



On oxidation of $[\text{M}(\text{H}_2\text{O})_6]^{3+}$ to $[\text{M}(\text{H}_2\text{O})_6]^{4+}$, the solution turned colourless. Deduce the electronic configuration of the transition metal **M**.

- A $[\text{Ar}]3d^14s^2$
- B $[\text{Ar}]3d^24s^2$
- C $[\text{Ar}]3d^34s^2$
- D $[\text{Ar}]3d^{10}4s^2$

09-4-M-25 [NA]

When drops of $\text{NH}_3(\text{aq})$ are added to $\text{Cu}(\text{NO}_3)_2(\text{aq})$, a pale blue precipitate is formed. This precipitate dissolves when excess $\text{NH}_3(\text{aq})$ is added, forming a deep blue solution. On adding of dilute hydrochloric acid, the pale blue precipitate reforms.

Which process does **not** occur in this sequence?

- A dative bond formation
- B formation of a complex ion
- C precipitation of copper(II) hydroxide
- D reduction of copper(II) ions

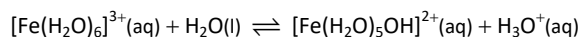
09-4-M-26 [TM]

Which of the following is not correct about the first row transition metal or its compounds?

- A Na_2FeO_4 is a coloured solid.
- B CoF_3 oxidises water.
- C Na_2CrO_4 can be oxidized to $\text{Na}_2\text{Cr}_2\text{O}_7$.
- D Cu_2O is insoluble in water.

09-4-M-27 [RJ]

The hexa-aquairon(III) ion hydrolyses as shown.



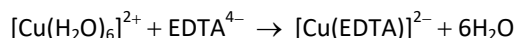
Which statements are correct?

- 1 The corresponding iron(II) ion, $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ is less likely to undergo hydrolysis.
- 2 The iron undergoes a change in oxidation state.
- 3 This hydrolysis is favoured by low pH values.

- A 1, 2 and 3 are correct.
- B 1 and 2 only are correct.
- C 2 and 3 only are correct.
- D 1 only is correct.

09-4-M-28 [TM]

Which of the following statements about the reaction below is **true**?



- 1 Both $[\text{Cu}(\text{EDTA})]^{2-}$ and $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ are octahedral complexes.
 - 2 $K_{\text{stab}} [\text{Cu}(\text{EDTA})]^{2-} > K_{\text{stab}} [\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
 - 3 This is a redox reaction.
- A 1, 2 and 3 are correct.
 - B 1 and 2 only are correct.
 - C 2 and 3 only are correct.
 - D 1 only is correct.

09-4-M-29 [VJ]

A dilute solution of nickel(II) chloride is pale green at room temperature. When a test tube containing nickel(II) chloride solution is immersed in liquid nitrogen (temperature: -196°C), the pale green solution solidifies and becomes colourless.

Which of the following statements best explains the observation above?

- A Chloride ion has been substituted by a stronger ligand.
- B The oxidation state of nickel has changed from +2 to 0.
- C The probability of $d-d^*$ electronic transitions was greatly reduced.
- D The solution does not contain complex ions at -196°C .

09-4-M-30 [HC]

Aqueous magnesium fluoride is added to an aqueous solution of iron(III) chloride. After a few minutes, aqueous potassium thiocyanate is added, followed by aqueous sodium cyanide. The following sequence of colour changes is observed:

yellow → colourless → red

The table below shows the colour of various Fe(III) complexes.

complex	$[\text{Fe}(\text{H}_2\text{O})\text{F}_5]^{2-}$	$[\text{Fe}(\text{CN})_6]^{3-}$	$[\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+}$
colour	colourless	red	deep red

Which is the correct arrangement of the complexes in order of increasing stability?

- A $[\text{Fe}(\text{H}_2\text{O})\text{F}_5]^{2-} < [\text{Fe}(\text{CN})_6]^{3-} < [\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+}$
 B $[\text{Fe}(\text{H}_2\text{O})\text{F}_5]^{2-} < [\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+} < [\text{Fe}(\text{CN})_6]^{3-}$
 C $[\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+} < [\text{Fe}(\text{CN})_6]^{3-} < [\text{Fe}(\text{H}_2\text{O})\text{F}_5]^{2-}$
 D $[\text{Fe}(\text{H}_2\text{O})_5(\text{SCN})]^{2+} < [\text{Fe}(\text{H}_2\text{O})\text{F}_5]^{2-} < [\text{Fe}(\text{CN})_6]^{3-}$

09-4-M-31 [VJ]

Iron, a typical transition metal, exhibits variable oxidation states.

BaFeO_n is an iron-containing salt, where n represents the number of oxygen atoms. The anion in the salt is a powerful oxidizing agent. On treatment with excess potassium iodide, 1 mole of the anion liberates 1.5 moles of iodine and the anion is converted to Fe^{3+} .

What is the value of n ?

- A 2
 B 3
 C 4
 D 5

09-4-M-32 [TM]

Which of the following statements describe the characteristics of cobalt (a typical transition element) but **not** barium (a typical group II element)?

- 1 Its compounds have wide applications in homogeneous catalysis.
 2 It forms coloured complexes.
 3 It contains d -orbitals.
- A 1, 2 and 3 are correct.
 B 1 and 2 only are correct.
 C 2 and 3 only are correct.
 D 1 only is correct.

09-4-M-33 [RJ]

The following data refer to copper as a typical transition metal element and to calcium as an s -block element.

For which property are the data under the correct element?

	Property	copper	calcium
1	metallic radius/ nm	0.128	0.197
2	density/ g cm^{-3}	8.96	1.55
3	melting point/ K	1356	1123

- A 1, 2 and 3 are correct.
 B 1 and 2 only are correct.
 C 2 and 3 only are correct.
 D 1 only is correct.

09-4-M-34 [TM]

Zn^{2+} has a full set of valence d electrons.

What is **not** a direct consequence of this property?

- A Aqueous solutions of its salts do not absorb visible light.
 B Its complexes are colourless.
 C Its complexes are octahedral.
 D The metal exhibits only one oxidation state.

09-4-M-35 [NA]

Chromium(III) chloride combines with ammonia to form compound **X** in which the co-ordination number of chromium is 6. When solution **X** is treated with an excess aqueous silver nitrate, only two-third of the total chloride present is precipitated as AgCl .

What is the formula of compound **X**?

- A $\text{Cr}(\text{NH}_3)_3\text{Cl}_3$
 B $\text{Cr}(\text{NH}_3)_4\text{Cl}_3$
 C $\text{Cr}(\text{NH}_3)_5\text{Cl}_3$
 D $\text{Cr}(\text{NH}_3)_6\text{Cl}_3$

09-4-M-36 [VJ]

When concentrated ammonia is added to silver bromide, the salt dissolves. Which of the following explains this observation?