

Q1. Which of the following is the correct electronic configuration of Boron?

- (a) $1s^2 2s^2 2p^1$
- (b) $1s^2 2s^1 2p^2$
- (c) $1s^2 2s^2 2p^2$
- (d) $1s^2 2s^2 2p^3$

Answer: (a)

Explanation: Boron has atomic number 5 $\rightarrow 1s^2 2s^2 2p^1$.

Q2. Which of the following elements shows the most pronounced anomalous behavior in Group 13?

- (a) Al
- (b) Ga
- (c) In
- (d) B

Answer: (d)

Explanation: Boron (first element) shows anomalous properties due to small size, high ionization enthalpy, absence of d-orbitals.

Q3. Down the group (Group 13), the atomic size:

- (a) Increases
- (b) Decreases
- (c) Remains constant
- (d) First decreases then increases

Answer: (a)

Explanation: Atomic radius generally increases down the group due to the addition of new shells.

Q4. Which oxidation states are most stable for Group 13 elements?

- (a) +1 only
- (b) +2 and +4
- (c) +3 and +1
- (d) +4 and +2

Answer: (c)

Explanation: +3 is common; +1 becomes more stable down the group due to inert pair effect.

Q5. The ionization enthalpy from B \rightarrow Al shows:

- (a) A regular increase
- (b) A regular decrease
- (c) Anomalous increase at Ga
- (d) Remains constant

Answer: (c)

Explanation: Ga shows slightly higher ionization enthalpy due to poor shielding by 3d and 10 electrons.

Q6. Which of the following is NOT a characteristic of Boron?

- (a) High ionization enthalpy
- (b) Forms stable BF_3 molecule
- (c) Acts as a metal
- (d) Exists only as covalent compounds

Answer: (c)

Explanation: Boron is a metalloid, not a typical metal.

Q7. The stable oxidation state of Thallium (Tl) is:

- (a) +3
- (b) +2
- (c) +1
- (d) 0

Answer: (c)

Explanation: Due to strong inert pair effect, $\text{Tl}(+1)$ is most stable.

Q8. Which property increases irregularly down Group 13 due to d- and f-block contraction?

- (a) Ionization enthalpy
- (b) Atomic radius

- (c) Electronegativity
- (d) Oxidation potential

Answer: (a)

Explanation: Because of d- and f-block contraction, Ga has almost the same radius as Al, causing irregularity.

Q9. Which element of Group 13 has maximum electronegativity?

- (a) B
- (b) Al
- (c) Ga
- (d) In

Answer: (a)

Explanation: Small size and high effective nuclear charge make Boron highly electronegative in its group.

Q10. Which element does NOT show a +3 oxidation state?

- (a) B
- (b) Al
- (c) In
- (d) Tl

Answer: (d)

Explanation: Tl predominantly shows +1 due to inert pair effect.

Q11. The first member of Group 14 shows anomalous properties because:

- (a) It has maximum size
- (b) It lacks p-orbitals
- (c) It lacks d-orbitals
- (d) It is radioactive

Answer: (c)

Explanation: Carbon lacks d-orbitals, so it cannot expand its octet.

Q12. Which is the most stable oxidation state of lead (Pb)?

- (a) +4
- (b) +2
- (c) +3
- (d) +1

Answer: (b)

Explanation: Due to inert pair effect, +2 is more stable than +4 in Pb.

Q13. The decreasing order of ionization enthalpy among Group 14 elements is:

- (a) $C > Si > Ge > Sn > Pb$
- (b) $Pb > Sn > Ge > Si > C$
- (c) $Si > C > Ge > Sn > Pb$
- (d) $C > Si > Pb > Ge > Sn$

Answer: (a)

Explanation: Ionization enthalpy decreases down the group with increase in size.

Q14. Which of the following is NOT an allotrope of carbon?

- (a) Graphite
- (b) Fullerene
- (c) Silicones
- (d) Graphene

Answer: (c)

Explanation: Silicones are polymers of silicon, not carbon allotropes.

Q15. Diamond is a bad conductor of electricity because:

- (a) It has free electrons
- (b) It has localized covalent bonds
- (c) It is metallic in nature
- (d) It has delocalized π electrons

Answer: (b)

Explanation: In diamond, all four valencies of carbon are satisfied by strong covalent bonds → no free electrons.

Q16. Which of the following has the maximum ionization enthalpy among Group 13 elements?

- A. B
- B. Al
- C. Ga
- D. Tl

Answer: A. B

Explanation: Ionization enthalpy decreases down the group due to increasing atomic size and shielding effect. Hence, Boron has the maximum ionization enthalpy.

Q17. Which Group 14 element forms a stable cation with +2 oxidation state due to inert pair effect?

- A. Carbon
- B. Silicon
- C. Tin
- D. Lead

Answer: D. Lead

Explanation: Inert pair effect is significant in heavier elements. Pb shows stability of +2 oxidation state more than +4.

Q18. Which of the following shows anomalous behavior in Group 13 due to its small size and high electronegativity?

- A. Al
- B. Ga
- C. B
- D. In

Answer: C. B

Explanation: Boron differs from other group members in forming covalent bonds, non-availability of d-orbitals, and high ionization enthalpy.

Q19. The maximum covalency of Boron is limited to:

- A. 2
- B. 3
- C. 4
- D. 6

Answer: B. 3

Explanation: Boron does not have d-orbitals in its valence shell, so its maximum covalency is restricted to 3.

Q20. Which of the following oxides of Group 14 is amphoteric?

- A. CO₂
- B. SiO₂
- C. SnO₂
- D. PbO

Answer: C. SnO₂

Explanation: SnO₂ reacts with both acids and bases, hence it is amphoteric.

Q21. Which Group 13 element has the lowest melting point?

- A. B
- B. Al
- C. Ga
- D. In

Answer: C. Ga

Explanation: Gallium has an unusually low melting point ($\approx 29.7^\circ\text{C}$) due to weak metallic bonding.

Q22. The stability order of +1 oxidation state among Group 13 elements is:

- A. $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$
- B. $\text{Tl} < \text{In} < \text{Ga} < \text{Al} < \text{B}$
- C. $\text{Ga} < \text{B} < \text{Al} < \text{Tl} < \text{In}$
- D. $\text{Al} < \text{B} < \text{Ga} < \text{In} < \text{Tl}$

Answer: A. $\text{B} < \text{Al} < \text{Ga} < \text{In} < \text{Tl}$

Explanation: +1 oxidation state stability increases down the group due to inert pair effect.

Q23. Which of the following is a covalent hydride of Group 14?

- A. CH_4
- B. SnH_4
- C. PbH_4
- D. All of the above

Answer: D. All of the above

Explanation: All hydrides of Group 14 elements (tetrahydrides) are covalent in nature, though stability decreases down the group.

Q24. The anomalous behavior of Carbon in Group 14 is due to:

- A. Absence of d-orbitals
- B. Small size and high ionization enthalpy
- C. High electronegativity
- D. All of the above

Answer: D. All of the above

Explanation: Carbon shows unique properties (catenation, multiple bonding) because of its small size, high electronegativity, and lack of d-orbitals.

Q25. Which of the following is used as a semiconductor from Group 14?

- A. Carbon
- B. Silicon
- C. Lead
- D. Tin

Answer: B. Silicon

Explanation: Silicon is widely used in semiconductors due to its suitable band gap and availability.

Q26. Which of the following oxides is amphoteric in nature?

- A. B_2O_3

- B. Al_2O_3
- C. Ga_2O_3
- D. All of the above

Answer: D. All of the above

Explanation: Boron oxide is weakly acidic, but Al_2O_3 and Ga_2O_3 are amphoteric, showing dual behavior.

Q27. Which property decreases regularly from B \rightarrow Tl in Group 13?

- A. Atomic size
- B. Ionization enthalpy
- C. Electronegativity
- D. Metallic character

Answer: B. Ionization enthalpy

Explanation: Ionization enthalpy decreases down the group due to increase in atomic size and shielding effect.

Q28. Which pair of Group 14 oxides is most acidic?

- A. CO_2 , SiO_2
- B. SnO_2 , PbO_2
- C. PbO , SnO
- D. SiO_2 , SnO_2

Answer: A. CO_2 , SiO_2

Explanation: Acidic character decreases down the group; CO_2 and SiO_2 are acidic, while SnO_2 is amphoteric and PbO is basic.

Q29. Which Group 13 halide acts as a strong Lewis acid?

- A. BCl_3
- B. AlCl_3
- C. GaCl_3
- D. InCl_3

Answer: A. BCl_3

Explanation: Boron trihalides are strong Lewis acids due to electron deficiency and absence of d-orbitals.

Q30. The decreasing order of catenation tendency in Group 14 is:

- A. $\text{Si} > \text{C} > \text{Ge} > \text{Sn} > \text{Pb}$
- B. $\text{C} > \text{Si} > \text{Ge} > \text{Sn} > \text{Pb}$
- C. $\text{Pb} > \text{Sn} > \text{Ge} > \text{Si} > \text{C}$
- D. $\text{Sn} > \text{Ge} > \text{Si} > \text{C} > \text{Pb}$

Answer: B. $\text{C} > \text{Si} > \text{Ge} > \text{Sn} > \text{Pb}$

Explanation: Catenation decreases down the group due to decreasing bond enthalpy of M–M bonds.

Q31. Which of the following forms electron-deficient compounds?

- A. Boron
- B. Aluminium
- C. Gallium
- D. All of the above

Answer: D. All of the above

Explanation: Group 13 elements often form electron-deficient compounds (e.g., BCl_3 , AlCl_3) with incomplete octet.

Q32. Which of the following is a correct statement about CO and CO_2 ?

- A. CO is neutral, CO_2 is acidic
- B. Both are acidic
- C. Both are basic
- D. CO is basic, CO_2 is neutral

Answer: A. CO is neutral, CO_2 is acidic

Explanation: CO is neutral, while CO_2 dissolves in water to form carbonic acid.

Q33. Which Group 14 compound is used as a reducing agent in the manufacture of ammonia?

- A. CCl_4
- B. SiCl_4
- C. CO
- D. PbO

Answer: C. CO

Explanation: CO acts as a reducing agent in the Bosch process for the manufacture of ammonia.

Q34. Which Group 13 element has the highest density?

- A. Al
- B. Ga
- C. In
- D. Tl

Answer: D. Tl

Explanation: Density generally increases down the group; thallium has the maximum density among Group 13.

Q35. The correct order of acidic character of Group 13 oxides is:

- A. $B_2O_3 > Al_2O_3 > Ga_2O_3 > In_2O_3 > Tl_2O_3$
- B. $Tl_2O_3 > In_2O_3 > Ga_2O_3 > Al_2O_3 > B_2O_3$
- C. $Al_2O_3 > Ga_2O_3 > In_2O_3 > Tl_2O_3 > B_2O_3$
- D. $Ga_2O_3 > Tl_2O_3 > In_2O_3 > Al_2O_3 > B_2O_3$

Answer: A. $B_2O_3 > Al_2O_3 > Ga_2O_3 > In_2O_3 > Tl_2O_3$

Explanation: Acidic character decreases down the group; basicity increases.

Q36. Which of the following is not a correct property of Boron?

- A. Boron is a metalloid
- B. Boron shows maximum covalency of 4
- C. Boron forms electron-deficient compounds
- D. Boron does not form B^{3+} ions in aqueous solution

Answer: B. Boron shows maximum covalency of 4

Explanation: Boron has no d-orbitals, so its maximum covalency is only 3.

Q37. Which Group 14 element shows anomalous behavior similar to Boron in Group 13?

- A. Silicon

- B. Germanium
- C. Tin
- D. Lead

Answer: A. Silicon

Explanation: Both B and Si are small, have high ionization enthalpy and electronegativity, and form covalent compounds.

Q38. Which Group 14 hydride is least stable?

- A. CH₄
- B. SiH₄
- C. SnH₄
- D. PbH₄

Answer: D. PbH₄

Explanation: Stability decreases down the group due to decreasing bond enthalpy.

Q39. Which of the following forms the maximum number of allotropes?

- A. Carbon
- B. Silicon
- C. Tin
- D. Lead

Answer: A. Carbon

Explanation: Due to strong catenation ability and multiple bond formation, carbon has many allotropes (diamond, graphite, fullerenes, nanotubes).

Q40. Which is the most stable oxidation state of Tin?

- A. +1
- B. +2
- C. +3
- D. +4

Answer: D. +4

Explanation: Sn shows +2 and +4 oxidation states, but +4 is more stable than +2 for Sn.

Q41. Which of the following has the maximum metallic character?

- A. B
- B. Al
- C. In
- D. Tl

Answer: D. Tl

Explanation: Metallic character increases down the group due to decrease in ionization enthalpy.

Q42. Which is the strongest reducing agent among the following Group 14 hydrides?

- A. CH₄
- B. SiH₄
- C. SnH₄
- D. PbH₄

Answer: D. PbH₄

Explanation: Reducing power increases as stability decreases; PbH₄ is least stable and most reducing.

Q43. The maximum covalency of Aluminium is:

- A. 2
- B. 3
- C. 4
- D. 6

Answer: D. 6

Explanation: Aluminium can expand its octet using vacant d-orbitals and show covalency up to 6.

Q44. Which of the following elements has abnormal high melting point due to strong covalent bonding in a network solid?

- A. B
- B. C
- C. Si

D. All of the above

Answer: D. All of the above

Explanation: B, C, and Si form giant covalent structures leading to abnormally high melting points.

Q45. Which of the following is NOT correct about Group 14 elements?

- A. Carbon shows maximum catenation tendency
- B. Down the group, metallic character increases
- C. Stability of +4 oxidation state increases down the group
- D. Pb shows +2 oxidation state more stable than +4

Answer: C. Stability of +4 oxidation state increases down the group

Explanation: Actually, +4 is stable for lighter elements (C, Si), while +2 becomes more stable for heavier (Pb) due to inert pair effect.