Example Items

Chemistry
Pre-AP

Chemistry Pre-AP Example Items are a **representative set** of items for the ACP. Teachers may use this set of items along with the test blueprint as guides to prepare students for the ACP. On the last page, the correct answer, content SE and SE justification are listed for each item.

The specific part of an SE that an Example Item measures is NOT necessarily the only part of the SE that is assessed on the ACP. None of these Example Items will appear on the ACP.

Teachers may provide feedback regarding Example Items.

(1) Download the Example Feedback Form and email it. The form is located on the homepage of Assessment.dallasisd.org.

OR

(2) To submit directly, click "Example Feedback" **after** you login to the Assessment website.

First Semester
2018–2019
Code #: 3201

STAAR CHEMISTRY REFERENCE MATERIALS

ATOMIC STRUCTURE

Speed of light = (frequency)(wavelength) $c = f\lambda$

Energy = (Planck's constant)(frequency) $E_{photon} = hf$

$$\text{Energy} = \frac{(\text{Planck's constant})(\text{speed of light})}{(\text{wavelength})} \qquad E_{photon} = \frac{hc}{\lambda}$$

BEHAVIOR OF GASES

$$\text{Total pressure of a gas} = \begin{pmatrix}\text{sum of the partial pressures}\\ \text{of the component gases}\end{pmatrix} \qquad P_T = P_1 + P_2 + P_3 + \ \ldots$$

(Pressure)(volume) = (moles)(ideal gas constant)(temperature) $PV = nRT$

$$\frac{(\text{Initial pressure})(\text{initial volume})}{(\text{Initial moles})(\text{initial temperature})} = \frac{(\text{final pressure})(\text{final volume})}{(\text{final moles})(\text{final temperature})} \qquad \frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$$

(Initial pressure)(initial volume) = (final pressure)(final volume) $P_1V_1 = P_2V_2$

$$\frac{(\text{Initial volume})}{(\text{Initial temperature})} = \frac{(\text{final volume})}{(\text{final temperature})} \qquad \frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{(\text{Initial volume})}{(\text{Initial moles})} = \frac{(\text{final volume})}{(\text{final moles})} \qquad \frac{V_1}{n_1} = \frac{V_2}{n_2}$$

SOLUTIONS

$$\text{Molarity} = \frac{\text{moles of solute}}{\text{liter of solution}} \qquad M = \frac{\text{mol}}{\text{L}}$$

$$\text{Ionization constant of water} = \begin{pmatrix}\text{hydrogen ion}\\ \text{concentration}\end{pmatrix}\begin{pmatrix}\text{hydroxide ion}\\ \text{concentration}\end{pmatrix} \qquad K_w = [H^+][OH^-]$$

$$\begin{pmatrix}\text{Volume of}\\ \text{solution 1}\end{pmatrix}\begin{pmatrix}\text{molarity of}\\ \text{solution 1}\end{pmatrix} = \begin{pmatrix}\text{volume of}\\ \text{solution 2}\end{pmatrix}\begin{pmatrix}\text{molarity of}\\ \text{solution 2}\end{pmatrix} \qquad V_1M_1 = V_2M_2$$

pH = –logarithm (hydrogen ion concentration) $pH = -\log[H^+]$

THERMOCHEMISTRY

$$\text{Heat gained or lost} = (\text{mass})\begin{pmatrix}\text{specific}\\ \text{heat}\end{pmatrix}\begin{pmatrix}\text{change in}\\ \text{temperature}\end{pmatrix} \qquad Q = mc_p\Delta T$$

$$\text{Enthalpy of reaction} = \begin{pmatrix}\text{enthalpy}\\ \text{of products}\end{pmatrix} - \begin{pmatrix}\text{enthalpy}\\ \text{of reactants}\end{pmatrix} \qquad \Delta H = \Delta H^o_f(\text{products}) - \Delta H^o_f(\text{reactants})$$

STAAR CHEMISTRY REFERENCE MATERIALS

OTHER FORMULAS

$$\text{Density} = \frac{\text{mass}}{\text{volume}} \qquad D = \frac{m}{V}$$

$$\text{Percent error} = \left(\frac{\text{accepted value} - \text{experimental value}}{\text{accepted value}}\right)(100)$$

$$\text{Percent yield} = \left(\frac{\text{actual yield}}{\text{theoretical yield}}\right)(100)$$

CONSTANTS AND CONVERSIONS

Avogadro's number $= 6.02 \times 10^{23}$ particles per mole

h = Planck's constant $= 6.63 \times 10^{-34}\ \text{J} \cdot \text{s}$

c = speed of light $= 3.00 \times 10^{8}\ \frac{\text{m}}{\text{s}}$

K_w = ionization constant of water $= 1.00 \times 10^{-14}\left(\frac{\text{mol}}{\text{L}}\right)^2$

alpha particle (α) $= {}^{4}_{2}\text{He}$ beta particle (β) $= {}^{0}_{-1}\text{e}$ neutron $= {}^{1}_{0}\text{n}$

standard temperature and pressure (STP) = 0°C and 1 atm

0°C = 273 K

volume of ideal gas at STP $= 22.4\ \frac{\text{L}}{\text{mol}}$

$1\ \text{cm}^3 = 1\ \text{mL} = 1\ \text{cc}$

1 atm = 760 mm Hg = 101.3 kPa

R = ideal gas constant $= 0.0821\ \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}} = 8.31\ \frac{\text{L} \cdot \text{kPa}}{\text{mol} \cdot \text{K}} = 62.4\ \frac{\text{L} \cdot \text{mm Hg}}{\text{mol} \cdot \text{K}}$

1 calorie (cal) = 4.18 joules (J)

1000 calories (cal) = 1 Calorie (Cal) = 1 kilocalorie (kcal)

RULES FOR SIGNIFICANT FIGURES

1. Non-zero digits and zeros between non-zero digits are always significant.
2. Leading zeros are not significant.
3. Zeros to the right of all non-zero digits are only significant if a decimal point is shown.
4. For values written in scientific notation, the digits in the coefficient are significant.
5. In a common logarithm, there are as many digits after the decimal point as there are significant figures in the original number.

STAAR CHEMISTRY REFERENCE MATERIALS

STAAR State of Texas Assessments of Academic Readiness

POLYATOMIC IONS

Acetate	$C_2H_3O_2^-$, CH_3COO^-
Ammonium	NH_4^+
Carbonate	CO_3^{2-}
Chlorate	ClO_3^-
Chlorite	ClO_2^-
Chromate	CrO_4^{2-}
Cyanide	CN^-
Dichromate	$Cr_2O_7^{2-}$
Hydrogen carbonate	HCO_3^-
Hydroxide	OH^-
Hypochlorite	ClO^-
Nitrate	NO_3^-
Nitrite	NO_2^-
Perchlorate	ClO_4^-
Permanganate	MnO_4^-
Phosphate	PO_4^{3-}
Sulfate	SO_4^{2-}
Sulfite	SO_3^{2-}

SOLUBILITY OF COMMON IONIC COMPOUNDS IN WATER

Soluble compounds contain	Common exceptions
$C_2H_3O_2^-$, CH_3COO^-	None
NH_4^+	None
NO_3^-	None
CN^-	None
ClO^-	None
ClO_2^-	None
ClO_3^-	None
ClO_4^-	None
Br^-	Compounds of Ag^+, Pb^{2+}, and Hg_2^{2+}
Cl^-	Compounds of Ag^+, Pb^{2+}, and Hg_2^{2+}
I^-	Compounds of Sr^{2+}, Ba^{2+}, Pb^{2+}, and Hg_2^{2+}
SO_4^{2-}	Compounds of Sr^{2+}, Ba^{2+}, Pb^{2+}, and Hg_2^{2+}

Insoluble compounds contain	Common exceptions
CO_3^{2-}	Compounds of NH_4^+ and the alkali metal cations
PO_4^{3-}	Compounds of NH_4^+ and the alkali metal cations
CrO_4^{2-}	Compounds of NH_4^+ and the alkali metal cations
$Cr_2O_7^{2-}$	Compounds of NH_4^+ and the alkali metal cations
OH^-	Compounds of NH_4^+, the alkali metal cations, Ca^{2+}, Sr^{2+}, and Ba^{2+}
S^{2-}	Compounds of NH_4^+, the alkali metal cations, Ca^{2+}, Sr^{2+}, and Ba^{2+}

ACTIVITY SERIES

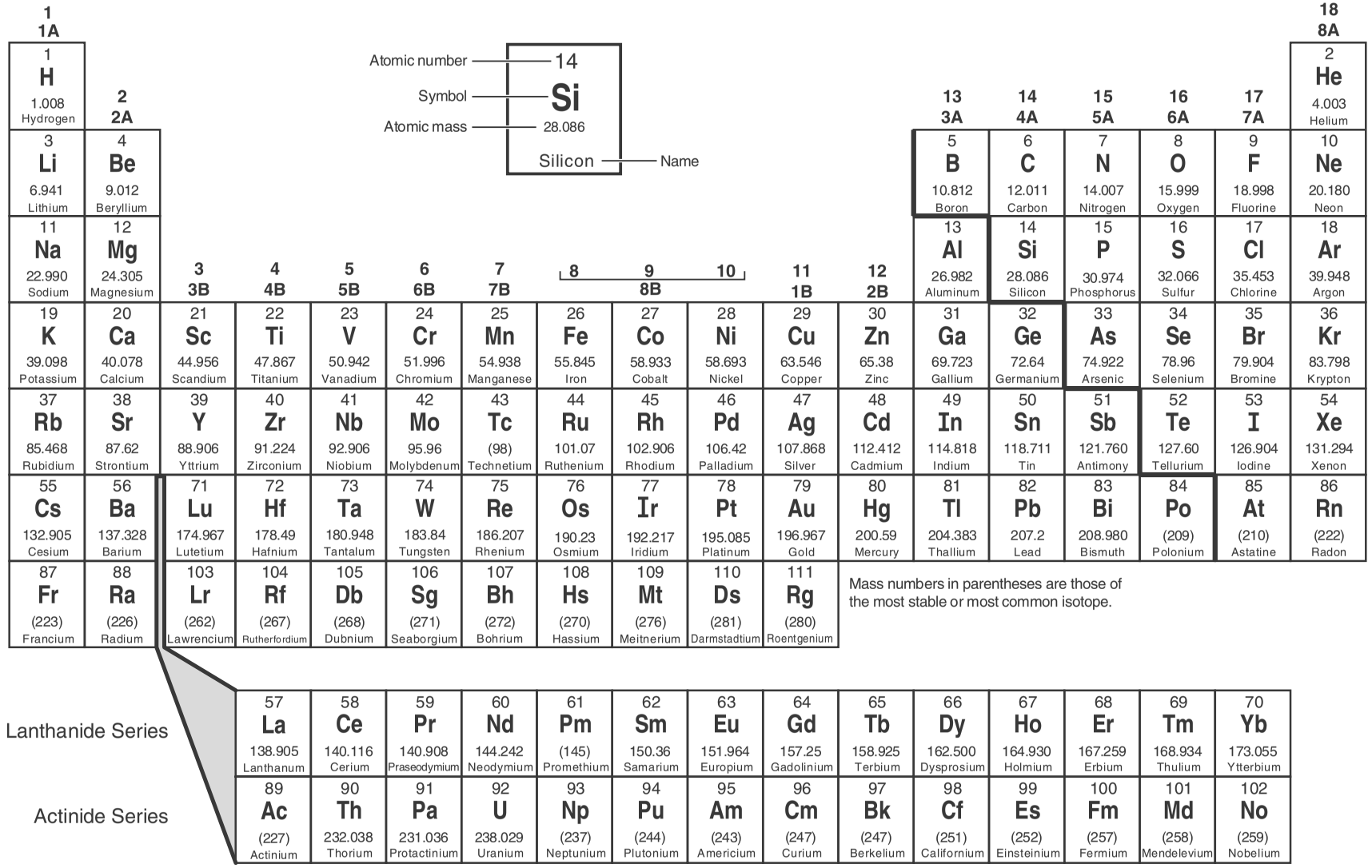
Metal

Lithium
Potassium
Barium
Calcium
Sodium
Magnesium
Aluminum
Manganese
Zinc
Chromium
Iron
Cobalt
Nickel
Tin
Lead
(Hydrogen)
Copper
Mercury
Silver
Platinum
Gold

STAAR CHEMISTRY REFERENCE MATERIALS

STAAR™ State of Texas Assessments of Academic Readiness

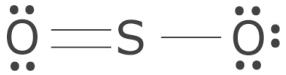
PERIODIC TABLE OF THE ELEMENTS

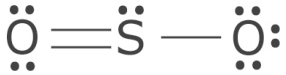


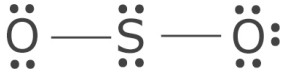
Updated Spring 2011

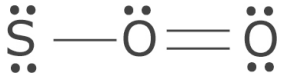
EXAMPLE ITEMS Chemistry Pre-AP, Sem 1

1 What is the Lewis electron dot structure for the covalent compound sulfur dioxide?

A 

B 

C 

D 

2 An unknown element was recently discovered and found to have the characteristics shown in the table.

Characteristics of _____?_____
1. Shares 1 electron or gains 1 electron to attain a stable noble gas configuration.
2. Is very reactive.
3. Is a gas at room temperature.
4. Readily forms salts.

In which group does the unknown element most likely belong?

A Alkali Metals

B Alkaline Earth Metals

C Halogens

D Transition Metals

3 A 14-karat gold ring consists of 14 parts gold and 10 parts copper. This alloy can be separated by density when melted. Which type of matter is the 14-karat gold ring?

A Compound

B Pure substance

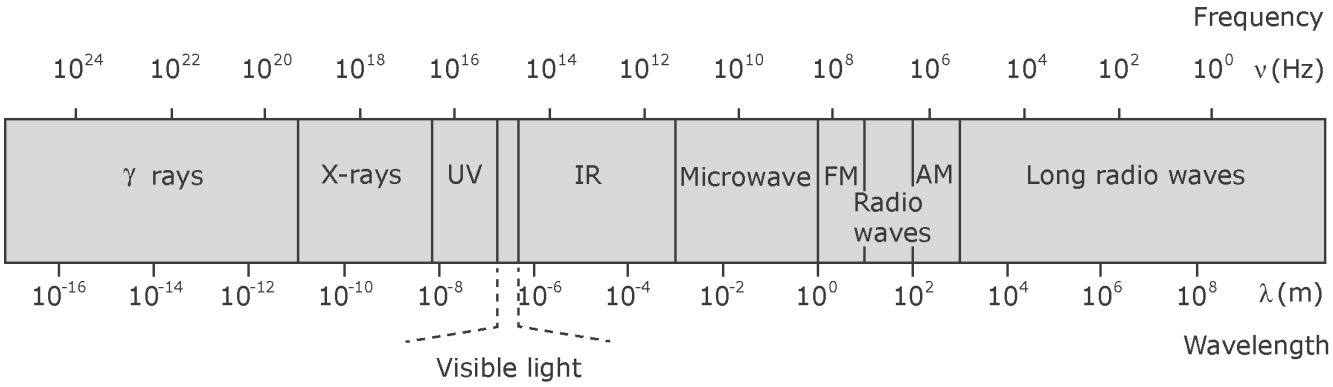
C Homogeneous mixture

D Heterogeneous mixture

Dallas ISD - Example Items

EXAMPLE ITEMS Chemistry Pre-AP, Sem 1

Use the electromagnetic spectrum to answer the next question.



4 Which type of electromagnetic waves have the greatest energy?

A Gamma rays

B Microwaves

C Radio waves

D Visible light

5 What is the percent composition of phosphorus in the compound $Ca_3(PO_4)_2$?

A 10.0%

B 20.0%

C 30.0%

D 50.0%

6 An unbalanced chemical reaction is shown.

$$\_\_SnCl_4 + \_\_Fe \rightarrow \_\_SnCl_2 + \_\_FeCl_3$$

When the equation is balanced, what is the coefficient of $SnCl_2$?

A 2

B 3

C 4

D 6

Dallas ISD - Example Items

EXAMPLE ITEMS Chemistry Pre-AP, Sem 1

7 Matter exists as a solid, a liquid or a gas. The solid state is distinguished by its ability to —

A be easily compressible

B take the shape of a container

C have particles of low density

D maintain an ordered pattern

8 Which represents the ground state electron configuration for manganese?

A $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^5$

B $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 4d^5$

C $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^7$

D $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4d^7$

9 What is the formula of the compound lead (IV) phosphide?

A Pb_3P_4

B Pb_4P_3

C P_3Pb_4

D P_4Pb_3

10 What causes the atomic radius of the elements to decrease across Period 3 from left to right?

A The shielding effect

B The decreasing metallic character

C The increasing nuclear charge

D The increasing number of neutrons

11 Determine the number of molecules in 11 grams of CO_2.

A 2.4×10^{24}

B 4.0×10^{0}

C 4.2×10^{-25}

D 1.5×10^{23}

Dallas ISD - Example Items

EXAMPLE ITEMS Chemistry Pre-AP, Sem 1

12 The Electron Sea Model explains why metals —

A are excellent conductors

B are very reactive

C accept electrons easily

D form ionic compounds

13 What is the name of the compound $FeCl_3$?

A Iron chloride

B Iron trichloride

C Iron tetrachloride

D Iron (III) chloride

14 Which statement is a chemical property of copper?

A It is a mineral.

B It is a liquid at 1083 °C.

C It reacts with nitric acid.

D It is malleable and ductile.

15 Which is an example of an empirical formula?

A H_2O_2

B N_2O_2

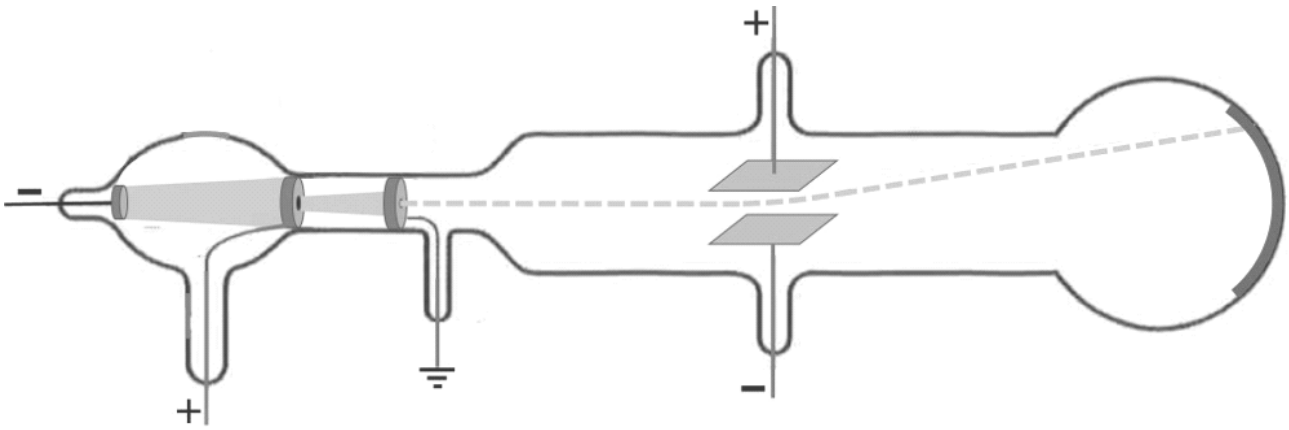
C C_3H_2

D B_2H_6

Dallas ISD - Example Items

EXAMPLE ITEMS Chemistry Pre-AP, Sem 1

16 The figure shows a cathode ray tube.



In 1897, J.J. Thomason used a device like the one shown to discover that cathode rays were streams of —

A photons

B electrons

C protons

D ions

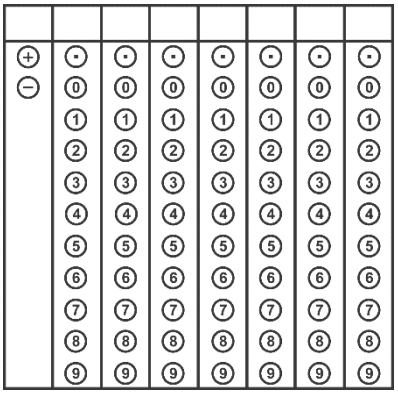
17 The table shows the two isotopes of an unknown element.

Isotope	Mass (amu)	Percent Abundance	Average Mass
x	10.013	19.8%	
y	11.009	80.2%	
Average Atomic Mass			**?**

What is the average atomic mass of the unknown element?

(Express the answer to three significant figures.)

Record the answer and fill in the bubbles on the grid provided. Be sure to use the correct place value.



EXAMPLE ITEMS Chemistry Pre-AP Key, Sem 1

Item#	Key	SE	Process Skills	SE Justification
1	B	C.7C	2I	Construct electron dot formulas to illustrate covalent bonds.
2	C	C.5B	2H	Use the Periodic Table to identify and explain the properties of chemical families including halogens.
3	C	C.4D	--	Classify matter as pure substances or mixtures through investigation of their properties.
4	A	C.6B	2H, 2I	Describe the mathematical relationships between energy, frequency, and wavelength of light using the electromagnetic spectrum.
5	B	C.8C	2G	Calculate percent composition of compounds.
6	B	C.8E	2G	Balance chemical equations using the law of conservation of mass.
7	D	C.4C	--	Compare solids, liquids, and gases in terms of, structure.
8	A	C.6D	--	Express the arrangement of electrons in atoms using electron configurations.
9	A	C.7B	--	Write the chemical formulas of ionic compounds containing representative elements.
10	C	C.5C	2H	Interpret periodic trends including atomic radius using the Periodic Table.
11	D	C.8B	2G	Calculate the number of molecules in a sample of material using Avogadro’s number.
12	A	C.7D	--	Describe metallic bonding and explain electrical conductivity.
13	D	C.7A	--	Name ionic compounds containing transition metals using the International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules.
14	C	C.4A	--	Differentiate between physical and chemical properties.
15	C	C.8D	--	Differentiate between empirical and molecular formulas.
16	B	C.6A	3F	Describe the experimental design and conclusions used in the development of modern atomic theory, including Thomson's discovery of electron properties.
17	10.8	C.6C	2H, 2G	Calculate average atomic mass of an element using isotopic composition.