

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

**PHYSICAL SETTING
CHEMISTRY**

Tuesday, August 13, 2002 — 12:30 to 3:30 p.m., only

You are to answer *all* questions in all parts of this examination according to the directions provided in the examination booklet.

Your answer sheet for Part A and Part B–1 is the last page of this examination booklet. Turn to the last page and fold it along the perforations. Then, slowly and carefully, tear off your answer sheet and fill in the heading.

Your answer booklet for Part B–2 and Part C is stapled in the center of this examination booklet. Open the examination booklet, carefully remove your answer booklet, and close the examination booklet. Then fill in the heading of your answer booklet.

Record the number of your choice for each Part A and Part B–1 multiple-choice question on your separate answer sheet. Write your answers to the Part B–2 and Part C questions in your answer booklet. All work 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 answer sheet and answer booklet.

When you have completed the examination, you must sign the statement printed at the end of 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 *Reference Tables for Physical Setting/Chemistry* must be available for your use while taking this examination.

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, write 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 *Reference Tables for Physical Setting/Chemistry*.

1 Subatomic particles can usually pass undeflected through an atom because the volume of an atom is composed of

- (1) an uncharged nucleus
- (2) largely empty space
- (3) neutrons
- (4) protons

2 What is the total number of electrons in the valence shell of an atom of aluminum in the ground state?

- (1) 8
- (2) 2
- (3) 3
- (4) 10

3 Which of these elements has physical and chemical properties most similar to silicon (Si)?

- (1) germanium (Ge)
- (2) lead (Pb)
- (3) phosphorus (P)
- (4) chlorine (Cl)

4 What is the total number of protons in the nucleus of an atom of potassium-42?

- (1) 15
- (2) 19
- (3) 39
- (4) 42

5 Given the equation: $\text{H}_2\text{O}(s) \rightleftharpoons \text{H}_2\text{O}(\ell)$

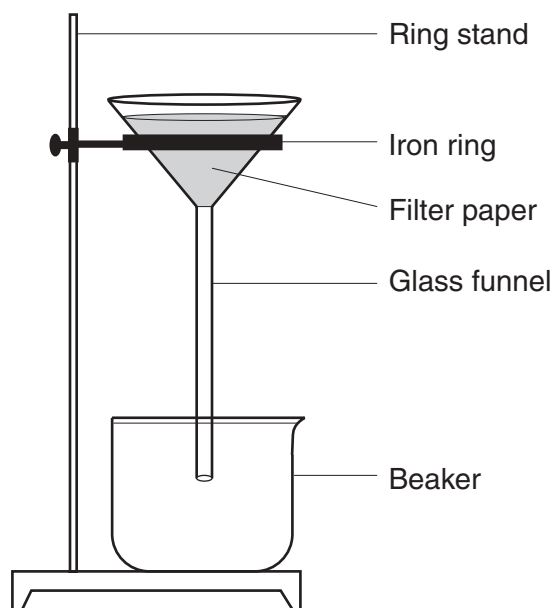
At which temperature will equilibrium exist when the atmospheric pressure is 1 atm?

- (1) 0 K
- (2) 100 K
- (3) 273 K
- (4) 373 K

6 Which species represents a chemical compound?

- (1) N_2
- (2) NH_4^+
- (3) Na
- (4) NaHCO_3

7 Which mixture can be separated by using the equipment shown below?



- (1) $\text{NaCl}(\text{aq})$ and $\text{SiO}_2(\text{s})$
- (2) $\text{NaCl}(\text{aq})$ and $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$
- (3) $\text{CO}_2(\text{aq})$ and $\text{NaCl}(\text{aq})$
- (4) $\text{CO}_2(\text{aq})$ and $\text{C}_6\text{H}_{12}\text{O}_6(\text{aq})$

8 Which reaction represents natural nuclear decay?

- (1) $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
- (2) $\text{KClO}_3 \rightarrow \text{K}^+ + \text{ClO}_3^-$
- (3) ${}_{92}^{235}\text{U} \rightarrow {}_2^4\text{He} + {}_{90}^{231}\text{Th}$
- (4) ${}_{7}^{14}\text{N} + {}_2^4\text{He} \rightarrow {}_8^{17}\text{O} + {}_1^1\text{H}$

9 If an equation is balanced properly, both sides of the equation must have the same number of

- (1) atoms
- (2) coefficients
- (3) molecules
- (4) moles of molecules

- 10 Which of the following elements has the highest electronegativity?
 (1) H (2) K (3) Al (4) Ca
- 11 Which formula represents an ionic compound?
 (1) NaCl (2) N₂O (3) HCl (4) H₂O
- 12 Which species does *not* have a noble gas electron configuration?
 (1) Na⁺ (2) Mg²⁺ (3) Ar (4) S
- 13 Which statement correctly describes a chemical reaction at equilibrium?
 (1) The concentrations of the products and reactants are equal.
 (2) The concentrations of the products and reactants are constant.
 (3) The rate of the forward reaction is less than the rate of the reverse reaction.
 (4) The rate of the forward reaction is greater than the rate of the reverse reaction.
- 14 Given the reaction:

$$\text{CH}_4(\text{g}) + 2 \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$$
 What is the overall result when CH₄(g) burns according to this reaction?
 (1) Energy is absorbed and ΔH is negative.
 (2) Energy is absorbed and ΔH is positive.
 (3) Energy is released and ΔH is negative.
 (4) Energy is released and ΔH is positive.
- 15 A hydrated salt is a solid that includes water molecules within its crystal structure. A student heated a 9.10-gram sample of a hydrated salt to a constant mass of 5.41 grams. What percent by mass of water did the salt contain?
 (1) 3.69% (2) 16.8% (3) 40.5% (4) 59.5%
- 16 Which statement correctly describes a sample of gas confined in a sealed container?
 (1) It always has a definite volume, and it takes the shape of the container.
 (2) It takes the shape and the volume of any container in which it is confined.
 (3) It has a crystalline structure.
 (4) It consists of particles arranged in a regular geometric pattern.
- 17 Which molecule contains a triple covalent bond?
 (1) H₂ (2) N₂ (3) O₂ (4) Cl₂
- 18 The solid and liquid phases of water can exist in a state of equilibrium at 1 atmosphere of pressure and a temperature of
 (1) 0°C (2) 100°C (3) 273°C (4) 373°C
- 19 Which compound is an alcohol?
 (1) propanal (2) ethyne (3) butane (4) methanol
- 20 In which reaction is soap a product?
 (1) addition (2) substitution (3) saponification (4) polymerization
- 21 The spontaneous decay of an atom is called
 (1) ionization (2) crystallization (3) combustion (4) transmutation
- 22 In any redox reaction, the substance that undergoes reduction will
 (1) lose electrons and have a decrease in oxidation number
 (2) lose electrons and have an increase in oxidation number
 (3) gain electrons and have a decrease in oxidation number
 (4) gain electrons and have an increase in oxidation number

23 Which electron configuration is correct for a sodium ion?

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

24 In which equation does the term "heat" represent heat of fusion?

- (1) $\text{NaCl}(s) + \text{heat} \rightarrow \text{NaCl}(\ell)$
(2) $\text{NaOH}(aq) + \text{HCl}(aq) \rightarrow \text{NaCl}(aq) + \text{H}_2\text{O}(\ell) + \text{heat}$
(3) $\text{H}_2\text{O}(\ell) + \text{heat} \rightarrow \text{H}_2\text{O}(g)$
(4) $\text{H}_2\text{O}(\ell) + \text{HCl}(g) \rightarrow \text{H}_3\text{O}^+(aq) + \text{Cl}^-(aq) + \text{heat}$

25 Which substance is an Arrhenius acid?

- (1) $\text{LiF}(aq)$
(2) $\text{HBr}(aq)$
- (3) $\text{Mg}(\text{OH})_2(aq)$
(4) CH_3CHO

26 Which type of emission has the highest penetrating power?

- (1) alpha
(2) beta
- (3) positron
(4) gamma

Note that questions 27 through 30 have only three choices.

27 As the elements in Group 17 are considered in order of increasing atomic number, the chemical reactivity of each successive element

- (1) decreases
(2) increases
(3) remains the same

28 As the pressure on the surface of a liquid *decreases*, the temperature at which the liquid will boil

- (1) decreases
(2) increases
(3) remains the same

29 As a Ca atom undergoes oxidation to Ca^{2+} , the number of neutrons in its nucleus

- (1) decreases
(2) increases
(3) remains the same

30 As the temperature of a liquid increases, its vapor pressure

- (1) decreases
(2) increases
(3) remains the same

Part B-1

Answer all questions in this part.

Directions (31–50): For each statement or question, write 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 Reference Tables for Physical Setting/Chemistry.

31 Compared to the nonmetals in Period 2, the metals in Period 2 generally have larger

- (1) ionization energies
- (2) electronegativities
- (3) atomic radii
- (4) atomic numbers

32 Which of the following Group 2 elements has the lowest first ionization energy?

- (1) Be
- (2) Mg
- (3) Ca
- (4) Ba

33 The table below shows the normal boiling point of four compounds.

Compound	Normal Boiling Point (°C)
HF(ℓ)	19.4
CH ₃ Cl(ℓ)	-24.2
CH ₃ F(ℓ)	-78.6
HCl(ℓ)	-83.7

Which compound has the strongest intermolecular forces?

- (1) HF(ℓ)
- (2) CH₃Cl(ℓ)
- (3) CH₃F(ℓ)
- (4) HCl(ℓ)

34 According to Table I, which salt releases energy as it dissolves?

- (1) KNO₃
- (2) LiBr
- (3) NH₄NO₃
- (4) NaCl

35 During a laboratory activity, a student combined two solutions. In the laboratory report, the student wrote “A yellow color appeared.” The statement represents the student’s recorded

- (1) conclusion
- (2) observation
- (3) hypothesis
- (4) inference

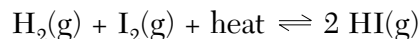
36 How many moles of solute are contained in 200 milliliters of a 1 M solution?

- (1) 1
- (2) 0.2
- (3) 0.8
- (4) 200

37 Increasing the temperature increases the rate of a reaction by

- (1) lowering the activation energy
- (2) increasing the activation energy
- (3) lowering the frequency of effective collisions between reacting molecules
- (4) increasing the frequency of effective collisions between reacting molecules

38 Given the equilibrium reaction in a closed system:



What will be the result of an increase in temperature?

- (1) The equilibrium will shift to the left and [H₂] will increase.
- (2) The equilibrium will shift to the left and [H₂] will decrease.
- (3) The equilibrium will shift to the right and [HI] will increase.
- (4) The equilibrium will shift to the right and [HI] will decrease.

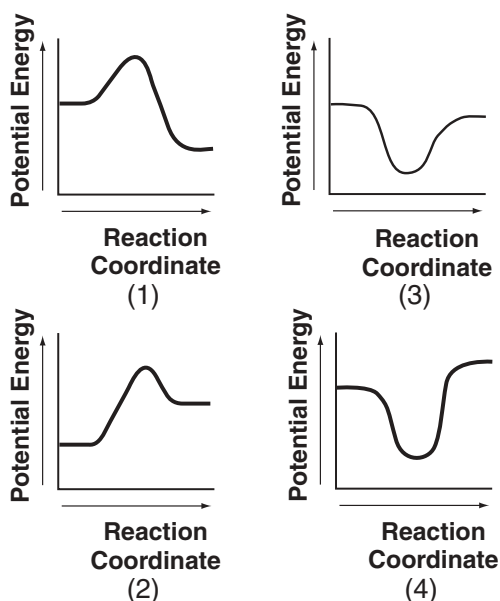
39 Which sample has the lowest entropy?

- (1) 1 mole of KNO₃(ℓ)
- (2) 1 mole of KNO₃(s)
- (3) 1 mole of H₂O(ℓ)
- (4) 1 mole of H₂O(g)

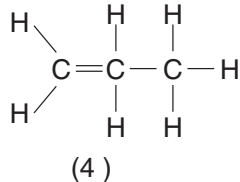
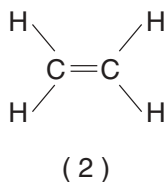
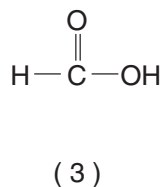
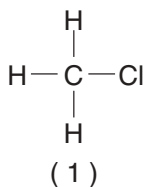
40 Which of the following compounds is least soluble in water?

- (1) copper (II) chloride
- (2) aluminum acetate
- (3) iron (III) hydroxide
- (4) potassium sulfate

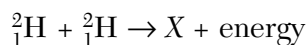
- 41 According to Table I, which potential energy diagram best represents the reaction that forms $\text{H}_2\text{O}(\ell)$ from its elements?



- 42 Which structural formula is *incorrect*?



- 43 Given the fusion reaction:



Which particle is represented by X?

- (1) ${}^1_1\text{H}$ (3) ${}^3_2\text{He}$
 (2) ${}^3_1\text{H}$ (4) ${}^4_2\text{He}$
- 44 The vapor pressure of a liquid is 0.92 atm at 60°C . The normal boiling point of the liquid could be
- (1) 35°C (3) 55°C
 (2) 45°C (4) 65°C

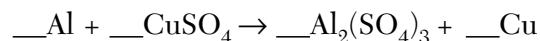
- 45 When 50. milliliters of an HNO_3 solution is exactly neutralized by 150 milliliters of a 0.50 M solution of KOH , what is the concentration of HNO_3 ?

- (1) 1.0 M (3) 3.0 M
 (2) 1.5 M (4) 0.5 M

- 46 In Period 3, from left to right in order, each successive element will

- (1) decrease in electronegativity
 (2) decrease in atomic mass
 (3) increase in number of protons
 (4) increase in metallic character

- 47 Given the unbalanced equation:



When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

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

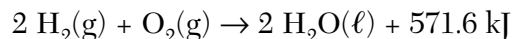
- 48 One hundred grams of water is saturated with NH_4Cl at 50°C . According to Table G, if the temperature is lowered to 10°C , what is the total amount of NH_4Cl that will precipitate?

- (1) 5.0 g (3) 30. g
 (2) 17 g (4) 50. g

- 49 What is the total number of grams of $\text{NaI}(\text{s})$ needed to make 1.0 liter of a 0.010 M solution?

- (1) 0.015 (3) 1.5
 (2) 0.15 (4) 15

- 50 Given the reaction:



What is the approximate ΔH for the formation of 1 mole of $\text{H}_2\text{O}(\ell)$?

- (1) -285.8 kJ (3) -571.6 kJ
 (2) $+285.8 \text{ kJ}$ (4) $+571.6 \text{ kJ}$

Part B-2

Answer all questions in this part.

Directions (51–57): 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 On a field trip, Student X and Student Y collected two rock samples. Analysis revealed that both rocks contained lead and sulfur. One rock contained a certain percentage of lead and sulfur by mass, and the other rock contained a different percentage of lead and sulfur by mass. Student X stated that the rocks contained two different mixtures of lead and sulfur. Student Y stated that the rocks contained two different compounds of lead and sulfur. Their teacher stated that both students could be correct.

Draw particle diagrams in *each* of the rock diagrams provided in *your answer booklet* to show how Student X's and Student Y's explanations could both be correct. Use the symbols in the key provided in *your answer booklet* to sketch lead and sulfur atoms. [2]

- 52 One electron is removed from both an Na atom and a K atom, producing two ions. Using principles of atomic structure, explain why the Na ion is much smaller than the K ion. Discuss both ions in your answer. [2]

- 53 In the space provided in *your answer booklet*, draw an electron-dot diagram for *each* of the following substances:

- a* calcium oxide (an ionic compound) [1]
b hydrogen bromide [1]
c carbon dioxide [1]

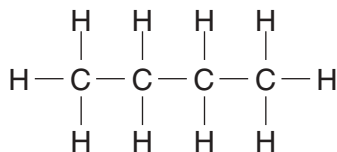
- 54 A sample of water is heated from a liquid at 40°C to a gas at 110°C. The graph of the heating curve is shown in your answer booklet.

- a* On the heating curve diagram provided in *your answer booklet*, label *each* of the following regions: [1]

Liquid, only
Gas, only
Phase change

- b* For section *QR* of the graph, state what is happening to the water molecules as heat is added. [1]
c For section *RS* of the graph, state what is happening to the water molecules as heat is added. [1]

55 Given the structural formula for butane:



In the space provided *in your answer booklet*, draw the structural formula of an isomer of butane. [1]

56 Given the ester: ethyl butanoate

a In the space provided *in your answer booklet*, draw the structural formula for this ester. [1]

b Determine the gram formula mass of this ester. [1]

57 Given the reaction: $4 \text{Al}(s) + 3 \text{O}_2(g) \rightarrow 2 \text{Al}_2\text{O}_3(s)$

a Write the balanced oxidation half-reaction for this oxidation-reduction reaction. [1]

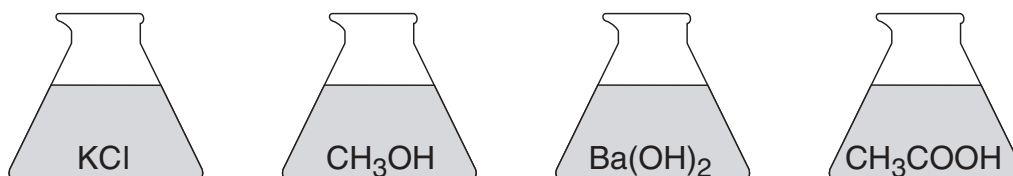
b What is the oxidation number of oxygen in Al_2O_3 ? [1]

Part C

Answer all questions in this part.

Directions (58–62): 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*.

- 58 *a* State one possible advantage of using nuclear power instead of burning fossil fuels. [1]
b State one possible risk of using nuclear power. [1]
c If animals feed on plants that have taken up Sr-90, the Sr-90 can find its way into their bone structure. Explain one danger to the animals. [1]
- 59 Four flasks each contain 100 milliliters of aqueous solutions of equal concentrations at 25°C and 1 atm.



- a* Which solutions contain electrolytes? [1]
b Which solution has the *lowest* pH? [1]
c What causes some aqueous solutions to have a low pH? [1]
d Which solution is most likely to react with an Arrhenius acid to form a salt and water? [1]
e Which solution has the *lowest* freezing point? Explain your answer. [2]
- 60 The equation for the saturated solution equilibrium of potassium nitrate (KNO₃) is shown below.
- $$\text{KNO}_3(\text{s}) + \text{energy} \xrightleftharpoons{\text{H}_2\text{O}} \text{K}^+(\text{aq}) + \text{NO}_3^-(\text{aq})$$
- a* In the space provided in *your answer booklet*, diagram the products. Use the key provided in *your answer booklet*. Indicate the exact arrangement of the particles you diagram. [2]
b Compare the rate of dissolving KNO₃ with the rate of recrystallization of KNO₃ for the saturated solution. [1]

- 61 Electron affinity is defined as the energy released when an atom and an electron react to form a negative ion. The data for Group 1 elements are presented below.

Element	Atomic Number	Electron Affinity in kJ/mole
Cs	55	45.5
H	1	72.8
K	19	46.4
Li	3	59.8
Na	11	52.9
Rb	37	?

On the grid provided *in your answer booklet*, draw a graph to show the relationship between *each* member of Group 1 and its electron affinity by following the directions below.

- a* Label the *y*-axis “Electron Affinity” and choose an appropriate scale. Label the *x*-axis “Atomic Number” and choose an appropriate scale. [1]
- b* Plot the data from the data table and connect the points with straight lines. [1]
- c* Using your graph, estimate the electron affinity of Rb, in kilojoules/mole. [1]

- 62 A student used a balance and a graduated cylinder to collect the following data:

Sample mass	10.23 g
Volume of water	20.0 mL
Volume of water and sample	21.5 mL

- a* Calculate the density of the element. Show your work. Include the appropriate number of significant figures and proper units. [3]
- b* If the accepted value is 6.93 grams per milliliter, calculate the percent error. [1]
- c* What error is introduced if the volume of the sample is determined first? [1]
-

Tear Here

The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

PHYSICAL SETTING CHEMISTRY

Tuesday, August 13, 2002 — 12:30 to 3:30 p.m., only

ANSWER SHEET

Student Sex: Male Female Grade

Teacher School

Record your answers to Part A and Part B-1 on this answer sheet.

Part A

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

Part A Score

[Box for Part A Score]

Part B-1

- 31 41
32 42
33 43
34 44
35 45
36 46
37 47
38 48
39 49
40 50

Part B-1 Score

[Box for Part B-1 Score]

Write your answers to Part B-2 and Part C in your answer booklet.

The declaration below should be signed when you have completed the examination.

I do hereby affirm, at the close of this examination, that I had no unlawful knowledge of the questions or answers prior to the examination and that I have neither given nor received assistance in answering any of the questions during the examination.

Signature

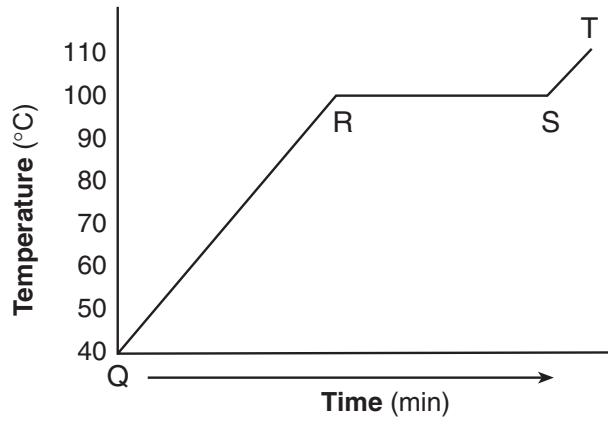
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For Raters Only

54 a



54a

b _____

b

c _____

c

55

55

56 a

56a

b _____

b

57 a _____

57 a

b _____

b

[b]

Total Score for Part B-2

Part C

For Raters
Only

58 a _____

58a

b _____

b

c _____

c

59 a _____
b _____

59a

c _____

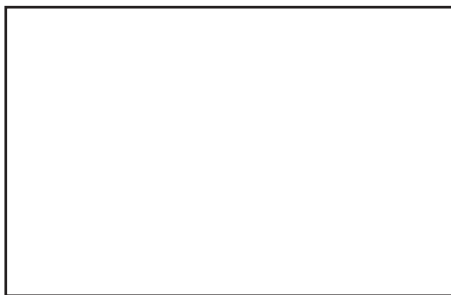
c

d _____
e _____

d

e

60 a



Key

Water molecule

K⁺

NO₃⁻

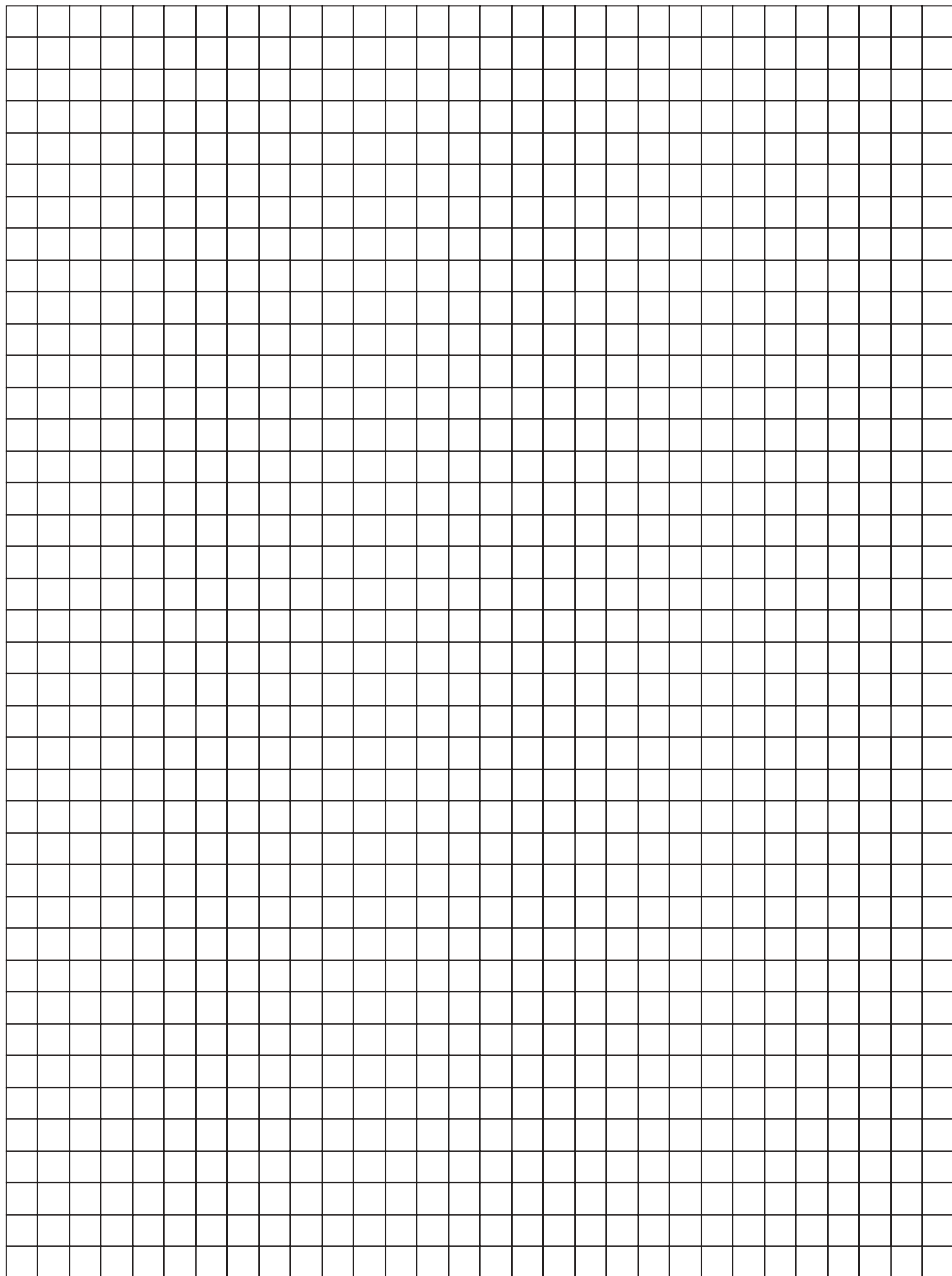
60a

b _____

b

**For Raters
Only**

61 *a* and *b*



61*a*

b

c _____

c

62 *a*

62*a*

b _____

b

c _____

c

[d]

Total Score for Part C

FOR TEACHERS ONLY

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

PS-CH PHYSICAL SETTING/CHEMISTRY

Tuesday, August 13, 2002 — 12:30 to 3:30 p.m., only

SCORING KEY AND RATING GUIDE

Directions to the Teacher:

Refer to the directions on page 3 before rating student papers.

Part A and Part B-1
Allow 1 credit for each correct response.

Part A			Part B-1	
1 2	11 1	21 4	31 3	41 1
2 3	12 4	22 3	32 4	42 4
3 1	13 2	23 2	33 1	43 4
4 2	14 3	24 1	34 2	44 4
5 3	15 3	25 2	35 2	45 2
6 4	16 2	26 4	36 2	46 3
7 1	17 2	27 1	37 4	47 2
8 3	18 1	28 1	38 3	48 2
9 1	19 4	29 3	39 2	49 3
10 1	20 3	30 2	40 3	50 1

Directions to the Teacher

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

Use only *red* ink or *red* pencil in rating Regents papers. Do *not* correct the student's work by making insertions or changes of any kind.

On the detachable answer sheet for Part A and Part B–1, indicate by means of a checkmark each incorrect or omitted answer. In the box provided at the end of each part, record the number of questions the student answered correctly for that part.

At least two science teachers must participate in the scoring of each student's responses to the Part B–2 and Part C open-ended questions. 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 all 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. Complete sentences are *not* required. Phrases, diagrams, and symbols may be used. In the student's answer booklet, record the number of credits earned for each answer in the box printed to the right of the answer lines or spaces for that question.

Fractional credit is *not* allowed. Only whole-number credit may be given to a response. Units need not be given when the wording of the questions allows such omissions.

Raters should enter the scores earned for Part A, Part B–1, Part B–2, and Part C on the appropriate lines in the box printed on the answer booklet and then should add these four scores and enter the total in the box labeled "Total Written Test Score." Then, the student's raw score should be converted to a scaled score by using the conversion chart printed at the end of this Scoring Key and Rating Guide. The student's scaled score should be entered in the labeled box on the student's answer booklet. The scaled score is the student's final examination score.

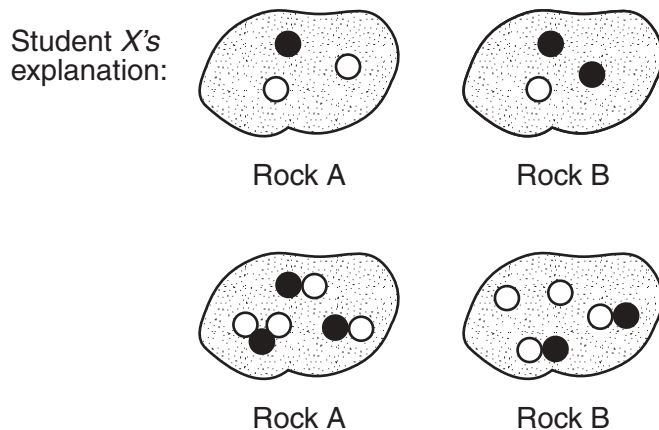
All student answer papers that receive a scaled score of 60 through 64 **must** be scored a second time. For the second scoring, a different committee of teachers may score the student's paper or the original committee may score the paper, except that no teacher may score the same open-ended questions that he/she scored in the first rating of the paper. The school principal is responsible for assuring that the student's final examination score is based on a fair, accurate, and reliable scoring of the student's answer paper.

Because scaled scores corresponding to raw scores in the conversion chart may change from one examination to another, it is crucial that for each administration, the conversion chart provided in the scoring key for that administration be used to determine the student's final score. The chart in this scoring key is usable only for this administration of the examination.

Part B–2

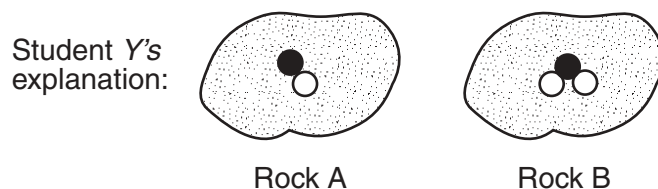
Allow a total of 15 credits for this part. The student must answer all questions in this part.

- 51** [2] Allow 1 credit for a correct diagram of Student X's explanation in which Rock B shows a different mix of nontouching atoms of Pb and S than Rock A shows or a mix of correctly drawn compounds of PbS (○●) and PbS₂ (○●○) or a mix of element(s) and compound(s) of Pb and S. Acceptable responses include, but are not limited to, these examples:



and

Allow 1 credit for a correct diagram of Student Y's explanation in which Rock A and Rock B show two different combinations of Pb and S atoms touching or connecting. Acceptable responses include, but are not limited to, this example:



- 52** [2] Allow 1 credit for a correct response for K.

and

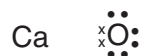
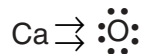
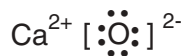
Allow 1 credit for a correct response for Na.

Acceptable responses include, but are not limited to, these examples:

K^{1+} has three energy levels, while Na^{1+} has only two energy levels.

Na^+ has its valence electrons drawn closer to the nucleus than K^+ because the effect of the nucleus is greater for Na^+ .

- 53 [3] **a** Allow 1 credit for a correctly drawn diagram. The number of dots in the diagram drawn must be correct. Charges are necessary *only* if electron transfer is *not* clearly shown. Acceptable responses include, but are not limited to, these examples:

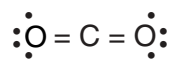


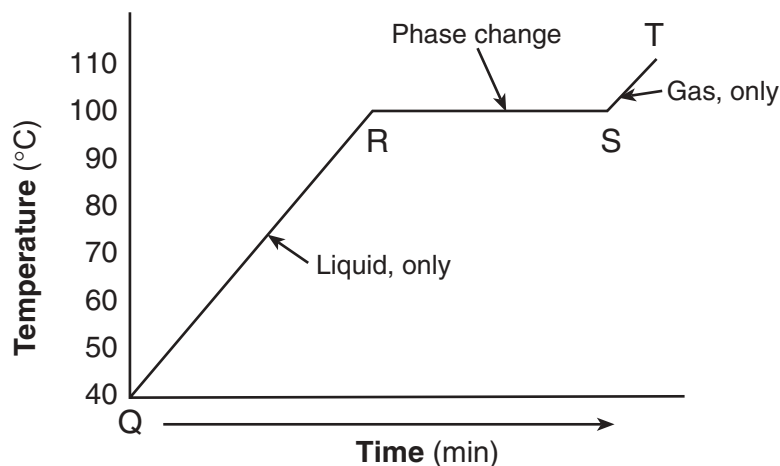
Note: Do *not* deduct for missing brackets.

- b** Allow 1 credit for a correctly drawn diagram. The number of dots in the diagram drawn must be correct. Acceptable responses include, but are not limited to, these examples:



- c** Allow 1 credit for a correctly drawn diagram. The number of dots in the diagram drawn must be correct. Acceptable responses include, but are not limited to, these examples:



54 [3] *a*


Allow 1 credit for correctly labeling all three regions.

b Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

The water molecules acquire more kinetic energy.

Heat is converted to kinetic energy of the water molecules.

The water molecules speed up or increase their relative motion.

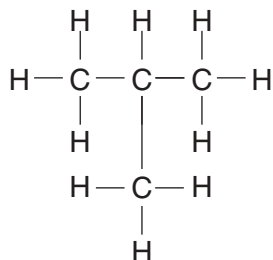
c Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

The potential energy of the water molecules increases.

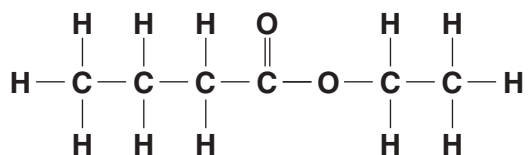
The water molecules change from the liquid phase to the gas phase.

There is less attraction between the H₂O molecules.

55 [1] Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:



- 56 [2] **a** Allow 1 credit for



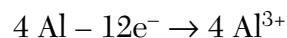
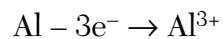
Note: Mirror images of the above structural formula are acceptable.

- b** Allow 1 credit for **116** or **116 g**.

or

Allow 1 credit for any numerically correct value that is consistent with the student's drawing in part *a*.

- 57 [2] **a** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:



- b** Allow 1 credit for **-2**.

Part C

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

- 58** [3] **a** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

less air pollution

low cost

conservation of fossil fuels

more energy produced

- b** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

nuclear meltdown

biological risks (cancer, mutations)

contamination of the environment

radiation exposure

lack of storage facilities for spent fuel rods

radiation emitted

- c** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

Sr-90 is radioactive and might cause tissue damage to the animal.

Sr-90 emits beta particles.

Bones become radioactive.

- 59 [6] **a** Allow 1 credit for **KCl**, **Ba(OH)₂**, and **CH₃COOH**. All three solutions must be correct to receive credit.

b Allow 1 credit for **CH₃COOH**.

- c** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, these examples:

They yield H⁺(H₃O⁺) in solution.

They are acids.

[H⁺] > [OH⁻]

d Allow 1 credit for **Ba(OH)₂**.

e Allow 1 credit for **Ba(OH)₂**.

and

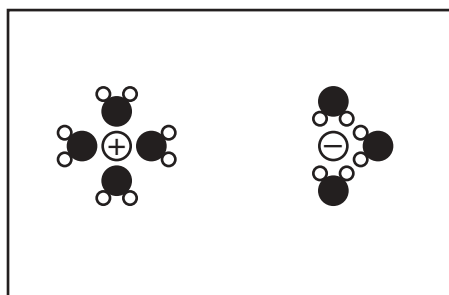
Allow 1 credit for an appropriate explanation. Acceptable responses include, but are not limited to, these examples:

It has the greatest number of particles dissolved.

It dissociates into the greatest number of particles.

It has the highest van't Hoff factor (*i*).

- 60 [3] **a**



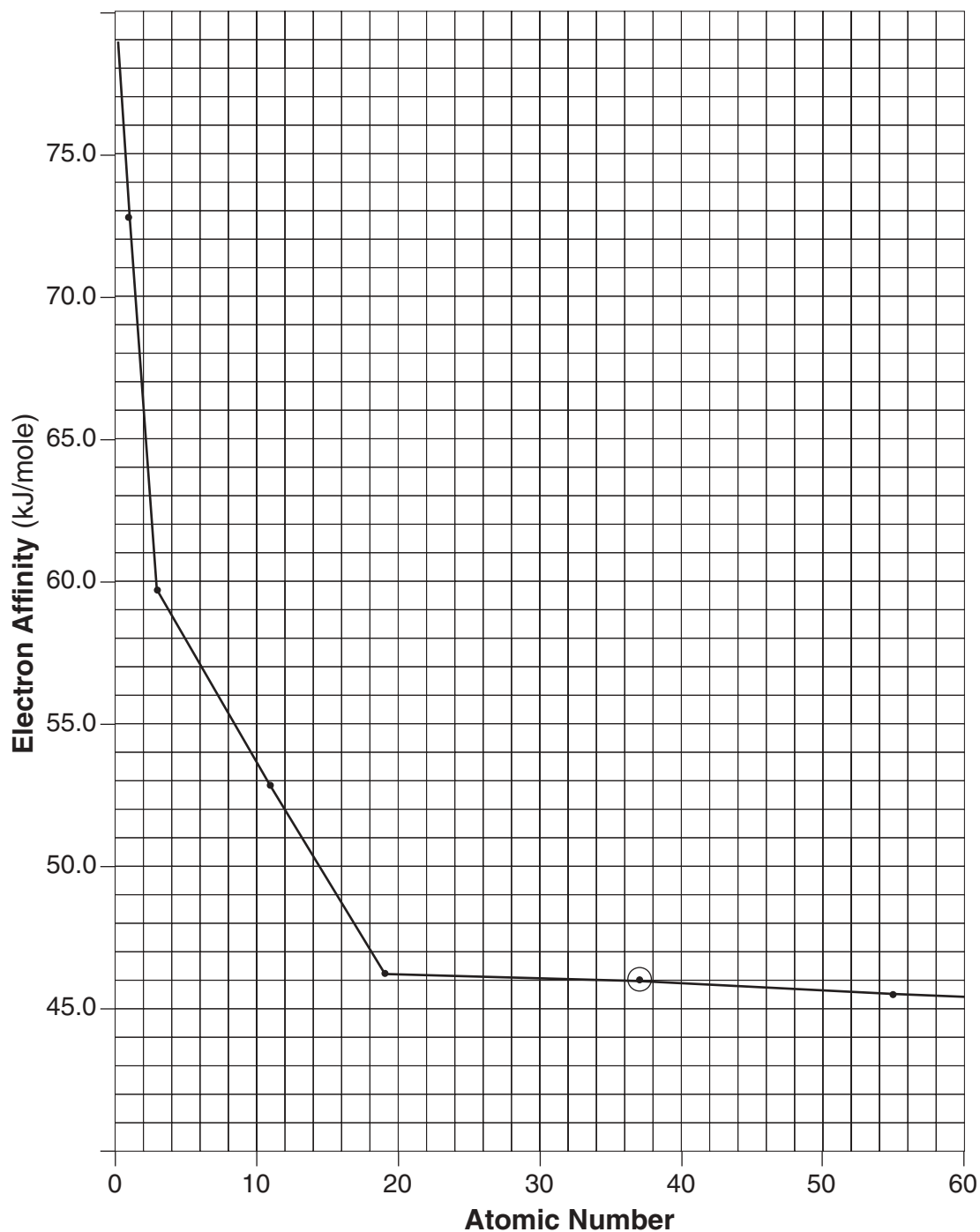
Allow 1 credit for showing that the ions are separated.

and

Allow 1 credit for showing water molecules around each ion with the proper orientation.

b Allow 1 credit for a response that states that the **rates are equal**.

61 [3]



a Allow 1 credit if *both* axes are labeled and also have an appropriate scale.

b Allow 1 credit for an acceptable plot of curve.

c Allow 1 credit if the response is in the range of 45.6 to 46.3.

or

Allow 1 credit for a response that is consistent with the student's graph in parts *a* and *b*.

Note: Allow credit if the student uses whole numbers rather than tenths.

- 62** [5] **a** Allow 1 credit for a correct setup. Acceptable responses include, but are not limited to, these examples:

$$\frac{10.23}{21.5 - 20.0} = 6.8$$

$$\frac{10.23}{1.5} = 6.8$$

$$\frac{10.23 \text{ g}}{1.5 \text{ mL}} = 6.8 \text{ g/mL}$$

and

Allow 1 credit for the appropriate number of significant figures, to the nearest tenth. Accept answers in the range of 6.7–6.9 or for a response that is consistent with the student's setup.

and

Allow 1 credit for the proper units. Acceptable responses include, but are not limited to, these examples:

g/mL

grams per milliliter

- b** Allow 1 credit for a response in the range of 1.8 to 2.0%. The negative sign is *not* necessary.

or

Allow 1 credit for a response that is consistent with the student's value in part *a*.

- c** Allow 1 credit for a correct response. Acceptable responses include, but are not limited to, this example:

The density would increase because the sample was wet when weighed.

Regents Examination in Physical Setting/Chemistry
August 2002
Chart for Converting Total Test Raw Scores to
Final Examination Scores (Scaled Scores)

Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score	Raw Score	Scaled Score
85	100	63	72	41	59	19	39
84	98	62	71	40	58	18	38
83	96	61	70	39	58	17	36
82	94	60	70	38	57	16	35
81	93	59	69	37	57	15	33
80	91	58	68	36	56	14	32
79	90	57	68	35	55	13	30
78	88	56	67	34	55	12	28
77	87	55	67	33	54	11	26
76	85	54	66	32	53	10	24
75	84	53	65	31	52	9	22
74	83	52	65	30	51	8	20
73	81	51	64	29	51	7	18
72	80	50	64	28	50	6	16
71	79	49	63	27	49	5	13
70	78	48	63	26	48	4	11
69	77	47	62	25	47	3	8
68	76	46	62	24	46	2	6
67	75	45	61	23	44	1	3
66	74	44	61	22	43	0	0
65	73	43	60	21	42		
64	73	42	60	20	41		

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 scaled score that corresponds to that raw score. The scaled score is the student's final examination score. Enter this score in the space labeled "Final Score" on the student's answer sheet.

Map to Core Curriculum

August 2002 Physical Setting/ Chemistry			
Question Numbers			
Key Ideas	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		36	61,62
Math Key Idea 2			61
Math Key Idea 3			62
Sci. Inq. Key Idea 1			60
Sci. Inq. Key Idea 2			
Sci. Inq. Key Idea 3			
Eng. Des. Key Idea 1			
Standard 2			
Key Idea 1		35,40,44,50	
Key Idea 2			
Standard 6			
Key Idea 1			
Key Idea 2			60,62
Key Idea 3			
Key Idea 4			
Key Idea 5			61
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		31,32,37,38,45, 46,47,48,49,51, 52,55,56,57,	59,60
Key Idea 4		34,36,39,41,42, 43,54	58
Key Idea 5		33,53	
Standard 4			
Key Idea 3	1,2,3,4,6,7,9, 13,15,16,18,19, 20,22,23,25,26, 27,29	31,32,36,37,38, 39,40,42,45,46, 47,48,49,50,51, 55,56,57	59,60,61,62
Key Idea 4	5,8,14,24	34,35,41,43,54	58
Key Idea 5	10,11,12,17,21, 28,30	33,44,52,53	
Reference Tables			
2002 Edition	2,3,4,8,10,11, 12,14,15,17,19, 25,27	35,36,40,43,44, 45,46,48,49,50, 52,56	59