

# IONIZATION ENERGY - INTRODUCTION TO COLLEGE CHEMISTRY FORMATIVE ASSESSMENT - KEY



## STUDENT CHECK FOR UNDERSTANDING

**Concepts:**  
Ion Formation,  
Octet Rule, Ionic  
Radii, Ionization  
Energy Trends,  
Electron  
Affinity  
Trends

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### PART I

Use the periodic table to help you determine which element(s) in Period 2 fit each description on the second page. Briefly justify why each answer you have given is correct using your knowledge of periodic trends and atomic structure. You may use some elements more than once. Once you have finished, use the sandbox to check your answers.

Group →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
↓ Period																		
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
Lanthanides	57 La	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			
Actinides	89 Ac	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			

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<p style="text-align: center;"><b>Forms a 2+ Ion</b></p> <p>Element: <b>Beryllium</b></p> <p>Justification: <b>Beryllium is a Group 2 metal. This means it has two valence electrons it will lose to give it the charge 2<sup>+</sup>.</b></p>	<p style="text-align: center;"><b>Has three valence electrons</b></p> <p>Element: <b>Boron</b></p> <p>Justification: <b>It is a group three element to the right coming immediately after beryllium (two valence electrons) in its period.</b></p>	<p style="text-align: center;"><b>Has one valence electron</b></p> <p>Element: <b>Lithium</b></p> <p>Justification: <b>It is a group one element to the right coming immediately before beryllium (two valence electrons) in its period.</b></p>
<p style="text-align: center;"><b>Highest First Ionization Energy</b></p> <p>Element: <b>Neon</b></p> <p>Justification: <b>Neon has a complete octet and thus it would require the most energy to remove an electron from it.</b></p>	<p style="text-align: center;"><b>Forms a 2- Ion</b></p> <p>Element: <b>Oxygen</b></p> <p>Justification: <b>Oxygen has six valence electrons and thus gains two electrons to complete its octet. This gives it a 2- charge.</b></p>	<p style="text-align: center;"><b>Most Energy Released When Gaining Electron</b></p> <p>Element: <b>Fluorine</b></p> <p>Justification: <b>Electron affinity generally increases from left to right across a period. Fluorine is the furthest to the right in the period.</b></p>
<p style="text-align: center;"><b>Forms a 1+ Ion</b></p> <p>Element: <b>Sodium</b></p> <p>Justification: <b>Sodium is a Group 1 metal. This means it has one valence electrons it will lose to give it the charge 1<sup>+</sup>.</b></p>	<p style="text-align: center;"><b>Lowest First Ionization Energy</b></p> <p>Element: <b>Sodium</b></p> <p>Justification: <b>Ionization energy decreases from right to left across a period. Sodium is furthest to the left in its period.</b></p>	<p style="text-align: center;"><b>Ion Would Have 8 Protons &amp; 10 Electrons</b></p> <p>Element: <b>Oxygen</b></p> <p>Justification: <b>Oxygen has the atomic number of 8 (8 protons) and would gain 2 electrons to complete its octet (10 electrons total).</b></p>
<p style="text-align: center;"><b>Its complete octet generally prevents it from forming an ion.</b></p> <p>Element: <b>Neon</b></p> <p>Justification: <b>Neon has eight valence electrons, which is considered a complete octet.</b></p>	<p style="text-align: center;"><b>Gains three electrons to complete octet</b></p> <p>Element: <b>Nitrogen</b></p> <p>Justification: <b>Nitrogen has five valence electrons and thus gains three electrons to complete its octet.</b></p>	<p style="text-align: center;"><b>Gains one electron to complete octet</b></p> <p>Element: <b>Fluorine</b></p> <p>Justification: <b>Fluorine has seven valence electrons and thus gains one to complete its octet.</b></p>