1. The arrangement of the elements from left to right in Period 4 on the Periodic Table is based on	9. On the modern Periodic Table, the elements are arranged in order of increasing
A) atomic massB) atomic numberC) the number of electron shells	 A) atomic mass B) atomic number C) mass number D) oxidation number 10. Which quantity identifies an element?
D) the number of oxidation states2. The elements in Period 4 on the Periodic Table are arranged in order of increasing	A) atomic numberB) mass numberC) total number of neutrons in an atom of the
A) atomic radiusB) atomic numberC) number of valence electrons	element D) total number of valence electrons in an atom of the element
D) number of occupied shells of electrons3. Which list of elements consists of a metal, a	11. The elements on the Periodic Table are arranged in order of increasing
metalloid, and a nonmetal? A) Li, Na, Rb B) Cr, Mo, W	A) boiling pointB) electronegativityC) atomic numberD) atomic mass
 C) Sn, Si, C D) O, S, Te 4. The elements on the Periodic Table are arranged in order of increasing 	12. Which list of elements contains a metal, a metalloid, and a nonmetal?
order of increasingA) atomic massB) atomic numberC) molar massD) oxidation number	 A) Zn, Ga, Ge B) Si, Ge, Sn C) Cd, Sb, I D) F, Cl, Br 13. Which list consists of elements that have the most
5. Which list includes elements with the most similar chemical properties?	similar chemical properties?A) Mg, Al, and Si B) Mg, Ca, and Ba
A) Br, Ga, Hg B) Cr, Pb, Xe C) O, S, Se D) N, O, F	C) K, Al, and Ni D) K, Ca, and Ga
6. The elements in Group 2 are classified as	
A) metalsB) metalloidsC) nonmetalsD) noble gases	
7. Compared to the atoms of nonmetals in Period 3, the atoms of metals in Period 3 have	
A) fewer valence electronsB) more valence electronsC) fewer electron shellsD) more electron shells	
8. The elements on the Periodic Table are arranged in order of increasing	
A) atomic massB) atomic numberC) first ionization energyD) selected oxidation state	
	<u> </u>

14. Five cubes of iron are tested in a laboratory. The tests and the results are shown in the table below. **Iron Tests and the Results**

Test	Procedure	Result
1	A cube of Fe is hit with a hammer.	The cube is flattened.
2	A cube of Fe is placed in 3 M HCl(aq).	Bubbles of gas form.
3	A cube of Fe is heated to 1811 K.	The cube melts.
4	A cube of Fe is left in damp air.	The cube rusts.
5	A cube of Fe is placed in water.	The cube sinks.

Which tests demonstrate chemical properties?

A) 1, 3, and 4 B) 1, 3, and 5 C) 2 and 4	D) 2 and 5
15. Which property can be defined as the ability of a substance to be hammered into thin sheets?	21. Which statement describes a chemical property of iron?
 A) conductivity B) malleability C) melting point D) solubility 16. At STP, which element is a good conductor of electricity? 	 A) Iron can be flattened into sheets. B) Iron conducts electricity and heat. C) Iron combines with oxygen to form rust. D) Iron can be drawn into a wire. 22. Which list of symbols represents nonmetals, only?
 A) chlorine B) iodine C) silver D) sulfur 17. A solid element that is malleable, a good conductor of electricity, and reacts with oxygen is classified as a 	 A) B, Al, Ga B) Li, Be, B C) C, Si, Ge D) P, S, Cl 23. Which phrase describes the molecular structure and properties of two solid forms of carbon, diamond
 A) metal B) metalloid C) noble gas D) nonmetal 18. Which elements are malleable and good conductors of electricity? A) iodine and silver B) iodine and xenon C) tin and silver D) tin and xenon 	 and graphite? A) the same molecular structures and the same properties B) the same molecular structures and different properties C) different molecular structures and the same properties
 19. An element that has a low first ionization energy and good conductivity of heat and electricity is classified as a A) metal B) metalloid C) nonmetal D) noble gas 	 properties D) different molecular structures and different properties 24. Which element has chemical properties that are most similar to the chemical properties of fluorine?
 20. Which substance can <i>not</i> be decomposed by ordinary chemical means? A) methane B) mercury C) ethanol D) ammonia 	 A) boron B) chlorine C) neon D) oxygen 25. Which element is classified as a nonmetal? A) Be B) Al C) Si D) Cl

 26. A characteristic of a nonmetal is A) low ionization energy B) high electronegativity C) high electronegativity B) to ionization energy and low electronegativity B) to ionization energy and low electronegativity C) high ionization energy and low electronegativity C) high ionization energy and low electronegativity D) high ionization energy and low electronegativity D) high ionization energy and high electronegativity D) Noon is a gas at STP. B) Ncon has a low melting point. C) Neon atoms have a stable valence electron D) Neon atoms have a stable valence electrons A) nore protons than neutrons B) more neutrons than portons C) a total of two valence electrons A) At a Of eight valence electrons A) At B) Cl C) Na D) Nc 31. Which list of elements is a metalloid? A) Al B) Ar C) As D) Au 33. Which Group 14 element is a metalloid? A) Kinch Group 14 eleme			
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 electron configuration. This atom could be an atom of A) Al B) Cl C) Na D) Ne 31. Which list of elements contains a metal, a metalloid, and a nonmetal? A) Ag, Si, I2 B) Ge, As, Ne C) K, Cu, Br2 D) S, Cl2, Ar 32. Which element is a metalloid? A) Al B) Ar C) As D) Au 33. Which Group 14 element is a metalloid? A) tin B) silicon 	30. An atom in the ground state has a stable valence	-	
ofA) AlB) ClC) NaD) Ne31. Which list of elements contains a metal, a metalloid, and a nonmetal?A) Ag, Si, I2B) Ge, As, NeB) Ge, As, NeA) Ag, Si, I2B) Ge, As, NeD) number of valence electronsD) number of valence electronsA) Ag, Si, I2D) S, Cl2, ArH. What is the total number of valence electrons in a germanium atom in the ground state?32. Which element is a metalloid?A) AlB) ArC) AsD) Au33. Which Group 14 element is a metalloid?A) tinB) siliconA) aluminumB) lithium(A) tinB) siliconC) sheershereD) seen dium	-		
 A) Al B) Cl C) Na D) Ne 31. Which list of elements contains a metal, a metalloid, and a nonmetal? A) Ag, Si, I₂ B) Ge, As, Ne C) K, Cu, Br₂ D) S, Cl₂, Ar 32. Which element is a metalloid? A) Al B) Ar C) As D) Au 33. Which Group 14 element is a metalloid? A) tin B) silicon B) mass number C) number of electron shells D) number of valence electrons 41. What is the total number of valence electrons in a germanium atom in the ground state? A) Al B) Ar C) As D) Au 34. Which Group 14 element is a metalloid? A) tin B) silicon C) abarrhams C) abarrhams C) Na D) Ne B) mass number C) number of electron shells D) number of valence electrons in a germanium atom in the ground state? A) 22 B) 2 C) 32 D) 4 42. Which element has an atom in the ground state with a total of three valence electrons? A) aluminum B) lithium C) abarrhams D) acondium 	of		
 31. Which list of elements contains a metal, a metalloid, and a nonmetal? A) Ag, Si, I2 B) Ge, As, Ne D) Au 32. Which element is a metalloid? A) Al B) Ar C) As D) Au 33. Which Group 14 element is a metalloid? A) tin B) silicon C) number of electron shells D) number of valence electrons 41. What is the total number of valence electrons in a germanium atom in the ground state? A) 22 B) 2 C) 32 D) 4 42. Which element has an atom in the ground state with a total of three valence electrons? A) aluminum B) lithium C) number of electron shells D) number of valence electrons 	A) Al B) Cl C) Na D) Ne		
and a nonmetal?D) number of valence electronsA) Ag, Si, I2B) Ge, As, NeD) S, Cl2, ArC) K, Cu, Br2D) S, Cl2, Ar41. What is the total number of valence electrons in a germanium atom in the ground state?32. Which element is a metalloid?A) AlB) ArC) AsD) AuA) AlB) ArC) AsD) Au42. Which element has an atom in the ground state with a total of three valence electrons?A) tinB) siliconA) aluminumB) lithiumC) rheer hereC) rheer hereD) coern diverse	31. Which list of elements contains a metal, a metalloid,	,	
 C) K, Cu, Br2 D) S, Cl2, Ar 32. Which element is a metalloid? A) Al B) Ar C) As D) Au 33. Which Group 14 element is a metalloid? A) tin B) silicon A) tin B) silicon A) aluminum B) lithium C) absorbergy (C) and (C) and (C) and (C) absorbergy (C) and (C) and (C) absorbergy (C) and (C) absorbergy	and a nonmetal?	,	
C) K, Cu, Br2D) S, Cl2, Argermanium atom in the ground state?32. Which element is a metalloid?A) AlB) ArC) AsD) AuA) AlB) ArC) AsD) Au42. Which element has an atom in the ground state with a total of three valence electrons?A) tinB) siliconA) aluminumB) lithiumC) AsC) AsC) AsC) AsC) AsA) tinB) siliconC) shownhoreC) sound junction	A) Ag, Si, I ₂ B) Ge, As, Ne	41. What is the total number of valence electrons in a	
A) AlB) ArC) AsD) Au33. Which Group 14 element is a metalloid? A) tin42. Which element has an atom in the ground state with a total of three valence electrons?A) tinB) siliconA) tinB) silicon	C) K, Cu, Br ₂ D) S, Cl ₂ , Ar		
33. Which Group 14 element is a metalloid?a total of three valence electrons?A) tinB) siliconA) aluminumB) lithiumC) nhormhorusD) scendium	32. Which element is a metalloid?	A) 22 B) 2 C) 32 D) 4	
A) tinB) siliconA) aluminumB) lithiumC) shoesheresD) seen dium	A) Al B) Ar C) As D) Au	42. Which element has an atom in the ground state with	
(1) (1) (2)	33. Which Group 14 element is a metalloid?	a total of three valence electrons?	
(\mathbf{D}) absorb area (\mathbf{D}) score diverse	A) tin B) silicon		
		C) phosphorus D) scandium	

- 43. Which atom has the largest atomic radius?
 - A) potassium B) rubidium
 - C) francium D) cesium
- 44. As the elements is Period 3 are considered in order of increasing atomic number, there is a general *decrease* in
 - A) atomic mass
 - B) atomic radius
 - C) electronegativity
 - D) first ionization energy
- 45. An atom of which element has the largest atomic radius?
 - A) Fe B) Mg C) Si D) Zn
- 46. As atomic number increases within Group 15 on the Periodic Table, atomic radius
 - A) decreases, only
 - B) increases, only
 - C) decreases, then increases
 - D) increases, then decreases
- 47. How do the atomic radius and metallic properties of sodium compare to the atomic radius and metallic properties of phosphorus?
 - A) Sodium has a larger atomic radius and is more metallic.
 - B) Sodium has a larger atomic radius and is less metallic.
 - C) Sodium has a smaller atomic radius and is more metallic.
 - D) Sodium has a smaller atomic radius and is less metallic.
- 48. Which list of elements from Group 2 on the Periodic Table is arranged in order of increasing atomic radius?
 - A) Be, Mg, Ca B) Ca, Mg, Be
 - C) Ba, Ra, Sr D) Sr, Ra, Ba

Element	Atomic Mass (atomic mass unit)	Atomic Radius (pm)
Xx	69.7	141
Yy	114.8	?
Zz	204.4	171

49. The data table below shows elements Xx, Yy, and Zz from the same group on the Periodic Table.

What is the most likely atomic radius of element *Yy*?

A) 103 pm	B) 127 pm	C) 166 pm	D) 185 pm
50. Which list of ele	ments is arranged in	order of	53. Which general trends in first ionization e
increasing electr	onegativity?		electronegativity values are demonstrated

A) Be, Mg, Ca	B) F, Cl, Br
C) K, Ca, Sc	D) Li, Na, K

- 51. Which statement describes the general trends in electronegativity and atomic radius as the elements in Period 2 are considered in order from left to right?
 - A) Both electronegativity and atomic radius increase.
 - B) Both electronegativity and atomic radius decrease.
 - C) Electronegativity increases and atomic radius decreases.
 - D) Electronegativity decreases and atomic radius increases.
- 52. Which atom has the greatest attraction for the electrons in a chemical bond?

A)	hydrogen	B) oxygen
/) 0	-)

C) silicon D) sulfur

- energy and electronegativity values are demonstrated by Group 15 elements as they are considered in order from top to bottom? A) The first ionization energy decreases and the electronegativity decreases. B) The first ionization energy increases and the electronegativity increases. C) The first ionization energy decreases and the electronegativity increases. D) The first ionization energy increases and the electronegativity decreases. 54. Which element has atoms with the strongest attraction for electrons in a chemical bond? B) nitrogen A) chlorine C) fluorine D) oxygen 55. Which atom has the weakest attraction for electrons in a chemical bond? A) a boron atom B) a calcium atom C) a fluorine atom D) a nitrogen atom 56. Which statement describes the general trends in metallic properties as the elements in Period 2 are considered in order of increasing atomic number? A) Metallic properties remains same.
 - B) Metallic properties increase.
 - C) Metallic properties increase and then decrease.
 - D) Metallic properties decrease.

57. Which general trend is demonstrated by the Group17 elements as they are considered in order from topto bottom on the Periodic Table?	63. Which general trend is found in Period 2 on the Periodic Table as the elements are considered in order of increasing atomic number?		
A) a decrease in atomic radiusB) a decrease in electronegativityC) an increase in first ionization energyD) an increase in nonmetallic behavior	A) decreasing atomic massB) decreasing electronegativityC) increasing atomic radiusD) increasing first ionization energy		
58. Based on Reference Table S, atoms of which of these elements have the strongest attraction for the electrons in a chemical bond?	64. The amount of energy required to remove the outermost electron from a gaseous atom in the ground state is known as		
 A) Al B) Si C) P D) S 59. The strength of an atom's attraction for the electrons in a chemical bond is the atom's A) electronegativity B) ionization energy C) heat of reaction D) heat of formation 60. Which statement describes the general trends in electronegativity and first ionization energy as the elements in Period 3 are considered in order from Na 	 A) first ionization energy B) activation energy C) conductivity D) electronegativity 65. How much energy is required to remove the most loosely bound electron from a neutral atom of carbon in the gaseous phase? A) 363 kJ B) 441 kJ 		
 to Cl? A) Electronegativity increases, and first ionization energy decreases. B) Electronegativity decreases, and first ionization energy increases. C) Electronegativity and first ionization energy both increase. D) Electronegativity and first ionization energy both decrease. 61. Which atom in the ground state requires the <i>least amount of energy to remove its valence electron</i>? 	 C) 1086 kJ D) 1242 kJ 66. In Period 2 of the Periodic Table, which Group contains the element with the highest first ionization energy? A) alkali metals B) alkaline earth metals C) halogens D) noble gases 67. As elements of Group 15 of the Periodic Table are considered in order from top to bottom, the metallic 		
A) lithium atomB) potassium atomC) rubidium atomD) sodium atom	character of the atoms of each successive element generallyA) decreases B) increases		
62. Samples of four Group 15 elements, antimony, arsenic, bismuth, and phosphorus, are in the gaseous phase. An atom in the ground state of which element requires the <i>least</i> amount of energy to remove its most loosely held electron?	C) remains the same68. In which of the following elements is the <i>least</i> amount of energy required to remove the most loosely bound electron from an atom in the gaseous state?		
A) As B) Bi C) P D) Sb	 A) Sr B) Ar C) Al D) Cl 69. Which element in Group 1 has the greatest tendency to lose an electron? A) cesium B) potassium C) rubidium D) sodium 		

70. The first ionization energy of an element is 736 kilojoules per mole of atoms. An atom of this element in the ground state has a total of how many valence electrons?

A) 1 B) 2 C) 3 D) 4

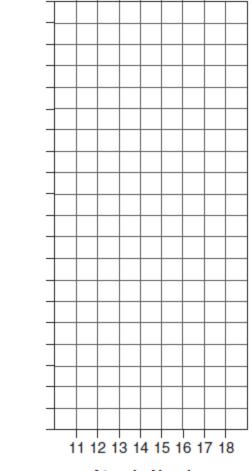
Base your answers to questions $\mathbf{71}$ and $\mathbf{72}$ on the information below.

The atomic number and corresponding atomic radius of the Period 3 elements are shown in the data table below.

Data Table		
Atomic Number	Atomic Radius (pm)	
11	160.	
12	140.	
13	124	
14	114	
15	109	
16	104	
17	100.	
18	101	

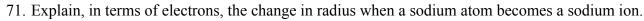
Data Table

Atomic Radius Versus Atomic Number



Atomic Radius (pm)

Atomic Number



- 72. On the grid above, plot the data from the data table. Circle and connect the points.
- 73. Base your answer to the following question on the information below.The ionic radii of some Group 2 elements are given in the table below.

Ionic Radii	of Some	Group 2	Elements
	or some		

Symbol	Atomic Number	lonic Radius (pm)
Be	4	44
Mg	12	66
Ca	20	99
Ва	56	134

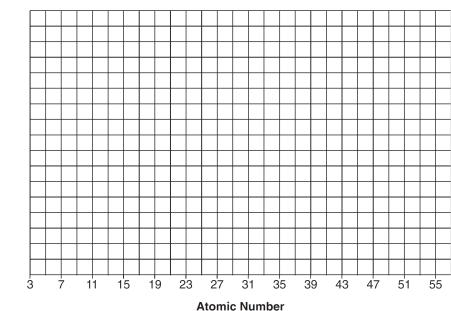
On the same grid, plot the data from the data table. Circle and connect the points.

74. Base your answer to the following question on "the table below.

Element	Atomic Number	First Ionization Energy (kJ/mol)
lithium	3	520
sodium	11	496
potassium	19	419
rubidium	37	403
cesium	55	376

First Ionization Energy of Selected Elements

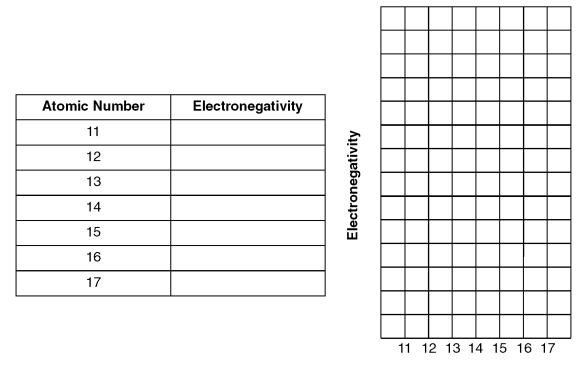
On a grid, mark an appropriate scale on the axis labeled "First Ionization Energy (kj/mol)." An appropriate scale is one that allows a trend to be seen.



First Ionization Energy Versus Atomic Number of Selected Elements

First lonization Energy (kJ/mol)

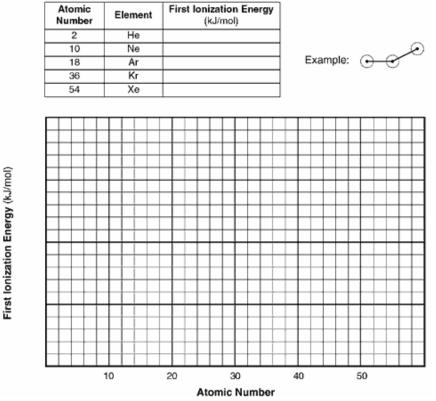
75. Base your answer to the following question on the data table provided.



Atomic Number

On the same grid, plot the data from the data table. Circle and connect the points.

76. Base your answer to the following question on the Reference Tables for Physical Setting/Chemistry.



a Complete the data table provided for the following Group 18 elements: He, Ne, Ar, Kr, Xe *b* Using information from your data table in part *a*, construct a line graph on the grid provided, following the directions below.

• Mark an appropriate scale on the axis labeled "First Ionization Energy (kJ/mol). "

• Plot the data from your data table. Circle each point and connect the points.

c Based on your graph in part b, describe the trend in first ionization energy of Group 18 elements as the atomic number increases.