Example Items

Integrated Physics and Chemistry

Integrated Physics and Chemistry 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 #: 3291

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

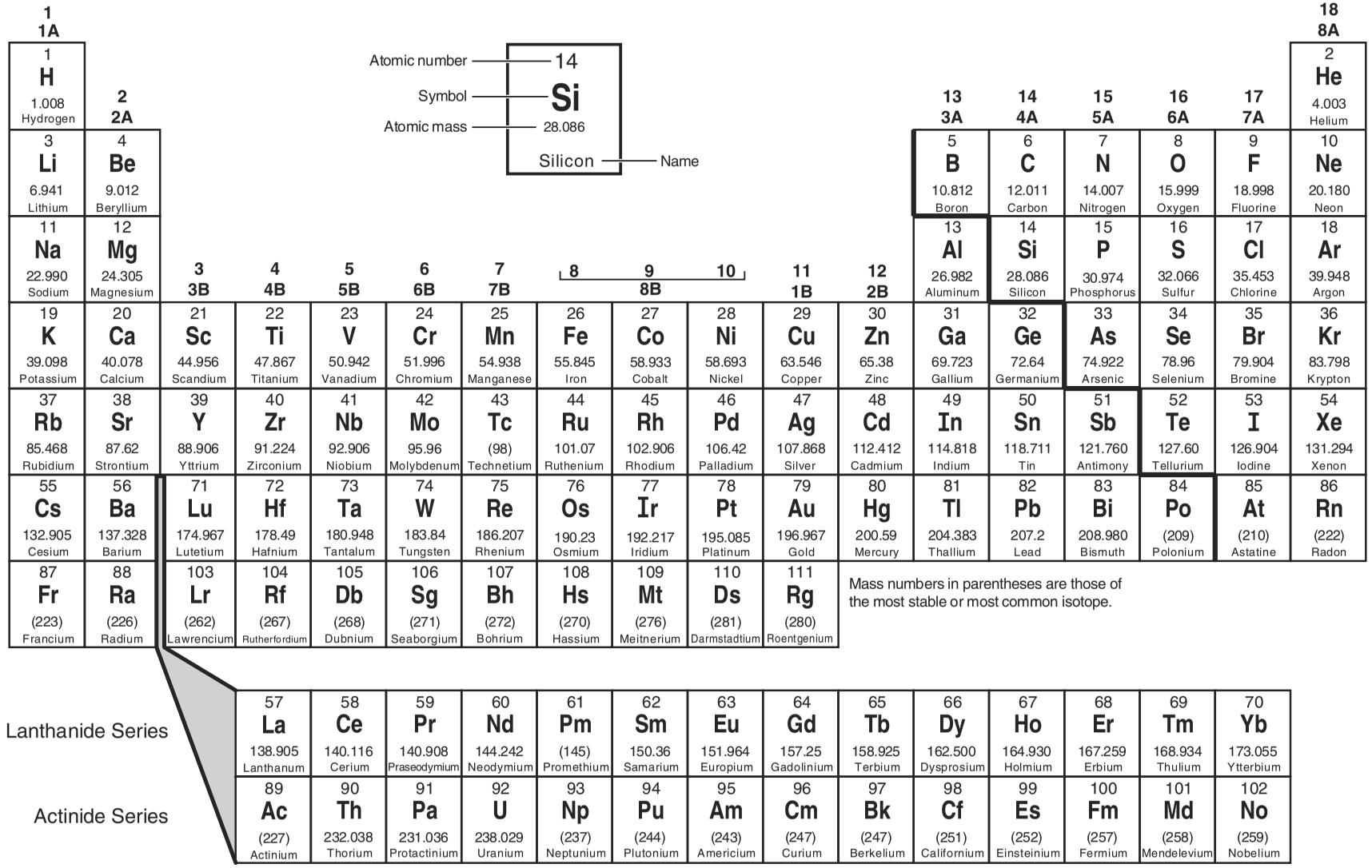
Metal

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



	1 1A												13 3A	14 4A	15 5A	16 6A	17 7A	18 8A
1	1 H 1.008 Hydrogen	2 2A																2 He 4.003 Helium
2	3 Li 6.941 Lithium	4 Be 9.012 Beryllium											5 B 10.812 Boron	6 C 12.011 Carbon	7 N 14.007 Nitrogen	8 O 15.999 Oxygen	9 F 18.998 Fluorine	10 Ne 20.180 Neon
3	11 Na 22.990 Sodium	12 Mg 24.305 Magnesium	3 3B	4 4B	5 5B	6 6B	7 7B	8	9 8B	10	11 1B	12 2B	13 Al 26.982 Aluminum	14 Si 28.086 Silicon	15 P 30.974 Phosphorus	16 S 32.066 Sulfur	17 Cl 35.453 Chlorine	18 Ar 39.948 Argon
4	19 K 39.098 Potassium	20 Ca 40.078 Calcium	21 Sc 44.956 Scandium	22 Ti 47.867 Titanium	23 V 50.942 Vanadium	24 Cr 51.996 Chromium	25 Mn 54.938 Manganese	26 Fe 55.845 Iron	27 Co 58.933 Cobalt	28 Ni 58.693 Nickel	29 Cu 63.546 Copper	30 Zn 65.38 Zinc	31 Ga 69.723 Gallium	32 Ge 72.64 Germanium	33 As 74.922 Arsenic	34 Se 78.96 Selenium	35 Br 79.904 Bromine	36 Kr 83.798 Krypton
5	37 Rb 85.468 Rubidium	38 Sr 87.62 Strontium	39 Y 88.906 Yttrium	40 Zr 91.224 Zirconium	41 Nb 92.906 Niobium	42 Mo 95.96 Molybdenum	43 Tc (98) Technetium	44 Ru 101.07 Ruthenium	45 Rh 102.906 Rhodium	46 Pd 106.42 Palladium	47 Ag 107.868 Silver	48 Cd 112.412 Cadmium	49 In 114.818 Indium	50 Sn 118.711 Tin	51 Sb 121.760 Antimony	52 Te 127.60 Tellurium	53 I 126.904 Iodine	54 Xe 131.294 Xenon
6	55 Cs 132.905 Cesium	56 Ba 137.328 Barium	71 Lu 174.967 Lutetium	72 Hf 178.49 Hafnium	73 Ta 180.948 Tantalum	74 W 183.84 Tungsten	75 Re 186.207 Rhenium	76 Os 190.23 Osmium	77 Ir 192.217 Iridium	78 Pt 195.085 Platinum	79 Au 196.967 Gold	80 Hg 200.59 Mercury	81 Tl 204.383 Thallium	82 Pb 207.2 Lead	83 Bi 208.980 Bismuth	84 Po (209) Polonium	85 At (210) Astatine	86 Rn (222) Radon
7	87 Fr (223) Francium	88 Ra (226) Radium	103 Lr (262) Lawrencium	104 Rf (267) Rutherfordium	105 Db (268) Dubnium	106 Sg (271) Seaborgium	107 Bh (272) Bohrium	108 Hs (270) Hassium	109 Mt (276) Meitnerium	110 Ds (281) Darmstadtium	111 Rg (280) Roentgenium							

Lanthanide Series	57 La 138.905 Lanthanum	58 Ce 140.116 Cerium	59 Pr 140.908 Praseodymium	60 Nd 144.242 Neodymium	61 Pm (145) Promethium	62 Sm 150.36 Samarium	63 Eu 151.964 Europium	64 Gd 157.25 Gadolinium	65 Tb 158.925 Terbium	66 Dy 162.500 Dysprosium	67 Ho 164.930 Holmium	68 Er 167.259 Erbium	69 Tm 168.934 Thulium	70 Yb 173.055 Ytterbium
Actinide Series	89 Ac (227) Actinium	90 Th 232.038 Thorium	91 Pa 231.036 Protactinium	92 U 238.029 Uranium	93 Np (237) Neptunium	94 Pu (244) Plutonium	95 Am (243) Americium	96 Cm (247) Curium	97 Bk (247) Berkelium	98 Cf (251) Californium	99 Es (252) Einsteinium	100 Fm (257) Fermium	101 Md (258) Mendelevium	102 No (259) Nobelium

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

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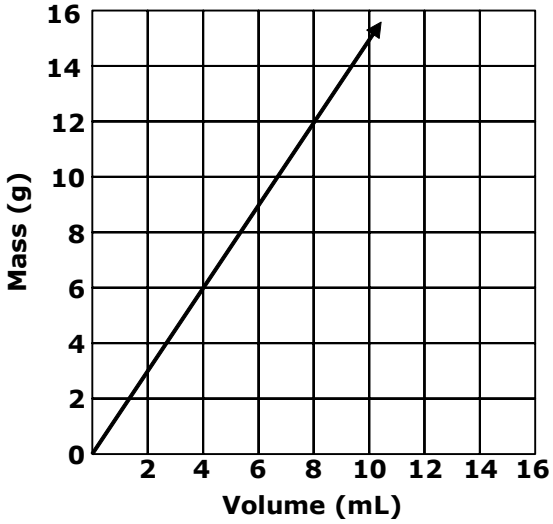
EXAMPLE ITEMS IPC, Sem 1

1 The graph shows the relationship between the mass and volume of a certain liquid.



Based on the information in the graph, what is the density of this liquid?

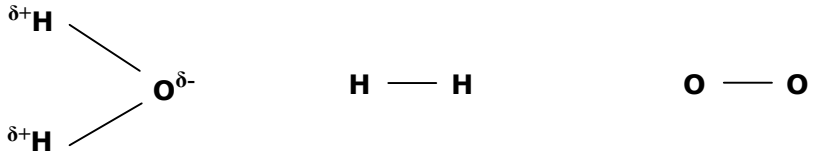
A 0.67 g/mL

B 1.5 g/mL

C 2 g/mL

D 24 g/mL

2 As part of an assignment on polar covalence, IPC students were given the molecular diagrams shown.



Water **Hydrogen** **Oxygen**

Which molecule is a polar covalent molecule?

A Hydrogen only

B Oxygen only

C Water only

D Water, hydrogen, and oxygen

Dallas ISD - Example Items

EXAMPLE ITEMS IPC, Sem 1

3 The table summarizes the characteristics of one state of matter. It also provides the microscopic explanation for each characteristic.

Characteristics	Microscopic Explanation for Characteristic
Takes the shape of its container	Particles can move and slide past one another
Not easily compressible	There is little free space between particles
Flows easily	Particles can move and slide past one another

Which state of matter is described?

A Gas

B Plasma

C Solid

D Liquid

4 Which nuclear reaction results in the nuclei of two hydrogen isotopes combining to form a helium nucleus?

A Nuclear fusion

B Nuclear fission

C Nuclear combustion

D Nuclear meltdown

5 Why are magnesium and calcium in the same group of the Periodic Table?

A Both elements are alkali metals.

B Both elements are ductile and malleable.

C Both elements have the same number of energy levels.

D Both elements have the same number of valence electrons.

6 A carbon atom combines with four hydrogen atoms to form methane, CH_4. What is the role of the valence electrons in this chemical change?

A To produce a color change

B To create a precipitate

C To form covalent bonds

D All of the above

EXAMPLE ITEMS IPC, Sem 1

7 Two liquids, both at room temperature, are poured into a beaker. They combine chemically in reaction to form a new substance that's warmer than two reactants. As a result of the reaction, the new substance is —

A an endothermic reaction

B an exothermic reaction

C unable to be classified

D both an endothermic and exothermic reaction

8 What is an environmental effect of the depletion of the ozone layer?

A An increase in the production and use of oil

B An increase in carbon dioxide in the atmosphere

C An increase in the use of chlorofluorocarbons (CFC's)

D An increase in the number of people with skin cancer

9 Thermal energy causes ice to melt and become liquid water. During the melting process, thermal energy flows —

A out of the surrounding warmer environment and into the cooler ice

B into the surrounding warmer environment and out of the cooler ice

C out of the surrounding warmer environment and out of the cooler ice

D into the surrounding warmer environment and into the cooler ice

10 Sodium (Na) reacts with 77 g of chlorine (Cl) to produce 127 g of table salt (NaCl). How many grams of sodium react?

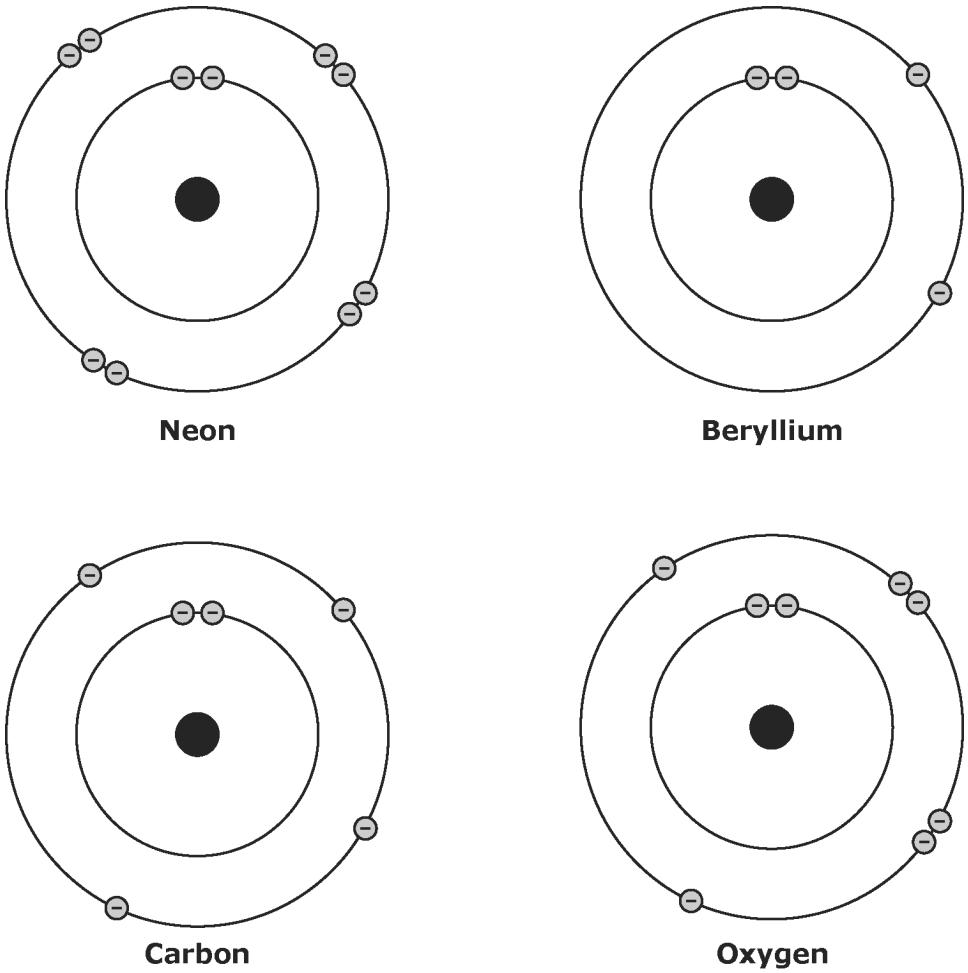
A 50 g

B 77 g

C 127 g

D 204 g

11 The figure shows the arrangement of electrons in four different atoms.



Which atom must gain two electrons to become stable?

A Neon

B Carbon

C Oxygen

D Beryllium

EXAMPLE ITEMS IPC Key, Sem 1

Item#	Key	SE	Process Skills	SE Justification
1	B	IPC.6C	2D	Analyze physical properties of elements and compounds such as density.
2	C	IPC.6E	2D	Relate the structure of water to its function as a solvent.
3	D	IPC.6A	2D	Examine the physical properties of liquids, as explained by the arrangement and motion of atoms, or molecules.
4	A	IPC.7E	--	Describe nuclear fusion.
5	D	IPC.6D	2D	Relate the placement of an element on the Periodic Table to its bonding.
6	C	IPC.7B	--	Recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons.
7	B	IPC.7D	3A	Classify chemical reactions as exothermic or endothermic.
8	D	IPC.7F	--	Describe the environmental impact of ozone depletion.
9	A	IPC.7A	3A	Investigate a change of state as it relates to energy transfer.
10	A	IPC.7C	--	Demonstrate that mass is conserved when substances undergo chemical change.
11	C	IPC.6B	--	Relate chemical properties of substances to the arrangement of their atoms.