



K-16 Education Center

Continuing & Innovative Education

Chemistry A

Credit by Exam Study Guide

This EA/CBE Study Guide can help you prepare for the exam by giving you an idea of what you need to study, review, and learn. To succeed, you should be thoroughly familiar with the subject matter before you attempt to take the exam.

Every question that appears on the EA/CBE is grounded in the knowledge and skills statements and student expectations within the state-mandated standards, the Texas Essential Knowledge and Skills (TEKS). It should be noted that the exam will not test every student expectation. However, it is important that students study and know the entire scope of the TEKS so that they can develop a complete understanding of the content. The EA/CBEs are global exams grounded in the TEKS and are not designed to be a final exam for the University of Texas high school courses. You can view the TEKS for this exam online at <http://www.tea.state.tx.us/teks/>. Since questions are not taken from any one source, you can prepare by reviewing any of the state-adopted textbooks.

About the Exam

The EA/CBE consists of 50 multiple-choice questions that are equally weighted. You will be provided the Formula Sheet and Periodic Table of the Elements shown at the end of this Study Guide. You will be allowed **3 hours** to take the exam.

Materials Given with the Exam

For paper-based exams, a formula sheet and periodic table will be provided with your test. For computer-based exams, the proctor will provide to you a paper copy of the formula sheet and periodic table immediately prior to testing. You will return the sheet after the exam. The formula sheet and periodic table can be found at the end of this study guide.

Concepts and Objectives

The bulleted lists and sample questions below may not refer to all the material that will be on the exam. This list only provides additional information for some of the student expectations tested in the Chemistry, First Semester EA/CBE. Ultimately, you should use the TEKS to guide your exam preparation.

Safe Lab Practices and Appropriate Use of Lab Glassware/Equipment

- know the safety rules and procedures that are to be followed when conducting a lab;
- recognize the different glassware and equipment that is used in the lab;
- know why and how scientists use the different pieces of glassware and laboratory equipment.

Introduction to Chemistry

- be familiar with the five branches of chemistry;
- discuss the scientific method.

Characteristics of Matter

- define *matter*;
- describe the properties of solids, liquids and gasses;
- identify an element, a mixture, and a compound;
- discuss different methods used to separate mixtures and compounds;
- know how to identify chemical changes;
- identify whether a chemical reaction or a physical change has taken place;
- define and apply the Law of Conservation of Mass.

Scientific Measurements

- know the units of the metric system and its prefixes;
- write conversion factors;
- convert from metric to standard units and between metric units;
- define *accuracy* and *precision*;
- calculate the percent error in experimental data;
- identify the number of significant figures in a given quantity;
- write answers to calculations using the correct number of significant figures;
- calculate the percent composition of a substance;
- be able to accurately read a piece of equipment designed to measure the volume of a liquid;
- use and apply the formula for density.

Atoms and The Periodic Table of the Elements

- know the four major atomic theories and the scientists who developed these theories;
- explain how the theory of the atom evolved into the modern atomic theory of the atom;
- understand and calculate the components of the atom;
- define *mass number* and *isotope*;
- write conventional and shorthand electron configurations;
- understand electron orbital notation;
- explain how a flame test is used to study electrons;
- represent atoms using 2-D and 3-D models;
- know the history and arrangement of the Periodic Table of the Elements;
- explain the relationship of elements in the same period, the same group, and the same block;
- understand the different trends in Periodic Table of the Elements.

Nuclear Chemistry and Energy

- explain radioactive decay and what makes isotopes stable or unstable;
- write nuclear equations;
- know the different types of radioactive decay;
- understand the difference between fission and fusion;
- explain a nuclear chain reaction;
- define *electromagnetic spectrum*;
- understand the concept of half-life and how to calculate radioactive decay
- identify radioactive elements.
- know the major components of a nuclear power plant and their processes;
- identify different uses for radioactive materials;
- identify safety concerns that are considered before building a nuclear power plant;
- describe how nuclear waste is produced and how we dispose of these materials.

Ions

- use the Periodic Table of the Elements to identify an element's oxidation number;
- identify whether an element will form a cation or an anion;
- identify the charge of polyvalent metals;
- explain why transition metals have multiple oxidation numbers;
- name oxyanions;
- be familiar with the polyatomic ions and their charges.

Chemical Formulas and Nomenclature

- apply the Law of Conservation of Mass, the Law of Definite Proportions, and the Law of Multiple Proportions in order to write chemical formulas;
- write chemical formulas for polyatomic ions and transition metals;
- identify and name the 7 types of compounds;
- identify functional groups in organic compounds.

Stoichiometry

- convert from molecules/atoms to moles, and moles to molecules/atoms;
- calculate the molar mass of a compound;
- convert from moles to mass, and mass to moles;
- calculate the percent composition of a compound;
- know the difference between the empirical and molecular formula of a compound;
- calculate the empirical formula and molecular formula of a compound.

Valence Electrons

- define *valence electron*;
- predict the charge and number of valence electrons in an element;
- predict whether an atom will accept or donate valence electrons when forming a bond;
- predict the relative reactivity that an atom will have when bonding.

Chemical Bonds

- write Lewis dot structures for atoms, ionic compounds, and covalent compounds;
- apply principles of Lewis dot structures to predict the ratio of elements in a compound;
- use the difference in electronegativity to identify ionic and covalent bonds;
- know and understand the reasons for the physical properties of ionic compounds;
- understand the type of atoms that are involved in covalent bonds;
- predict the behavior of electrons in polar and non-polar covalent bonds;
- explain the difference between ionic and covalent bonds;
- understand the physical properties of metals and explain the reason for these properties;
- explain the behavior of valence electrons in a metallic bond;
- explain and identify the properties of alloys.

Geometry of Molecules

- explain and apply the Valence Shell Electron-Pair Repulsion (VSEPR) theory;
- predict the number of unshared pairs or electrons in the central atom of a molecule;
- know the angles between bonding atoms in each of the molecular shapes;
- predict whether a molecule will be polar or non-polar based on the molecule's shape.

Sample Questions

These sample questions will give you a better idea of the types of questions you can expect on the EA/CBE. These are provided to illustrate the format of the exam. They are not the actual exam. In order to be successful on the exam, you must study the TEKS and all of the concepts previously listed.

1. What type of chemical bond usually indicates unequal sharing of electrons in a compound?
 - A Non-polar
 - B Ionic
 - C Hybrid
 - D Polar covalent

2. What is the correct order of procedure for generating hydrogen gas using zinc metal and hydrochloric acid?
 1. Place zinc in flask.
 2. Cover flask with rubber stopper.
 3. Clean and label glassware.
 4. Put on goggles and apron.
 5. Use pipette to put acid in flask.
 - A 3, 4, 5, 1, 2
 - B 3, 5, 4, 1, 2
 - C 1, 5, 2, 4, 3
 - D 4, 3, 1, 5, 2

3. An excited hydrogen electron emits a red wavelength of light approximately 680 nanometers (680×10^{-9} meters) in length at a frequency of 4.4×10^{14} hertz. Use $V = f\lambda$ to find the velocity of the wave.
 - A 4.4×10^{-4} m/s
 - B 1.55×10^{-21} m/s
 - C 3×10^8 m/s
 - D 4.4×10^8 m/s

4. Freon is a gas that was once used in refrigeration until it was discovered to cause problems for the Earth's ozone layer. A specific form of Freon contains 9.93% carbon, 58.6% chlorine, and 31.4% fluorine. If its molecular mass is 480 g/mol, what is its empirical formula?
- A $\text{C}_2\text{F}_2\text{Cl}_{12}$
B $\text{C}_4\text{F}_8\text{Cl}_{18}$
C CFC_{12}
D $\text{CF}_2\text{Cl}_{12}$
5. If you were searching for rare compounds on Earth, which of the following would you be least likely to find?
- A MnSe_2
B KrO_2
C K_3P
D AgNO_3

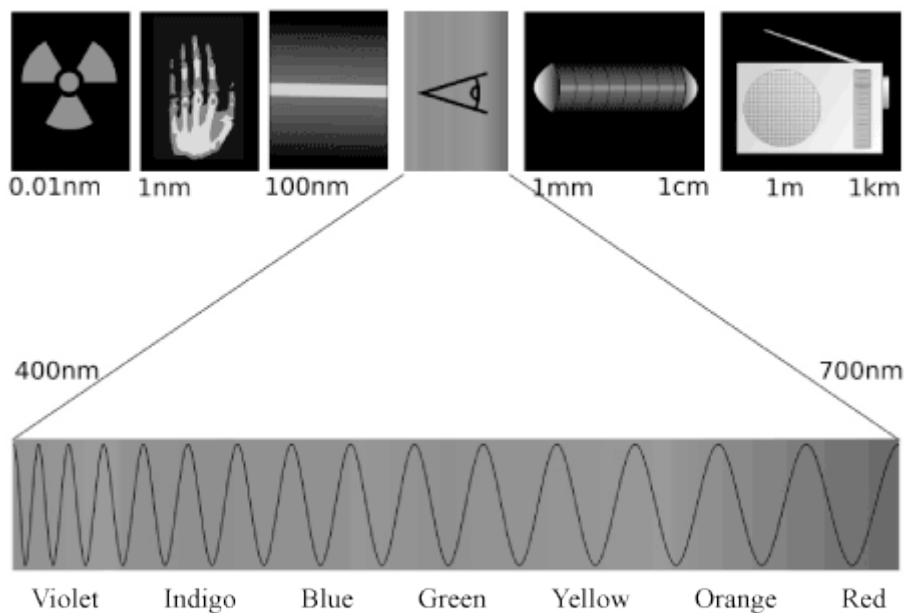
Answer Key

Item Number	Correct Answer	TEKS expectation
1	D	8A
2	D	2D
3	C	6A
4	D	11B
5	B	8A

Formula Sheet

Alpha particle = $\alpha = {}^4_2\text{He}$	Density = $\frac{\text{mass}}{\text{velocity}} : D = \frac{m}{v}$
$V = f\lambda$	Velocity = frequency • wavelength
cc = cubic centimeter = cm^3	amu = atomic mass unit
1 kilogram = 1000 grams	1 centimeter = 10 millimeters
Avogadro's number = 6.03×10^{23}	Speed of light = $3.0 \times 10^8 \text{ m/s}$

Visible Spectrum



Periodic Table of the Elements

Atomic number	14
Symbol	Si
Atomic mass	28.086
	Silicon

Group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	IA	IIA	IIIB	IVB	VB	VIB	VII	VIII	VIII	VIII	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	H 1.008 Hydrogen																	He 4.0026 Helium
2		Li 6.941 Lithium																Ne 20.179 Neon
3			Na 22.990 Sodium															Ar 39.948 Argon
4				K 39.098 Potassium														Kr 83.80 Krypton
5					Rb 85.468 Rubidium													Xe 131.29 Xenon
6						Cs 132.905 Cesium												Rn (222) Radon
7																		

Mass numbers in parentheses are those of the most stable or most common isotope.

58	Ce	59	Pr	60	Nd	61	Pm	62	Sm	63	Eu	64	Gd	65	Tb	66	Dy	67	Ho	68	Er	69	Tm	70	Yb	71	Lu
140.12	Cerium	140.908	Praseodymium	144.24	Neodymium	145	Promethium	150.36	Samarium	151.97	Europium	157.25	Gadolinium	158.925	Terbium	162.50	Dysprosium	164.930	Holmium	167.26	Erbium	168.934	Thulium	173.04	Ytterbium	174.967	Lutetium
90	Th	91	Pa	92	U	93	Np	94	Pu	95	Am	96	Cm	97	Bk	98	Cf	99	Es	100	Fm	101	Md	102	No	103	Lr
232.038	Thorium	231.036	Protactinium	238.029	Uranium	237.048	Neptunium	244	Plutonium	(243)	Americium	(247)	Curium	(247)	Berkelium	(251)	Californium	(252)	Einsteinium	(257)	Fermium	(258)	Mendelevium	(259)	Nobelium	(262)	Lawrencium

Lanthanide Series

Actinide Series