Valency and Oxidation state

1. (a) Examples of neutral oxides are CO, H_2O, N_2O. These oxides are neutral towards litmus paper.

2. **(c) Valence electrons shell**

3rd period elements have electrons in **three shells (n = 3)**.

(a) Atomic number 3 → Only lithium.
(b) 3 complete sub-shells → Not all sub-shells are complete (e.g., 3p is being filled).
(c) Valence electrons shell → All elements have **valence electrons in the 3rd shell**.
(d) 3 electrons less than the octet → Only true for some elements.

3. **(c) d-block elements**

s-block elements → Fixed valency (1 or 2).

p-block elements → Mostly fixed valency (except some)
d-block elements (transition metals) → Show **variable valency** due to involvement of (n-1)d electrons.
Radioactive elements → Not related to valency.

4. **(a) K**

Reducing agents lose electrons easily. Metals in **Group 1 (alkali metals)** are strongest reducers.

K > Ba > Mg > Al (in reactivity with water or tendency to lose electrons).

5. (a) Basic or metallic character of pentaoxides in VA group increases down the group. Hence acidity decreases.

6. **(d) Halogens**

This corresponds to **7 electrons in the outermost shell**.

Elements with **$ns^2\ np^5$ configuration** are **one electron short of a complete octet**, which is characteristic of **halogens**.
Examples: F ($2s^2 2p^5$), Cl ($3s^2 3p^5$), Br ($4s^2 4p^5$).

7. (a) Na_2O, MgO, Al_2O_3, CuO. More the metallic character higher the e^- donating tendency. Therefore lower the I.E. more the basic nature of oxide.

8. (d) As it can donate e^- easily due to low comparative attraction by the nucleus to the valence e^-.

9. (b) Because of the non-metallic character increases.

10. (d) Oxidizing power increases in a group.

11. **(d) $Ba(OH)_2$**

Basicity of hydroxides **increases down the group** in Group 2 (alkaline earth metals).

Given hydroxides: $Be(OH)_2$, $Mg(OH)_2$, $Ca(OH)_2$, $Ba(OH)_2$
Trend of basicity: $Be(OH)_2 < Mg(OH)_2 < Ca(OH)_2 < Ba(OH)_2$

12. **(c) Increases one by one from IA to IVA and then decreases from VA to VIIA one by one**

Valency w.r.t oxygen = number of bonds an element forms with oxygen (assume forming stable oxides).

Trend across a period:
IA → VIIA elements
Valency **increases from 1 to 4** (IA → IVA), then **decreases from 3 to 1** (VA → VIIA)
So the correct description:

13. Answer: (a) B

Non-metallic character **increases across a period** and **decreases down a group**.

Elements: B, Be, Mg, Al (all period 2 & 3 elements)
Be → metallic character more, Mg → metallic,, Al → metallic, B → semimetal, more non-metallic than others

14. (c) HF is least acidic due to the small size of fluorine.

15. **(d) Larger size of phosphorus atom Nitrogen (N)**: Small size → strong **repulsion between lone pair and bonding pairs** → pentavalent nitrogen is unstable.

Phosphorus (P): Larger atomic size → can accommodate 5 bonds easily → pentavalent phosphorus is stable.
So, the key reason is the **larger size of phosphorus atom**.

16. (d) $Co - [Ar]3d^7 4s^2$, it has 3 unpaired e^- so it is a paramagnetic.

17. (a) Transition elements due to presence of vacant *d*-orbitals.

18. (c) Its valency is 2. So it will form *MO* type compound.

19. (a) Oxides of alkali metals are most basic.

20. **(b) Decreases from left to right across a period and increases on descending a group**
Across a period (left → right): Metallic character **decreases** because atoms hold electrons more tightly.

Down a group: Metallic character **increases** because outer electrons are farther from the nucleus and lost more easily.

21. (a) Fluorine is the most easily reduced in halogens.

22. (b) Across the period non-metallic character increases. Hence basic nature of oxide decreases.

23. (b) Fluorine is more reactive than chlorine, bromine and iodine.

24. (b) Both are coinage metals

$3d^{10}4s^1 - Cu; \quad 4d^{10}5s^1 - Ag$

25. **(d) I^-**

F^-, Cl^-, Br^-, I^- → Reducing ability **increases down the group** because larger ions lose electrons more easily.

Trend: $F^- < Cl^- < Br^- < I^-$