheet: **Table K** of the Chemistry Reference Tables lists the names and formulas of some of the most commonly used acids, including **acetic acid**, whose formula is **$CH_3COOH$**.

77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

$HC_2H_3O_2(aq)$

$CH_3COOH$

**Table K**
**Common Acids**

| Formula | Name |
|---|---|
| $HCl(aq)$ | hydrochloric acid |
| $HNO_2(aq)$ | nitrous acid |
| $HNO_3(aq)$ | nitric acid |
| $H_2SO_3(aq)$ | sulfurous acid |
| $H_2SO_4(aq)$ | sulfuric acid |
| $H_3PO_4(aq)$ | phosphoric acid |
| $H_2CO_3(aq)$ or $CO_2(aq)$ | carbonic acid |
| $CH_3COOH(aq)$ or $HC_2H_3O_2(aq)$ | ethanoic acid (acetic acid) |

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

The active ingredient in the pain reliever aspirin is acetylsalicylic acid. This compound can be produced by reacting salicylic acid with acetic acid. The label of one aspirin bottle indicates that the accepted mass of acetylsalicylic acid in each tablet is 325 milligrams.

In a laboratory, an aspirin tablet is crushed and mixed with water to dissolve all of the acetylsalicylic acid. The measured pH of the resulting solution is 3.0.

## Way # 87:

78 State the color of methyl orange indicator after the indicator is placed in the solution. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 87 | Acid/Base | Table M | uses colored indicators to tell pH | 3:00 |



Here's how to use Table M: **Methyl orange** has a pH range of 3.1 - 4.4, where **any solution with a pH of 3.1 or less will be red** and any solution with a pH of 4.4 or higher will be yellow. Since **the pH of the solution in this question is 3.0**, methyl orange will be **red**.

**Table M**
**Common Acid–Base Indicators**

| Indicator | Approximate pH Range for Color Change | Color Change |
|---|---|---|
| methyl orange | 3.1–4.4 | red to yellow |
| bromthymol blue | 6.0–7.6 | yellow to blue |
| phenolphthalein | 8–9 | colorless to pink |
| litmus | 4.5–8.3 | red to blue |
| bromcresol green | 3.8–5.4 | yellow to blue |
| thymol blue | 8.0–9.6 | yellow to blue |

Source: *The Merck Index*, 14th ed., 2006, Merck Publishing Group

78 [1] Allow 1 credit for red.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

A student investigated heat transfer using a bottle of water. The student placed the bottle in a room at 20.5°C. The student measured the temperature of the water in the bottle at 7 a.m. and again at 3 p.m. The data from the investigation are shown in the table below.

**Water Bottle Investigation Data**

| 7 a.m. | | 3 p.m. | |
|---|---|---|---|
| Mass of Water (g) | Temperature (°C) | Mass of Water (g) | Temperature (°C) |
| 800. | 12.5 | 800. | 20.5 |

**Way # 13:**

80 Compare the average kinetic energy of the water molecules in the bottle at 7 a.m. to the average kinetic energy of the water molecules in the bottle at 3 p.m. [1]

**100 Ways to PASS the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 13 | Heat | temperature | average kinetic energy | 1:38 |



Straight from the review sheet: Since **average kinetic energy means temperature**, the average kinetic energy of the water molecules at 7 a.m. is **lower** than the average kinetic energy of the water molecules at 3 p.m.

**80** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The average kinetic energy of the water molecules at 7 a.m. is less than the average kinetic energy of the water molecules at 3 p.m.

The average kinetic energy of the molecules is greater at 3 p.m.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

A student investigated heat transfer using a bottle of water. The student placed the bottle in a room at 20.5°C. The student measured the temperature of the water in the bottle at 7 a.m. and again at 3 p.m. The data from the investigation are shown in the table below.

**Water Bottle Investigation Data**

| 7 a.m. | | 3 p.m. | |
|---|---|---|---|
| Mass of Water (g) | Temperature (°C) | Mass of Water (g) | Temperature (°C) |
| 800. | 12.5 | 800. | 20.5 |

**Way # 14:**

81 State the direction of heat transfer between the surroundings and the water in the bottle from 7 a.m. to 3 p.m. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 14 | Heat | heat flow | high temperature to low temperature | 2:44 |



Straight from the review sheet: Since **heat always flows from high temperature to low temperature**, the direction of heat transfer will be **from the room (20.5◦C) to the water bottle (12.5◦C)**.

**81** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Heat was transferred from the surroundings to the water in the bottle.

The water absorbed energy from the surroundings.

# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

In one method of making bread, starch is broken down into glucose. Zymase, an enzyme present in yeast, acts as a catalyst for the reaction in which the glucose reacts to produce ethanol and carbon dioxide. The carbon dioxide gas causes the bread dough to rise. The balanced equation below represents the catalyzed reaction.

$$C_6H_{12}O_6(aq) \xrightarrow{\text{zymase}} 2CH_3CH_2OH(aq) + 2CO_2(g)$$

## Way # 98:

84 Identify the functional group in an ethanol molecule. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 98 | Organic Chemistry | Organic functional groups | Table R | 2:34 |



Straight from the review sheet: **Table R** of the Chemistry Reference Tables lists various organic functional groups. Compounds whose names end with **-ol** are classified as **alcohols,** so **ethanol belongs to the alcohol functional group.**

**Table R**
**Organic Functional Groups**

| Class of Compound | Functional Group | General Formula | Example |
|---|---|---|---|
| alcohol | —OH | *R*—OH | $CH_3CH_2CH_2OH$<br>1-propanol |

84 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

—OH

alcohol group

**Note:** Do *not* allow credit for hydroxide or $OH^-$.

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# PHYSICAL SETTING
# CHEMISTRY

**Thursday,** January 24, 2013 — 1:15 to 4:15 p.m., only

In one method of making bread, starch is broken down into glucose. Zymase, an enzyme present in yeast, acts as a catalyst for the reaction in which the glucose reacts to produce ethanol and carbon dioxide. The carbon dioxide gas causes the bread dough to rise. The balanced equation below represents the catalyzed reaction.

$$C_6H_{12}O_6(aq) \xrightarrow{\text{zymase}} 2CH_3CH_2OH(aq) + 2CO_2(g)$$

## Way # 80:

85 State how the catalyst, zymase, increases the rate of this reaction. [1]

**100 Ways to *PASS* the Chemistry Regents!**

| Way | Topic | Main Concept | Explanation | Video Length (min:sec) |
|---|---|---|---|---|
| 80 | Kinetics/Equilibrium | Catalyst | increases the rate of a reaction by lowering the activation energy | 1:58 |



Straight from the review sheet: A **catalyst** increases the rate of a reaction by **lowering the activation energy**.

**85** [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Zymase provides an alternate reaction pathway.

A reaction that involves zymase has a lower activation energy.

## Additional Resources

## Chemistry Regents Exam, Answer Booklet, Answer Key, Conversion Chart & Reference Tables

January 2013 Chemistry Regents Exam
January 2013 Chemistry Regents Answer Booklet
January 2013 Chemistry Regents Answer Key
January 2013 Chemistry Regents Conversion Chart
2011 Edition of the Chemistry Reference Tables

# Thank You So Much!

**I hope you've learned something from this Study Guide. I can't thank you enough for your continued support of www.ChemVideoTutor.com and everything I do.**

**I appreciate each and every one of you for taking time out of your day or evening to go through this Study Guide, and if you have an extra second, I would love to hear what you think about it as well as how you ultimately do on the Chemistry Regents!**

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**Guy Hauptman**
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