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NY

Surviving Chemistry Regents Exam

One Day at a Time

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for The New York State Chemistry Regents Exam

The Physical Setting

With Answers and Explanations

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Day 19: 15 Multiple Choice Questions

15 points *Part A and B-1 Practice*

Start: Answer all questions on this day before stopping.

1. An atom in the ground state has seven valence electrons. The atom could be an atom of which element?
(1) calcium (3) oxygen
(2) fluorine (4) sodium
2. Which statement identifies the element arsenic?
(1) Arsenic has atomic number of 33.
(2) Arsenic has a melting point of 84 K.
(3) An atom of arsenic in the ground state has eight valence electrons.
(4) An atom of arsenic in the ground state has a radius of 146 pm..
3. What is the number of electrons in an atom of potassium?
(1) 18 (3) 20
(2) 19 (4) 39
4. Which statement describes a chemical property of hydrogen gas?
(1) Hydrogen gas burns in air
(2) Hydrogen gas is colorless
(3) Hydrogen gas has a density of 0.000 9 g/cm³ at STP
(4) Hydrogen gas has a boiling point of 20. K at standard pressure.
5. Which unit can be used to express solution concentration?
(1) J/mol (3) mol/L
(2) L/mol (4) mol/s
6. Given the equation representing a system at equilibrium:
$$\text{H}_2\text{O(s)} < \rightleftharpoons > \text{H}_2\text{O(l)}$$

At which temperature does this equilibrium exist at 101.3 kilopascals?

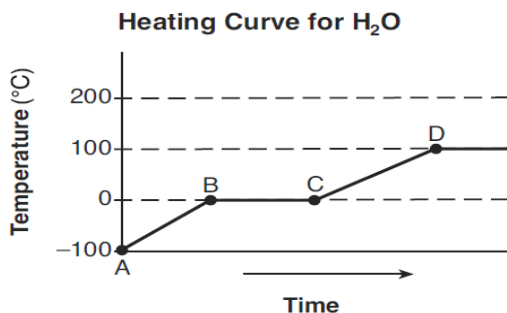
(1) 0 K (3) 32 K
(2) 0°C (4) 273°C
7. Which metal is more active than Ni and less active than Zn?
(1) Cu (3) Mg
(2) Cr (4) Pb

Day 19: continue.

8. Which list of nuclear emissions is arranged in order from the least penetrating power to the greatest penetrating power?
- (1) alpha particle, beta particle, gamma ray
 - (2) alpha particle, gamma ray, beta particle
 - (3) gamma ray, beta particle, alpha particle
 - (4) beta particle, alpha particle, gamma ray
9. Which compound releases hydroxide ions in an aqueous solution?
- (1) CH_3COOH
 - (2) CH_3OH
 - (3) HCl
 - (4) KOH
10. At $20.^\circ\text{C}$, a 1.2 gram sample of Mg ribbon reacts rapidly with 10.0 millimeters of 1.0 M HCl(aq) . Which change in conditions would have caused the reaction to proceed more slowly?
- (1) increasing the initial temperature to 25°C
 - (2) decreasing the concentration of HCl(aq) to 0.1 M
 - (3) using 1.2 g of powdered Mg
 - (4) using 2.4 g of Mg ribbon
11. Which compound is least soluble in water at 6.0°C ?
- (1) KClO_3
 - (2) KNO_3
 - (3) NaCl
 - (4) NH_4Cl
12. Which electron configuration represents an atom in an excited state?
- (1) 2 – 7
 - (2) 2 – 6 – 2
 - (3) 2 – 8 – 1
 - (4) 2 – 8 – 8 – 1
13. Which two radioisotopes have the same decay mode?
- (1) ^{37}Ca and ^{53}Fe
 - (2) ^{220}Fr and ^{60}Co
 - (3) ^{37}K and ^{42}K
 - (4) ^{99}Tc and ^{19}Ne

Day 19: continue.

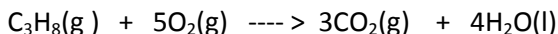
14. The graph below represents the relationship between temperature and time as heat is added to a sample of H_2O .



Which statement correctly describes the energy of the particles of the sample during interval BC ?

- (1) Potential energy decreases and average kinetic energy increases
- (2) Potential energy increases and average kinetic energy decreases
- (3) Potential energy increases and average kinetic energy remains the same.
- (4) Potential energy remains the same and average kinetic energy increases.

15. Given the balanced equation representing a reaction:



What is the total number of moles of $\text{O}_2(\text{g})$ required for the complete combustion of 1.5 moles of $\text{C}_3\text{H}_8(\text{g})$?

- | | |
|--------------|-------------|
| (1) 0.30 mol | (3) 4.5 mol |
| (2) 1.5 mol | (4) 7.5 mol |

Day 19

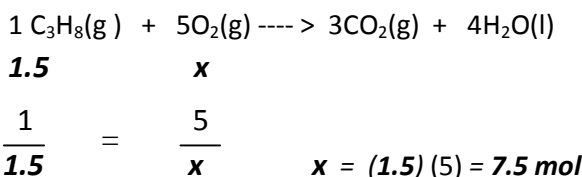
Stop. Correct your answers and note how many correct **Points**

Day 19: Answers and Explanations

- 1. 2** *Look* on the Periodic Table for configuration of each atom.
Note: Last number in configuration is the number of valence e-
- 2. 1** *Note:* This is the only choice that gives a correct information for As.
Note: Use the Periodic Table and Table S to check each info.
- 3. 2** *Recall:* Number of electrons (19) = atomic number of K (19)
- 4. 1** *Recall:* A chemical property depends on interaction with another substance.
Relate: Burning is chemical property because it requires interaction with (oxygen)
- 5. 3** *Note:* Molarity equation is on Table T
- $$\text{molarity} = \frac{\text{moles (mol) of solute}}{\text{Liter (L) of solution}} = \frac{\text{mol}}{\text{L}}$$
- 6. 2** *Note:* The equation represents the melting of ice.
Recall: Ice melts at 0°C (273 K)
- 7. 2** *Note:* Relative reactivity of metals is shown on Table J:
Note: According to Table J:
 Cr is more active (higher up) than Ni
 Cr is less active (lower down) than Zn
- 8. 1** *Note:* The correct choice is a fact about penetrating power of nuclear particles
- 9. 4** *Recall:* Hydroxide (OH-) are produced by bases.
Note: Bases (such as KOH) are listed on Table L

Day 19: Answers and Explanations

10. **2** *Note:* Of all the changes to the reaction given as choices, a decrease in temp is the change that will produce slower rate (proceed slower).
All other changes will produce faster rates of reaction
11. **1** *Note:* Table G shows solubility of substances
Note: At any given temperature, the substance closest to bottom is the least soluble at that temperature.
Note: At 6.0°C, KClO₃ curve is the closest to the bottom
12. **2** *Recall:* an excited state configuration is not the same as what's on the Periodic Table for a given element.
Note: The correct choice has 10 e⁻ = # of e⁻ in a neon atom. But the configuration is differently arranged from one given on Periodic Table for a ground state Ne.
13. **1** *Recall:* Decay mode are given on Table N
Note: According to Table N, both Ca-37 and Fe-53 decay by emitting a positron (β⁺)
14. **3** *Note:* During BC, temperature is constant (therefore, no change in average kinetic energy)
Recall: When kinetic energy is constant, potential energy changes.
15. **4** *Note:* This is a mole proportion problem
Setup mole proportion to solve:



Tracking your progress

If you have completed Day 11, 13, 15, 17 and 19 multiple choice question sets, you can easily check your progress and improvements in this question category.

- . Go to page 211
- . Plot and graph the number of points you got correct on each of the days using the second graph on the page (the 15-point graph)

Day 20: Constructed Response Questions
10 points *Part B-2 and C Practice*

Start: Answer all questions on this day before stopping.

Base your answers to questions 1 and 2 on the information below.

In 1897, J.J. Thompson demonstrated in an experiment that cathode rays were deflected by an electric field. This suggested that cathode rays were composed of negatively charged particles found in all atoms. Thomson concluded that the atom was a positively charged sphere of almost uniform density in which negatively charged particles were embedded. The total negative charge in an atom was balanced by the positive charge, making the atom electrically neutral.

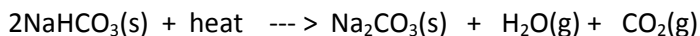
In the early 1900's, Ernest Rutherford bombarded a very thin sheet of gold foil with alpha particles. After interpreting the results of the gold foil experiment, Rutherford proposed a more sophisticated model of the atom.

1. State one conclusion from Rutherford's experiment that contradicts one conclusion made by Thomson. [1]
2. State one aspect of the modern model of the atom that agrees with a conclusion made by Thomson. [1]

Day 20: continue.

Base your answers to questions 3 through 5 on the information below.

Some dry chemicals can be used to put out forest fires. One of these chemicals is NaHCO_3 . When $\text{NaHCO}_3(\text{s})$ is heated, one of the products is $\text{CO}_2(\text{g})$, as shown in the balanced equation below.



3. In the space in your answer booklet, show a correct numerical setup for calculating the percent composition by mass of carbon in the product, Na_2CO_3 . [1]

4. Identify the type of chemical reaction represented by this equation. [1]

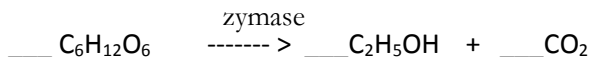
5. Determine, the total number of moles of $\text{CO}_2(\text{g})$ produced when 7.0 moles of $\text{NaHCO}_3(\text{s})$ is completely reacted. [1]

Day 20: continue.

Base your answer to questions 6 through 8 on the information below.

During a bread-making process, glucose is converted to ethanol and carbon dioxide, causing the bread dough to rise. Zymase, an enzyme produced by yeast, is a catalyst needed for this reaction.

6. Balance the equation below for the reaction that causes bread dough to rise, using the smallest whole-number coefficients. [1]



7. In the space in your answer booklet, draw a structural formula for the alcohol formed in this reaction. [1]

8. State the effect of zymase on the activation energy for this reaction. [1]

-
9. Explain, in terms of collision theory, why the rate of a chemical reaction increases with an increase in temperature. [1]

10. Base on the Periodic Table, explain why chlorine and bromine have similar chemical properties [1]

Day 20

Stop. Correct your answers and note how many correct **Points**

Day 20: Answers and Explanations

1. 1 point Acceptable responses include, but are not limited to:
The nucleus is small and positively charged (not the whole atom)
The atom is mostly empty space (Not a uniform density with negative charges embedded throughout)

Note: These conclusions from Rutherford's Gold foil experiment contradicts conclusions made by JJ Thompson.

2. 1 point Acceptable responses include, but are not limited to:
The total number of electrons is equal to the total positive to make atom neutral.

Number of negative equals number of positive

3. 1 point Acceptable setups includes, but are not limited to:

$$\% \text{ C} = \frac{12}{106} \times 100 \quad \text{or} \quad \frac{1200}{106}$$

Note: Percent composition equation is on Table T

$$\% \text{ C} = \frac{\text{Total mass of C}}{\text{Formula mass of Na}_2\text{CO}_3} \times 100$$

4. 1 point Acceptable responses include, but are not limited to:
Endothermic
Note: heat is on left (reactant side) of the equation

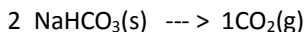
Decomposition:
Note: Equation shows the breaking up of NaHCO_3 into smaller substances

Day 20: Answers and Explanations

5. 1 point

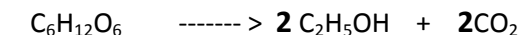
3.5 moles

Note: this is a mole proportion problem:



$$\begin{array}{ccc} 7 & & x \\ 2 & & 1 \\ \hline 7 & = & x \end{array} \quad x = 3.5 \text{ moles}$$

6. 1 point

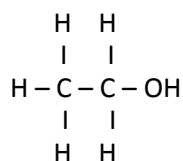


Recall: a balanced equation must show conservation of atoms.

Number of each atom on both sides must be the same.

Note: The correct coefficients allow there to be 6 C, 12 H, and 6 O atoms on each side of the equation.

7. 1 point



Note: The position of the OH may vary

8. 1 point

Acceptable responses include, but are not limited to:

Zymase (a catalyst) lowers activation energy for the reaction.

Zymase provides alternate pathways for the reaction.

9. 1 point

Acceptable responses include, but are not limited to:

There is an increase in the kinetic energy of the particles.

There is increase in the frequency of collisions or particles.

10. 1 point

Acceptable responses include, but are not limited to:

Cl and Br are in the same Group (17).

Cl and Br are halogens

Cl and Br have the same number of valance electrons

Cl and Br have similar oxidation state.

Day 27: Practice Regents Exam 1

Part A and B-1

Start: Answer all questions in Part A and B-1 before stopping

Part A: Answer all questions in this part

Directions (1 – 30): For each statement or question, write on the separate answer sheet the number of the word or expression that, of those given, best completes the statement or answer the question. Some questions may require the use of the Reference Tables for Physical Setting/Chemistry.

- 1 What is the total number of valence electrons in a calcium atom in the ground state?
(1) 8 (3) 18
(2) 2 (4) 20
- 2 Which subatomic particles are located in the nucleus of an He-4 atom?
(1) electrons and neutrons
(2) electrons and protons
(3) neutrons and protons
(4) neutrons, protons, and electrons
- 3 In the late 1800s, experiments using cathode ray tubes led to the discovery of the
(1) electron (3) positron
(2) neutron (4) proton
- 4 The atomic mass of titanium is 47.88 atomic mass units. This atomic mass represents the
(1) total mass of all the protons and neutrons in an atom of Ti
(2) total mass of all the protons, neutrons, and electrons in an atom of Ti
(3) weighted average mass of the most abundant isotope of Ti
(4) weighted average mass of all the naturally occurring isotopes of Ti
- 5 An atom of which element has the largest atomic radius?
(1) Fe (3) Si
(2) Mg (4) Zn
- 6 Which element requires the *least* amount of energy to remove the most loosely held electron from a gaseous atom in the ground state?
(1) bromine (3) sodium
(2) calcium (4) silver

Day 28: Practice Regents Exam 1

Part B-2 and C

Start: Answer all questions in Part B-2 and C before stopping.

Part B-2: Answer all questions in this part

Directions (51-63): Record your answers in the spaces provided in your Answer Booklet. Some questions may require the use of the Reference Tables for Physical Setting/Chemistry.

51 In your answer booklet, write an electron configuration for a silicon atom in an excited state. [1]

Base your answers to questions 52 and 53 on the information below.

Densities of Group 14 Elements

Element	Density at STP (g/cm ³)
C	3.51
Si	2.33
Ge	5.32
Sn	7.31
Pb	11.35

52 Identify *one* element from this table for *each* type of element: metal, metalloid, and nonmetal. [1]

53 Calculate the volume of a tin block that has a mass of 95.04 grams at STP. Your response must include *both* a numerical setup and the calculated result. [2]

Day 29: Practice Regents Exam 2

Part A and B-1

Start: Answer all questions in Part A and B-1 before stopping.

Part A: Answer all questions in this part

Directions (1 – 30): For each statement or question, write on the separate answer sheet the number of the word or expression that, of those given, best completes the statement or answer the question. Some questions may require the use of the Reference tables for Physical setting/Chemistry.

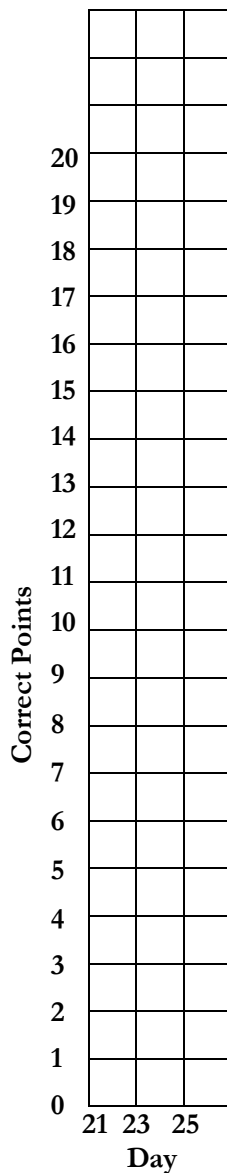
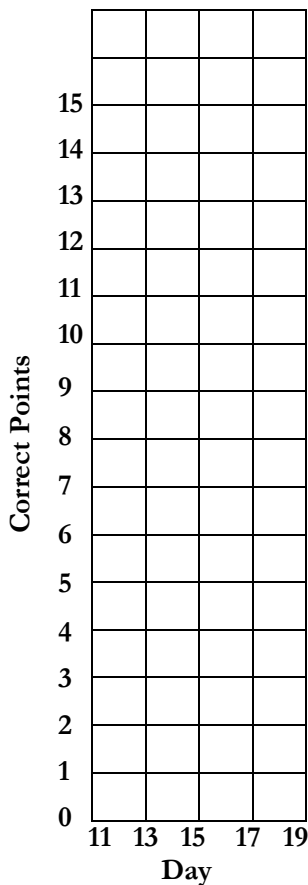
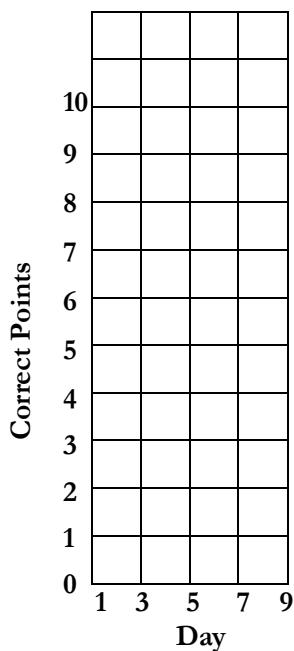
- 1 A neutron has a charge of
 - (1) +1
 - (2) +2
 - (3) 0
 - (4) -1
- 2 Which particle has the *least* mass?
 - (1) alpha particle
 - (2) beta particle
 - (3) neutron
 - (4) proton
- 3 A sample of matter must be copper if
 - (1) each atom in the sample has 29 protons
 - (2) atoms in the sample react with oxygen
 - (3) the sample melts at 1768 K
 - (4) the sample can conduct electricity
- 4 In the electron cloud model of the atom, an orbital is defined as the most probable
 - (1) charge of an electron
 - (2) conductivity of an electron
 - (3) location of an electron
 - (4) mass of an electron
- 5 The elements on the Periodic Table are arranged in order of increasing
 - (1) atomic number
 - (2) mass number
 - (3) number of isotopes
 - (4) number of moles
- 6 Which element has the highest melting point?
 - (1) tantalum
 - (2) rhenium
 - (3) osmium
 - (4) hafnium
- 7 In a chemical reaction, there is conservation of
 - (1) energy, volume, and mass
 - (2) energy, volume, and charge
 - (3) mass, charge, and energy
 - (4) mass, charge, and volume

Track Your Progress: Multiple Choice Questions

How well have you been improving on the multiple choice questions? It's easy to find out.

Get the correct points that you noted at the end of each multiple choice questions set (Odd Days).

Plot the points on the graph below. You hope to see an upward trend on each graph.



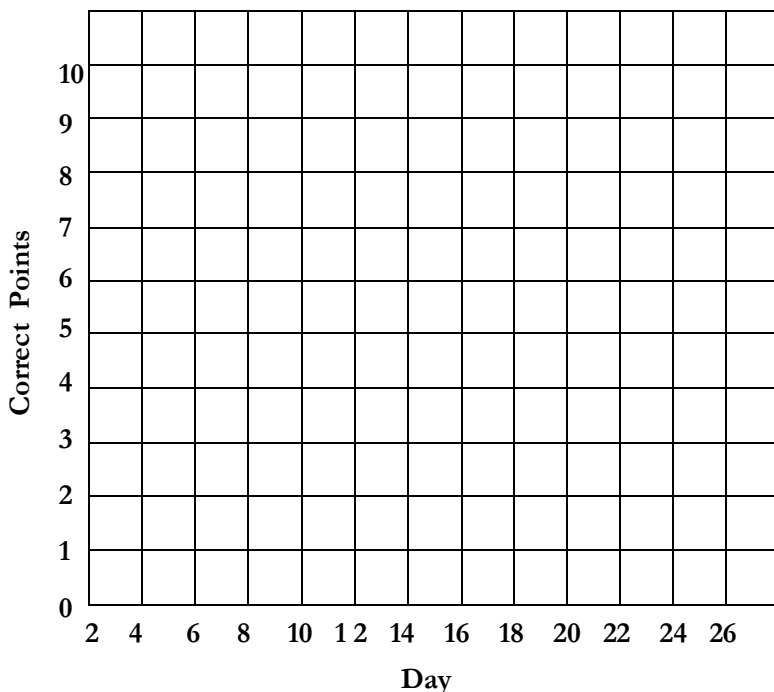
Track Your Progress: Constructed Response Questions

How well have you been improving on the constructed response questions? It's easy to find out.

Get the correct points that you noted at the end of each constructed response questions set (Even Days).

Plot the points on the graph below.

You hope to see an upward trend on the graph.



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