

Chapter 3 Practice Test

Part I: For each of the following, write the symbol of the element that best fits the description given. You may use an element more than once; you may even use it more than twice. (2 point each)

1. **Li** The alkali metal with the greatest ionization energy.
2. **F** The halogen with the greatest electronegativity.
3. **Rn** The noble gas with the greatest atomic radius.
4. **Br** The fourth period element with the highest electron affinity.
5. **Pm** The synthetic rare-earth element with the smallest atomic number.
6. **Be** The alkaline-earth element with the greatest second ionization energy.
7. **Sb** The fifth period metalloid with the largest atomic radius.
8. **He** The element on the periodic table with the smallest atomic radius.
9. **Ar** The third period non-metal with the highest ionization energy.
10. **C** The second period non-metal with the fewest valence electrons.
11. **U** The naturally occurring element with the greatest atomic mass.
12. **Ne** The second period element with the greatest ionization energy.
13. **He** The element with the greatest ionization energy.
14. **Se** The chalcogen non-metal with the greatest number of protons.
15. **Al** The third period metal with a 3+ oxidation number.
16. **Fr** The element with the lowest ionization energy.
17. **Be** The alkaline-earth element with the smallest atomic radius.
18. **F** The element with the greatest electronegativity.
19. **At** The sixth period element with the greatest electronegativity.
20. **B** The metalloid with the fewest valence electrons.
21. **Ne** The p block element with the smallest atomic radius.
22. **Kr** The inert fourth period element.
23. **Ra** The alkaline earth element with the smallest ionization energy.
24. **Pa** The actinide with the lowest atomic mass.
25. **Cs** The sixth period element with the fewest valence electrons.

Part II: Choose the BEST answer for each of the following multiple-choice questions. (1 point each)

26. Which of the following represents the ground state electron configuration for the Mn^{3+} ion?
(A) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4$ (B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^2$ (C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$
(D) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ (E) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^1$
27. The electron configuration: $1s^2 2s^2 2p^6 3s^2 3p^6$ corresponds to the electron configuration of:
(A) S^{2-} (B) Ca^{2+} (C) Cl^- (D) K^+ (E) all of these

28. Which of the following has the largest value for the second ionization energy?
 (A) sodium (B) chlorine (C) sulfur (D) aluminum (E) magnesium
29. Which of the following has the largest electron affinity?
 (A) sodium (B) chlorine (C) sulfur (D) aluminum (E) magnesium
30. In which of the following are the elements listed in order of increasing ionization energy?
 (A) B, Be, C, N (B) F, Cl, Br, I (C) O, N, C, B
 (D) Mg, Al, Si, P (E) N, O, F, Ne

Ionization Energies for element X (kJ mol^{-1})				
First	Second	Third	Fourth	Five
580	1815	2740	11600	14800

31. The ionization energies for element X are listed in the table above. On the basis of the data, element X is most likely to be:
 (A) Na (B) Mg (C) Al (D) Si (E) P
32. In which of the following are the elements listed in order of increasing Electronegativity?
 (A) Ba, Zn, C, Cl (B) N, O, S, Cl (C) N, P, As, Sb
 (D) K, Ba, Si, Ga (E) Li, K, Na, Ca
33. In the periodic table, as the atomic number increases from 11 to 17, what happens to the atomic radius?
 (A) It remains constant. (B) It increases only. (C) It increases, then decreases.
 (D) It decreases only. (E) It decreases, then increases.
34. Which of the following elements has one valence electron?
 (A) helium (B) chlorine (C) chromium (D) aluminum (E) zinc

Part III: Match each scientist on the left with the most fitting description on the right. (1 point each)

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|----------------------------------|---|
| 35. E Johann Dobereiner | a. The scientist who wrote the first periodic table. |
| 36. C Dmitri Mendeleev | b. This man had written a table similar to Mendeleev's but published it a year later. |
| 37. A A. Beguyer de Chancourtois | c. The youngest of 17 children and the Father of the Periodic Table. |
| 38. G Hennig Brand | d. He wrote Law of Octaves. |
| 39. B Lothar Meyer | e. The scientist who wrote the Law of Triads. |
| 40. D John Newlands | f. The first person to organize the periodic table by increasing atomic number. |
| 41. H Glenn T. Seaborg | g. This scientist discovered the first element, Phosphorus. |
| 42. F Henry Moseley | h. This scientist whose team created elements 94-102 |

Part IV: Write the correct electron configurations for each of the following ions. (2 points each)

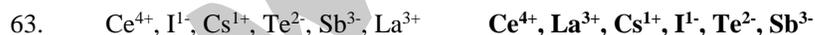
43. As^{3+} [Ar] $4s^2 3d^{10}$
44. Cu^{1+} [Ar] $3d^{10}$
45. Mn^{6+} [Ar] $3d^1$

Part V: Write the Lewis Dot Diagram and ion for each of the following elements. (1 point for each answer)

Element:	46. Phosphorus	47. Indium	48. Helium	49. Vanadium	50. Cr ³⁺
Dot Diagram:	5	3	2	2	8
Oxidation Number:	3-	3+	0	2+	3+

Part VI: For each of the following statements, determine which term it best describes. Use: alkali, halogen, chalcogen, metalloid, alkaline earth, lanthanide, actinide, noble gas. You will use some terms more than once. (1 point each)

51. **chalcogens** This group contains a metal, metalloid and non-metals.
52. **lanthanides** This series of elements that contains one synthetic element.
53. **alkaline earth** This group of elements loses 2 electrons when they form ions.
54. **alkali** This group reacts with water and air.
55. **metalloids** This term refers to elements that have properties of both metals and non-metals.
56. **noble gases** The elements in this group are inert.
57. **halogens** This group contains solid, liquid & gaseous elements at room temperature.
58. **alkaline earth** The elements in this group are harder and denser than the alkali metals.
59. **alkali** This group has a one valence electron.
60. **actinides** This group of elements is composed of mostly synthetic elements.
61. **halogens** This group contains the most reactive non-metals.

Part VII: Put the following species in an isoelectric set in order from smallest to largest. (2 points)**Part VIII: Free Response (2 points)**

64. Explain the reason for the observed trend in atomic radius across a period.

More protons in the nucleus and more electrons in the same energy level which leads to more attraction and a smaller atomic radius.