

1. The arrangement of the elements from left to right in Period 4 on the Periodic Table is based on

- A) atomic mass
 B) atomic number
C) the number of electron shells
D) the number of oxidation states

2. 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

3. Which list of elements consists of a metal, a metalloid, and a noble gas?

- A) aluminium, sulfur, argon
B) magnesium, sodium, sulfur
 C) sodium, silicon, argon
D) silicon, phosphorous, chlorine

4. Which phrase describes the molecular structure and properties of two solid forms of carbon, diamond 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
 D) different molecular structures and different properties

5. Which element is *least* likely to undergo a chemical reaction?

- A) lithium B) carbon
C) fluorine D) neon

6. Which element has both metallic and nonmetallic properties?

- A) Rb B) Rn C) Si D) Sr

7. Which element is a gas at STP?

- A) sulfur B) xenon
C) potassium D) phosphorus

~~8. At STP, a 1-liter sample of Ne(g) and a 1-liter sample of Kr(g) have the same~~

- A) mass
B) density
C) number of atoms
D) number of electrons

9. Which element is a liquid at STP?

- A) bromine B) cesium
C) francium D) iodine

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10. Two forms of solid carbon, diamond and graphite, differ in their physical properties due to the differences in their
- A) atomic numbers
 B) crystal structures
 C) isotopic abundances
 D) percent compositions
11. Which element has the greatest density at STP?
- A) calcium *1.54*
 B) carbon *(20 - density)*
 C) chlorine *3.2*
 D) copper *8.96*
12. Which electron-dot symbol correctly represents an atom of its given element?
- A) $\ddot{\text{S}} \cdot$
 B) $\ddot{\text{Al}} \cdot$
 C) $\ddot{\text{Li}} \cdot$
 D) $\cdot \ddot{\text{B}} \cdot$
- 2-8-6 2-8-3 2-1 2-3*
13. Element X reacts with copper to form the compounds Cu_2X and CuX_2 . In which group on the Periodic Table is element X found?
- A) Group 1
 B) Group 2
 C) Group 13
 D) Group 17
14. The number of valence electrons in each atom of an element affects the element's
- A) chemical properties
 B) number of isotopes
 C) decay mode
 D) half-life
15. The valence electron of which atom in the ground state has the greatest amount of energy?
- A) cesium
 B) lithium
 C) rubidium
 D) sodium
- max energy!! least IE to remove!*
16. Which compound forms a green aqueous solution?
- A) RbCl
 C) NiCl_2
 B) CaCl_2
 D) ZnCl_2
17. Which physical characteristic of a solution may indicate the presence of a transition element?
- A) its density
 B) its color
 C) its effect on litmus
 D) the effect on phenolphthalein
18. Which compound is colorless in a water solution?
- A) $\text{Al}_2(\text{SO}_4)_3$
 B) $\text{Cr}_2(\text{SO}_4)_3$
 C) $\text{Fe}_2(\text{SO}_4)_3$
 D) $\text{Co}_2(\text{SO}_4)_3$
19. What occurs when a magnesium atom becomes a magnesium ion?
- A) Electrons are gained and the oxidation number increases.
 B) Electrons are gained and the oxidation number decreases.
 C) Electrons are lost and the oxidation number increases.
 D) Electrons are lost and the oxidation number decreases.
20. What is the number of electrons in an Al^{3+} ion?
- A) 10 B) 13 C) 3 D) 16
21. What is the net charge of an ion that has 8 protons, 9 neutrons, and 10 electrons?
- A) 1+ B) 2+ C) 1- D) 2-
22. Which element, represented by X, reacts with fluorine to produce the compound XF_2 ?
- A) aluminum
 C) magnesium
 B) argon
 D) sodium
23. An atom of an element has a total of 12 electrons. An ion of the same element has a total of 10 electrons. Which statement describes the charge and radius of the ion?
- A) The ion is positively charged and its radius is smaller than the radius of the atom.
 B) The ion is positively charged and its radius is larger than the radius of the atom.
 C) The ion is negatively charged and its radius is smaller than the radius of the atom.
 D) The ion is negatively charged and its radius is larger than the radius of the atom.
24. An atom of an element forms a 2^+ ion. In which group on the Periodic Table could this element be located?
- A) 1 B) 2 C) 13 D) 17
25. What is the net charge on an ion that has 9 protons, 11 neutrons, and 10 electrons?
- A) 1+ B) 2+ C) 1- D) 2-

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26. Compared to a phosphorus atom, a P^{3-} ion has
- A) more electrons and a larger radius
 - B) more electrons and a smaller radius
 - C) fewer electrons and a larger radius
 - D) fewer electrons and a smaller radius
27. Which ion has the *smallest* radius?
- A) O^{2-}
 - B) S^{2-}
 - C) Se^{2-}
 - D) Te^{2-}
28. Which atom has the largest atomic radius?
- A) potassium
 - B) rubidium
 - C) francium
 - D) cesium
29. As the elements in 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
30. 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
31. An ion of which element has a larger radius than an atom of the same element?
- A) aluminum
 - B) chlorine
 - C) magnesium
 - D) sodium
32. Which atom has the greatest attraction for the electrons in a chemical bond?
- A) hydrogen
 - B) oxygen
 - C) silicon
 - D) sulfur
33. Which statement describes the general trends in electronegativity and first ionization energy as the elements in Period 3 are considered in order from Na 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.
34. Which atom in the ground state requires the *least amount of energy to remove its valence electron*?
- A) lithium atom
 - B) potassium atom
 - C) rubidium atom
 - D) sodium atom
35. Which two elements have the most similar chemical properties?
- A) beryllium and magnesium
 - B) hydrogen and helium
 - C) phosphorous and sulfur
 - D) potassium and strontium
36. Sodium atoms, potassium atoms, and cesium atoms have the same
- A) atomic radius
 - B) first ionization energy
 - C) total number of protons
 - D) oxidation state
37. When the elements in Group 1 are considered in order from top to bottom, each successive element at standard pressure has
- A) a higher melting point and a higher boiling point
 - B) a higher melting point and a lower boiling point
 - C) a lower melting point and a higher boiling point
 - D) a lower melting point and a lower boiling point
38. At 298 K, oxygen (O_2) and ozone (O_3) have different properties because their
- A) atoms have different atomic numbers
 - B) atoms have different atomic masses
 - C) molecules have different molecular structures
 - D) molecules have different average kinetic energies

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39. Which property can be defined as the ability of a substance to be hammered into thin sheets?

- A) conductivity
- B) malleability
- C) melting point
- D) solubility

40. At STP, which element is solid, brittle, and a poor conductor of electricity?

- A) Al
 - B) K
 - C) Ne
 - D) S
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