



K-16 Education Center

Continuing & Innovative Education

Integrated Physics & Chemistry B

Credit by Exam Review Sheet

This Credit by Exam Review Sheet 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 Credit by Exam/Examination for Acceleration 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 an 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 CBE/EAs are a global exam 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 Credit by Exam consists of 70 multiple-choice questions that are worth 1 point each. You will be allowed **3 hours** to take the exam and you will be allowed to use a **graphing calculator**. There is a Periodic Table of Elements and a Formula Sheet included with 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 list and sample questions below may not refer to all the material that will be in the exam. This list only provides additional information for some of the student expectations tested in the IPC Second Semester Credit by Exam. Ultimately, you should use the TEKS to guide your exam preparation.

In IPC B, students focus on the following concepts:

- Electricity
- Properties and Structures of Matter
- Solutions and Chemical Reactions

Students should be able to demonstrate mastery of these skills:

Electricity:

- Know the three subatomic particles, their charge and location, which are the most loosely held, and which are involved in charging an object;
- Summarize the difference between charged and uncharged particles in terms of their number of protons and electrons;
- Compare and contrast the three methods of charging an object, describe and example of each.

Electric Circuits:

- Describe the direction of electric field lines in a circuit;
- Friction (losing energy as a form of heat);
- Relate the strength of electric fields to the distance from a charged particle;
- Compare the direction of the current in a circuit to the direction of electron flow;
- Describe the direction of electron flow in relation to the positive and negative terminals of a battery;
- Know the various ways in which Ohm's Law is represented as a formula;
- Use and manipulate Ohm's Law to calculate voltage, resistance, or current if given two out of the three values;
- Understand that if one of the variables in Ohm's Law is changed, how the other variables are affected;
- Know how Ohm's Law can be represented graphically, and interpret the meaning of the slope of its graph;
- Interpret circuit diagrams, with emphasis on recognizing open circuits, closed circuits, series circuits, and parallel circuits;
- Compare and contrast series and parallel circuits in terms of how they are connected, how they respond to additional lights on the circuit, and how they respond when a light burns out on the circuit;
- Define voltage;
- Use the appropriate formula for calculating total resistance on both series and parallel circuits.

Magnetism and Electromagnetism:

- Describe the behavior of magnets when opposite poles are placed close to one another, and when like poles are placed close to one another;
- Describe and account for the Earth's magnetic field;
- Explain how a compass works;
- Describe how an electrical generator works;
- Be familiar with various methods for inducing a current through a wire;
- Know how to build and how to vary the strength of an electromagnet;
- Define the Tyndall Effect;
- Identify the three elements that display magnetic effects as Fe, Co, and Ni.

Matter:

- Describe the difference between pure substances, mixtures, elements and compounds;
- Describe the difference between homogeneous and heterogeneous mixtures;
- If given a sample of matter, determine if it is an element, compound, heterogeneous mixture, or homogeneous mixture;
- Provide examples of physical properties and chemical properties;
- Recognize the difference between physical and chemical properties, and physical and chemical changes;
- Summarize the various phases of matter;
- Describe why phase changes in matter are physical changes;
- Be able to calculate the density of a substance using the appropriate formula, given two out of the three variables in the formula;
- Select the appropriate scientific equipment necessary to calculate the density of an object;
- Be familiar with the various units used to express density;
- Understand that the density of a pure substance is constant, and does not depend on the amount of substance present;
- Summarize the conditions in which an object will float on water, both in terms of density and buoyancy;
- Calculate the mass of an object if given its weight on Earth;
- Define viscosity and summarize the factors that affect the viscosity of a fluid.

Atoms and Elements:

- Summarize the various models of the atom proposed through history, including the features of each model, the charges and locations of the subatomic particles in each model, and the scientists who devised the model;
- Ionizing radiation waves;
- Determine the number of protons, neutrons, and electrons in a neutral atom if given the atomic number and the mass number;
- Define isotope, and recognize isotopes of an element if given their atomic numbers and mass numbers;
- Calculate the average atomic mass of an element, if given all isotopes, their masses, and their percent abundance;
- Describe the distance of electrons around the nucleus in terms of energy;
- Recognize that electrons orbit the nucleus in discrete energy levels;
- Describe how the elements in the Periodic Table are arranged;
- Summarize the usefulness of the Periodic Table in predicting the reactivity of elements;
- Define the Law of Conservation of Atoms;
- Define valence electrons and describe their location, their readiness to interact, and their relationship to families of elements in the Periodic Table.

Radioactivity:

- Be familiar with the types of electromagnetic radiation which exist on the electromagnetic spectrum;
- Be familiar with the three types of radioactive decay (nuclear radiation);
- Balance nuclear equations, and determine the identity of elements formed from nuclear decay;

- Understand fusion and fission;
- Understand the concept of half life;
- Calculate half life problems;
- Discuss the various benefits and dangers involved in the uses and applications of radioactivity.

Changes in Matter:

- Define the term *chemical bond*;
- Compare and contrast the types of chemical bonds (ionic, covalent, and metallic);
- Describe why noble gases are stable based on their number of valence electrons;
- Recognize the chemical formula of a compound if given its name;
- Give the name of a chemical compound if given the chemical formula;
- Convert to moles, if given the molar mass (in grams) of a chemical compound;
- Convert to molar mass (in grams), if given the moles of a chemical compound;
- Review the difference between physical changes and chemical changes;
- Summarize the types of evidence which show that a chemical reaction has taken place;
- Provide the correct set of coefficients to balance a chemical equation;
- Relate balanced chemical equations to the Law of Conservation of Mass;
- Describe, compare, and contrast the five types of chemical reactions;
- Predict the products, and number of moles of each product, if given the reactants in a chemical equation.

Heat:

- Convert between the Fahrenheit, Celsius, and Kelvin temperature scales using the appropriate formulas;
- Describe the direction of heat flow, when substances of two different temperatures are in contact (endothermic/exothermic);
- Summarize the difference between conduction, convection, and radiation as methods of heat transfer;
- Explain the difference between conductors of heat and insulators of heat;
- Summarize what happens during phase changes, in terms of the average kinetic energy of the molecules, the motion of the molecules, and the level of heat energy;
- Determine the specific heat capacity, mass, heat energy lost or gained, or temperature change of a substance using the appropriate formula ($Q = mc\Delta T$);
- Relate the technique of calorimetry to the Law of Conservation of Energy.

Solution Chemistry:

- Describe why water is a polar molecule;
- Summarize the factors which make water an unusual substance, including its density and hydrogen bonding;
- Define the terms *solute*, *solvent*, *solution*, and *solubility*;
- Describe the factors that affect the solubility of a solute, including temperature, stirring, and surface area;
- Determine the solute and solvent, if given a mixture of different volumes of liquids;
- Define acids and bases in terms of pH, and if they are proton donors or acceptors;
- Be able to differentiate between weak and strong acids and bases in a pH scale;

- Determine the pH of a substance if given its hydronium ion concentration;
- Identify the acid, base, conjugate acid, and conjugate base if given an acid-base chemical equation.

Sample Questions

These sample questions will give you a better idea of the types of questions you can expect on the Credit by Exam. 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 and review the TEKS and the concepts previously listed.

Multiple-Choice

1. Because even a good conductor such as copper wire provides some resistance to the movement of electrons, part of the electrical energy in a circuit is converted to
 - A ions.
 - B heat.
 - C electrons.
 - D positive charges.
2. Evidence that the Earth's magnetic poles have wandered and reversed can be found in
 - A Aurora Borealis.
 - B igneous geologic formations.
 - C changing weather patterns.
 - D gravitational differences.
3. Hard water contains dissolved minerals such as magnesium sulfate that can be removed using a water softener in a chemical reaction. If two moles of MgSO_4 are removed from 10 L of water, how many grams of this mineral were extracted?
 - A 12 g
 - B 120 g
 - C 240 g
 - D 360 g
4. If five moles of hydrogen gas are burned while combining with two and a half moles of oxygen gas in the formation of water, how many moles of water have been created?
 - A 2.5
 - B 5
 - C 7.5
 - D 12.5

5. What is the oxidation number for manganese in the compound potassium permanganate KMnO_4 ?
- A +2
B +4
C +6
D +7

Answer Key

Item Number	Correct Answer	TEKS Expectation	TAKS Objective
1	B	112.42(c)6F	5, 6(F)
2	B	112.42(c)3A	1, 3(A)
3	C	112.42(c)8A	4, 7(D)
4	B	112.42(c)8C	4, 8(C)
5	D	112.42(c)8B,8C	4, 7(D), 8(C)

Formulas

Area = length x width	$A = l \cdot w$
Density = $\frac{\text{mass}}{\text{volume}}$	$D = \frac{m}{v}$
% error = $\frac{\text{actual} - \text{experimental}}{\text{actual}} \times 100$	$\% \text{ err} = \frac{\text{act} - \text{exp}}{\text{act}} \times 100$
Force = mass x acceleration	$F = m \cdot a$
distance = velocity x time	$d = v \cdot t$
final velocity = initial velocity + acceleration x time	$v_f = v_i + a \cdot t$
Acceleration = $\frac{\text{final velocity} - \text{initial velocity}}{\text{change in time}}$	$a = \frac{\Delta v}{t}$
Momentum = mass x velocity	$p = m \cdot v$
Weight = mass x gravity	$W = m \cdot g$
Gravitational potential energy = mass x gravity x height	$GPE = mgh$
Kinetic energy = $\frac{1}{2}(\text{mass} \times \text{velocity}^2)$	$KE = \frac{1}{2}mv^2$
Work = force x distance	$W = F \cdot d$
Power = $\frac{\text{work}}{\text{time}}$	$P = \left(\frac{W}{t} \right)$
Power = Force x velocity	$P = F \cdot v$
Ideal Mechanical Advantage = $\frac{\text{length}}{\text{height}}$	$IMA = \frac{L}{H}$
Ideal Mechanical Advantage = $\frac{\text{length of slope}}{\text{height of slope}}$	$IMA = \frac{L_s}{H_s}$
Ideal Mechanical Advantage = $\frac{\text{length of effort arm}}{\text{length of resistance arm}}$	$IMA = \frac{L_e}{L_r}$
Actual Mechanical Advantage = $\frac{\text{mass}}{\text{effort force}}$	$AMA = \frac{m}{F_{\text{effort}}}$
% Efficiency = $\left(\frac{\text{Work Output}}{\text{Work Input}} \right) \times 100$	$\%E = \left(\frac{W_{\text{out}}}{W_{\text{in}}} \right) \times 100$

Period = $2\pi \sqrt{\frac{\text{Length}}{\text{gravity}}}$	$T = 2\pi \sqrt{\frac{L}{g}}$
Period = $2\pi \sqrt{\frac{\text{mass}}{\text{spring constant}}}$	$T = 2\pi \sqrt{\frac{m}{k}}$
spring constant = $\left[\frac{\text{Force}}{\text{distance}} \right]$	$k = \left[\frac{F}{d} \right]$
frequency = $\frac{\text{number of waves}}{\text{time}}$	$f = \frac{\# \text{ of waves}}{t}$
wave speed = frequency x wavelength	$v = f\lambda$
Magnification = $\frac{\text{height of image}}{\text{height of object}}$	$M = \frac{h_i}{h_o}$
Current = $\frac{\text{voltage}}{\text{resistance}}$	$I = \frac{V}{R}$
Total Resistance = Sum of Resistance	$R_T = R_1 + R_2 + R_3 \dots$
Total Resistance = Sum of the inverse of resistance	$R_T = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots$
pH = - log [concentration of hydronium]	$pH = -\log [H^+]$
energy = mass x specific heat x change in temperature	$q = m \cdot c \cdot \Delta T$

Constants and Conversion Factors

$^{\circ}F = \left(\frac{9}{5} \cdot ^{\circ}C \right) + 32$	$K = ^{\circ}C + 273$
speed of light = $c = 3.0 \times 10^8$ m/s	speed of sound = 340 m/s
gravity = $g = 9.8$ m/s ²	1 inch = 2.54 centimeters
1 foot = 12 inches = 0.305 meter	1 yard = 0.915 meter
1 meter = 100 centimeters	1 mile = 5280 feet
1 year = 365 days	

Atomic number — 14

Symbol

5

Atomic mass — 28.086

Name

18
VIII A

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		VIIB		VIII		IB		IIB		IIIA		IVA		VA		VIA		VIIA		VIIIA																																																				
Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass		Symbol		Atomic mass																																																
1	H	1.008	Hydrogen	2	He	4.0026	Helium	3	Li	6.941	Lithium	4	Be	9.012	Beryllium	5	B	10.81	Boron	6	C	12.011	Carbon	7	N	14.007	Nitrogen	8	O	15.999	Oxygen	9	F	18.998	Fluorine	10	Ne	20.179	Neon																																											
2	Na	22.990	Sodium	3	Mg	24.305	Magnesium	4	Al	26.982	Aluminum	5	Si	28.086	Silicon	6	P	30.974	Phosphorus	7	S	32.066	Sulfur	8	Cl	35.453	Chlorine	9	Ar	39.948	Argon																																																			
3	K	39.098	Potassium	4	Ca	40.08	Calcium	5	Sc	44.956	Scandium	6	Ti	47.88	Titanium	7	V	50.942	Vanadium	8	Cr	51.996	Chromium	9	Mn	54.938	Manganese	10	Fe	55.847	Iron	11	Co	58.933	Cobalt	12	Ni	58.69	Nickel	13	Cu	63.546	Copper	14	Zn	65.39	Zinc	15	Ga	69.72	Gallium	16	Ge	72.61	Germanium	17	As	74.922	Arsenic	18	Se	78.96	Selenium	19	Br	79.904	Bromine	20	Kr	83.80	Krypton											
4	Rb	85.468	Rubidium	5	Sr	87.62	Sr	6	Y	88.906	Yttrium	7	Zr	91.224	Zirconium	8	Nb	92.906	Niobium	9	Mo	95.94	Molybdenum	10	Tc	(98)	Technetium	11	Ru	101.07	Ruthenium	12	Rh	102.906	Rhodium	13	Pd	106.42	Palladium	14	Ag	107.868	Silver	15	Cd	112.41	Cadmium	16	In	114.82	Indium	17	Sn	118.71	Tin	18	Sb	121.763	Antimony	19	Te	127.60	Tellurium	20	I	126.904	Iodine	21	Xe	131.29	Xenon											
5	Cs	132.905	Cesium	6	Ba	137.33	Barium	7	La	138.906	Lanthanum	8	Hf	178.49	Hafnium	9	Ta	180.948	Tantalum	10	W	183.84	Tungsten	11	Re	186.207	Rhenium	12	Os	190.23	Osmium	13	Ir	192.22	Iridium	14	Pt	195.08	Platinum	15	Au	196.967	Gold	16	Hg	200.59	Mercury	17	Tl	204.383	Thallium	18	Pb	207.2	Lead	19	Bi	208.980	Bismuth	20	Po	(209)	Polonium	21	At	(210)	Astatine	22	Rn	(222)	Radon											
6	Fr	(223)	Francium	7	Ra	(226)	Radium	8	Ac	(227)	Actinium	9	Th	(232)	Thorium	10	Pa	(231)	Protactinium	11	U	(238)	Uranium	12	Np	(237)	Neptunium	13	Pu	(244)	Plutonium	14	Am	(243)	Americium	15	Cm	(247)	Curium	16	Bk	(247)	Berkelium	17	Cf	(251)	Californium	18	Es	(252)	Einsteinium	19	Fm	(257)	Fermium	20	Md	(288)	Mendelevium	21	No	(289)	Nobelium	22	Lr	(262)	Lutetium															
7	Mass numbers in parentheses are those of the most stable or most common isotope.																						23	La	138.905	Lanthanum	24	Ce	140.12	Cerium	25	Pr	140.907	Praseodymium	26	Nd	144.24	Neodymium	27	Pm	(145)	Promethium	28	Sm	150.36	Samarium	29	Eu	151.96	Europium	30	Gd	157.25	Gadolinium	31	Tb	158.925	Terbium	32	Dy	162.50	Dysprosium	33	Ho	164.93	Holmium	34	Er	167.26	Erbium	35	Tm	168.93	Thulium	36	Yb	173.05	Ytterbium	37	Lu	174.967	Lutetium

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

Lanthanide Series

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
140.12	140.908	144.24	(145)	150.36	151.97	157.25	158.925	162.50	164.930	167.26	168.934	173.04	174.967
Cerium	Praseodymium	Neodymium	Promethium	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium	Lutetium

Actinide Series

90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
232.038	231.036	238.029	237.048	(244)	(243)	(247)	(247)	(251)	(252)	(257)	(258)	(259)	(262)
Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium	Lawrencium