PHYSICAL SETTING/CHEMISTRY REGENTS EXAMINATION

TEST SAMPLER DRAFT

Fall 2001

The University of the State of New York
THE STATE EDUCATION DEPARTMENT
Office of Curriculum, Instruction, and Assessment
Albany, New York 12234

THE STATE EDUCATION DEPARTMENT / THE UNIVERSITY OF THE STATE OF NEW YORK / ALBANY, NY 12234

Assistant Commissioner for Curriculum, Instruction, and Assessment

November 2001

Dear Colleagues:

Following several years of planning and development, the Physical Setting/Chemistry Test Sampler Draft is complete. School districts, science teachers, supervisors, and administrators have assisted the State Education Department in the development process in a variety of ways. Teachers have pretested test items with their students and developed and reviewed test items and scoring materials. Administrators have arranged for their students to participate in the pretest and field test process. Teachers and supervisors will continue to write, develop, pretest, and field test questions for future Physical Setting/Chemistry examinations.

This Test Sampler Draft is being distributed to all secondary schools in the State. Schools are requested to make additional copies available to their chemistry teachers.

The Test Sampler Draft provides examples of the types and formats of questions and scoring materials that are being developed for the Physical Setting/Chemistry Regents examination that will be administered for the first time in June 2002. We expect that further refinements of the formats of questions and scoring materials will occur as a result of information gathered from the pretesting process.

We are interested in receiving your feedback on these preliminary materials. A comment sheet is included on the inside back cover of the Test Sampler Draft so that you may forward your responses to us. The comment sheet may be faxed to (518) 473-0858 or mailed to the address listed below:

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Sincerely,

Roseanne DeFabio

Acknowledgments

The New York State Education Department acknowledges the significant contributions made by teachers, supervisors, and other educators who assisted in the development of the Physical Setting/Chemistry Regents Examination Test Sampler Draft. These contributions include writing items, creating scoring materials, determining design, reviewing the draft, coordinating the sensitivity review, revising the reference tables, and mapping the draft to the Physical Setting/Chemistry Core Curriculum.

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Introduction

The Physical Setting/Chemistry Regents examination has been developed to assess student achievement at commencement level of Standards 1, 2, 4, 6, and 7 of the *Learning Standards for Mathematics, Science, and Technology*. Items for the examination were developed through the cooperative efforts of teachers, school districts, other science educators, and New York State Education Department staff. The written portion of this examination will be administered in a 3-hour period and will first be offered in June 2002.

The written portion of the examination will include three parts: A, B, and C. Students should be prepared to answer questions in multiple-choice, constructed-response, and extended constructed-response formats. Questions will be content- and skills-based and may require students to graph data, complete a data table, label or draw diagrams, design experiments, make calculations, or write short or extended responses. In addition, questions may require students to hypothesize, interpret, analyze, evaluate data, or apply their scientific knowledge and skills to real-world situations. Some of the questions will require use of the 2002 edition of the Reference Tables for Physical Setting/Chemistry.

In the future, (not before 2004) a Part D will be added that will focus on assessment of laboratory skills. As more information becomes available, the New York State Education Department will inform schools of the development status of the performance test.

Students will be required to answer ALL of the questions on the Physical Setting/Chemistry Regents examination.

Physical Setting/Chemistry Regents Examination Format

PART	ITEM TYPE(S)	DESCRIPTION OF THE ITEMS	APPROXIMATE PERCENT OF TOTAL TEST RAW SCORE
A	Multiple-choice questions	Content-based questions assessing the student's knowledge and understanding of core material (primarily from Standard 4)	35
B	Multiple-choice and constructed-response questions	Content- and skills-based questions assessing the student's ability to apply, analyze, and evaluate material (primarily from Standards 1, 2, 4, 6, and 7)	30
C	Constructed-response and/or extended constructed-response questions	Content-based and application questions assessing the student's ability to apply knowledge of science concepts and skills to address real-world situations (primarily from Standards 1, 2, 4, 6, and 7)	20

Each examination will be scaled, and all examination forms equated, based on a standard-setting process. A chart for converting the student's total examination raw score to a scaled score will be provided in the rating guide for each administration.

Appendix I, "Examination Blueprint" (page 43), indicates the approximate percentage of examination questions for each content standard in the Physical Setting/Chemistry Core Curriculum. Appendix II, "Mapping the Sampler to the Core Curriculum" (page 44) and Appendices III-VI "Mapping the Standards in the Core Curriculum to the Sampler" (pages 45-47) link each question in the Test Sampler Draft to the Physical Setting/Chemistry Core Curriculum and the 2002 edition of the Reference Tables for Physical Setting/Chemistry. Individual questions may be linked to multiple standards in addition to the Reference Tables for Physical Setting/Chemistry.

Test modifications must be consistently provided to students with disabilities when it is determined that such accommodations are necessary. Such modifications must be documented either in an Individualized Education Plan (IEP) or in a Section 504 Accommodation Plan. Modifications are being redrawn to reflect the requirements of the new assessments. The revised State assessments are being developed by both special and general educators to ensure that they are appropriate for students with disabilities.

The Physical Setting/Chemistry Regents Examination Test Sampler Draft may be used in the classroom to help teachers plan for instruction. Teachers are encouraged to reproduce and use the sample examination in the Test Sampler Draft to introduce students to the test format and use the scoring materials for practice in scoring student papers.

Laboratory Requirements: Critical to understanding science concepts is the use of scientific inquiry to develop explanations of natural phenomena. Therefore, as a prerequisite for admission to the performance test and the written portion of the Regents examination in Physical Setting/Chemistry, students must have successfully completed a minimum of 1200 minutes of hands-on laboratory experience with satisfactory reports on file. Because of the strong emphasis on student development of laboratory skills, a minimum of 280 minutes per week of class and laboratory time is recommended.

Sample Test Questions for the Physical Setting/Chemistry Regents Examination Part A

Answer all questions in this part.

Directions (1–35): 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 answers the question. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

1 Compared to an atom of hydrogen in the ground state, an atom of hydrogen in the excited state has

(1) absorbed energy, only
(2) released energy, only
(3) neither released nor absorbed energy
(4) both released and absorbed energy

2 What is the total number of electrons in the outermost shell of a phosphorus atom in the ground state?

(1) 1
(2) 2
(3) 3
(4) 5

3 Based on Reference Table *S*, which of the following atoms requires the *least* energy for the removal of the most loosely bound electron?

(1) Sn
(2) Sr
(3) Be
(4) Br

4 What is the mass number of $^{19}_{9}F$?

(1) 9
(2) 10
(3) 19
(4) 28

5 All atoms of a given element *must* contain the same number of

(1) protons
(2) neutrons
(3) electrons plus neutrons
(4) protons plus neutrons

6 Which element is a brittle, nonconducting solid at 25°C?

(1) Br
(2) S
(3) Al
(4) Bi

7 An atom of helium-4 differs from an atom of lithium-7 in that the atom of helium-4 has

(1) one more proton
(2) one more neutron
(3) two less protons
(4) two less neutrons

8 Antimony is classified as a

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

9 Given the reaction:

$$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$$

What is the ratio of moles of CO_2 produced to moles of C_2H_6 consumed?

(1) 1 to 1
(2) 2 to 1
(3) 3 to 2
(4) 7 to 2

10 Which equation shows conservation of charge?

(1) $Fe \rightarrow Fe^{2+} + e^-$
(2) $Fe + 2e^- \rightarrow Fe^{2+}$
(3) $Fe \rightarrow Fe^{2+} + 2e^-$
(4) $Fe + 2e^- \rightarrow Fe^{3+}$

11 What is the formula of nitrogen (II) oxide?

(1) NO
(2) NO_2
(3) N_2O
(4) N_2O_4

12 Which formula represents an ionic compound?

(1) H_2O
(2) KCl
(3) NH_3
(4) CH_4

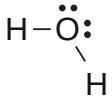
13 An oxide ion (O^{2-}) formed from an oxygen-18 atom contains exactly

(1) 8 protons, 8 neutrons, 10 electrons
(2) 8 protons, 10 neutrons, 8 electrons
(3) 8 protons, 10 neutrons, 10 electrons
(4) 10 protons, 8 neutrons, 8 electrons

14 Which bond is *least* polar?

(1) As–Cl
(2) Bi–Cl
(3) P–Cl
(4) N–Cl

15 Which pair of characteristics describes the molecule illustrated below?



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

16 A sample of unknown composition was tested in a laboratory. The sample could *not* be decomposed by physical or chemical means. On the basis of these results, the laboratory reported that the unknown sample was most likely

(1) a compound
(2) an element
(3) a mixture
(4) a solution

17 Which intermolecular force of attraction accounts for the relatively high boiling point of water?

(1) hydrogen bonding
(2) covalent bonding
(3) metallic bonding
(4) ionic bonding

18 Based on Reference Table *H*, which substance has the weakest intermolecular forces?

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

19 At 1 atmosphere and 298 K, 1 mole of H_2O (ℓ) molecules and 1 mole of C_2H_5OH (ℓ) molecules both have the same

(1) vapor pressure
(2) average kinetic energy
(3) mass
(4) density

20 Given the reaction at equilibrium:

$$C_2(g) + D_2(g) \rightleftharpoons 2\ CD(g) + \text{energy}$$

Which change will cause the equilibrium to shift?

(1) increase in pressure
(2) increase in volume
(3) addition of heat
(4) addition of a catalyst

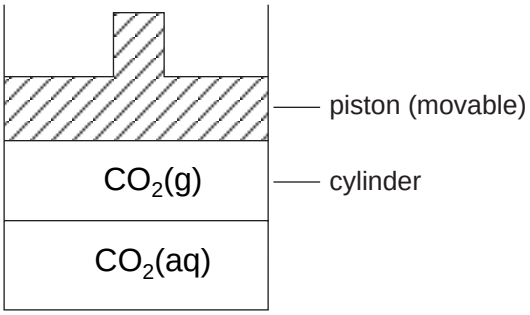
21 Given the equilibrium at 101.3 kPa:

$$H_2O\ (s) \rightleftharpoons H_2O(\ell)$$

At what temperature does this equilibrium occur?

(1) 100 K
(2) 273 K
(3) 298 K
(4) 373 K

22 Given the diagram below that shows carbon dioxide in an equilibrium system at a temperature of 298 K and a pressure of 1 atm:



Which changes *must* increase the solubility of the carbon dioxide?

(1) increase pressure and decrease temperature
(2) increase pressure and increase temperature
(3) decrease pressure and decrease temperature
(4) decrease pressure and increase temperature

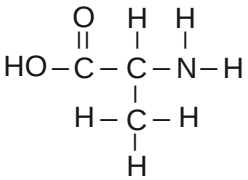
23 Which formula represents a molecule of a saturated hydrocarbon?

(1) C_2H_2
(2) C_4H_{10}
(3) C_5H_8
(4) C_6H_6

24 Molecules of 2-methyl butane and 2,2-dimethyl propane have different

(1) structural formulas
(2) molecular formulas
(3) numbers of carbon atoms
(4) numbers of covalent bonds

25 The molecule below belongs to which class of compounds?



(1) alcohol
(2) ester
(3) aldehyde
(4) amino acid

26 The transfer of which particle is required for a redox reaction to occur?

(1) electron
(2) ion
(3) neutron
(4) proton

27 What is the oxidation number of chromium in $K_2Cr_2O_7$?

(1) +6
(2) +2
(3) +7
(4) +12

28 Given the reaction:

$$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$$

Which equation represents the oxidation that takes place?

(1) $Mg^{2+} + 2e^- \rightarrow Mg$
(2) $Mg \rightarrow Mg^{2+} + 2e^-$
(3) $Cu^{2+} + 2e^- \rightarrow Cu$
(4) $Cu \rightarrow Cu^{2+} + 2e^-$

29 Which substance is an Arrhenius acid?

(1) NH_3
(2) KOH
(3) $HC_2H_3O_2$
(4) CH_3OH

30 Which of the following pH values indicates the highest concentration of hydronium ions in a solution?

(1) pH = 1
(2) pH = 2
(3) pH = 3
(4) pH = 4

31 Which substance yields hydroxide ion as the only negative ion in aqueous solution?

(1) $Mg(OH)_2$
(2) $C_2H_4(OH)_2$
(3) $MgCl_2$
(4) CH_3Cl

32 Which type of radiation is identical in mass and charge to a helium nucleus?

(1) alpha
(2) beta
(3) positron
(4) proton

33 Which isotope is radioactive?

(1) C–12
(2) Ne–20
(3) Tc–99
(4) Pb–206

34 Which equation represents nuclear fusion?

(1) ${}^{14}_{6}C \rightarrow {}^{14}_{7}N + {}^{0}_{-1}e$
(2) ${}^{27}_{13}Al + {}^{4}_{2}He \rightarrow {}^{30}_{15}P + {}^{1}_{0}n$
(3) ${}^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{139}_{56}Ba + {}^{94}_{36}Kr + 3{}^{1}_{0}n$
(4) ${}^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n$

Note that question 35 has only three choices.

35 In a gaseous system at equilibrium with its surroundings, as molecules of *A*(g) collide with molecules of *B*(g) without reacting, the total energy of the gaseous system

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

Part B

Answer all questions in this part.

Directions (36–50): 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 answers the question. Some questions may require the use of the *Reference Tables for Physical Setting/Chemistry*.

36 The temperature of a 2.0-liter sample of helium gas at STP is increased to 27°C and the pressure is decreased to 80. kPa What is the new volume of the helium sample?

(1) 1.4 L
(2) 2.0 L
(3) 2.8 L
(4) 4.0 L

37 Given the reaction:

$$2\ C_2H_6 + 7\ O_2 \rightarrow 4\ CO_2 + 6\ H_2O$$

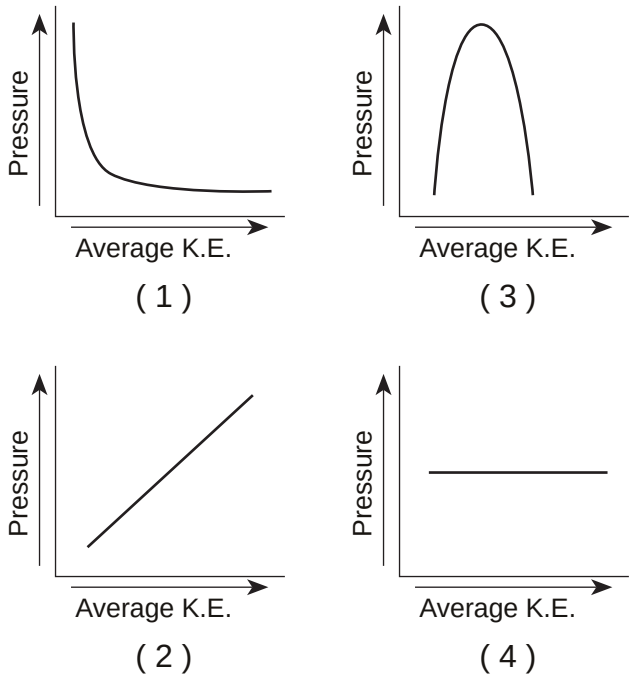
What is the total number of moles of CO_2 produced by the complete combustion of 5.0 moles of C_2H_6 ?

(1) 1.0 mole
(2) 2.0 moles
(3) 5.0 moles
(4) 10. moles

38 Approximately what fraction of an original Co–60 sample remains after 21 years?

(1) $\frac{1}{2}$
(2) $\frac{1}{4}$
(3) $\frac{1}{8}$
(4) $\frac{1}{16}$

39 Which graph best shows the relationship between the pressure of a gas and its average kinetic energy at constant volume?



40 Which two solutions, when mixed together, will undergo a double replacement reaction and form a white, solid substance?

(1) $NaCl(aq)$ and $LiNO_3(aq)$
(2) $KCl(aq)$ and $AgNO_3(aq)$
(3) $KCl(aq)$ and $LiCl(aq)$
(4) $NaNO_3(aq)$ and $AgNO_3(aq)$

41 An unknown substance, liquid *X*, is tested in the laboratory. The chemical and physical test results are listed below.

- Nonconductor of electricity
- Insoluble in water
- Soluble in hexane
- Low melting point as a solid
- Combustion produces only CO_2 and H_2O

Based on these results, a student should conclude that liquid *X* is

(1) ionic and organic
(2) ionic and inorganic
(3) covalent and organic
(4) covalent and inorganic

42 How many milliliters of 12.0 M HCl(aq) must be diluted with water to make exactly 500. mL of 3.00 M hydrochloric acid?

(1) 100. mL
(2) 125. mL
(3) 200. mL
(4) 250. mL

43 Based on Reference Table *G*, what is the maximum number of grams of KCl(s) that will dissolve in 200 grams of water at 50°C to produce a saturated solution?

(1) 38 g
(2) 42 g
(3) 58 g
(4) 84 g

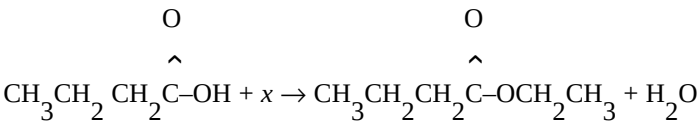
44 What is the molarity of an HCl solution if 20. milliliters of this acid is needed to neutralize 10. milliliters of a 0.50 M NaOH solution?

(1) 1.0 M
(2) 0.75 M
(3) 0.50 M
(4) 0.25 M

45 During a laboratory experiment, a sample of aluminum is found to have a mass of 12.50 grams and a volume of 4.6 milliliters. What is the density of this sample, expressed to the correct number of significant figures?

(1) 2.717 g/mL
(2) 2.72 g/mL
(3) 3 g/mL
(4) 2.7 g/mL

46 Given the incomplete reaction:

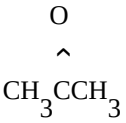


Which compound is represented by *x*?

(1)

(2) 

(3) 

(4) 

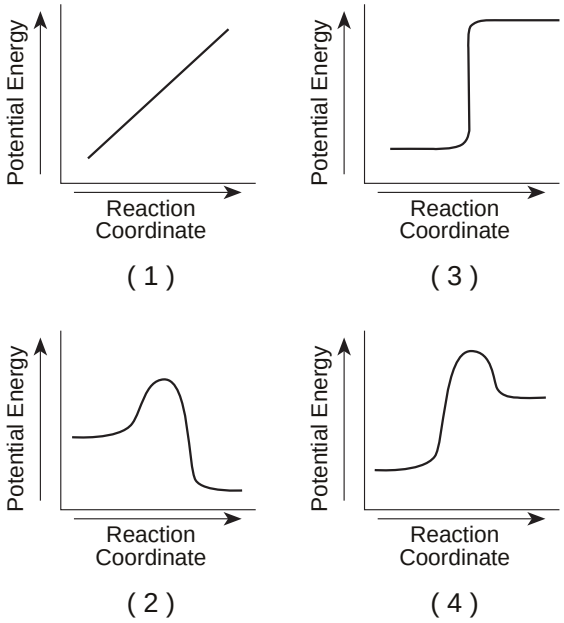
47 A hydrate is a compound with water molecules incorporated into its crystal structure. In an experiment to find the percent by mass of water in a hydrated compound, the following data were recorded:

Mass of crucible + hydrated crystals before heating	7.50 grams
Mass of crucible	6.90 grams
Mass of crucible + anhydrous crystals after heating	7.20 grams

What is the percent by mass of water in the hydrate?

(1) 8.0 %
(2) 50. %
(3) 72. %
(4) 96. %

48 When a spark is applied to a mixture of hydrogen and oxygen, the gases react explosively. Which potential energy diagram best represents the reaction?



49 Which equation shows an increase in entropy?

(1) $CO_2(g) \rightarrow CO_2(s)$
(2) $CO_2(\ell) \rightarrow CO_2(g)$
(3) $CH_3OH(\ell) \rightarrow CH_3OH(s)$
(4) $CH_3OH(g) \rightarrow CH_3OH(\ell)$

50 The laboratory process of distillation does *not* involve

(1) changing a liquid to vapor
(2) changing a vapor to liquid
(3) liquids with different boiling points
(4) liquids with the same boiling points

Directions (51–55): 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 a laboratory experiment, a student determined the mass of the product, NaCl(s), to be 1.84 grams.

a Calculate the gram formula mass of NaCl(s). Round atomic masses from the Periodic Table to the nearest tenth. Show all work. [1]

Indicate the correct answer, including an appropriate unit. [1]

b Calculate the number of moles of NaCl(s) produced. Show all work. [1]

Indicate the correct answer. [1]

52 Draw a correct Lewis electron-dot structure for each of the following in the boxes provided *in your answer booklet*.

a An atom of hydrogen [1]

b An atom of nitrogen [1]

c A molecule of ammonia (NH_3) [1]

53 Given the equation:

$$CaCO_3(s) \rightarrow CaO(s) + CO_2(g)$$

a Name the type of reaction this equation represents. [1]

b Explain, in terms of particle behavior, why entropy is increasing during this reaction. [1]

54 Base your answers to question 54 on the information below:

 represents one molecule of nitrogen

a In the space provided *in your answer booklet*, draw a particle model that shows at least six molecules of nitrogen gas. [1]

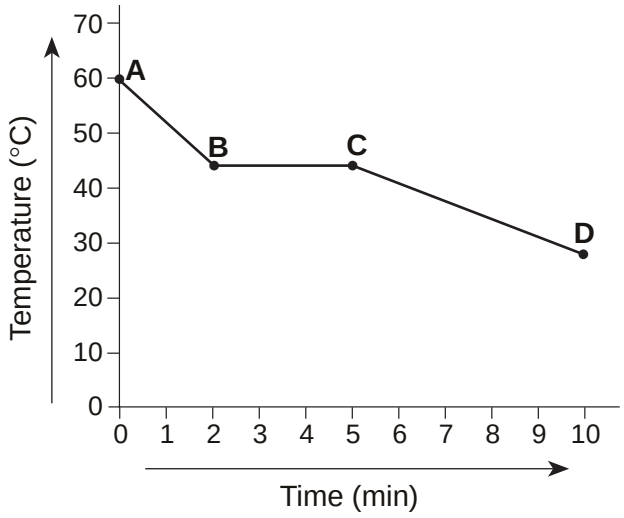
b In the space provided *in your answer booklet*, draw a particle model that shows at least six molecules of liquid nitrogen. [1]

c Describe, in terms of particle arrangement, the difference between nitrogen gas and liquid nitrogen. [1]

d Good models should reflect the true nature of the concept being represented. What is a limitation of two-dimensional models? [1]

55 Given the graph below that represents the uniform cooling of a sample of lauric acid starting as a liquid above freezing point.

Cooling Curve for Lauric Acid



a Which line segment represents a phase change, only? [1]

b What is the melting point of lauric acid? [1]

c At which point do the particles of lauric acid have the highest average kinetic energy? [1]

d Name the phase change that takes place during this 10-minute cooling time. [1]

Part C

Answer all questions in this part.

Directions (56–60): 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*.

56 Skiers, snowmobilers, and others involved in outdoor winter recreation use disposable heat packs. These heat packs are porous paper pouches containing sawdust, powdered carbon, sodium chloride, powdered iron, and Zeolite™. During production, this mixture is moistened slightly with water and then sealed in an airtight plastic pack. The reaction starts when the pack is opened and the mixture is exposed to air.

Given the unbalanced equation:

$$\_\_\_\_\_Fe(s) + \_\_\_\_\_O_2(g) \rightarrow \_\_\_\_\_Fe_2O_3(s)$$

a *In your answer booklet*, balance the equation, using smallest whole number coefficients. [1]

b If the word "energy" was added to the equation to correctly indicate the energy change in this heat pack reaction, would the word "energy" be placed on the "reactant side" or on the "product side" of the equation? [1]

57 Given the data table below showing the solubility of salt *X*:

Temperature (^oC)	Mass of Solute per 100 g of H_2O (g)
10	22
25	40.
30	48
60	107
70	135

a Which salt on Table G is most likely to be salt *X*? [1]

b On the graph provided *in your answer booklet*, scale and label the *y*-axis including appropriate units. [1]

c Plot the data from the data table. Surround each point with a small circle and draw a best-fit curve for the solubility of salt *X*. [1]

d Using your graph, predict the solubility of salt *X* at 50^o C. [1]

e If the pressure on the salt solution was increased, what effect would this pressure change have on the solubility of the salt? [1]

58 In the early 1900s, evidence was discovered that atoms were not "hard spheres." It was shown that atoms themselves had an internal structure. One experiment involved gold metal foil.

a *In your answer booklet,* complete the simple model for an atom of gold-197 by placing the correct numbers in the two blanks. [1]

b In the gold-foil experiment, alpha particles were directed toward the foil. Most of the alpha particles passed directly through the foil with no effect. This result did not agree with the "hard spheres model" for the atom. What conclusion about the internal structure of the atom did this evidence show? [1]

c In the same experiment, some of the alpha particles returned toward the source. What does this evidence indicate about the charge of the atom's nucleus? [1]

59 A student wishes to determine how the rate of reaction of magnesium strips with hydrochloric acid, HCl(aq), varies as a function of temperature of the HCl(aq). Give *two* additional factors, other than the temperature, that could affect the rate of reaction and must be held constant during the experiment. [2]

Base your answers to question 60 on the article below and on your knowledge of chemistry.

The Decaffeinating Tradition

For coffee beans to be labeled "decaffeinated," at least 97% of the caffeine must be removed. There are three primary methods for decaffeination: chemical extraction, the Swiss water process, and supercritical fluid extraction.

Although all methods of decaffeinating coffee involve the use of "chemicals," one process has been traditionally referred to as "chemical extraction," probably because it uses organic solvents that are not typically part of our normal environment. The traditional method offers two slightly varied options using dichloromethane (CH_2Cl_2) or ethyl acetate ($CH_3COOC_2H_5$) as solvents. With both solvents, the beans are first soaked in water to soften them and speed the decaffeinating process. The beans are then soaked in one of the two solvents, which dissolves the caffeine in the bean. Once the solvent has removed the caffeine, the coffee beans are treated with steam. This evaporates the organic solvent along with the caffeine.

The process is identical for both solvents, but many coffee companies prefer to use ethyl acetate to decaffeinate their coffee. This allows them to label the beans "naturally decaffeinated," because ethyl acetate occurs naturally in orange rinds and many other fruits. Although consumers may prefer this label, it is misleading. The ethyl acetate used is actually synthesized; it is not extracted from fruits because it would be too costly.

Both of these commercial methods have a growing number of detractors, prompting many coffee companies to turn toward other methods. Opposition arises because the solvents used can never be completely removed from the coffee beans. The traces left behind, however, are below the amounts required for the "decaffeinated" label. Because of the recognized potential hazards associated with the use of dichloromethane and ethyl acetate, the United States Food and Drug Administration and the United States Department of Agriculture continue to investigate and evaluate any possible dangers that might be associated with the use of these chemicals.

60 *a* In the space provided *in your answer booklet,* draw the structural formula for ethyl acetate. (The correct IUPAC name is ethyl ethanoate.) [1]

b To what class of organic compounds does ethyl acetate belong? [1]

c In the space provided *in your answer booklet,* draw a correct structural formula for dichloromethane. [1]

d To what class of organic compounds does dichloromethane belong? [1]

e Which do you think is better, ethyl acetate or dichloromethane, as a decaffeinating agent for coffee? Explain your choice in terms of the information found in the article. [1]

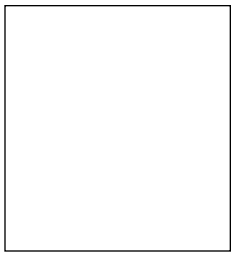
f Indicate whether you think the caffeine molecule is polar or nonpolar; then explain your answer in terms of the solubility of the caffeine molecule. [1]

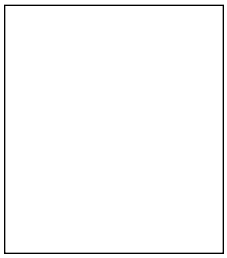
Part B

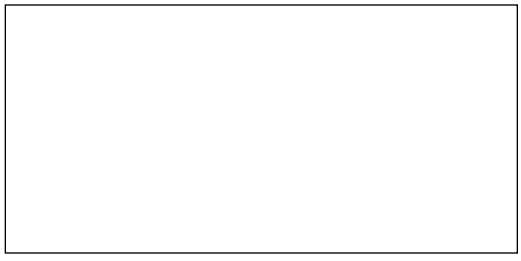
Answer Booklet

51 ***a***

b

52 ***a***  **hydrogen**

b  **nitrogen**

c  **ammonia**

53 ***a*** _____

b _____

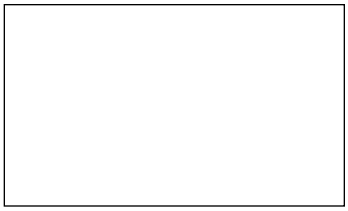
_____

_____

_____

_____

54 ***a***



b

c _____

_____

_____

_____

d _____

_____

_____

55 ***a*** _____

b _____

c _____

d _____

Physical Setting/Chemistry

Test Sampler

Part C

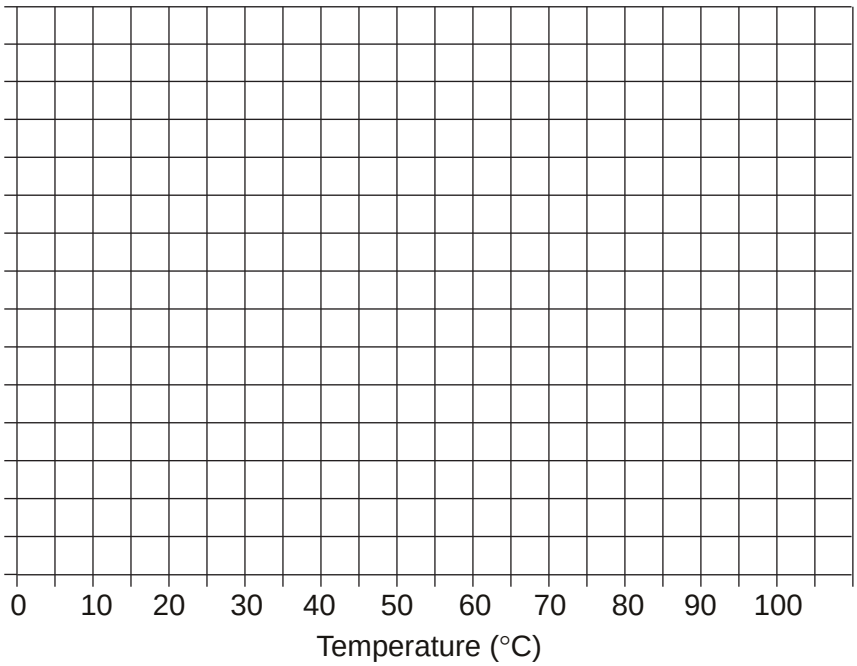
Answer Booklet

56 ***a*** _____Fe(s) + _____O_2(g) → _____Fe_2O_3(s)

b _____

57 ***a*** _____

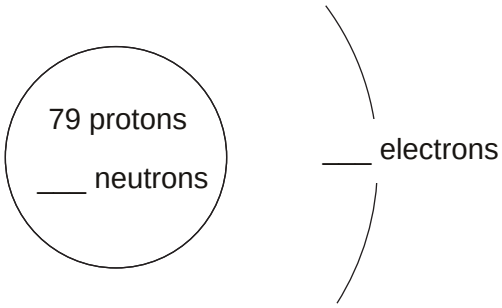
b-c



d _____

e _____

58 ***a***



b _____

_____

_____

_____

c _____

_____

_____

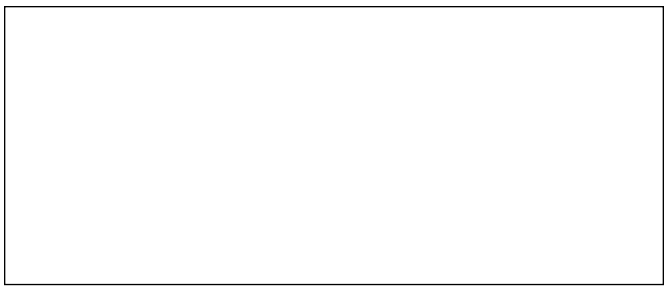
59 (1) _____

_____

(2) _____

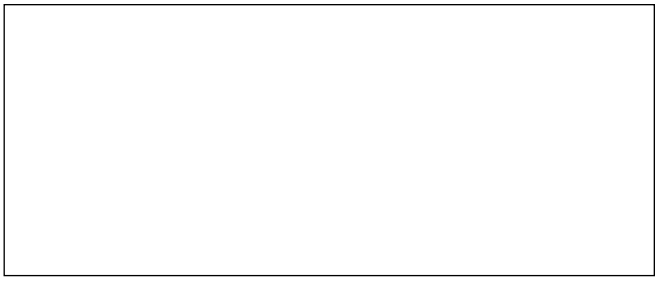
_____

60 ***a***



b _____

c



d _____

e _____

_____

_____

f _____

_____

_____