

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:
 - ☐ transferring an electron
 - ☐ donating a lone pair in a dative covalent bond
 - ☐ sharing one electron each
 - ☐ forming an ionic bond
3. Ligand exchange is when:
 - ☐ electrons are transferred
 - ☐ the complex is destroyed
 - ☐ one ligand replaces another on the metal ion (often a colour change)
 - ☐ the metal ion changes oxidation state
4. In a free transition-metal ion, the five d orbitals are:
 - ☐ empty
 - ☐ degenerate (the same energy)
 - ☐ split into two sets
 - ☐ all different energies
5. Geometrical (cis/trans) isomerism in $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ means the two identical ligands are:
 - ☐ mirror images
 - ☐ always opposite
 - ☐ adjacent (cis) or opposite (trans)
 - ☐ removed
6. The equilibrium constant for the formation of a complex from its aqua ion is the _____

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

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

9. In ligand exchange, one ligand is replaced by another around the central metal ion.
☐ True ☐ False
10. Transition-metal complexes are coloured because d-electrons absorb part of the _____ spectrum.

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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. **stability**

A larger value means a more stable complex.

7. **d**

This gives variable oxidation states and colour.

8. **ligand**

It forms a coordinate bond to the metal.

9. **True**

It can change the complex's colour.

10. **visible**

The complementary colour is transmitted.