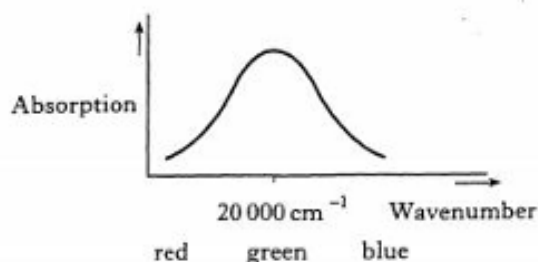


2001 AH MC2 (88%)



2. The colour which would be observed is

- A blue
- B green
- C purple
- D yellow.

2003 AH MC2 (80%)

2. An aqueous solution of potassium permanganate is coloured purple. In which region of the visible spectrum is it absorbing?

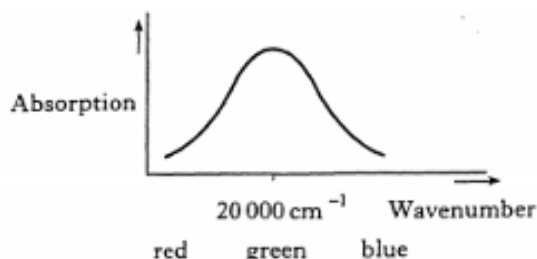
- A Red
- B Orange
- C Green
- D Violet

2015 revAH MC9 (62%)

9. Which of the following solids would form a colourless aqueous solution?

- A $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
- B $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$
- C K_2CrO_4
- D CoCl_2

2001 AH MC3 (65%)



3. The colour is caused by

- A electrons absorbing energy to jump from one d orbital to another d orbital
- B excited electrons dropping to the ground state
- C electrons absorbing energy to jump from the first to the second shell
- D electrons absorbing energy to jump from the second to the third shell.

2004 AH MC9 (54%) and 2011 AH MC10 (52%)

9. Which of the following ions is **least** likely to be coloured?

- A $\text{Ti}(\text{H}_2\text{O})_6^{3+}$
- B $\text{Cr}(\text{NH}_3)_6^{3+}$
- C $\text{Ni}(\text{H}_2\text{O})_6^{2+}$
- D $\text{Zn}(\text{NH}_3)_4^{2+}$

2011 AH MC2 (81%)

2. In colorimetry, as the concentration of a coloured solution decreases
- A the absorbance increases
 - B the absorbance decreases
 - C the radiation wavelength increases
 - D the radiation wavelength decreases.

2014 revAH MC4 (92%)

4. The colour of a highly concentrated ionic solution which absorbs light only in the ultra-violet region of the electromagnetic spectrum is
- A red
 - B black
 - C violet
 - D colourless.

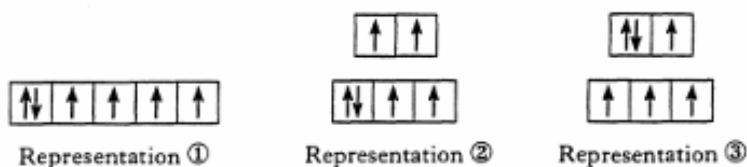
2012 AH MC4 (37%)

4. In absorption spectroscopy, as the concentration of an ionic solution decreases, the radiation transmitted
- A increases in intensity
 - B decreases in intensity
 - C increases in wavelength
 - D decreases in wavelength.

2014 AH MC4 (76%) and 2014 revAH MC7 (82%)

4. In absorption spectroscopy, as the concentration of an ion in solution increases, there is an increase in the
- A wavelength of radiation absorbed
 - B frequency of radiation absorbed
 - C intensity of radiation absorbed
 - D intensity of radiation transmitted.

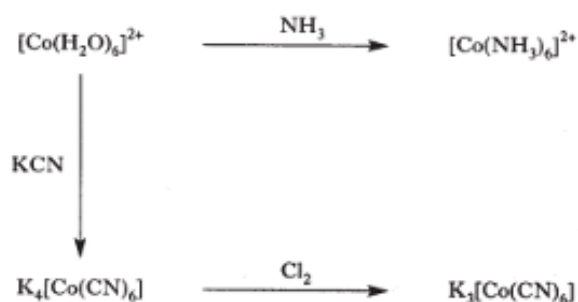
1. Under certain conditions the 3d electrons in the Fe^{2+} ion can be represented as



- (c) (i) Under which conditions could representation ① exist? 1
- (ii) Under which conditions could representation ② exist? 1
- (iii) What could cause the electronic configuration of the Fe^{2+} ion to change from representation ② to representation ③? 1

2004 AH L5d

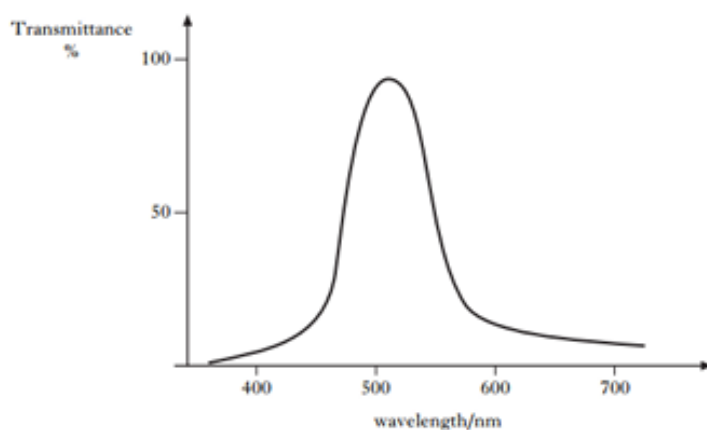
5. Consider the following reactions.



- (d) There is a colour change when NH_3 is added to $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$. 1
 Why does this change of ligand result in different wavelengths of light being absorbed?

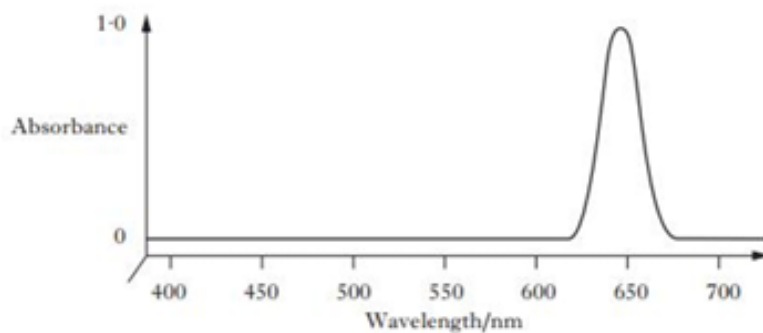
2008 AH L2a

2. An aqueous solution of the compound $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$ gave the following **transmittance** spectrum.



- (a) From the above spectrum, deduce the colour of the solution. 1

5.



The absorption spectrum of a solution of sodium tetrachlorocobaltate(II) is shown above.

(a) Predict the most likely colour of the solution.

1

2014 AH L4

4. A chromium compound is known to exist in the following three isomeric forms. The co-ordination number of chromium is the same in each isomer.

- A** $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}(\text{Cl}^-)_3$
B $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{2+}(\text{Cl}^-)_2 \cdot \text{H}_2\text{O}$
C $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]^+(\text{Cl}^-) \cdot 2\text{H}_2\text{O}$

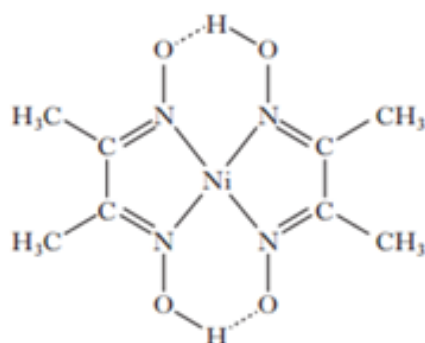
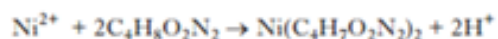
(c) All three forms have different colours in solution.

- (i) Explain how colour arises in transition metal compounds such as those above.
 (ii) Suggest why the three solutions have different colours.

2

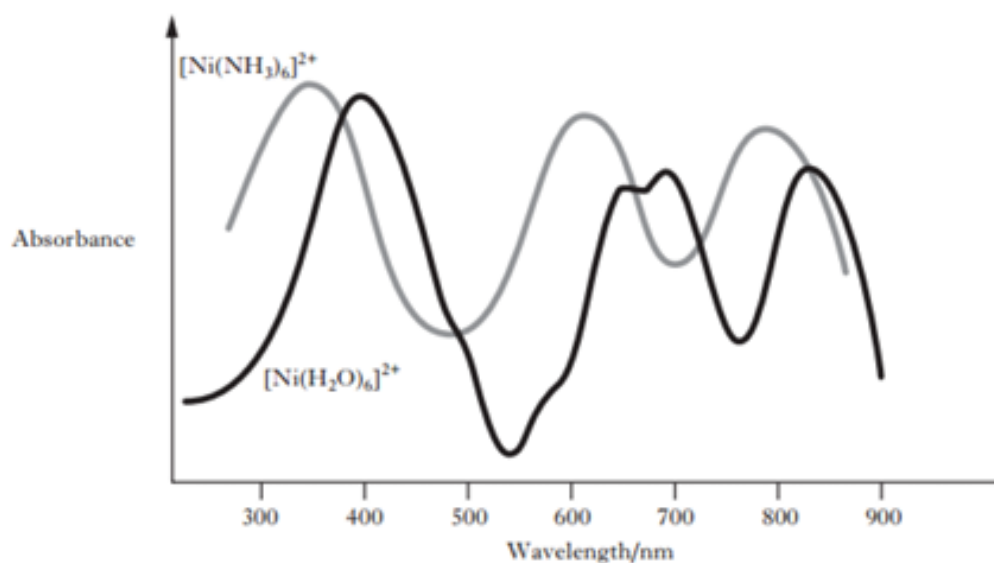
1

5. Nickel(II) ions react quantitatively with dimethylglyoxime ($\text{C}_4\text{H}_8\text{O}_2\text{N}_2$) forming a complex which precipitates out as a red solid. The equation for the reaction and the structure of the complex are shown below.



Relative formula mass = 288.7

5. (d)



- Why is $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}(\text{Cl}^-)_2(\text{aq})$ likely to be green? 1
- Explain why the peaks in the absorption spectrum of $[\text{Ni}(\text{NH}_3)_6]^{2+}$ are at shorter wavelengths. 2
- Predict the colour of $[\text{Ni}(\text{NH}_3)_6]^{2+}(\text{Cl}^-)_2(\text{aq})$. 1