

28. Chemistry of transition elements

Starter Quiz · 课前小测

A-Level Chemistry

Name: _____ Score: _____

1. A transition element is a d-block element that:

- ☐ forms one or more stable ions with incomplete d orbitals
- ☐ has a full d sub-shell in all its ions
- ☐ is in the s-block
- ☐ never forms ions

2. A ligand bonds to a metal ion by:

- ☐ donating a lone pair in a dative covalent bond
- ☐ transferring an electron
- ☐ sharing one electron each
- ☐ forming an ionic bond

3. Ligand exchange is when:

- ☐ one ligand replaces another on the metal ion (often a colour change)
- ☐ the metal ion changes oxidation state
- ☐ electrons are transferred
- ☐ the complex is destroyed

4. In a free transition-metal ion, the five d orbitals are:

- ☐ degenerate (the same energy)
- ☐ all different energies
- ☐ split into two sets
- ☐ empty

5. Geometrical (cis/trans) isomerism in $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ means the two identical ligands are:

- ☐ adjacent (cis) or opposite (trans)
- ☐ always opposite
- ☐ mirror images
- ☐ removed

6. Transition-metal complexes can show both geometrical and optical isomerism.

- ☐ True ☐ False

7. The equilibrium constant for the formation of a complex from its aqua ion is the _____ constant.

8. A transition element forms at least one ion with an incomplete _____ subshell.

9. A molecule or ion that donates a lone pair to a central metal ion is a _____.

10. In ligand exchange, one ligand is replaced by another around the central metal ion.

- ☐ True ☐ False

1. **forms one or more stable ions with incomplete d orbitals**

The incomplete d orbitals (in a stable ion) define a transition element.

2. **donating a lone pair in a dative covalent bond**

A ligand donates a lone pair to the metal's vacant orbital — a dative (coordinate) bond.

3. **one ligand replaces another on the metal ion (often a colour change)**

Swapping a ligand for another changes the complex and usually its colour.

4. **degenerate (the same energy)**

They are degenerate until ligands approach and split them into two sets.

5. **adjacent (cis) or opposite (trans)**

In a square planar complex the matching ligands sit next to each other (cis) or across (trans).

6. **True**

Square planar/octahedral complexes show cis/trans; octahedral ones with bidentate ligands show optical isomerism.

7. **stability**

A larger value means a more stable complex.

8. **d**

This gives variable oxidation states and colour.

9. **ligand**

It forms a coordinate bond to the metal.

10. **True**

It can change the complex's colour.