WEIRD CHEMIST

Inert Pair Effect — Answer Key & Solutions

Chapter: p-Block Elements —

DPP – 03

Topic: Inert Pair Effect | **Set:** 15 Questions | **Exam:** JEE / NEET

▶ MASTER ANSWER KEY

Q.No	Skill	Group	Answer	Ideal Time
1	Analytical Ability	13	**B**	∼50 s
2	Analytical Ability	14	**B**	∼50 s
3	Analytical Ability	15	**B**	∼50 s
4	Conceptual Clarity	13	**A**	∼30 s
5	Conceptual Clarity	14	**A**	∼30 s
6	Conceptual Clarity	15	**A**	∼30 s
7	Application Skills	13	**B**	∼40 s
8	Application Skills	14	**B**	∼35 s
9	Application Skills	15	**A**	∼35 s
10	Diagram Literacy	13	**B**	∼40 s
11	Diagram Literacy	14	**B**	∼40 s
12	Diagram Literacy	15	**B**	∼40 s
13	Time Management	13	**B**	∼25 s
14	Time Management	14	**C**	∼25 s
15	Time Management	15	**C**	∼25 s

▶ TYPE 1 : Analytical Ability — Solutions

Q1 — Analytical Ability (Group 13) [Ans: B] (∼50 s)

"+1 stability rises down the group" ⇒ "+3 stability falls down the group" ⇒ Tl^{3+} most readily drops to Tl^{+}, so it is the strongest oxidiser. **Skill:** pure recall fails; the answer needs a two-step logical link between the trends.

Q2 — Analytical Ability (Group 14) [Ans: B] (∼50 s)

Sn^{2+} is a reducing agent ⇒ readily oxidised to Sn^{4+}, so $+4$ is the stable end for Sn. Pb^{4+} is an oxidising agent ⇒ readily reduced to Pb^{2+}, so $+2$ is the stable end for Pb. Hence the $+4$ state grows *less* stable from Sn to Pb. **Skill:** two separate facts must be combined to deduce the trend.

Q3 — Analytical Ability (Group 15) [Ans: B] (∼50 s)

"$+5$ stability decreases down the group" ⇒ Bi(V) is the least stable $+5$ species; "$+3$ stability increases" ⇒ Bi(III) is the preferred state. So Bi(V) most readily drops to Bi(III), making it the strongest oxidiser. **Skill:** two stated trends must be linked.

▶ TYPE 2 : Conceptual Clarity — Solutions

Q4 — Conceptual Clarity (Group 13) [Ans: A] (∼30 s)

Poor d/f shielding → high Z_{eff} → the ns^2 pair is held tightly. **Skill:** distractor (3) is the classic misconception ("bigger atom → electrons leave easily"), the *opposite* of the real cause — it is Z_{eff}, not size, that locks the ns^2 pair.

Q5 — Conceptual Clarity (Group 14) [Ans: A] (∼30 s)

The rising $+2$ tendency is due to the inability of the ns^2 electrons to take part in bonding (inert pair effect). **Skill:** distractor (2) is the classic misconception — it claims it gets "easier to lose all four electrons," but the effect is the *opposite*: the ns^2 pair is held back, so only the two np electrons bond, giving $+2$.

Q6 — Conceptual Clarity (Group 15) [Ans: A] (∼30 s)

The inert pair effect: the ns^2 pair increasingly resists bonding down the group, favouring $+3$ over $+5$. **Skill:** distractor (3) is the misconception "easier to remove all five electrons," the *opposite* of the effect, in which fewer electrons (only the np) take part.

▶ TYPE 3 : Application Skills — Solutions

Q7 — Application Skills (Group 13) [Ans: B] (∼40 s)

Tl strongly prefers the $+1$ state, so $TlCl_3 \longrightarrow TlCl + Cl_2$. **Skill:** decomposition is a brand-new scenario; you *apply* the "Tl prefers $+1$" idea to predict the product.

Q8 — Application Skills (Group 14) [Ans: B] (∼35 s)

A reducing agent is itself oxidised. Sn^{2+} (in $SnCl_2$) → Sn^{4+}, donating electrons that reduce $Fe^{3+} \longrightarrow Fe^{2+}$. PbO_2 is an oxidiser (opposite role); GeO_2 and CO_2 are stable $+4$ species. **Skill:** "Sn^{2+} is a reducing agent" applied to a new redox reaction.

Q9 — Application Skills (Group 15) [Ans: A] (∼35 s)

Bi prefers $+3$, so Bi(V) in $NaBiO_3$ readily accepts electrons and is reduced to Bi(III) — a powerful oxidiser. **Skill:** "$+5$ is least stable for Bi" applied to a specific new reagent ($NaBiO_3$).

▶ TYPE 4 : Diagram-Based Visual Literacy — Solutions

Q10 — Diagram Literacy (Group 13) [Ans: B] (∼40 s)

The rising curve $= +1$ (stability increases down the group), so the falling curve (Y) must be the $+3$ state. **Skill:** map the described trend *direction* onto the concept rather than restating a fact.

Q11 — Diagram Literacy (Group 14) [Ans: B] (∼40 s)

The falling curve (P) is the $+4$ state (most stable for C/Si, least for Pb); the rising curve (Q) is the $+2$ state (most stable for Pb). The crossover near Sn reflects Sn showing *both* states. **Skill:** map two trend directions onto two oxidation states.

Q12 — Diagram Literacy (Group 15) [Ans: B] (∼40 s)

The rising curve (X) is the $+3$ state (stability increases down the group), so the falling curve (Y) is the $+5$ state. **Skill:** read the trend *direction* off the described plot.

▶ TYPE 5 : Time Management & Strategic Thinking — Solutions

Q13 — Time Management (Group 13) [Ans: B] (∼25 s)

One rule ("$+3$ falls, $+1$ rises down the group") eliminates (1) (Al has no inert pair effect, $+3$ dominates), (3) (Tl^+ is the most stable $+1$, hence weakest reducer) and (4) (trend backwards). Only (2) survives. **Skill:** the governing rule clears three options at a glance.

Q14 — Time Management (Group 14) [Ans: C] (∼25 s)

The rule ("down Group 14, $+2$ rises, $+4$ falls; Sn^{2+} reduces, Pb^{4+} oxidises") eliminates (1) (Pb prefers $+2$, so $PbCl_2 > PbCl_4$), (2) (Sn^{2+} is a reducer) and (4) (trend backwards). Only (3) survives. **Skill:** one rule, three eliminations.

Q15 — Time Management (Group 15) [Ans: C] (∼25 s)

The rule ("down Group 15, $+5$ falls, $+3$ rises") eliminates (1) (Bi prefers $+3$, so $BiCl_3 > BiCl_5$), (2) ($+5$ becomes less stable) and (4) ($+3$ becomes more stable). Only (3) survives. **Skill:** the governing rule clears three options at a glance.