Student Name ______________________

Teacher Name ______________________

School ______________________

System ______________________

CHEMISTRY

PRACTICE TEST

Tennessee End of Course Assessment
Chemistry

Chemistry

PEARSON

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Chemistry Reference Sheet

Periodic Table of the Elements

Key

11 — Atomic Number **Na** — Element Symbol Sodium — Element Name 22.990 — Average Atomic Mass *

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 **H** Hydrogen 1.008																	2 **He** Helium 4.003
2	3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012											5 **B** Boron 10.811	6 **C** Carbon 12.011	7 **N** Nitrogen 14.007	8 **O** Oxygen 15.999	9 **F** Fluorine 18.998	10 **Ne** Neon 20.180
3	11 **Na** Sodium 22.990	12 **Mg** Magnesium 24.305											13 **Al** Aluminum 26.982	14 **Si** Silicon 28.086	15 **P** Phosphorus 30.974	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.453	18 **Ar** Argon 39.948
4	19 **K** Potassium 39.098	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.956	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.942	24 **Cr** Chromium 51.996	25 **Mn** Manganese 54.938	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933	28 **Ni** Nickel 58.693	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.409	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.610	33 **As** Arsenic 74.922	34 **Se** Selenium 78.960	35 **Br** Bromine 79.904	36 **Kr** Krypton 83.800
5	37 **Rb** Rubidium 85.468	38 **Sr** Strontium 87.620	39 **Y** Yttrium 88.906	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.906	42 **Mo** Molybdenum 95.940	43 **Tc** Technetium (98)	44 **Ru** Ruthenium 101.070	45 **Rh** Rhodium 102.906	46 **Pd** Palladium 106.420	47 **Ag** Silver 107.868	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.710	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.600	53 **I** Iodine 126.904	54 **Xe** Xenon 131.290
6	55 **Cs** Cesium 132.905	56 **Ba** Barium 137.327	57 **La** Lanthanum 138.905	72 **Hf** Hafnium 178.490	73 **Ta** Tantalum 180.948	74 **W** Tungsten 183.840	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.230	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.084	79 **Au** Gold 196.967	80 **Hg** Mercury 200.590	81 **Tl** Thallium 204.383	82 **Pb** Lead 207.200	83 **Bi** Bismuth 208.980	84 **Po** Polonium (209)	85 **At** Astatine (210)	86 **Rn** Radon (222)
7	87 **Fr** Francium (223)	88 **Ra** Radium (226)	89 **Ac** Actinium (227)	104 **Rf** Rutherfordium (261)	105 **Db** Dubnium (262)	106 **Sg** Seaborgium (266)	107 **Bh** Bohrium (264)	108 **Hs** Hassium (269)	109 **Mt** Meitnerium (268)	110 **Ds** Darmstadtium (271)	111 **Rg** Roentgenium (272)	112 **Cn** Copernicium (285)	113 **Uut** ?	114 **Fl** Flerovium (289)	115 **Uup** ?	116 **Lv** Livermorium (292)	117 **Uus** ?	118 **Uuo** ?

58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.908	60 **Nd** Neodymium 144.242	61 **Pm** Promethium (145)	62 **Sm** Samarium 150.360	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.250	65 **Tb** Terbium 158.925	66 **Dy** Dysprosium 162.500	67 **Ho** Holmium 164.930	68 **Er** Erbium 167.259	69 **Tm** Thulium 168.934	70 **Yb** Ytterbium 173.040	71 **Lu** Lutetium 174.967
90 **Th** Thorium 232.038	91 **Pa** Protactinium 231.036	92 **U** Uranium 238.029	93 **Np** Neptunium (237)	94 **Pu** Plutonium (244)	95 **Am** Americium (243)	96 **Cm** Curium (247)	97 **Bk** Berkelium (247)	98 **Cf** Californium (251)	99 **Es** Einsteinium (252)	100 **Fm** Fermium (257)	101 **Md** Mendelevium (258)	102 **No** Nobelium (259)	103 **Lr** Lawrencium (262)

* If this number is in parentheses, then it refers to the atomic mass of the most stable isotope.

Turn over for Formulas, Constants, and Unit Conversions

Chemistry Reference Page

Formulas, Constants, and Unit Conversions

Formulas

Change in Enthalpy (Heat): $Q = m(\triangle T)c_p$

Heat of Fusion: $Q = m\triangle H_{fus}$

Ideal Gas Law: $PV = nRT$

Heat of Vaporization: $Q = m\triangle H_{vap}$

Density: $d = \frac{m}{V}$

Molarity (M) = $\frac{\text{mol of solute}}{\text{L of solution}}$

Combined Gas Law: $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

Molality (m) = $\frac{\text{mol of solute}}{\text{kg of solvent}}$

Boiling Point Elevation: $\triangle T_b = k_b \times m$

Freezing Point Depression: $\triangle T_f = k_f \times m$

Constants

Universal Gas Constant (R): $0.0821 \frac{\text{atm} \times \text{L}}{\text{mol} \times \text{K}}$, or equal to $8.31 \frac{\text{kPa} \times \text{L}}{\text{mol} \times \text{K}}$

Molar Volume at STP: $22.4 \frac{\text{L}}{\text{mol}}$

Avogadro's Number (1 mole): 6.02×10^{23}

Specific Heat Capacity of Liquid Water: c_p (H_2O) = $1.00 \frac{\text{cal}}{\text{g} \times {}^\circ\text{C}} = 4.18 \frac{\text{J}}{\text{g} \times {}^\circ\text{C}}$

Unit Conversions

1 atm = 760 mm Hg = 760 Torr = 101.3 kPa = $14.7 \frac{\text{lb}}{\text{in.}^2}$ = 29.92 in. Hg

K = °C + 273

1.000 calorie = 4.184 Joules

1 mL = 1 cm^3

1 L = 1,000 mL = 1,000 cm^3

giga (G) = 10^9, mega (M) = 10^6, kilo (k) = 10^3, hecto (h) = 10^2, deka (da) = 10^1

deci (d) = 10^{-1}, centi (c) = 10^{-2}, milli (m) = 10^{-3}, micro (μ) = 10^{-6}, nano (n) = 10^{-9}

Common Ions

Element Name	Charges	Ions	Charges	Ions	Charges
Silver (Ag^{1+})	1+	Ammonium (NH_4^+)	1+	Oxide (O^{2-})	2–
Zinc (Zn^{2+})	2+	Nitrate (NO_3^-)	1–	Sulfide (S^{2-})	2–
Scandium (Sc^{3+})	3+	Nitrite (NO_2^-)	1–	Sulfate (SO_4^{2-})	2–
Copper (Cu^{1+}, Cu^{2+})	1+, 2+	Hydrogen Carbonate (HCO_3^-)	1–	Sulfite (SO_3^{2-})	2–
Gold (Au^{1+}, Au^{3+})	1+, 3+	Perchlorate (ClO_4^-)	1–	Carbonate (CO_3^{2-})	2–
Cobalt (Co^{2+}, Co^{3+})	2+, 3+	Chlorate (ClO_3^-)	1–	Peroxide (O_2^{2-})	2–
Nickel (Ni^{2+}, Ni^{3+})	2+, 3+	Chlorite (ClO_2^-)	1–	Chromate (CrO_4^{2-})	2–
Lead (Pb^{2+}, Pb^{4+})	2+, 4+	Hypochlorite (ClO^-)	1–	Dichromate ($Cr_2O_7^{2-}$)	2–
Tin (Sn^{2+}, Sn^{4+})	2+, 4+			Phosphate (PO_4^{3-})	3–
Mercury (Hg^{1+}, Hg^{2+})	1+, 2+				
Iron (Fe^{2+}, Fe^{3+})	2+, 3+				
Titanium (Ti^{2+}, Ti^{3+}, Ti^{4+})	2+, 3+, 4+				
Chromium (Cr^{2+}, Cr^{3+})	2+, 3+				
Vanadium (V^{2+}, V^{3+}, V^{4+})	2+, 3+, 4+				
Manganese (Mn^{2+}, Mn^{3+}, Mn^{4+})	2+, 3+, 4+				

Turn over for Periodic Table of the Elements

Contents

Introduction to Chemistry

Content of tests

The testing program titled the *Tennessee End of Course Assessment* was established to meet the Tennessee mandate for end of course assessments in Tennessee secondary schools. These tests measure the Tennessee State Performance Indicators. Subject areas covered by the end of course assessments include Mathematics, Language Arts, History, and Science.

Test development

For the *Tennessee End of Course Assessment*, a staff of writers—composed of both teachers and professional test developers experienced in each of the content areas—researched and wrote the items. Professional editors and content specialists carefully reviewed all items and test directions for content and accuracy. To provide a large pool of items for final test selection, the test developers created approximately twice as many items as were needed in the final editions of the tests.

After items were field tested, student responses were analyzed. Professional content editors and researchers carefully reviewed items, their data, and test directions for content, suitability, and accuracy before including particular items and test directions in operational tests.

Test administration

Tennessee End of Course Assessments are given to students as they near the end of courses that are included in the program. Tests may be given midyear for block schedules or near the end of the school year.

This test contains 65 multiple-choice questions.

You will have ample time to read and answer each of the questions. The Chemistry test has been designed to be administered in one session and is not timed. The first 15 minutes are set aside to complete identifying data on the answer sheet.

A reference page, similar to the one located in this Practice Test, will be in the front of the actual test. This page includes the periodic table, formulas, constants, and unit conversions for use during testing.

Calculator use is recommended. Sharing calculators during testing is not permitted.

The following types of calculators/devices may **NOT** be used during the test:

- pocket organizers
- electronic writing pads or input devices
- Some examples of prohibited calculators are:
  - Casio models: CFX-9970G, Algebra FX 2.0
  - Hewlett-Packard models: HP-40G, HP-49G
  - Texas Instruments models: TI-89, TI-92, Voyage 200, TI-NSPIRE - the CAS version (The non-CAS version of TI-NSPIRE is allowable.)
- calculators that can communicate (transfer data or information) wirelessly with other student calculators/devices
- cell phones, PSPs, and/or iPods

Students may use any four-function, scientific, or graphing calculator that does not have any of the above features. The use of devices that have a Computer Algebra System (CAS) is NOT allowed.

Tips for Taking the Test

Preparing for the test

- Take this Tennessee End of Course Practice Test for Chemistry several times.
- Review the Tennessee End of Course Item Sampler for Chemistry located at http://tennessee.gov/education/assessment/sec_samplers.shtml on the Tennessee Department of Education Web site.
- Become familiar with the correct way to mark answers on the answer sheet. There is a sample answer sheet in this Practice Test.

Before the test

- Get a good night's sleep. To do your best, you need to be rested.

During the test

- Relax. It is normal to be somewhat nervous before the test. Try to relax and not worry.
- Listen. Listen to and read the test directions carefully. Ask for an explanation of the directions if you do not understand them.
- Plan your time. Do not spend too much time on any one question. If a question seems to take too long, skip it and return to it later. Answer all questions you are sure of first.
- Think. If you are not sure how to answer a question, read it again and try your best to answer the question. Rule out answer choices that you know are incorrect and choose from those that remain.

Answer Sheet for the Practice Test

1 Ⓐ Ⓑ Ⓒ Ⓓ	14 Ⓕ Ⓖ Ⓗ Ⓙ	27 Ⓐ Ⓑ Ⓒ Ⓓ	40 Ⓕ Ⓖ Ⓗ Ⓙ	53 Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓕ Ⓖ Ⓗ Ⓙ	15 Ⓐ Ⓑ Ⓒ Ⓓ	28 Ⓕ Ⓖ Ⓗ Ⓙ	41 Ⓐ Ⓑ Ⓒ Ⓓ	54 Ⓕ Ⓖ Ⓗ Ⓙ
3 Ⓐ Ⓑ Ⓒ Ⓓ	16 Ⓕ Ⓖ Ⓗ Ⓙ	29 Ⓐ Ⓑ Ⓒ Ⓓ	42 Ⓕ Ⓖ Ⓗ Ⓙ	55 Ⓐ Ⓑ Ⓒ Ⓓ
4 Ⓕ Ⓖ Ⓗ Ⓙ	17 Ⓐ Ⓑ Ⓒ Ⓓ	30 Ⓕ Ⓖ Ⓗ Ⓙ	43 Ⓐ Ⓑ Ⓒ Ⓓ	56 Ⓕ Ⓖ Ⓗ Ⓙ
5 Ⓐ Ⓑ Ⓒ Ⓓ	18 Ⓕ Ⓖ Ⓗ Ⓙ	31 Ⓐ Ⓑ Ⓒ Ⓓ	44 Ⓕ Ⓖ Ⓗ Ⓙ	57 Ⓐ Ⓑ Ⓒ Ⓓ
6 Ⓕ Ⓖ Ⓗ Ⓙ	19 Ⓐ Ⓑ Ⓒ Ⓓ	32 Ⓕ Ⓖ Ⓗ Ⓙ	45 Ⓐ Ⓑ Ⓒ Ⓓ	58 Ⓕ Ⓖ Ⓗ Ⓙ
7 Ⓐ Ⓑ Ⓒ Ⓓ	20 Ⓕ Ⓖ Ⓗ Ⓙ	33 Ⓐ Ⓑ Ⓒ Ⓓ	46 Ⓕ Ⓖ Ⓗ Ⓙ	59 Ⓐ Ⓑ Ⓒ Ⓓ
8 Ⓕ Ⓖ Ⓗ Ⓙ	21 Ⓐ Ⓑ Ⓒ Ⓓ	34 Ⓕ Ⓖ Ⓗ Ⓙ	47 Ⓐ Ⓑ Ⓒ Ⓓ	60 Ⓕ Ⓖ Ⓗ Ⓙ
9 Ⓐ Ⓑ Ⓒ Ⓓ	22 Ⓕ Ⓖ Ⓗ Ⓙ	35 Ⓐ Ⓑ Ⓒ Ⓓ	48 Ⓕ Ⓖ Ⓗ Ⓙ	61 Ⓐ Ⓑ Ⓒ Ⓓ
10 Ⓕ Ⓖ Ⓗ Ⓙ	23 Ⓐ Ⓑ Ⓒ Ⓓ	36 Ⓕ Ⓖ Ⓗ Ⓙ	49 Ⓐ Ⓑ Ⓒ Ⓓ	62 Ⓕ Ⓖ Ⓗ Ⓙ
11 Ⓐ Ⓑ Ⓒ Ⓓ	24 Ⓕ Ⓖ Ⓗ Ⓙ	37 Ⓐ Ⓑ Ⓒ Ⓓ	50 Ⓕ Ⓖ Ⓗ Ⓙ	63 Ⓐ Ⓑ Ⓒ Ⓓ
12 Ⓕ Ⓖ Ⓗ Ⓙ	25 Ⓐ Ⓑ Ⓒ Ⓓ	38 Ⓕ Ⓖ Ⓗ Ⓙ	51 Ⓐ Ⓑ Ⓒ Ⓓ	64 Ⓕ Ⓖ Ⓗ Ⓙ
13 Ⓐ Ⓑ Ⓒ Ⓓ	26 Ⓕ Ⓖ Ⓗ Ⓙ	39 Ⓐ Ⓑ Ⓒ Ⓓ	52 Ⓕ Ⓖ Ⓗ Ⓙ	65 Ⓐ Ⓑ Ⓒ Ⓓ

Directions for Taking the Practice Test

In this Practice Test, you will perform various mathematical operations. You may use your calculator and Reference Page located in the front of this book to help you solve the problems. You may write in the open spaces in this book to work the problems, but remember to fill in the circle on your answer sheet that goes with the answer you choose for each question. Fill in the circle completely and make your mark heavy and dark. If you want to change an answer, erase the mark you made and make a new mark.

You will do the items in this Practice Test by yourself. Remember to read all the directions carefully. When you see the words *Go On* at the bottom of the page, go to the next page. When you come to the word STOP, you have finished this test. When you have finished, you may check your answers.

On your answer sheet, find Number 1. Mark your answers beginning with Number 1.

You may begin.

Stop when you have finished the test.

At the end of the Practice Test, make sure that all your marks are heavy and dark and that you have completely erased any marks that you do not want.

Turn to Page 48 and locate the Answer Key. Check your answers and review those items that you marked incorrectly.

1 **Which part of an atom is most directly involved in chemical bonding?**

- **A** nucleus
- **B** electron
- **C** proton
- **D** neutron

2 **Which element has the highest electronegativity?**

- **F** nitrogen
- **G** iodine
- **H** fluorine
- **J** selenium

3 **Which set of tools will provide the most precise measurements for calculating the density of an irregularly shaped rock?**

- **A** flask and beaker
- **B** flask and balance
- **C** balance and graduated cylinder
- **D** beaker and graduated cylinder

Go On ▶

4 **Which of these is an example of a chemical change?**

F Methane is burned in air.
G Solid gold is melted to make jewelry.
H A bar of copper is stretched into a long copper wire.
J Iron is coated with bronze to prevent rusting.

5 **What volume will 50.2 grams of $CO_2(g)$ occupy at STP?**

A 1.14 liters
B 19.6 liters
C 25.6 liters
D 98.2 liters

6 **Which element on the periodic table has a total of 16 protons?**

F germanium (Ge)
G phosphorus (P)
H oxygen (O)
J sulfur (S)

Go On ▶

7 **The half-life of cobalt-60 is 5.27 years. Approximately how much of a 199 g sample will remain after 20 years?**

A 10.0 g
B 12.5 g
C 40.0 g
D 50.0 g

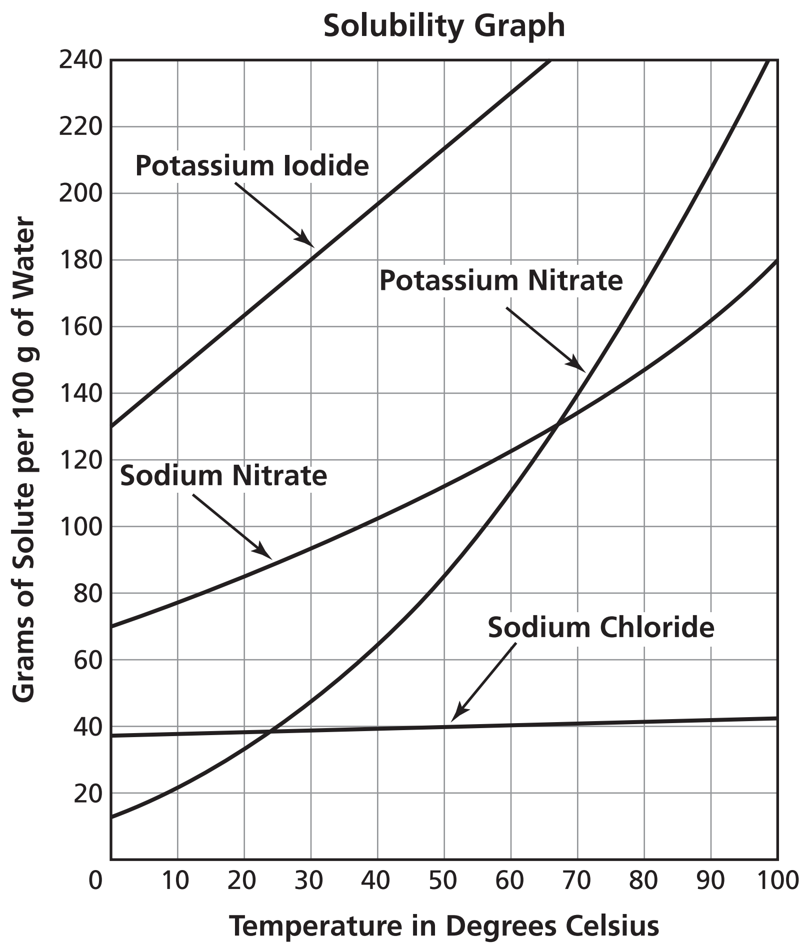
8 **Scientist Henri Becquerel observed that some minerals, such as potassium uranyl sulfate, could release energy when placed on a photographic plate wrapped in black paper. Becquerel concluded that the potassium uranyl sulfate absorbed energy from the sun and then released the energy to expose the photographic plate. Later Becquerel proposed an alternate explanation for the same experiment: the uranium in potassium uranyl sulfate released energy without energy being absorbed from external sources.**

Which statement best explains why Becquerel's later explanation was more likely to be accurate?

F Becquerel was considered the best scientific thinker of the time.
G Becquerel's peers reasoned that his explanation was scientifically sound.
H Experiments showed that a sample of the uranium could expose a photographic plate even if it was kept in a dark place.
J Scientists were unable to determine the mechanism by which uranium could absorb and release solar energy.

Go On ▶

9 **The graph shows the solubilities of four compounds.**



A supersaturated solution at 50°C contains 41 g of solute in 100 g of water. Which compound does the supersaturated solution contain?

A Potassium Iodide

B Potassium Nitrate

C Sodium Nitrate

D Sodium Chloride

Go On ▶

10 **The reaction shown represents the oxidation of ammonia (NH_3).**

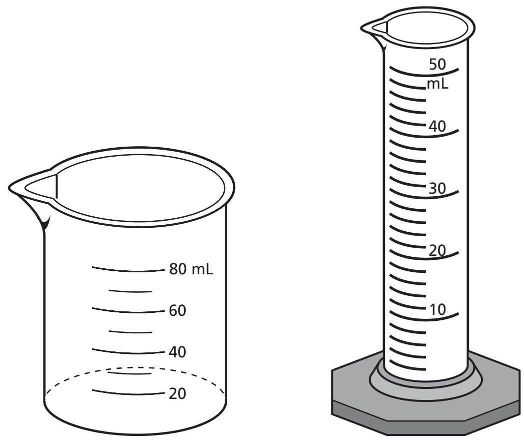
$$4NH_3(aq) + 5O_2(g) \longrightarrow 4NO(g) + 6H_2O(l)$$

How many grams of water (H_2O) will be formed when 34 grams of ammonia reacts with an excess of oxygen (O_2)?

F 51 grams
G 54 grams
H 64 grams
J 110 grams

11 **Two measuring tools are shown.**

Measuring Tools



What is the <u>most</u> appropriate tool for measuring 30.0 mL of a sodium chloride solution?

A the beaker because it is more stable and the liquid is less likely to spill

B the beaker because it is calibrated to hold large amounts of liquid

C the graduated cylinder because it is calibrated to measure the liquid more precisely

D the graduated cylinder because it will be nearly filled with liquid

12 **The equation represents an incomplete chemical reaction.**

$$\mathbf{Al + Cl_2 \longrightarrow \_\_\_}$$

What is the product of the chemical reaction?

F Al_2Cl_3
G $AlCl$
H $AlCl_2$
J $AlCl_3$

13 **Isotopes of an element have different numbers of**

A protons.
B neutrons.
C electrons.
D positrons.

14 **What is the molarity of a 0.5 L sample of solution that contains 60.0 g of sodium hydroxide (NaOH)?**

F 0.8 M
G 1.5 M
H 3.0 M
J 6.0 M

Go On ▶

15 **Which element has the highest electronegativity?**

A beryllium (Be)
B fluorine (F)
C silver (Ag)
D silicon (Si)

16 **Air pollution from automobile exhaust is minimized by using electric cars powered by lead-acid batteries. What will be a negative effect of using lead-acid batteries?**

F Toxic metal in the batteries will enter the environment.
G Sulfuric acid in the batteries will generate electricity.
H Oxygen and hydrogen will be produced by the batteries.
J Dense and malleable metal will be used in the batteries.

Go On ▶

17 **The chart shows the acid-base testing of four samples.**

Samples	Acid-Base Indicators	Results
Sample 1	Phenolphthalein	pink to colorless
Sample 2	Phenolphthalein	colorless to pink
Sample 3	Litmus paper	blue turns red
Sample 4	Litmus paper	red turns blue

Based on the chart, which sample or samples are acids?

A Sample 1 only

B Samples 2 and 4

C Samples 1 and 3

D Sample 4 only

18 **A chemical equation is shown.**

$$\_\_\_\ \mathbf{Al} + \_\_\_\ \mathbf{O_2} \rightarrow \_\_\_\ \mathbf{Al_2O_3}$$

What is the molar ratio for the chemical reaction when the equation is balanced?

F 1 : 2 : 5
G 2 : 1 : 1
H 4 : 3 : 1
J 4 : 3 : 2

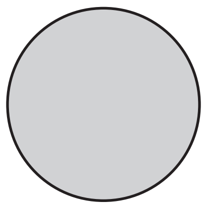
19 **Which characteristic of an exothermic reaction differs from that of an endothermic reaction?**

A An exothermic reaction absorbs heat as the reaction progresses.
B The activation energy is higher in an exothermic reaction.
C An exothermic reaction releases heat as the reaction progresses.
D The products in exothermic reactions have more potential energy than the reactants.

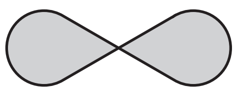
Go On

20 Which illustration represents the region in which an electron of a hydrogen atom is most likely found at ground state?

F



G



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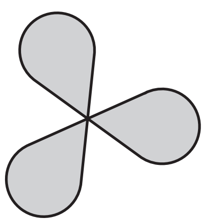
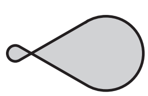


J



Go On ▶

21 **Magnesium (Mg) and oxygen (O_2) react to form magnesium oxide (MgO).**

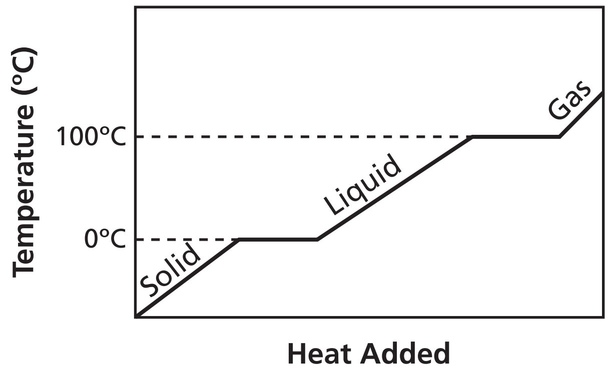
$$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$$

Which type of chemical reaction does the equation represent?

A decomposition
B double replacement
C single replacement
D composition

Go On

22 **The graph represents the phase changes of water.**



Based on the graph, what change occurred when ice at 0°C was heated at a constant rate?

F Molecules broke apart into atoms.

G Elements dissociated into ions.

H Intermolecular attractions were decreased.

J Chemical energy was stored.

Go On ▶

23 **A 2135 cm^3 sample of dry air has a pressure of 98.4 kPa at 127°C. What is the volume of the sample if the temperature is increased to 206°C when the pressure is kept constant?**

A 1320 cm^3

B 1780 cm^3

C 2560 cm^3

D 3460 cm^3

24 **Which property do the liquid phase and the gas phase of a substance have in common?**

F Both phases are highly compressible.

G Both phases lack a definite shape.

H Both phases have high densities.

J Both phases have equal kinetic energy.

25 **What is the percent composition by mass of sulfur in ammonium sulfate, $(NH_4)_2SO_4$?**

A 6.7%

B 24%

C 28%

D 32%

Go On

26 **Anhydrous copper(II) sulfate is a gray-white powder. When a student heated 250 g of bright blue copper(II) sulfate pentahydrate ($CuSO_4 \cdot 5H_2O$) in a test tube, the sample crumbled and turned gray white. The sample also lost 90 g. Based on this information, what is the most acceptable conclusion?**

F The color of the sample changed when copper reacted with sulfate ions.

G The mass of the sample decreased after the copper(II) sulfate evaporated.

H The sample became dehydrated when it was heated.

J The sample went from the solid phase to the gaseous phase.

27 **Which of these is a base?**

A LiOH

B $BaCl_2$

C KI

D KNO_3

28 **Which of these represents a release of energy?**

F $H_2O(l) \longrightarrow H_2O(g)$

G $H_2O(s) \longrightarrow H_2O(l)$

H $H_2O(g) \longrightarrow H_2O(l)$

J $H_2O(s) \longrightarrow H_2O(g)$

Go On ▶

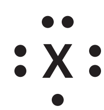
29 **The chemical equation shows methane (CH_4) burned in the presence of oxygen gas (O_2).**

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

Which type of reaction does this equation represent?

A composition
B single replacement
C double replacement
D combustion

30 **The diagram represents the Lewis electron-dot structure of a neutral element.**



Which element does this Lewis electron-dot structure most likely represent?

F Na
G Mg
H Cl
J Ar

Go On

31 **A student fills a flask with 5.0 moles of nitrogen gas and then seals the flask. Which change will happen when the student warms the flask?**

A The temperature of the nitrogen gas will decrease.
B The pressure inside the flask will increase.
C The volume inside the flask will decrease.
D The molar mass of the nitrogen gas will increase.

32 **Which characteristic is more similar in liquids and solids as compared to gases?**

F the masses of particles
G the distance between particles
H the degree to which particles are organized
J the strength of chemical bonds within particles

33 **Which statement best describes the Bohr model of the atom?**

A Electrons are arranged in energy clouds.
B Electrons have properties similar to waves.
C Electrons orbit around the nucleus in set paths.
D Electrons make up most of the mass of an atom.

Go On

34 **What is the approximate percent composition of phosphorus in phosphoric acid (H_3PO_4)?**

F 29.5%

G 31.6%

H 65.3%

J 98.0%

35 **Which of these is an example of a homogeneous mixture?**

A a bowl of noodle soup

B a container of water and sand

C a glass of salt water

D a bottle of oil and vinegar

Go On ▶

36 **The equation represents the breakdown of potassium chlorate ($KClO_3$).**

$$2KClO_3 \longrightarrow 2KCl + 3O_2$$

What volume of oxygen gas (O_2) does 20.0 grams of potassium chlorate ($KClO_3$) produce at STP based on the equation shown?

F 5.48 liters

G 7.80 liters

H 67.3 liters

J 72.9 liters

37 **A student sets up an experiment to investigate the effect of temperature on the volume of 50 grams of gas inside a balloon. Which statement correctly describes the design of the experiment?**

A The temperature is an experimental control, and the volume is the independent variable.

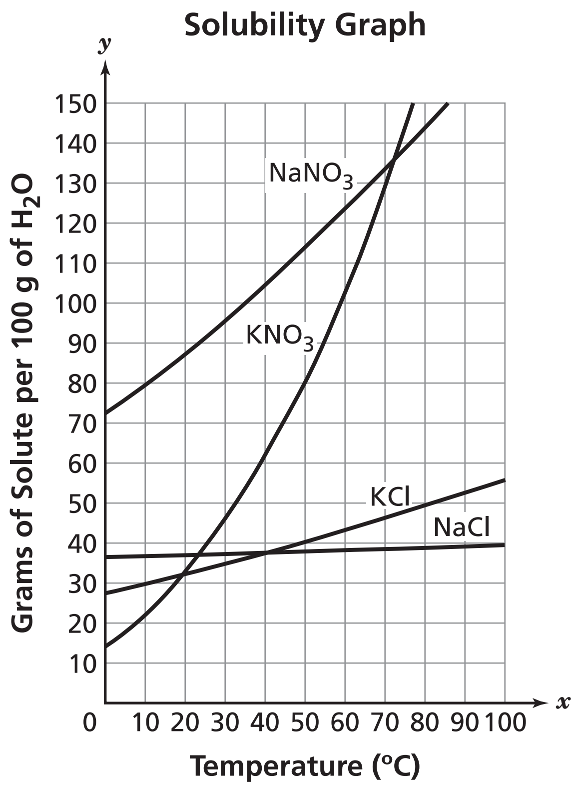
B The volume is an experimental control, and the temperature is the dependent variable.

C The mass of the gas is an experimental control, and the temperature is the independent variable.

D The temperature is an experimental control, and the mass of the gas is the dependent variable.

Go On ▶

38 **The graph shows the solubility of several solutes in 100 grams of water.**



Which of these is an unsaturated solution?

F 60 grams of KNO_3 dissolved in 200 grams of H_2O at 10°C

G 90 grams of $NaNO_3$ dissolved in 100 grams of H_2O at 20°C

H 35 grams of KCl dissolved in 100 grams of H_2O at 60°C

J 40 grams of NaCl dissolved in 75 grams of H_2O at 90°C

Go On ▶

39 **An engine cylinder contains 250 mL of gas at a pressure of 1.0 atm. As the engine runs, it compresses the cylinder, reducing the volume of the gas to 25 mL. What is the new pressure of the gas at this volume?**

- **A** 0.10 atm
- **B** 10.0 atm
- **C** 25 atm
- **D** 250 atm

40 **What is the approximate mass of 1.50 moles of ammonia (NH_3)?**

- **F** 10.0 grams
- **G** 15.0 grams
- **H** 17.0 grams
- **J** 25.5 grams

Go On

41 **What is the total number of electrons in all *s* orbitals of a neutral atom of phosphorus?**

A 2
B 4
C 6
D 8

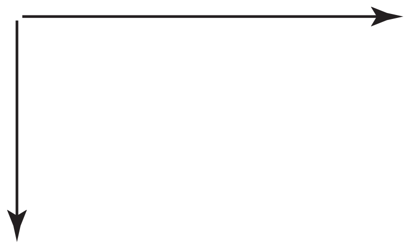
42 **Which process represents a chemical change?**

F oxidation
G sublimation
H evaporation
J condensation

Go On ▶

43 **Which pair of arrows correctly represents how atomic radii change, from smallest radius to largest radius, on the periodic table of the elements?**

A



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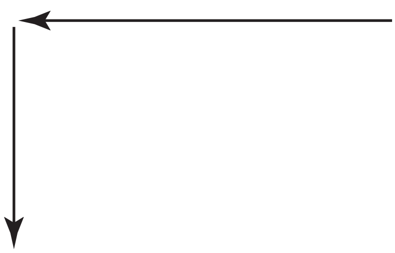
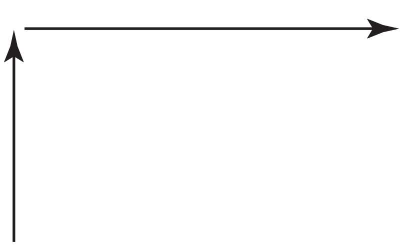


C

D



Go On ▶

44 **A company wanted to begin manufacturing and promoting a floor cleaner that it claimed would clean floors better than previous products. The company sent its product to two independent research groups, which determined the floor cleaner did clean floors better than previous products. How did each research company come to a bias-free conclusion?**

- **F** Each test was repeated multiple times until the desired results were obtained.
- **G** Both research groups came to the same conclusion when reviewing the company's claim.
- **H** Both research groups used standard protocols made available for the tests.
- **J** Technicians at each research group did not know which products they were testing and comparing.

45 **What are the products of the decomposition of mercury(II) oxide (HgO)?**

- **A** Hg_2 and O_2
- **B** Hg_2 and O
- **C** Hg and O_2
- **D** HgO and O_2

Go On ▶

46 **How did the quantum mechanical model of the atom improve on Bohr's atomic model?**

F by showing that most of the atom is empty space

G by establishing the probability clouds of the electrons

H by predicting the particle nature of the electrons

J by measuring the absorption spectra of discrete orbits

47 **Early in the history of the periodic table, a scientist observed the relationships between element characteristics and atomic mass. The scientist used this information to predict the existence of unknown elements with specific atomic masses and characteristics. How was this information applied by modern scientists?**

A Scientists were able to predict the properties of new elements.

B Scientists were able to change the atomic makeup of elements.

C Scientists were able to make computer parts because of the unpredictable properties of silicon.

D Scientists were able to create new elements with unpredictable physical and chemical properties.

Go On ▶

48 **What is the molarity of a 2.0-liter solution containing 58 grams of NaCl?**

- **F** 0.50 M
- **G** 1.0 M
- **H** 2.0 M
- **J** 3.2 M

49 **The electron configuration of a neutral atom of calcium is shown.**

$$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2$$

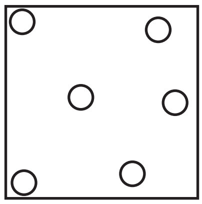
How many valence electrons are in the atom?

- **A** 2
- **B** 4
- **C** 8
- **D** 20

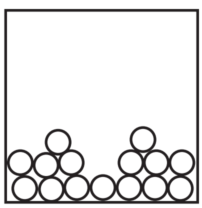
Go On ▶

50 Which of these best illustrates the spacing of atoms in a liquid?

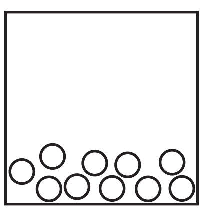
F



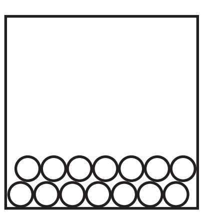
G



H



J



Go On

$$\_\_\_ N_2 + \_\_\_ O_2 \longrightarrow 2N_2O_5$$

51 **What quantities of nitrogen gas (N_2) and oxygen gas (O_2) will react completely to produce 2 moles of dinitrogen pentoxide (N_2O_5)?**

A 4 moles of N_2 and 10 moles of O_2

B 4 moles of N_2 and 5 moles of O_2

C 2 moles of N_2 and 10 moles of O_2

D 2 moles of N_2 and 5 moles of O_2

52 **Approximately how many grams of sodium chloride (NaCl) are required to prepare 500. mL of a 3.00 M solution?**

F 39.0 g

G 58.4 g

H 87.8 g

J 167 g

Go On ▶

53 **According to the quantum mechanical model of the atom, what is the maximum number of electrons that can occupy the second energy level?**

A 2
B 4
C 8
D 10

54 **Scientists built a prototype of an electric device that may help predict human reactions to new medicines. Which next step should the scientists take to determine whether the device will be useful?**

F test the device
G modify the device
H reevaluate the design of the device
J build the real device for application

Go On ▶

55 **A gas has a volume of 3.0 L at a pressure of 3.0 atm. What will be the final volume of the gas if the pressure is increased to 5.0 atm at a constant temperature?**

A 0.56 L

B 1.8 L

C 3.0 L

D 5.0 L

56 **The chemical equation represents the reaction between sodium (Na) and oxygen (O_2).**

$$4Na + O_2 \longrightarrow \_\_$$

What is the product of this reaction?

F $2Na_2O$

G $2NaO$

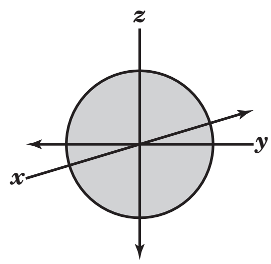
H $2NaO_2$

J $2Na_2O_2$

Go On ▶

57 **Boron has one electron in the 2*p* orbital. In which of these orbitals is the electron likely to be found?**

A



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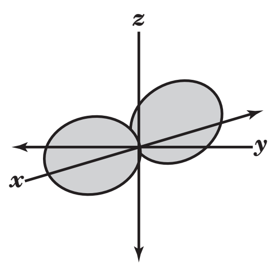

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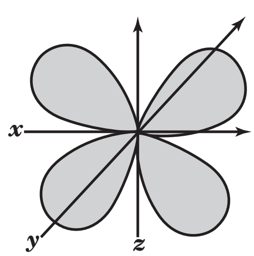

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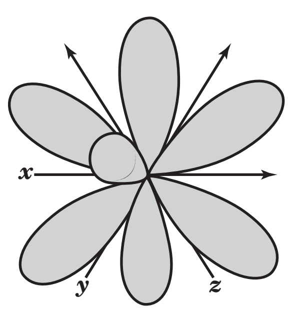
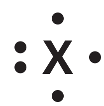


Go On ▶

58 **The diagram shows the Lewis electron-dot structure of Element X at ground state.**



Which of these could be the atomic number of Element X?

F 5
G 13
H 33
J 50

59 **How many atoms are in 3.50 moles of calcium (Ca)?**

A 4.00×10^{1}
B 1.40×10^{2}
C 6.02×10^{23}
D 2.10×10^{24}

Go On

60 **The chemical equation shows the production of calcium oxide (CaO) and carbon dioxide (CO_2).**

$$CaCO_3 \longrightarrow CaO + CO_2$$

How should this reaction be classified?

F decomposition
G composition
H single replacement
J double replacement

61 **Which of these gives an example of a chemical change?**

A burning a piece of wood
B cracking an egg
C folding a piece of paper
D melting an ice cube

Go On ▶

62 **Which of these describes how gallium forms a 3+ ion?**

- **F** The gallium loses 3 electrons.
- **G** The gallium loses 3 protons.
- **H** The gallium gains 3 electrons.
- **J** The gallium gains 3 protons.

63 **Which information about a solution is required to calculate its molarity?**

- **A** number of moles of solute and atomic mass of solute
- **B** number of moles of solvent and atomic mass of solute
- **C** number of particles of solvent and the volume of solvent
- **D** number of moles of solute and number of liters of solution

Go On ▶

64 **During the production of aspirin, 2.6 g of aspirin can be formed from 2.0 g of salicylic acid. What is the percent yield if only 1.7 g of aspirin is produced?**

F 35%

G 65%

H 77%

J 85%

$$^{222}_{88}\mathrm{Ra} \longrightarrow {}^{4}_{2}\mathrm{He} + {}^{218}_{86}\mathrm{Rn}$$

65 **Which type of nuclear decay is represented by the equation?**

A alpha

B beta

C gamma

D neutron

STOP

Answer Key

Item Number	Correct Answer
1	B
2	H
3	C
4	F
5	C
6	J
7	B
8	H
9	D
10	G
11	C
12	J
13	B
14	H
15	B
16	F
17	C
18	J
19	C
20	F
21	D
22	H

Item Number	Correct Answer
23	C
24	G
25	B
26	H
27	A
28	H
29	D
30	H
31	B
32	G
33	C
34	G
35	C
36	F
37	C
38	H
39	B
40	J
41	C
42	F
43	B
44	J

Item Number	Correct Answer
45	C
46	G
47	A
48	F
49	A
50	H
51	D
52	H
53	C
54	F
55	B
56	F
57	B
58	H
59	D
60	F
61	A
62	F
63	D
64	G
65	A

Reporting Categories

Below you will find that each item has been linked to its corresponding Reporting Category. These four Reporting Categories will be used to report scores from the actual test.

You can find the Reporting Categories and their Performance Indicators grouped together in the Tennessee End of Course Item Sampler for Chemistry located on the Tennessee Department of Education Web site at http://tennessee.gov/education/assessment/sec_samplers.shtml.

Item	Reporting Category
1	4 – Interactions of Matter
2	2 – Atomic Structure
3	1 – Embedded Inquiry, Technology & Engineering, Mathematics
4	3 – Matter and Energy
5	4 – Interactions of Matter
6	2 – Atomic Structure
7	4 – Interactions of Matter
8	1 – Embedded Inquiry, Technology & Engineering, Mathematics
9	3 – Matter and Energy
10	4 – Interactions of Matter
11	1 – Embedded Inquiry, Technology & Engineering, Mathematics
12	4 – Interactions of Matter
13	2 – Atomic Structure
14	3 – Matter and Energy
15	2 – Atomic Structure
16	1 – Embedded Inquiry, Technology & Engineering, Mathematics
17	4 – Interactions of Matter
18	4 – Interactions of Matter
19	3 – Matter and Energy
20	2 – Atomic Structure
21	4 – Interactions of Matter
22	3 – Matter and Energy

23	3 – Matter and Energy
24	3 – Matter and Energy
25	4 – Interactions of Matter
26	1 – Embedded Inquiry, Technology & Engineering, Mathematics
27	4 – Interactions of Matter
28	3 – Matter and Energy
29	4 – Interactions of Matter
30	2 – Atomic Structure
31	3 – Matter and Energy
32	3 – Matter and Energy
33	2 – Atomic Structure
34	4 – Interactions of Matter
35	3 – Matter and Energy
36	4 – Interactions of Matter
37	1 – Embedded Inquiry, Technology & Engineering, Mathematics
38	3 – Matter and Energy
39	3 – Matter and Energy
40	4 – Interactions of Matter
41	2 – Atomic Structure
42	3 – Matter and Energy
43	2 – Atomic Structure
44	1 – Embedded Inquiry, Technology & Engineering, Mathematics
45	4 – Interactions of Matter
46	2 – Atomic Structure
47	1 – Embedded Inquiry, Technology & Engineering, Mathematics
48	3 – Matter and Energy
49	2 – Atomic Structure
50	3 – Matter and Energy
51	4 – Interactions of Matter
52	3 – Matter and Energy
53	2 – Atomic Structure

54	1 – Embedded Inquiry, Technology & Engineering, Mathematics
55	3 – Matter and Energy
56	4 – Interactions of Matter
57	2 – Atomic Structure
58	2 – Atomic Structure
59	4 – Interactions of Matter
60	4 – Interactions of Matter
61	3 – Matter and Energy
62	4 – Interactions of Matter
63	3 – Matter and Energy
64	1 – Embedded Inquiry, Technology & Engineering, Mathematics
65	4 – Interactions of Matter

End of Course Assessment

Chemistry

PRACTICE TEST

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