

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

PHYSICAL SETTING CHEMISTRY

Wednesday, August 20, 2025 — 8:30 to 11:30 a.m., only

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

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.

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*.

- Which statement describes the modern model of the atom?
 - The atom has a small, negatively charged nucleus.
 - The atom is a hard, indivisible sphere.
 - Electrons are positive particles in the atom.
 - Electrons in the atom have wave-like properties.
- Which subatomic particles are found in the nucleus of a beryllium atom?
 - neutrons and electrons
 - neutrons and positrons
 - protons and neutrons
 - protons and electrons
- According to the electron cloud model of the atom, the region of space with the highest probability of locating an electron is
 - a fixed circular path
 - the nucleus
 - an excited state
 - an orbital
- Which element has atoms that each contain 14 protons?
 - Al
 - C
 - N
 - Si
- Which statement describes a chemical property of an element?
 - Aluminum melts at 933 K.
 - Copper is reddish in color.
 - Silver reacts with hydrogen sulfide.
 - Potassium has a density of 0.89 g/cm^3 at room temperature.
- At 298 K and 101.3 kPa, oxygen exists in two gaseous forms: $\text{O}_2(\text{g})$ and $\text{O}_3(\text{g})$. These two forms of oxygen have
 - the same molecular structure and the same properties
 - the same molecular structure and different properties
 - different molecular structures and the same properties
 - different molecular structures and different properties
- Which two terms represent types of chemical formulas?
 - spectral and covalent
 - spectral and molecular
 - structural and empirical
 - structural and nuclear
- In all chemical reactions, there is a conservation of
 - charge, mass, and energy
 - charge, mass, and volume
 - volume, energy, and charge
 - volume, energy, and mass
- A sample of solid tungsten has mobile valence electrons throughout the sample. Which type of bonding is present in the sample?
 - nonpolar covalent
 - polar covalent
 - metallic
 - ionic
- Which formula represents a polar molecule?
 - F_2
 - CH_4
 - CO_2
 - NH_3

- 11 What occurs when two fluorine atoms react to produce a fluorine molecule?
- (1) A bond is broken as energy is absorbed.
 - (2) A bond is broken as energy is released.
 - (3) A bond is formed as energy is absorbed.
 - (4) A bond is formed as energy is released.
- 12 A sample of $\text{NaCl}(s)$ and a sample of $\text{NaCl}(\ell)$ have
- (1) the same phase and the same physical properties
 - (2) the same phase and different physical properties
 - (3) different phases and the same physical properties
 - (4) different phases and different physical properties
- 13 Which substance can *not* be broken down by a chemical change?
- (1) manganese
 - (2) ethene
 - (3) propanal
 - (4) water
- 14 All aqueous solutions of glucose are classified as
- (1) mixtures with a fixed proportion
 - (2) compounds with a fixed proportion
 - (3) mixtures with proportions that may vary
 - (4) compounds with proportions that may vary
- 15 At which pressure and temperature does a sample of $\text{He}(g)$ behave most like an ideal gas?
- (1) 0.5 atm and 137 K
 - (2) 0.5 atm and 546 K
 - (3) 2.0 atm and 137 K
 - (4) 2.0 atm and 546 K
- 16 The kinetic molecular theory states that the particles of an ideal gas
- (1) constantly move in circular paths
 - (2) have no attractive forces between them
 - (3) create energy when gas particles collide with each other
 - (4) are separated by very small distances relative to their sizes
- 17 A reaction is most likely to occur when reactant particles collide with proper
- (1) energy and orientation
 - (2) mass and volume
 - (3) phase and charge
 - (4) pressure and density
- 18 A sample of gas is in a sealed, rigid cylinder at constant volume. Which changes occur in the force of collisions of the gas particles and frequency of their collisions when the sample is cooled?
- (1) Force of collisions decreases and frequency of collisions increases.
 - (2) Force of collisions decreases and frequency of collisions decreases.
 - (3) Force of collisions increases and frequency of collisions increases.
 - (4) Force of collisions increases and frequency of collisions decreases.
- 19 At STP, 2.0 liters of $\text{Ar}(g)$ contains 5.4×10^{22} atoms. How many atoms are contained in 2.0 liters of $\text{Ne}(g)$ at STP?
- (1) 2.7×10^{11}
 - (2) 2.7×10^{22}
 - (3) 5.4×10^{11}
 - (4) 5.4×10^{22}
- 20 When a system is at equilibrium, the concentrations of the reactants and the products must be
- (1) equal
 - (2) constant
 - (3) decreasing
 - (4) increasing
- 21 Which expression represents the heat of reaction for a chemical change?
- (1) (potential energy of the products) – (potential energy of the reactants)
 - (2) (potential energy of the products) + (potential energy of the reactants)
 - (3) (kinetic energy of the products) – (kinetic energy of the reactants)
 - (4) (kinetic energy of the products) + (kinetic energy of the reactants)

- 22 When a catalyst is added to a chemical reaction it produces
- (1) a greater heat of reaction
 - (2) a greater activation energy for the reactants
 - (3) an alternate reaction pathway
 - (4) an alternate potential energy for the products
- 23 Naturally occurring chemical systems tend to undergo changes toward
- (1) lower energy and lower disorder
 - (2) lower energy and greater disorder
 - (3) higher energy and lower disorder
 - (4) higher energy and greater disorder
- 24 Which formula represents an organic compound?
- | | |
|--------------------|----------------------------|
| (1) PCl_3 | (3) CH_3Cl |
| (2) BrCl | (4) NH_4Cl |
- 25 Where do oxidation and reduction occur in an electrochemical cell?
- (1) Oxidation occurs at the anode and reduction occurs at the cathode.
 - (2) Oxidation occurs at the anode and reduction occurs in the salt bridge.
 - (3) Oxidation occurs at the cathode and reduction occurs at the anode.
 - (4) Oxidation occurs at the cathode and reduction occurs in the salt bridge.
- 26 Which element is the most active nonmetal?
- | | |
|--------------|--------------|
| (1) bromine | (3) fluorine |
| (2) chlorine | (4) iodine |
- 27 When a sample of solid $\text{Ca}(\text{OH})_2$ dissolves in water, the only negative ions in the solution are
- | | |
|--------------------|------------------|
| (1) hydronium ions | (3) oxide ions |
| (2) hydroxide ions | (4) calcium ions |
- 28 Which products are formed when an Arrhenius acid and an Arrhenius base react?
- (1) an alcohol and an ester
 - (2) an alcohol and water
 - (3) a salt and an ester
 - (4) a salt and water
- 29 The stability of an isotope is related to the ratio of which subatomic particles?
- (1) neutrons and positrons
 - (2) neutrons and protons
 - (3) protons and positrons
 - (4) protons and electrons
- 30 Which nuclear emission has the greatest mass?
- | | |
|-----------------------|----------------|
| (1) an alpha particle | (3) a neutron |
| (2) a beta particle | (4) a positron |

Part B-1

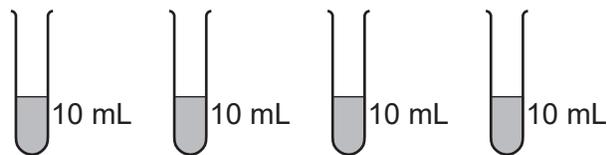
Answer all questions in this part.

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 Which element is listed with the number of valence electrons and the number of non-valence electrons in one of its atoms in the ground state?
- (1) Sodium has two valence electrons and 11 non-valence electrons.
(2) Phosphorus has five valence electrons and 10 non-valence electrons.
(3) Chlorine has seven valence electrons and 17 non-valence electrons.
(4) Argon has 10 valence electrons and 18 non-valence electrons.
- 32 An atom has a mass number of 112 and contains 48 protons. How many neutrons does this atom contain?
- (1) 48 (3) 64
(2) 54 (4) 160
- 33 There is a *decrease* in value of which property as the elements in Period 2 are considered in order from lithium to fluorine?
- (1) atomic radius
(2) electronegativity
(3) first ionization energy
(4) atomic mass
- 34 What is a chemical name for NaClO_3 ?
- (1) sodium chlorate
(2) sodium chlorite
(3) sodium hypochlorite
(4) sodium perchlorate
- 35 Which formula represents a molecule that has four electrons shared between the two atoms?
- (1) Br_2 (3) H_2
(2) Cl_2 (4) O_2
- 36 Given the balanced equation representing a reaction:
- $$4\text{Al}(s) + 3\text{O}_2(g) \rightarrow 2\text{Al}_2\text{O}_3(s) + 3351 \text{ kJ}$$
- What is the number of moles of $\text{Al}_2\text{O}_3(s)$ formed when 12 moles of $\text{O}_2(g)$ react completely?
- (1) 8 mol (3) 3 mol
(2) 2 mol (4) 12 mol
- 37 A substance has an empirical formula of CH_2 and a molar mass of 112 g/mol. What is the molecular formula for this compound?
- (1) CH_2 (3) C_8H_{16}
(2) C_4H_8 (4) $\text{C}_{12}\text{H}_{24}$
- 38 Compared to the vapor pressure of ethanol at 1.0 atm and 25°C , the vapor pressure of water at 1.0 atm and 25°C is
- (1) lower because water has weaker intermolecular forces
(2) lower because water has stronger intermolecular forces
(3) higher because water has weaker intermolecular forces
(4) higher because water has stronger intermolecular forces
- 39 Based on Table S, a molecule of which substance contains the most polar bond?
- (1) HBr (3) IBr
(2) HF (4) IF
- 40 Based on Table F, which compound is most soluble in water?
- (1) CaS (3) CaSO_4
(2) CaCO_3 (4) CaCrO_4

- 41 Each of four test tubes contains a different concentration of HCl(aq) at 298 K. A 1.0-gram sample of iron filings is added to each test tube. In which test tube is the reaction occurring at the fastest rate?

0.0020 M HCl(aq) 0.020 M HCl(aq) 0.20 M HCl(aq) 2.0 M HCl(aq)

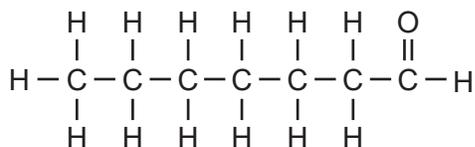


(1) (2) (3) (4)

- 42 Which equation represents an increase in entropy?

(1) $\text{CO}_2(\text{g}) \rightarrow \text{CO}_2(\text{s})$ (3) $\text{Br}_2(\text{g}) \rightarrow \text{Br}_2(\ell)$
 (2) $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{s})$ (4) $\text{I}_2(\text{s}) \rightarrow \text{I}_2(\text{g})$

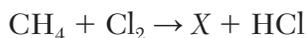
- 43 Given the formula representing a compound:



What is a chemical name for this compound?

(1) 1-heptanone (3) heptanal
 (2) 7-heptanol (4) heptanoic acid

- 44 Given the incomplete equation with X representing a missing product:



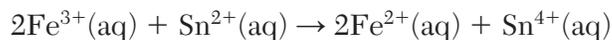
Which formula represents the missing product, X?

(1) CH_4Cl (3) CH_3Cl
 (2) CH_4Cl_2 (4) CH_3Cl_2

- 45 Which type of reaction produces ethanol and carbon dioxide from glucose, $\text{C}_6\text{H}_{12}\text{O}_6$?

(1) addition (3) substitution
 (2) fermentation (4) polymerization

- 46 Given the balanced ionic equation:



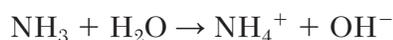
How many moles of electrons are gained by $\text{Fe}^{3+}(\text{aq})$ when $\text{Sn}^{2+}(\text{aq})$ loses 2 moles of electrons?

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

- 47 Which aqueous solution of LiCl is the best conductor of an electric current?

(1) 0.1 M LiCl(aq) (3) 0.001 M LiCl(aq)
 (2) 0.01 M LiCl(aq) (4) 0.0001 M LiCl(aq)

- 48 Given the equation representing a reaction:



According to one acid-base theory, the H_2O acts as an acid because it is an

(1) H^+ donor (3) OH^- donor
 (2) H^+ acceptor (4) OH^- acceptor

- 49 Based on Table N, which statement compares the half-lives and decay modes of krypton-85 and potassium-42?

(1) They have the same half-life and the same decay mode.
 (2) They have the same half-life but different decay modes.
 (3) They have different half-lives but the same decay mode.
 (4) They have different half-lives and different decay modes.

- 50 Which statement explains the energy released by a fission reaction?

(1) Thermal energy is converted to chemical energy.
 (2) Chemical energy is converted to thermal energy.
 (3) Mass is converted to energy.
 (4) Energy is converted to mass.

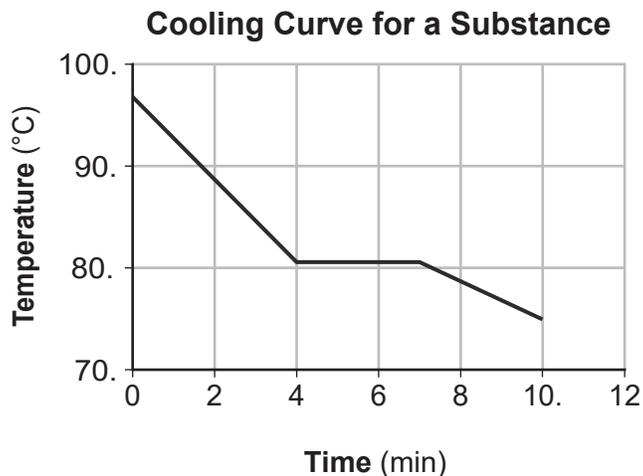
Part B-2

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*.

Base your answers to questions 51 through 53 on the information below and on your knowledge of chemistry.

A sample of a molecular substance starting as a liquid at 97.0°C and 1 atm is cooled for 10. minutes. The heat of fusion for this substance is 148 joules per gram. This cooling process is represented on the graph below.



- 51 State what happens to the average kinetic energy of the molecules in the sample during the first 3 minutes. [1]
- 52 Determine the freezing point of the substance in degrees Celsius. [1]
- 53 Determine the amount of heat, in joules, released when a 64.0-gram sample of this liquid substance solidifies at its freezing point. [1]
-

Base your answers to questions 54 through 56 on the information below and on your knowledge of chemistry.

At standard pressure, the boiling points of four hydrocarbons and the boiling points of four alcohols are shown in the table below.

Boiling Points of Selected Hydrocarbons and Alcohols at Standard Pressure

Hydrocarbon	Boiling Point (°C)	Alcohol	Boiling Point (°C)
methane	-161.5	methanol	64.6
ethane	-88.6	ethanol	78.3
propane	-42.1	1-propanol	97.2
butane	-0.5	1-butanol	117.1

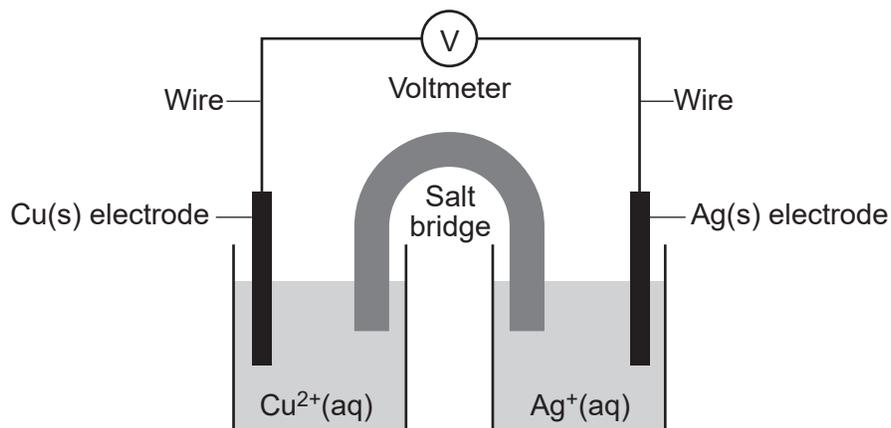
54 State, in terms of carbon-carbon bonds, why ethane is saturated. [1]

55 Draw a structural formula for 1-butanol. [1]

56 Describe what happens to the boiling points of the alcohols as the number of carbon atoms per molecule increases. [1]

Base your answers to questions 57 through 59 on the information below and on your knowledge of chemistry.

The diagram and ionic equation below represent an operating electrochemical cell.



- 57 State the oxidation number of the silver atoms in the Ag(s) electrode. [1]
- 58 State the form of energy that is converted to electrical energy in this operating cell. [1]
- 59 Write a balanced half-reaction equation for the oxidation reaction that occurs when the cell operates. [1]
-

Base your answers to questions 60 through 63 on the information below and on your knowledge of chemistry.

During a titration, 10.0 mL of HCl(aq) is exactly neutralized by adding 20.0 mL of 0.10 M NaOH(aq). The NaOH(aq) has a pH value of 13.0. During this laboratory activity appropriate safety equipment is used and safety procedures are followed.

60 State the color of bromthymol blue after it is added to a sample of the NaOH(aq) solution. [1]

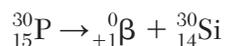
61 State, in terms of ions, why the HCl(aq) solution can conduct electricity. [1]

62 Show a numerical setup for calculating the molarity of the HCl(aq), using the titration data. [1]

63 State the pH value when the H⁺ ion concentration in the original NaOH(aq) has increased by a factor of 10 compared to its original value. [1]

Base your answers to questions 64 and 65 on the information below and on your knowledge of chemistry.

A phosphorus radioisotope decays by positron emission and has a half-life of 2.50 minutes. This reaction is represented by the equation below.



64 State, in terms of elements, why the equation represents a transmutation reaction. [1]

65 Determine the time required for an original 200.0-milligram sample of phosphorus-30 to decay until only 12.5 milligrams of the sample remains unchanged. [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 69 on the information below and on your knowledge of chemistry.

Compounds of gallium are used in lasers and light-emitting diodes, also known as LEDs. The atomic mass and natural abundance of the two naturally occurring isotopes of gallium are given in the table below.

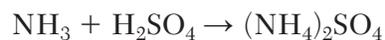
Naturally Occurring Isotopes of Gallium

Isotope	Atomic Mass (u)	Natural Abundance (%)
Ga-69	68.926	60.11
Ga-71	70.925	39.89

- 66 Compare the energy of an electron in the fourth shell of a gallium atom to the energy of an electron in the first shell of the same atom. [1]
- 67 State how a bright-line spectrum from a sample of an element viewed through a spectroscope can be used to identify the element as gallium. [1]
- 68 Show a numerical setup for calculating the atomic mass of gallium. [1]
- 69 Explain, in terms of *both* protons and neutrons, why an atom of Ga-69 and an atom of Ga-71 are classified as different isotopes of the same element. [1]
-

Base your answers to questions 70 through 73 on the information below and on your knowledge of chemistry.

Ammonium sulfate is a fertilizer produced by the reaction between ammonia and sulfuric acid. The unbalanced equation for this reaction is shown below.



- 70 State why the equation represents a synthesis reaction. [1]
- 71 Determine the percent composition by mass of nitrogen in NH_3 (gram-formula mass of $\text{NH}_3 = 17.0 \text{ g/mol}$). [1]
- 72 Determine the gram-formula mass of H_2SO_4 . [1]
- 73 Balance the equation *in your answer booklet* for the production of ammonium sulfate, using the smallest whole-number coefficients. [1]
-

Base your answers to questions 74 through 78 on the information below and on your knowledge of chemistry.

Seawater is also called salt water because it contains many dissolved ions. When the water is evaporated from a sample of seawater, solid salts such as NaCl form. The table below shows the percent of some of the ions in the sample of seawater.

**Some Ions in the Sample
of Seawater**

Ion	Percent of Total Ions (%)
Cl^-	55.3
Na^+	30.7
Mg^{2+}	3.7

- 74 State, in terms of element classification, why the bonding in a sample of sodium chloride is ionic. [1]
- 75 Identify the noble gas that has atoms with the same electron configuration as a chloride ion when both the atoms and the ions are in the ground state. [1]
- 76 In the space *in your answer booklet*, draw a Lewis electron-dot diagram for the ion in this table that has the greatest percentage of ions in seawater. [1]
- 77 State, in terms of electrons, why the radius of a Mg^{2+} ion is smaller than the radius of a Mg atom. [1]
- 78 Using the key *in your answer booklet*, draw *at least two* water molecules in the box, showing the orientation of *each* water molecule toward the Na^+ ion. [1]
-

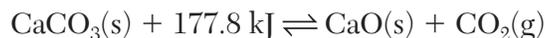
Base your answers to questions 79 through 81 on the information below and on your knowledge of chemistry.

A student investigating the properties of solutions dissolved 44.0 grams of KCl(s) in 200. grams of water at 30.°C. During this laboratory activity appropriate safety equipment was used and safety procedures were followed.

- 79 Classify, in terms of saturation, the type of solution produced by the student. [1]
- 80 Based on Table G, state what happens to the solubility of KCl in water as temperature increases from 30.°C to 70.°C. [1]
- 81 Compare the boiling point of the solution at standard pressure to the boiling point of water at standard pressure. [1]
-

Base your answers to questions 82 through 85 on the information below and on your knowledge of chemistry.

In a process used for centuries, limestone containing calcium carbonate is heated to produce calcium oxide and carbon dioxide gas. When placed in a sealed, rigid container, the reaction is reversible, allowing CaO and CO₂ to react to produce CaCO₃. These reactions produce an equilibrium system as represented by the equation below.



- 82 Compare the rate of the forward reaction to the rate of the reverse reaction in this equilibrium system. [1]
- 83 Convert the energy term in the equation, 177.8 kJ, to joules. [1]
- 84 Explain, in terms of collisions between CaO and CO₂, why adding more CO₂(g) to this equilibrium increases the amount of CaCO₃(s) in the system. [1]
- 85 On the labeled axes *in your answer booklet*, draw a potential energy diagram for the forward reaction in this system. [1]
-

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REGENTS HIGH SCHOOL EXAMINATION

**PHYSICAL SETTING
CHEMISTRY**

Wednesday, August 20, 2025 — 8:30 to 11:30 a.m., only

ANSWER BOOKLET

Student

Teacher

School Grade

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

Part B–2

51 _____

52 _____ °C

53 _____ J

54

55

56

57

58

59

60 _____

61 _____

62

63 _____

64 _____

65 _____ min

Part C

66

67

68

69

70 _____

71 _____ %

72 _____ g/mol

73 _____ NH₃ + _____ H₂SO₄ → _____ (NH₄)₂SO₄

74 _____

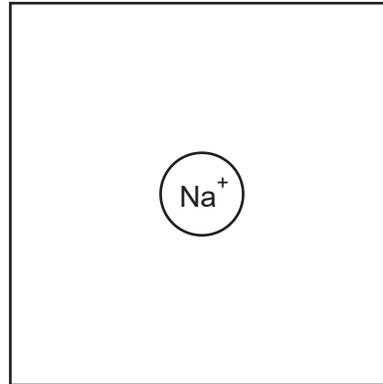
75 _____

76

77

78

Key	
●	= Hydrogen atom
○	= Oxygen atom
	= Water molecule



79

80

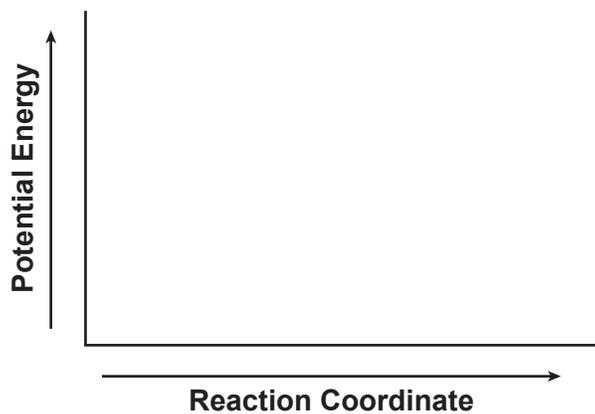
81

82

83 _____ J

84

85



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Regents Examination in Physical Setting/Chemistry – August 2025**Scoring Key: Parts A and B-1 (Multiple-Choice Questions)**

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Physical Setting/Chemistry	August '25	1	4	MC	1	1
Physical Setting/Chemistry	August '25	2	3	MC	1	1
Physical Setting/Chemistry	August '25	3	4	MC	1	1
Physical Setting/Chemistry	August '25	4	4	MC	1	1
Physical Setting/Chemistry	August '25	5	3	MC	1	1
Physical Setting/Chemistry	August '25	6	4	MC	1	1
Physical Setting/Chemistry	August '25	7	3	MC	1	1
Physical Setting/Chemistry	August '25	8	1	MC	1	1
Physical Setting/Chemistry	August '25	9	3	MC	1	1
Physical Setting/Chemistry	August '25	10	4	MC	1	1
Physical Setting/Chemistry	August '25	11	4	MC	1	1
Physical Setting/Chemistry	August '25	12	4	MC	1	1
Physical Setting/Chemistry	August '25	13	1	MC	1	1
Physical Setting/Chemistry	August '25	14	3	MC	1	1
Physical Setting/Chemistry	August '25	15	2	MC	1	1
Physical Setting/Chemistry	August '25	16	2	MC	1	1
Physical Setting/Chemistry	August '25	17	1	MC	1	1
Physical Setting/Chemistry	August '25	18	2	MC	1	1
Physical Setting/Chemistry	August '25	19	4	MC	1	1
Physical Setting/Chemistry	August '25	20	2	MC	1	1
Physical Setting/Chemistry	August '25	21	1	MC	1	1
Physical Setting/Chemistry	August '25	22	3	MC	1	1
Physical Setting/Chemistry	August '25	23	2	MC	1	1
Physical Setting/Chemistry	August '25	24	3	MC	1	1
Physical Setting/Chemistry	August '25	25	1	MC	1	1
Physical Setting/Chemistry	August '25	26	3	MC	1	1
Physical Setting/Chemistry	August '25	27	2	MC	1	1
Physical Setting/Chemistry	August '25	28	4	MC	1	1
Physical Setting/Chemistry	August '25	29	2	MC	1	1
Physical Setting/Chemistry	August '25	30	1	MC	1	1
Physical Setting/Chemistry	August '25	31	2	MC	1	1
Physical Setting/Chemistry	August '25	32	3	MC	1	1
Physical Setting/Chemistry	August '25	33	1	MC	1	1
Physical Setting/Chemistry	August '25	34	1	MC	1	1
Physical Setting/Chemistry	August '25	35	4	MC	1	1
Physical Setting/Chemistry	August '25	36	1	MC	1	1
Physical Setting/Chemistry	August '25	37	3	MC	1	1
Physical Setting/Chemistry	August '25	38	2	MC	1	1
Physical Setting/Chemistry	August '25	39	2	MC	1	1
Physical Setting/Chemistry	August '25	40	4	MC	1	1
Physical Setting/Chemistry	August '25	41	4	MC	1	1
Physical Setting/Chemistry	August '25	42	4	MC	1	1
Physical Setting/Chemistry	August '25	43	3	MC	1	1
Physical Setting/Chemistry	August '25	44	3	MC	1	1
Physical Setting/Chemistry	August '25	45	2	MC	1	1
Physical Setting/Chemistry	August '25	46	2	MC	1	1
Physical Setting/Chemistry	August '25	47	1	MC	1	1
Physical Setting/Chemistry	August '25	48	1	MC	1	1
Physical Setting/Chemistry	August '25	49	3	MC	1	1
Physical Setting/Chemistry	August '25	50	3	MC	1	1

Regents Examination in Physical Setting/Chemistry – August 2025

Scoring Key: Parts B-2 and C (Constructed-Response Questions)

Examination	Date	Question Number	Scoring Key	Question Type	Credit	Weight
Physical Setting/Chemistry	August '25	51	-	CR	1	1
Physical Setting/Chemistry	August '25	52	-	CR	1	1
Physical Setting/Chemistry	August '25	53	-	CR	1	1
Physical Setting/Chemistry	August '25	54	-	CR	1	1
Physical Setting/Chemistry	August '25	55	-	CR	1	1
Physical Setting/Chemistry	August '25	56	-	CR	1	1
Physical Setting/Chemistry	August '25	57	-	CR	1	1
Physical Setting/Chemistry	August '25	58	-	CR	1	1
Physical Setting/Chemistry	August '25	59	-	CR	1	1
Physical Setting/Chemistry	August '25	60	-	CR	1	1
Physical Setting/Chemistry	August '25	61	-	CR	1	1
Physical Setting/Chemistry	August '25	62	-	CR	1	1
Physical Setting/Chemistry	August '25	63	-	CR	1	1
Physical Setting/Chemistry	August '25	64	-	CR	1	1
Physical Setting/Chemistry	August '25	65	-	CR	1	1
Physical Setting/Chemistry	August '25	66	-	CR	1	1
Physical Setting/Chemistry	August '25	67	-	CR	1	1
Physical Setting/Chemistry	August '25	68	-	CR	1	1
Physical Setting/Chemistry	August '25	69	-	CR	1	1
Physical Setting/Chemistry	August '25	70	-	CR	1	1
Physical Setting/Chemistry	August '25	71	-	CR	1	1
Physical Setting/Chemistry	August '25	72	-	CR	1	1
Physical Setting/Chemistry	August '25	73	-	CR	1	1
Physical Setting/Chemistry	August '25	74	-	CR	1	1
Physical Setting/Chemistry	August '25	75	-	CR	1	1
Physical Setting/Chemistry	August '25	76	-	CR	1	1
Physical Setting/Chemistry	August '25	77	-	CR	1	1
Physical Setting/Chemistry	August '25	78	-	CR	1	1
Physical Setting/Chemistry	August '25	79	-	CR	1	1
Physical Setting/Chemistry	August '25	80	-	CR	1	1
Physical Setting/Chemistry	August '25	81	-	CR	1	1
Physical Setting/Chemistry	August '25	82	-	CR	1	1
Physical Setting/Chemistry	August '25	83	-	CR	1	1
Physical Setting/Chemistry	August '25	84	-	CR	1	1
Physical Setting/Chemistry	August '25	85	-	CR	1	1

Key

MC = Multiple-choice question

CR = Constructed-response question

The chart for determining students' final examination scores for the **August 2025 Regents Examination in Physical Setting/Chemistry** will be posted on the Department's web site at <https://www.nysedregents.org/Chemistry/> on the day of the examination. Conversion charts provided for the previous administrations of the Physical Setting/Chemistry examination must NOT be used to determine students' final scores for this administration.

FOR TEACHERS ONLY

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

PHYSICAL SETTING/CHEMISTRY

Wednesday, August 20, 2025 — 8:30 to 11:30 a.m., only

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: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> 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.

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*.

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. Teachers may not score their own students’ answer papers.

Students’ responses must be scored strictly according to the 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. Do not attempt to correct the student’s work by making insertions or changes of any kind. 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: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> on Wednesday, August 20, 2025. 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. Acceptable responses include, but are not limited to:

The average kinetic energy decreases.

The average KE goes down.

decreases

52 [1] Allow 1 credit for any value from 80.°C to 82°C, inclusive.

53 [1] Allow 1 credit for 9470 J *or* for any value from 9470 J to 9500 J, inclusive.

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

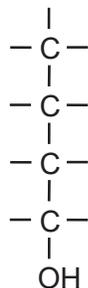
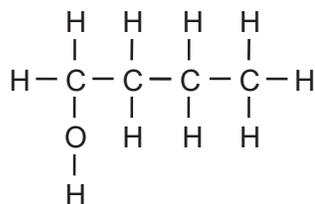
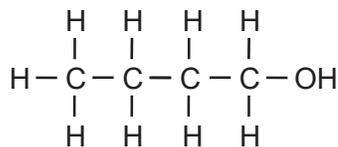
Ethane molecules have only single carbon-carbon bonds.

There are no multiple bonds between the carbon atoms.

No carbon-to-carbon double or triple bonds.

55 [1] Allow 1 credit.

Examples of 1-credit responses:



Note: Do *not* allow credit if only some of the H atoms bonded to C atoms are shown. Organic functional groups must be completely shown.

56 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The boiling point of each successive alcohol increases as the number of carbon atoms increases.

Boiling points increase.

more carbons, higher boiling point

increases

57 [1] Allow 1 credit for 0 *or* zero.

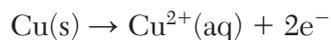
58 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

chemical potential energy

chemical

potential

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



Note: Do *not* allow credit for the e without the minus sign (−).

60 [1] Allow 1 credit for blue.

61 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

The HCl(aq) solution contains mobile ions.

The H⁺ and Cl[−] ions in the solution are moving.

The solution has aqueous ions.

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

$$M_A (10.0 \text{ mL}) = (0.10\text{M})(20.0 \text{ mL})$$

$$\frac{(0.10\text{M})(20.0 \text{ mL})}{10.0 \text{ mL}}$$

$$\frac{(.10)(20)}{10}$$

63 [1] Allow 1 credit for 12.0 *or* 12.

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

In this reaction, an isotope of phosphorus is changing into an isotope of silicon.

A different element is formed.

Phosphorous has an atomic number of 15 and becomes silicon with an atomic number of 14.

65 [1] Allow 1 credit for 10.00 min. 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:

The energy of an electron in the fourth shell is higher than the energy of an electron in the first shell.

The fourth shell electron has greater energy.

The electron in the first shell has less.

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

The spectral lines seen in the spectroscope are compared to the known bright-line spectrum of gallium.

The spectrum from the sample is matched to gallium on a chart of element spectra.

Compare the spectral wavelengths to those of gallium.

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

$$(68.926 \text{ u})(0.6011) + (70.925 \text{ u})(0.3989)$$

$$\frac{60.11(68.926) + 70.925 (39.89)}{100}$$

$$39.89\%(70.925) + 60.11\%(68.926)$$

Note: Do *not* allow credit for a numerical setup using mass numbers rather than isotopic masses.

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

Both atoms have 31 protons. Ga-69 has 38 neutrons and Ga-71 has 40 neutrons.

same number of protons, different number of neutrons

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

Two reactants form one product.

One substance is formed from two substances.

Two compounds form one compound.

- 71 [1] Allow 1 credit for 82.4% *or* for any value from 82% to 82.412%, inclusive.
- 72 [1] Allow 1 credit for 98 g/mol *or* for any value from 97.996 g/mol to 98.12 g/mol, inclusive.

- 73 [1] Allow 1 credit for $\underline{2}$ NH₃ + _____ H₂SO₄ → _____ (NH₄)₂SO₄
 Allow credit even if the coefficient “1” is written in front of H₂SO₄ and/or (NH₄)₂SO₄.

- 74 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 Sodium is a metal and chlorine is a nonmetal, so the bonding is ionic.
 An active metal reacted with an active nonmetal.

- 75 [1] Allow 1 credit for Ar *or* argon.

- 76 [1] Allow 1 credit. The positions of the electrons may vary.

Examples of 1-credit responses:

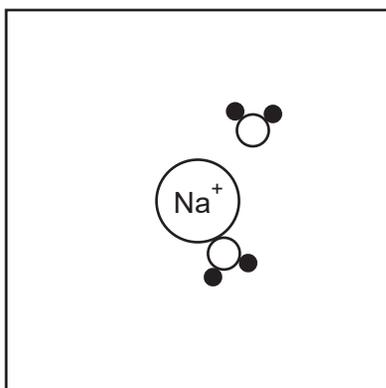
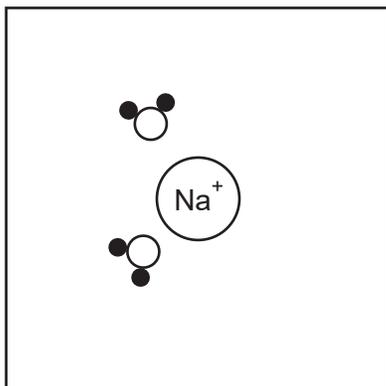


- 77 [1] Allow 1 credit. Acceptable responses include, but are not limited to:
 The Mg²⁺ ion is smaller because it has two shells of electrons and a Mg atom has three shells of electrons.
 The Mg²⁺ ion forms when the Mg atom loses two electrons.
 The magnesium ion has 10 electrons and the magnesium atom has 12 electrons.
 A Mg atom is formed when the Mg²⁺ gains two electrons.

Note: Do *not* allow credit for a response indicating that the Mg²⁺ ion lost electrons.

- 78 [1] Acceptable responses must show at least two water molecules. The oxygen atom of each water molecule must face toward the Na^+ ion.

Examples of 1-credit responses:



- 79 [1] Allow 1 credit for unsaturated *or* not saturated.

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

From 30.°C to 70.°C, the solubility of KCl in water increases.

At 70°C, KCl is more soluble than at 30°C.

The solubility increases.

increases

- 81 [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 water.

The boiling point of water is lower.

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

The rates of the forward and reverse reactions are equal.

The two reactions occur at the same rate.

equal

same

83 [1] Allow 1 credit. Acceptable responses include, but are not limited to:

177 800 J

1.778×10^5 J

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

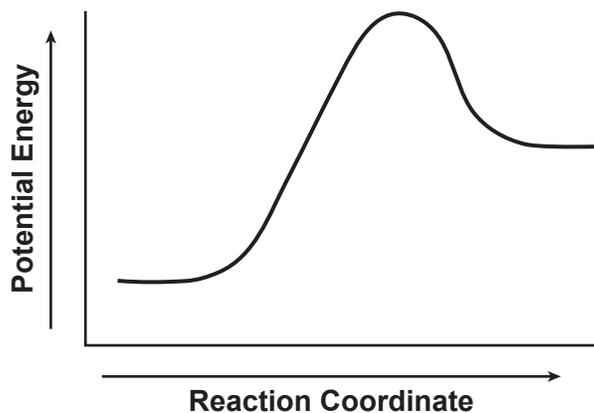
A greater number of effective collisions occur between CO_2 and CaO , producing more CaCO_3 .

More CO_2 molecules collide with CaO , producing more CaCO_3 .

Adding CO_2 increases the number of collisions between CaO and CO_2 .

85 [1] Allow 1 credit for showing that the PE of the products is higher than the PE of the reactants.

Example of a 1-credit response:



The *Chart for Determining the Final Examination Score for the August 2025 Regents Examination in Physical Setting/Chemistry* will be posted on the Department's web site at: <https://www.nysed.gov/state-assessment/high-school-regents-examinations> on Wednesday, August 20, 2025. 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 <https://www.nysed.gov/state-assessment/teacher-feedback-state-assessments>.
2. Click Regents Examinations.
3. Complete the required demographic fields.
4. Select the test title from the Regents Examination dropdown list.
5. Complete each evaluation question and provide comments in the space provided.
6. Click the SUBMIT button at the bottom of the page to submit the completed form.

Map to Core Curriculum

August 2025 Physical Setting/Chemistry			
Question Numbers			
Key Ideas/Performance Indicators	Part A	Part B	Part C
Standard 1			
Math Key Idea 1		38	68, 69, 83
Math Key Idea 2		51, 52, 56, 59, 62	73
Math Key Idea 3		32, 36, 39, 53, 65	71, 72
Science Inquiry Key Idea 1		40, 41, 43, 44, 48, 49, 50, 51, 54, 57, 58, 60, 61, 63, 64	66, 67, 70, 74, 75, 76, 77, 79, 80, 81, 82, 84
Science Inquiry Key Idea 2			
Science Inquiry Key Idea 3		34, 35, 38, 40, 41, 42, 43, 44, 46, 48, 51, 52, 55, 59, 60, 64	70, 75, 78, 80
Engineering Design Key Idea 1			
Standard 2			
Key Idea 1			
Key Idea 2			
Key Idea 3			
Standard 6			
Key Idea 1			
Key Idea 2		55, 76, 78, 85	
Key Idea 3		47, 63	
Key Idea 4			
Key Idea 5		56, 80	
Standard 7			
Key Idea 1			
Key Idea 2			
Standard 4 Process Skills			
Key Idea 3		31, 32, 33, 36, 37, 40, 42, 44, 45, 47, 54, 59, 60, 62, 63	67, 68, 69, 72, 73, 79, 80, 82, 84
Key Idea 4		51, 52, 53, 65	85
Key idea 5		38	75, 76
Standard 4			
Key Idea 3	1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29, 30	31, 32, 33, 34, 36, 37, 40, 41, 42, 43, 44, 45, 46, 47, 48, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63	66, 67, 68, 69, 70, 71, 72, 73, 79, 80, 81, 82, 84
Key Idea 4	21	49, 51, 52, 53, 65	83, 85
Key Idea 5	6, 9, 10, 11	35, 38, 39, 50, 64	74, 75, 76, 77, 78
Reference Tables			
2011 Edition	4, 5, 9, 11, 13, 24, 26, 27, 28, 29, 30	31, 33, 34, 35, 37, 38, 39, 40, 43, 49, 53, 55, 62	66, 71, 72, 74, 75, 76, 77, 79

Regents Examination in Physical Setting/Chemistry – August 2025

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

Raw Score	Scale Score						
85	100	63	74	41	59	19	38
84	98	62	73	40	58	18	36
83	96	61	72	39	57	17	35
82	95	60	72	38	56	16	34
81	93	59	71	37	56	15	32
80	92	58	70	36	55	14	31
79	90	57	70	35	54	13	29
78	89	56	69	34	53	12	27
77	88	55	68	33	52	11	26
76	87	54	67	32	52	10	24
75	85	53	67	31	51	9	22
74	84	52	66	30	50	8	20
73	83	51	66	29	49	7	18
72	82	50	65	28	48	6	16
71	81	49	64	27	47	5	13
70	80	48	63	26	46	4	11
69	79	47	63	25	45	3	9
68	78	46	62	24	44	2	6
67	77	45	61	23	43	1	3
66	77	44	61	22	42	0	0
65	76	43	60	21	40		
64	75	42	59	20	39		

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.