

- Explain why compounds of *d*-block elements are frequently paramagnetic. Use examples in your answer.

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Paramagnetism is the property of a compound to be attracted by an external magnetic field. It is a characteristic of any compound with unpaired electrons. *d*-Block elements have from 1 to 10 electrons in the *d*-orbitals. When forming compounds, some of these may be lost to give paramagnetic species. Species with odd numbers of electrons must be paramagnetic, species with even numbers of *d*-electrons, may or may not be paramagnetic. eg

Cu^{2+}, d^9	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	\uparrow	must be paramagnetic
Zn^{2+}, d^{10}	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	$\uparrow\downarrow$	must be diamagnetic
Fe^{2+}, d^6	$\uparrow\downarrow$	\uparrow	\uparrow	\uparrow	\uparrow	is paramagnetic

- Provide a systematic name for *cis*-[Co(en)₂Cl₂]Cl. Is this complex chiral? Explain your reasoning by drawing the structure of the complex.
en = NH₂CH₂CH₂NH₂ = ethane-1,2-diamine = ethylenediamine

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***cis*-dichloridobis(ethylenediamine)cobalt(III) chloride or
cis-dichloridobis(ethane-1,2-diamine)cobalt(III) chloride**

The complex is chiral as it is not superimposable on its mirror image.

