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 $[Pt(NH_3)_2Cl_2]$ means the two identical ligands are:

   ☐ non-superimposable mirror images of each other

   ☐ always opposite (trans), never adjacent

   ☐ adjacent (cis) or opposite (trans)

   ☐ swapped for two other ligands in each isomer

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

   _____

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   _____

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.

    _____

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.

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