

Name key

**Station 1** - The following multiple choice questions can be answered using the reference table. With your partner, answer each question and identify the reference table that can be used.

Question	What reference table can you use?
Which electron configuration represents the electrons in an atom of sodium in the ground state at STP? (1) 2-8-1    (2) 2-7-2    (3) 2-8-6    (4) 2-7-7	p table
At 298 K, which noble gas has the lowest density at STP? (1) Ne    (2) Kr    (3) Xe    (4) Rn	Table S
Which compound is saturated? (1) Butane    (2) ethene    (3) heptene    (4) pentyne	Table Q
Which metal is most easily oxidized? (most active) (1) Ag    (2) Co    (3) Cu    (4) Mg	Table J
Which substance is an Arrhenius acid? (1) H <sub>2</sub> (2) HCl    (3) KCl    (4) NH <sub>3</sub>	Table K

**Station 2** - The following multiple choice questions can be answered using the reference table. With your partner, answer each question and identify the reference table that can be used.

Question	What reference table can you use?
Which ion has the largest radius? (1) Br <sup>-</sup> (2) F <sup>-</sup> (3) Cl <sup>-</sup> (4) I <sup>-</sup>	p table / S
What is the vapor pressure of propanone at 50.°C? (1) 37 kPa    (2) 83 kPa    (3) 50. kPa    (4) 101 kPa	Table H
Which formula can represent an alkyne? $2n-2$ (1) C <sub>2</sub> H <sub>4</sub> (2) C <sub>3</sub> H <sub>4</sub> (3) C <sub>2</sub> H <sub>6</sub> (4) C <sub>3</sub> H <sub>6</sub>	Table Q
Which metal reacts spontaneously with Sr <sup>2+</sup> ions? (1) Ca(s)    (2) Cs(s)    (3) Co(s)    (4) Cu(s)	Table J
Based on Table I, what is the H value for the production of 1.00 mole of NO <sub>2</sub> (g) from its elements at 101.3 kPa and 298 K? (1) 33.2 kJ    (2) -33.2 kJ    (3) 132.8 kJ    (4) -132.8 kJ	Table I

**Station 3** - The following multiple choice questions can all be answered using an equation from Table T. Show your work in the column on the right, including the equation that you use.

Question	Work and Equation
<p>What is the number of moles of <math>\text{CO}_2</math> in a 220. gram sample of <math>\text{CO}_2</math> (gram formula mass - 44.0 g/mol) ?</p> <p>(1) 0.20 mol (2) 5.0 mol (3) 15 mol (4) 44 mol</p>	<p>moles = <math>\frac{\text{mass}}{\text{gfm}}</math></p> <p><math>5 \text{ mol} = \frac{220}{44}</math></p> <p><u>Table T</u></p>
<p>A solution contains 25 grams of <math>\text{KNO}_3</math> dissolved in 200. grams of <math>\text{H}_2\text{O}</math>. Which numerical setup can be used to calculate the percent by mass of <math>\text{KNO}_3</math> in this solution?</p> <p>(1) <math>\frac{25\text{g}}{175\text{g}} \times 100</math> (2) <math>\frac{25\text{g}}{200\text{g}} \times 100</math> (3) <math>\frac{25\text{g}}{225\text{g}} \times 100</math> (4) <math>\frac{200\text{g}}{225\text{g}} \times 100</math></p>	<p>Table T</p> <p><math>\frac{25}{25+200} \times 100</math>      <math>\frac{P}{W} \times 100</math></p>
<p>A rigid cylinder with a movable piston contains a sample of hydrogen gas. At 330. K, this sample has a pressure of 150. kPa and a volume of 3.50 L. What is the volume of this sample at STP?</p> <p>(1) 0.233 L (2) 4.29 L (3) 1.96 L (4) 6.26 L</p>	<p>Table T</p> <p><math>\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}</math></p> <p><math>\frac{(150)(3.5)}{330} = \frac{(101.3)(V_2)}{273}</math></p>
<p>Which numerical setup can be used to calculate the heat energy required to completely <u>melt</u> 100. grams of <math>\text{H}_2\text{O}(s)</math> at <math>0^\circ\text{C}</math>?</p> <p>(1) <math>(100. \text{ g})(334 \text{ J/g})</math> (2) <math>(100. \text{ g})(2260 \text{ J/g})</math>  (3) <math>(100. \text{ g})(4.18 \text{ J/g}\cdot\text{K})(0^\circ\text{C})</math> (4) <math>(100. \text{ g})(4.18 \text{ J/g}\cdot\text{K})(273 \text{ K})</math></p>	<p>Table T</p> <p><math>Q = m h_f</math></p> <p><math>Q = 100(334)</math></p>
<p>What is the concentration of an aqueous solution that contains 1.5 moles of <math>\text{NaCl}</math> in 500. milliliters of this solution?</p> <p>(1) 0.30 M (2) 3.0 M (3) 0.75 M (4) 7.5 M</p>	<p>Table T</p> <p><math>M = \frac{\text{moles}}{\text{Liters}}</math></p> <p><math>\frac{1.5}{0.5} = 3 \text{ mol}</math></p>

**Station 4** - The following questions require your knowledge of important vocabulary. Answer each question and in the column on the right, write and define the vocabulary word that the question addresses.

Question	Vocabulary Word and definition
Given the balanced equation representing a reaction $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$ The water molecule acts as a base because it (1) donates an $\text{H}^+$ (2) accepts an $\text{H}^+$ (3) donates an $\text{OH}^-$ (4) accepts an $\text{OH}^-$	Base: $\text{H}^+$ Acceptor "That basic base stole my $\text{H}^+$ "
An atom of which element reacts with an atom of hydrogen to form a bond with the greatest degree of polarity? (1) carbon <sup>2.6</sup> (2) nitrogen <sup>3.0</sup> (3) fluorine <sup>4.0</sup> (4) oxygen <sup>3.4</sup>	Polar Bond: greatest difference in electroneg.
What is the approximate mass of an atom that contains 26 protons, 26 electrons and 19 neutrons? (1) 26 u (2) 52 u (3) 45 u (4) 71 u	Mass = Proton + Neutron $26 + 19$ $45$
What is the total number of neutrons in an atom of K-42? (1) 19 (2) 23 (3) 20 (4) 42	Mass Notation K-42K <sub>mass</sub> $42 - 19 = 23$
Which equation represents neutralization? (1) $6\text{Li(s)} + \text{N}_2(\text{g}) \rightarrow 2\text{Li}_3\text{N(s)}$ (2) $2\text{Mg(s)} + \text{O}_2(\text{g}) \rightarrow 2\text{MgO(s)}$ (3) $2\text{KOH(aq)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O(l)}$ (4) $\text{Pb}(\text{NO}_3)_2(\text{aq}) + \text{K}_2\text{CrO}_4(\text{aq}) \rightarrow 2\text{KNO}_3(\text{aq}) + \text{PbCrO}_4(\text{s})$	Neutralization Acid + Base $\rightarrow$ Salt + $\text{H}_2\text{O}$

**Station 5** - The following questions are about a chemical reaction.

The balanced reaction below represents the reaction between a 5.0 g sample of zinc metal and a 0.5 M solution of hydrochloric acid. The reaction takes place in an open test tube at 298 K and 1 atm in a laboratory activity. $\text{Zn(s)} + 2 \text{HCl(aq)} \rightarrow \text{ZnCl}_2(\text{aq}) + \text{H}_2(\text{g}) + \text{energy}$	
a.) State one change in reaction conditions, other than adding a catalyst, that will increase the rate of the reaction.	$\uparrow [\ ]$ or temp
b.) On the axes below, draw a potential energy diagram for the reaction between zinc and hydrochloric acid.	<div style="text-align: center;"> <p>EXOTHERMIC</p> </div>

c.) Explain why this system will NOT reach equilibrium.	This is not a reversible rxn.
d.) Write the half reaction for the oxidation that occurs in the reaction between zinc and hydrochloric acid.	$Zn^0 \rightarrow Zn^{+2} + 2e^-$

**Station 6** - The following short answer questions are about acids and bases. Answer each question AND if applicable, indicate what reference table you used to help answer the question. The important vocabulary words in each question have been underlined.

In a laboratory activity, a student titrates a <u>20.0 mL</u> sample of HCl (aq) using 0.025 M NaOH (aq). In one of the titration trials, <u>17.6 mL</u> of the base solution exactly neutralizes the acid sample?	
a.) Identify the <u>positive ion</u> in the sample of HCl	$H^+$
b.) Show a numerical setup for calculating the concentration of hydrochloric acid using the <u>titration</u> data. (Write equation first)	$M_A V_A = M_B V_B$ $M_A (20) = (0.025)(17.6)$
c.) The concentration of the base is expressed to what number of significant figures.	2
d.) Explain why both HCl and NaOH are considered <u>electrolytes</u> .	Both have <u>mobile ions</u> in solution
e.) Name the compound NaOH	Sodium Hydroxide
f.) If they <u>hydronium ion</u> concentration of the acid increased by a factor of 100, what would happen to the pH of the acid?	(1) Increase by 1      (3) Increase by 2 (2) Decrease by 1      (4) Decrease by 2

**Station 7** - The following short answer questions are about the periodic table. Answer each question in the column on the left and then answer the extension question in the column on the right.

<p><b>Periodic trends are observed in the properties of the elements in Period 3 on the Periodic Table. These elements vary in physical properties, such as phase, and chemical properties, such as their ability to gain or lose electrons during a chemical reaction.</b></p>	
<p>a.) Identify the metals in Period 3 on the Periodic Table.</p>	<p>List properties of metals: Na, Mg, Al</p>
<p>b.) Identify the element in Period 3 that requires the least amount of energy to remove the most loosely held electron Na</p>	<p>Vocabulary Word - ionization energy</p>
<p>c.) Identify the element in Period 3 that has the greatest attraction for electrons in a chemical bond Cl</p>	<p>Vocabulary Word - electronegativity</p>
<p>d.) Identify the element in Period 3 that is least likely to undergo a chemical reaction Ar</p>	<p>Explain why. Already have 8 valence</p>
<p>e.) Compare the radius of the Magnesium ion to the radius of the Magnesium atom. Mg ion &lt; Mg Atom</p>	<p>Explain your comparison. Mg lost e<sup>-</sup></p>