The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Wednesday, June 20, 2012 — 1:15 to 4:15 p.m., only

This is a test of your knowledge of chemistry. Use that knowledge to answer all questions in this examination. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*. You are to answer *all* questions in all parts of this examination according to the directions provided in this examination booklet.

A separate answer sheet for Part A and Part B–1 has been provided to you. Follow the instructions from the proctor for completing the student information on your answer sheet. Record your answers to the Part A and Part B–1 multiple-choice questions on this separate answer sheet. Record your answers for the questions in Part B–2 and Part C in your separate answer booklet. Be sure to fill in the heading on the front of your answer booklet.

All answers in your answer booklet should be written in pen, except for graphs and drawings, which should be done in pencil. You may use scrap paper to work out the answers to the questions, but be sure to record all your answers on your separate answer sheet or in your answer booklet as directed.

When you have completed the examination, you must sign the statement printed on your separate answer sheet, indicating that you had no unlawful knowledge of the questions or answers prior to the examination and that you have neither given nor received assistance in answering any of the questions during the examination. Your answer sheet and answer booklet cannot be accepted if you fail to sign this declaration.

Notice. . .

A four-function or scientific calculator and a copy of the *2011 Edition Reference Tables for Physical Setting/Chemistry* must be available for you to use while taking this examination.

The use of any communications device is strictly prohibited when taking this examination. If you use any communications device, no matter how briefly, your examination will be invalidated and no score will be calculated for you.

DO NOT OPEN THIS EXAMINATION BOOKLET UNTIL THE SIGNAL IS GIVEN.

Part A

Answer all questions in this part.

Directions (1–30): For *each* statement or question, record on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

1 The mass of a proton is approximately equal to the mass of

(1) an alpha particle
(2) a beta particle
(3) a positron
(4) a neutron

2 An orbital of an atom is defined as the most probable location of

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

3 What must occur when an electron in an atom returns from a higher energy state to a lower energy state?

(1) A specific amount of energy is released.
(2) A random amount of energy is released.
(3) The atom undergoes transmutation.
(4) The atom spontaneously decays.

4 Which element is a liquid at 305 K and 1.0 atmosphere?

(1) magnesium
(2) fluorine
(3) gallium
(4) iodine

5 Which list of elements consists of a metal, a metalloid, and a nonmetal?

(1) Li, Na, Rb
(2) Cr, Mo, W
(3) Sn, Si, C
(4) O, S, Te

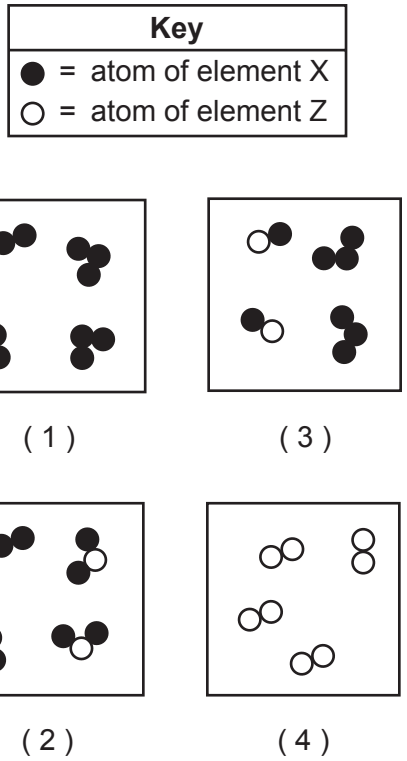
6 At STP, which physical property of aluminum always remains the same from sample to sample?

(1) mass
(2) density
(3) length
(4) volume

7 Which statement describes a chemical property of silicon?

(1) Silicon has a blue-gray color.
(2) Silicon is a brittle solid at 20.°C.
(3) Silicon melts at 1414°C.
(4) Silicon reacts with fluorine.

8 Which diagram represents a mixture of two different molecular forms of the same element?



9 A compound is broken down by chemical means during

(1) chromatography
(2) distillation
(3) electrolysis
(4) filtration

10 Which quantities must be conserved in all chemical reactions?

(1) mass, charge, density
(2) mass, charge, energy
(3) charge, volume, density
(4) charge, volume, energy

11 Which phrase describes the distribution of charge and the polarity of a CH_4 molecule?

(1) symmetrical and polar
(2) symmetrical and nonpolar
(3) asymmetrical and polar
(4) asymmetrical and nonpolar

12 What is the charge of the nucleus of an oxygen atom?

(1) 0
(2) −2
(3) +8
(4) +16

13 Which ion has *no* electrons?

(1) H^+
(2) Li^+
(3) Na^+
(4) Rb^+

14 To break a chemical bond, energy must be

(1) absorbed
(2) destroyed
(3) produced
(4) released

15 Which Lewis electron-dot diagram represents a nitrogen atom in the ground state?

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

16 What is the most likely electronegativity value for a metallic element?

(1) 1.3
(2) 2.7
(3) 3.4
(4) 4.0

17 Which polyatomic ion has a charge of 3−?

(1) chromate ion
(2) oxalate ion
(3) phosphate ion
(4) thiocyanate ion

18 Every chlorine atom has

(1) 7 electrons
(2) 17 neutrons
(3) a mass number of 35
(4) an atomic number of 17

19 Which substance can *not* be broken down by a chemical change?

(1) ammonia
(2) methanol
(3) propane
(4) phosphorus

20 At standard pressure, which substance becomes *less* soluble in water as temperature increases from 10.°C to 80.°C?

(1) HCl
(2) KCl
(3) NaCl
(4) NH_4Cl

21 Which type of concentration is calculated when the grams of solute is divided by the grams of the solution, and the result is multiplied by 1 000 000?

(1) molarity
(2) parts per million
(3) percent by mass
(4) percent by volume

22 Which type of energy is associated with the random motion of atoms and molecules in a sample of air?

(1) chemical energy
(2) electrical energy
(3) nuclear energy
(4) thermal energy

23 The temperature of a sample of matter is a measure of the

(1) total kinetic energy of the particles in the sample
(2) total potential energy of the particles in the sample
(3) average potential energy of the particles in the sample
(4) average kinetic energy of the particles in the sample

24 Which unit is used to express the pressure of a gas?

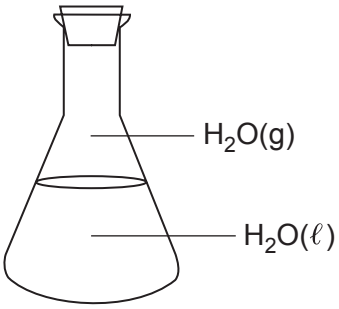
(1) mole
(2) joule
(3) kelvin
(4) pascal

25 Which sample of matter sublimes at room temperature and standard pressure?

(1) $Br_2(\ell)$ (3) $CO_2(s)$

(2) $Cl_2(g)$ (4) $SO_2(aq)$

26 Given the diagram representing a closed system at constant temperature:



Stoppered Flask

Which statement describes this system at equilibrium?

(1) The mass of $H_2O(\ell)$ equals the mass of $H_2O(g)$.

(2) The volume of $H_2O(\ell)$ equals the volume of $H_2O(g)$.

(3) The number of moles of $H_2O(\ell)$ equals the number of moles of $H_2O(g)$.

(4) The rate of evaporation of $H_2O(\ell)$ equals the rate of condensation of $H_2O(g)$.

27 Which reaction occurs at the cathode in an electrochemical cell?

(1) combustion (3) oxidation

(2) neutralization (4) reduction

28 Which substance yields $H^+(aq)$ as the only positive ion in an aqueous solution?

(1) CH_3CHO (3) CH_3COOH

(2) CH_3CH_2OH (4) CH_3OCH_3

29 Compared to the mass and the penetrating power of an alpha particle, a beta particle has

(1) less mass and greater penetrating power

(2) less mass and less penetrating power

(3) more mass and greater penetrating power

(4) more mass and less penetrating power

30 During a nuclear reaction, mass is converted into

(1) charge (3) isomers

(2) energy (4) volume

Part B–1

Answer all questions in this part.

Directions (31–50): For *each* statement or question, record on your separate answer sheet the *number* of the word or expression that, of those given, best completes the statement or answers the question. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

31 An atom in the ground state has two electrons in its first shell and six electrons in its second shell. What is the total number of protons in the nucleus of this atom?

(1) 5 (3) 7
(2) 2 (4) 8

32 A bromine atom in an excited state could have an electron configuration of

(1) 2-8-18-6 (3) 2-8-17-7
(2) 2-8-18-7 (4) 2-8-17-8

33 The atomic masses and the natural abundances of the two naturally occurring isotopes of lithium are shown in the table below.

Lithium Isotopes

Isotope	Atomic Mass (u)	Natural Abundance (%)
Li-6	6.02	7.5
Li-7	7.02	92.5

Which numerical setup can be used to determine the atomic mass of lithium?

(1) (0.075)(6.02 u) + (0.925)(7.02 u)
(2) (0.925)(6.02 u) + (0.075)(7.02 u)
(3) (7.5)(6.02 u) + (92.5)(7.02 u)
(4) (92.5)(6.02 u) + (7.5)(7.02 u)

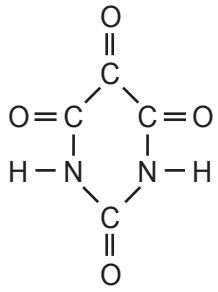
34 Element *X* reacts with chlorine to form an ionic compound that has the formula XCl_2. To which group on the Periodic Table could element *X* belong?

(1) Group 1 (3) Group 13
(2) Group 2 (4) Group 15

35 Which general trend is found in Period 3 as the elements are considered in order of increasing atomic number?

(1) increasing atomic radius
(2) increasing electronegativity
(3) decreasing atomic mass
(4) decreasing first ionization energy

36 Given the formula for a compound:



Which molecular formula and empirical formula represent this compound?

(1) C_2HNO_2 and CHNO
(2) C_2HNO_2 and C_2HNO_2
(3) $C_4H_2N_2O_4$ and CHNO
(4) $C_4H_2N_2O_4$ and C_2HNO_2

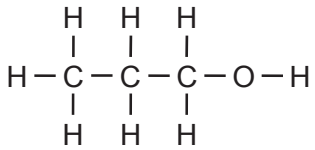
37 What is the gram-formula mass of $(NH_4)_3PO_4$?

(1) 112 g/mol (3) 149 g/mol
(2) 121 g/mol (4) 242 g/mol

38 In the ground state, which atom has a completely filled valence electron shell?

(1) C (3) Ne
(2) V (4) Sb

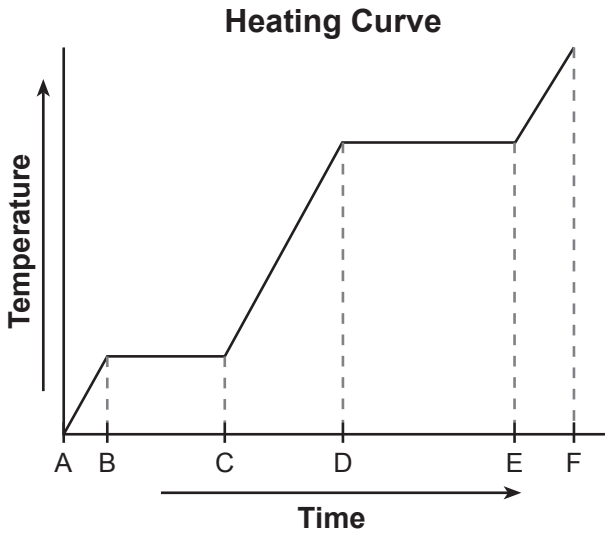
39 Given the formula:



The bond between which two atoms has the greatest degree of polarity?

(1) C and C
(2) C and O
(3) H and C
(4) H and O

40 Given the diagram representing a heating curve for a substance:



During which time interval is the average kinetic energy of the particles of the substance constant while the potential energy of the particles increases?

(1) *AC*
(2) *BC*
(3) *CD*
(4) *DF*

41 At 50.°C and standard pressure, intermolecular forces of attraction are strongest in a sample of

(1) ethanoic acid
(2) ethanol
(3) propanone
(4) water

42 At 101.3 kPa and 298 K, what is the total amount of heat released when one mole of aluminum oxide, $Al_2O_3(s)$, is formed from its elements?

(1) 393.5 kJ
(2) 837.8 kJ
(3) 1676 kJ
(4) 3351 kJ

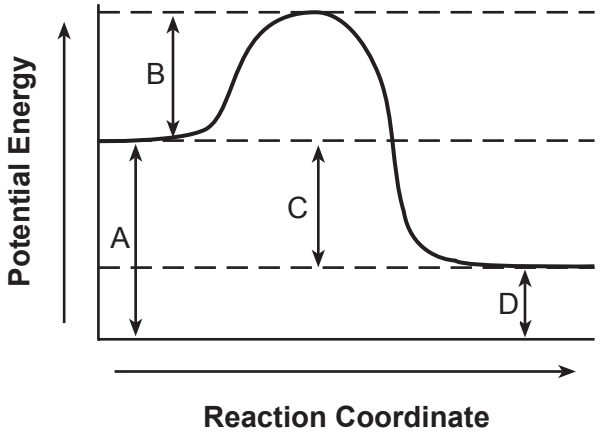
43 Given the balanced equation representing a reaction:

$$2H_2O(\ell) + 571.6\ kJ \rightarrow 2H_2(g) + O_2(g)$$

What occurred as a result of this reaction?

(1) Energy was absorbed, and entropy increased.
(2) Energy was absorbed, and entropy decreased.
(3) Energy was released, and entropy increased.
(4) Energy was released, and entropy decreased.

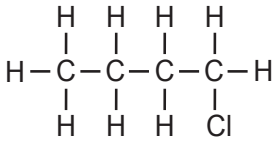
44 Given the potential energy diagram representing a reversible reaction:



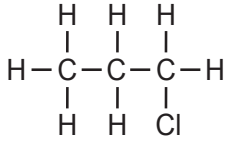
The activation energy for the reverse reaction is represented by

(1) $A + B$
(2) $B + C$
(3) $B + D$
(4) $C + D$

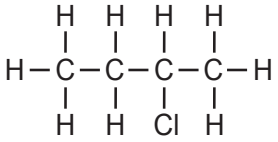
45 Which formula represents a molecule of 2-chlorobutane?



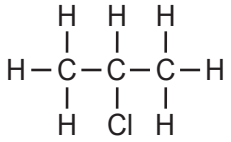
(1)



(3)



(2)



(4)

46 Which formula represents an unsaturated hydrocarbon?

(1) CH_4
(2) C_2H_4
(3) C_3H_8
(4) C_4H_{10}

47 Which ion is most easily reduced?

(1) Zn^{2+}
(2) Mg^{2+}
(3) Co^{2+}
(4) Ca^{2+}

48 Given the balanced equation representing a reaction:

$$HSO_4^-(aq) + H_2O(\ell) \rightarrow H_3O^+(aq) + SO_4^{2-}(aq)$$

According to one acid-base theory, the $H_2O(\ell)$ molecules act as

(1) a base because they accept H^+ ions
(2) a base because they donate H^+ ions
(3) an acid because they accept H^+ ions
(4) an acid because they donate H^+ ions

49 Which equation represents an oxidation-reduction reaction?

(1) $H^+ + OH^- \rightarrow H_2O$
(2) ${}^{238}_{92}U \rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$
(3) $Zn + Sn^{4+} \rightarrow Zn^{2+} + Sn^{2+}$
(4) $3AgNO_3 + Li_3PO_4 \rightarrow Ag_3PO_4 + 3LiNO_3$

50 Which equation represents natural transmutation?

(1) ${}^{10}_{5}B + {}^{4}_{2}He \rightarrow {}^{13}_{7}N + {}^{1}_{0}n$
(2) ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$
(3) $S + 2e^- \rightarrow S^{2-}$
(4) $Na \rightarrow Na^+ + e^-$

Part B–2

Answer all questions in this part.

Directions (51–65): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry.*

51 What is the mass of $KNO_3(s)$ that must dissolve in 100. grams of water to form a saturated solution at 50.°C? [1]

Base your answers to questions 52 through 55 on the information below.

The reaction between aluminum and an aqueous solution of copper(II) sulfate is represented by the unbalanced equation below.

$$Al(s) + CuSO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + Cu(s)$$

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

53 Balance the equation *in your answer booklet*, using the smallest whole-number coefficients. [1]

54 Explain why the equation represents a chemical change. [1]

55 Determine the total mass of Cu produced when 1.08 grams of Al reacts completely with 9.58 grams of $CuSO_4$ to produce 6.85 grams of $Al_2(SO_4)_3$. [1]

Base your answers to questions 56 through 59 on the information below.

A total of 1.4 moles of sodium nitrate is dissolved in enough water to make 2.0 liters of an aqueous solution. The gram-formula mass of sodium nitrate is 85 grams per mole.

56 Write the chemical formula for the solute in the solution. [1]

57 Show a numerical setup for calculating the mass of the solute used to make the solution. [1]

58 Compare the boiling point of the solution at standard pressure to the boiling point of H_2O at standard pressure. [1]

59 Determine the molarity of the solution. [1]

Base your answers to questions 60 through 62 on the information below.

Calcium reacts with water. This reaction is represented by the balanced equation below. The aqueous product of this reaction can be heated to evaporate the water, leaving a white solid, $Ca(OH)_2(s)$.

$$Ca(s) + 2H_2O(\ell) \rightarrow Ca(OH)_2(aq) + H_2(g)$$

60 Compare the electrical conductivity of the aqueous product in the reaction to the electrical conductivity of the white solid that remains after the water is evaporated from the solution. [1]

61 Write the chemical name of the base produced in the reaction. [1]

62 State *one* change in reaction conditions that will increase the rate of the reaction. [1]

Base your answers to questions 63 through 65 on the information below.

In a titration, 20.0 milliliters of 0.15 M HCl(aq) is exactly neutralized by 18.0 milliliters of KOH(aq).

63 Complete the equation *in your answer booklet* for the neutralization reaction by writing the formula of *each* product. [1]

64 Compare the number of moles of $H^+(aq)$ ions to the number of moles of $OH^-(aq)$ ions in the titration mixture when the HCl(aq) is exactly neutralized by the KOH(aq). [1]

65 Determine the concentration of the KOH(aq). [1]

Part C

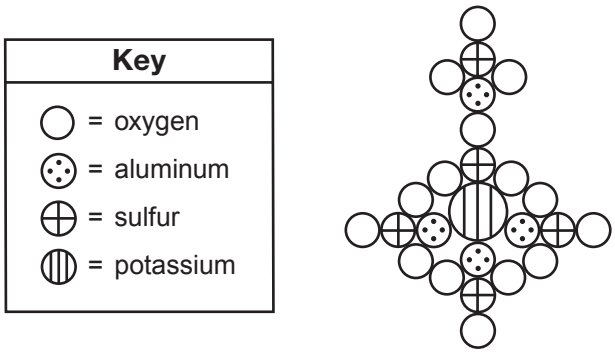
Answer all questions in this part.

Directions (66–85): Record your answers in the spaces provided in your answer booklet. Some questions may require the use of the *2011 Edition Reference Tables for Physical Setting/Chemistry*.

Base your answers to questions 66 through 68 on the information below.

John Dalton, an early scientist, sketched the structure of compounds using his own symbols for the elements known at the time. Dalton's symbols for four elements and his drawing of potassium aluminum sulfate are represented by the diagram below.

Dalton's Drawing for Potassium Aluminum Sulfate



Today, it is known that the chemical formula for potassium aluminum sulfate is $KAl(SO_4)_2 \bullet 12H_2O$. It is a hydrated compound because water molecules are included within its crystal structure. There are 12 moles of H_2O for every 1 mole of $KAl(SO_4)_2$. The compound contains two different positive ions. The gram-formula mass of $KAl(SO_4)_2 \bullet 12H_2O$ is 474 grams per mole.

66 Identify *one* positive ion in the hydrated compound. Your response must include *both* the chemical symbol and charge of the ion. [1]

67 Describe, in terms of composition, *one* way in which Dalton's perception of potassium aluminum sulfate differs from what is known today about the compound. [1]

68 Show a numerical setup for calculating the percent composition by mass of water in $KAl(SO_4)_2 \bullet 12H_2O$. [1]

Base your answers to questions 69 through 71 on the information below.

At standard pressure, hydrogen peroxide, H_2O_2, melts at $-0.4°C$, boils at 151°C, and is very soluble in water. A bottle of aqueous hydrogen peroxide, $H_2O_2(aq)$, purchased from a pharmacy has a pressure-releasing cap. Aqueous hydrogen peroxide decomposes at room temperature, as represented by the balanced equation below.

$$2H_2O_2(aq) \rightarrow 2H_2O(\ell) + O_2(g) + 196.0\ kJ$$

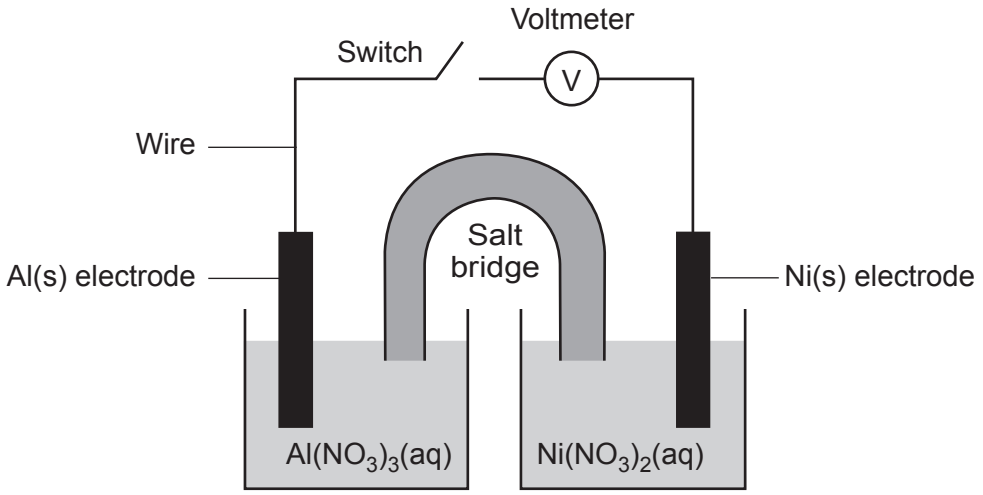
69 State, in terms of *both* melting point and boiling point, why H_2O_2 is a liquid at room temperature. [1]

70 State evidence that indicates the decomposition of $H_2O_2(aq)$ is exothermic. [1]

71 Explain why a hydrogen peroxide bottle needs a pressure-releasing cap. [1]

Base your answers to questions 72 through 75 on the information below.

A student constructs an electrochemical cell during a laboratory investigation. When the switch is closed, electrons flow through the external circuit. The diagram and equation below represent this cell and the reaction that occurs.



$$2Al(s) + 3Ni^{2+}(aq) \rightarrow 2Al^{3+}(aq) + 3Ni(s)$$

72 State the direction of electron flow through the wire when the switch is closed. [1]

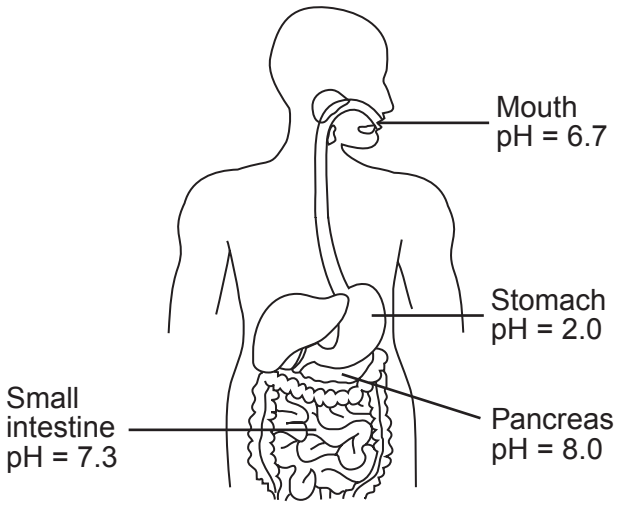
73 Write a balanced half-reaction equation for the oxidation that occurs when the switch is closed. [1]

74 Determine the number of moles of Al(s) needed to completely react with 9.0 moles of $Ni^{2+}(aq)$ ions. [1]

75 State, in terms of energy, why this cell is a voltaic cell. [1]

Base your answers to questions 76 through 78 on the information below.

The diagram below shows typical pH values found in four parts of the human digestive system. In the small intestine, the enzyme lipase acts as a catalyst, increasing the rate of fat digestion.



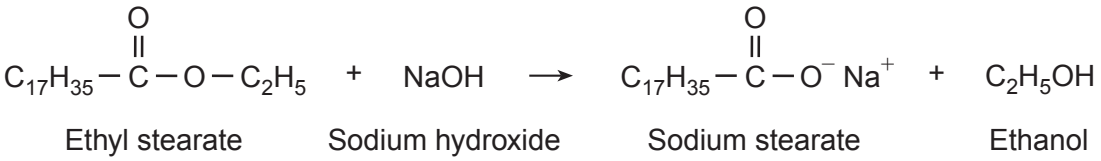
76 Which labeled part of the digestive system has the most acidic environment? [1]

77 What is the color of thymol blue at the pH of the small intestine? [1]

78 State how the catalyst lipase increases the rate of the fat digestion. [1]

Base your answers to questions 79 through 81 on the information below.

One type of soap is produced when ethyl stearate and sodium hydroxide react. The soap produced by this reaction is called sodium stearate. The other product of the reaction is ethanol. This reaction is represented by the balanced equation below.



79 Identify the type of organic reaction used to make soap. [1]

80 To which class of organic compounds does ethyl stearate belong? [1]

81 Identify the *two* types of bonds in the compound sodium stearate. [1]

Base your answers to questions 82 through 85 on the information below.

Nuclear fission has been used to produce electricity. However, nuclear fusion for electricity production is still under development. The notations of some nuclides used in nuclear reactions are shown in the table below.

Some Nuclides Used in Nuclear Reactions

Reaction	Nuclides
nuclear fission	$^{233}_{92}U$, $^{235}_{92}U$
nuclear fusion	$^{1}_{1}H$, $^{3}_{1}H$

82 Compare the atomic masses of nuclides used in fusion to the atomic masses of nuclides used in fission. [1]

83 Complete the table *in your answer booklet* that compares the total number of protons and the total number of neutrons for the hydrogen nuclides used for fusion. [1]

84 Complete the nuclear equation *in your answer booklet* for the fission of $^{235}_{92}U$ by writing the notation of the missing product. [1]

85 State *one* potential benefit of using nuclear fusion instead of the current use of nuclear fission to produce electricity. [1]

P.S./CHEMISTRY

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING
CHEMISTRY

Wednesday, June 20, 2012 — 1:15 to 4:15 p.m., only

ANSWER BOOKLET

Student . . . . . Sex: ☐ Male ☐ Female

Teacher . . . . . .

School . . . . . Grade . . . . . .

Record your answers for Part B–2 and Part C in this booklet.

Part B–2

51 _____ **g**

52 _____

53 _____ $Al(s)$ + _____ $CuSO_4(aq)$ → _____ $Al_2(SO_4)_3(aq)$ + _____ $Cu(s)$

54 _____

_____

_____

55 _____ **g**

56 _____

57

58 _____

_____

59 _____ **M**

60 _____

_____

61 _____

62 _____

_____

63 $KOH(aq) + HCl(aq) \rightarrow$ _____ + _____

64 _____

_____

65 _____ **M**

Part C

66 _____

67 _____

_____

68

69 _____

_____

_____

70 _____

_____

71 _____

_____

_____

72 _____

_____

73 _____

74 _____ **mol**

75 _____

_____

76 _____

77 _____

78 _____

_____

79 _____

80 _____

81 _____ and _____

82 _____

_____

83

Nuclide	Total Number of Protons	Total Number of Neutrons
$^{1}_{1}H$		
$^{3}_{1}H$		

84 $^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{142}_{56}Ba + {}^{91}_{36}Kr + 3$ _____ + energy

85 _____

_____

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REGENTS HIGH SCHOOL EXAMINATION

P.S.–CH PHYSICAL SETTING/CHEMISTRY

Wednesday, June 20, 2012 — 1:15 to 4:15 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 2 before rating student papers.

Updated information regarding the rating of this examination may be posted on the New York State Education Department's web site during the rating period. Check this web site at: http://www.p12.nysed.gov/apda/ and select the link "Scoring Information" for any recently posted information regarding this examination. This site should be checked before the rating process for this examination begins and several times throughout the Regents Examination period.

Part A and Part B–1

Allow 1 credit for each correct response.

Part A

1 . . . . . **4**	9 . . . . . **3**	17 . . . . . **3**	25 . . . . . **3** . . . . .
2 . . . . . **1**	10 . . . . . **2**	18 . . . . . **4**	26 . . . . . **4** . . . . .
3 . . . . . **1**	11 . . . . . **2**	19 . . . . . **4**	27 . . . . . **4** . . . . .
4 . . . . . **3**	12 . . . . . **3**	20 . . . . . **1**	28 . . . . . **3** . . . . .
5 . . . . . **3**	13 . . . . . **1**	21 . . . . . **2**	29 . . . . . **1** . . . . .
6 . . . . . **2**	14 . . . . . **1**	22 . . . . . **4**	30 . . . . . **2** . . . . .
7 . . . . . **4**	15 . . . . . **3**	23 . . . . . **4**	
8 . . . . . **1**	16 . . . . . **1**	24 . . . . . **4**	

Part B–1

31 . . . . . **4**	36 . . . . . **4**	41 . . . . . **1**	46 . . . . . **2** . . . . .
32 . . . . . **4**	37 . . . . . **3**	42 . . . . . **3**	47 . . . . . **3** . . . . .
33 . . . . . **1**	38 . . . . . **3**	43 . . . . . **1**	48 . . . . . **1** . . . . .
34 . . . . . **2**	39 . . . . . **4**	44 . . . . . **2**	49 . . . . . **3** . . . . .
35 . . . . . **2**	40 . . . . . **2**	45 . . . . . **2**	50 . . . . . **2** . . . . .

Directions to the Teacher

Follow the procedures below for scoring student answer papers for the Regents Examination in Physical Setting/Chemistry. Additional information about scoring is provided in the publication *Information Booklet for Scoring Regents Examinations in the Sciences.*

Do *not* attempt to *correct* the student's work by making insertions or changes of any kind.

Allow 1 credit for each correct response.

At least two science teachers must participate in the scoring of the Part B–2 and Part C open-ended questions on a student's paper. Each of these teachers should be responsible for scoring a selected number of the open-ended questions on each answer paper. No one teacher is to score more than approximately one-half of the open-ended questions on a student's answer paper.

Students' responses must be scored strictly according to the Scoring Key and Rating Guide. For open-ended questions, credit may be allowed for responses other than those given in the rating guide if the response is a scientifically accurate answer to the question and demonstrates adequate knowledge, as indicated by the examples in the rating guide. On the student's separate answer sheet, for each question, record the number of credits earned and the teacher's assigned rater/scorer letter.

Fractional credit is *not* allowed. Only whole-number credit may be given for a response. If the student gives more than one answer to a question, only the first answer should be rated. Units need not be given when the wording of the questions allows such omissions.

For hand scoring, raters should enter the scores earned in the appropriate boxes printed on the separate answer sheet. Next, the rater should add these scores and enter the total in the box labeled "Total Raw Score." Then the student's raw score should be converted to a scale score by using the conversion chart that will be posted on the Department's web site at: http://www.p12.nysed.gov/apda/ on Wednesday, June 20, 2012. The student's scale score should be entered in the box labeled "Scale Score" on the student's answer sheet. The scale score is the student's final examination score.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart may change from one administration to another, it is crucial that for each administration, the conversion chart provided for that administration be used to determine the student's final score.

Part B–2

Allow a total of 15 credits for this part. The student must answer all questions in this part.

51 [1] Allow 1 credit for 84 g ± 2 g.

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

single replacement

redox

53 [1] Allow 1 credit for _2_ Al(s) + _3_ $CuSO_4(aq)$ → ___ $Al_2(SO_4)_3(aq)$ + _3_ Cu(s).

Allow credit even if the coefficient "1" is written in front of $Al_2(SO_4)_3(aq)$.

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

The products are different substances with different properties from the reactants.

There is a loss and gain of electrons by substances in the reaction.

55 [1] Allow 1 credit for 3.81 g.

56 [1] Allow 1 credit for $NaNO_3$.

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

(85 g/mol)(1.4 mol)

(1.4)(85)

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

At standard pressure, the boiling point of the solution is higher than the boiling point of H_2O.

Water boils at a lower temperature.

59 [1] Allow 1 credit for 0.70 M. Significant figures do *not* need to be shown.

60 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The solution can conduct an electric current better than the white solid.

The $Ca(OH)_2(aq)$ is a good conductor and $Ca(OH)_2(s)$ is not.

61 [1] Allow 1 credit for calcium hydroxide.

62 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Increase the temperature of the water.

Increase the surface area of Ca(s).

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

$H_2O(\ell)$ and KCl(aq)

KCl and HOH

64 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The number of moles of $H^+(aq)$ ions equals the number of moles of $OH^-(aq)$ ions.

The number of hydrogen ions is the same as the number of hydroxide ions.

65 [1] Allow 1 credit for 0.17 M. Significant figures do *not* need to be shown.

Part C

Allow a total of 20 credits for this part. The student must answer all questions in this part.

66 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

K^+

Al^{3+}

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

Dalton's drawing did not include the element hydrogen.

He perceived 5 sulfur atoms, but the formula actually has 2 sulfur atoms.

Dalton's drawing had more aluminum.

It did not include water.

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

$$\frac{12(2\text{ g/mol} + 16\text{ g/mol})}{474\text{ g/mol}} \times 100$$

$$\frac{216}{474} \times 100$$

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

Room temperature is above the melting point and below the boiling point of H_2O_2.

Room temperature is between -0.4°C and 151°C.

-0.4°C < room temperature < 151°C

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

More energy is released than absorbed.

Heat is a product of the reaction.

71 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The excess pressure due to the production of oxygen gas in the bottle needs to be gradually released.

As $O_2(g)$ is produced, the pressure inside of the bottle might increase and the bottle might burst without the pressure-releasing cap.

72 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

Electrons flow from the Al electrode to the Ni electrode.

Electrons move left to right through the wire.

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

$Al \rightarrow 3e^- + Al^{3+}$

$2Al \rightarrow 2Al^{3+} + 6e^-$

74 [1] Allow 1 credit for 6.0 mol. Significant figures do *not* need to be shown.

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

A spontaneous reaction converts chemical energy to electrical energy.

A battery is not required to provide energy for the cell to operate.

76 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

stomach

the organ with a pH of 2

77 [1] Allow 1 credit for yellow.

78 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The lipase provides an alternate reaction pathway that requires less energy.

lower activation energy

79 [1] Allow 1 credit for saponification.

80 [1] Allow 1 credit for ester *or* esters.

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

covalent bonds and ionic bonds

polar and nonpolar

single and double

82 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The nuclides used for fusion have smaller atomic masses than nuclides used for fission.

The nuclides used in fission are many times more massive.

Fusion particles are lighter.

83 [1] Allow 1 credit for the correct number of protons and the correct number of neutrons for *both* hydrogen nuclides.

Example of a 1-credit response:

Nuclide	Total Number of Protons	Total Number of Neutrons
$^{1}_{1}H$	1	0
$^{3}_{1}H$	1	2

84 [1] Allow 1 credit for $^{1}_{0}n$.

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

Fusion produces more energy per gram of reactant.

The fusion process produces less radioactive waste.

The fusion reactant material is more readily available.

Regents Examination in Physical Setting/Chemistry

June 2012

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

The *Chart for Determining the Final Examination Score for the June 2012 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: http://www.p12.nysed.gov/apda/ on Wednesday, June 20, 2012. Conversion charts provided for previous administrations of the Regents Examination in Physical Setting/Chemistry must NOT be used to determine students' final scores for this administration.

Online Submission of Teacher Evaluations of the Test to the Department

Suggestions and feedback from teachers provide an important contribution to the test development process. The Department provides an online evaluation form for State assessments. It contains spaces for teachers to respond to several specific questions and to make suggestions. Instructions for completing the evaluation form are as follows:

1. Go to http://www.forms2.nysed.gov/emsc/osa/exameval/reexameval.cfm.
2. Select the test title.
3. Complete the required demographic fields.
4. Complete each evaluation question and provide comments in the space provided.
5. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

June 2012 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		51, 65	68
Math Key Idea 2		36, 46, 64	
Math Key Idea 3		33, 37, 39, 42, 49, 55, 56, 59, 65	68, 74, 84
Science Inquiry Key Idea 1		36, 46, 48, 54, 58, 60	69, 70, 71, 75, 78
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		39, 41, 42, 47, 48, 49, 50, 51, 56, 58, 61	66, 72, 76, 81
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2		50	67
Key Idea 3			76
Key Idea 4			
Key Idea 5		35, 41	
Standard 7			
Key Idea 1			71, 85
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		31, 32, 33, 34, 35, 36, 37, 38, 43, 45, 46, 49, 51, 52, 53, 54, 55, 57, 59, 62, 63, 65	71, 72, 73, 74, 75, 77, 79, 80, 83
Key Idea 4		40, 44	70, 82, 84, 85
Key idea 5		41, 60	81
Standard 4			
Key Idea 3	1, 2, 3, 4, 5, 6, 7, 9, 10, 12, 18, 19, 20, 21, 24, 26, 27, 28, 29	31, 32, 33, 34, 35, 36, 37, 43, 45, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65	67, 68, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 83
Key Idea 4	22, 23, 25	40, 42, 44	69, 70, 82, 84, 85
Key Idea 5	8, 11, 13, 14, 15, 16, 17, 30	38, 39, 41, 50	66, 81
Reference Tables			
2011 Edition		32, 34, 35, 38, 41, 42, 43, 45, 46, 47, 49, 50, 51, 56, 61, 63, 64, 65	66, 68, 72, 77, 80

Regents Examination in Physical Setting/Chemistry – June 2012

Chart for Converting Total Test Raw Scores to Final Examination Scores (Scale Scores)

Raw Score	Scale Score
85	100
84	98
83	97
82	95
81	94
80	92
79	91
78	90
77	89
76	87
75	86
74	85
73	84
72	83
71	82
70	81
69	80
68	79
67	78
66	77
65	77
64	76

Raw Score	Scale Score
63	75
62	74
61	73
60	73
59	72
58	71
57	70
56	70
55	69
54	68
53	67
52	67
51	66
50	66
49	65
48	64
47	63
46	63
45	62
44	61
43	61
42	60

Raw Score	Scale Score
41	59
40	58
39	58
38	57
37	56
36	55
35	54
34	54
33	53
32	52
31	51
30	50
29	49
28	48
27	47
26	46
25	45
24	44
23	43
22	41
21	40
20	39

Raw Score	Scale Score
19	37
18	36
17	35
16	33
15	32
14	30
13	28
12	27
11	25
10	23
9	21
8	19
7	17
6	15
5	12
4	10
3	8
2	5
1	3
0	0

To determine the student's final examination score, find the student's total test raw score in the column labeled "Raw Score" and then locate the scale score that corresponds to that raw score. The scale score is the student's final examination score. Enter this score in the space labeled "Scale Score" on the student's answer sheet.

Schools are not permitted to rescore any of the open-ended questions on this exam after each question has been rated once, regardless of the final exam score. Schools are required to ensure that the raw scores have been added correctly and that the resulting scale score has been determined accurately.

Because scale scores corresponding to raw scores in the conversion chart change from one administration to another, it is crucial that for each administration the conversion chart provided for that administration be used to determine the student's final score. The chart above is usable only for this administration of the Regents Examination in Physical Setting/Chemistry.