Transition metal – A2 2022 Chemistry P1&P3

1. June/2022/Paper_7405/1/No.7

0 7 Copper(II) complexes are coloured.
The colour is caused by the d electrons of copper moving from their ground state to an excited state.

0 7 . 1 Explain why aqueous solutions containing $[CuCl_4]^{2-}$ ions are yellow.

[2 marks]

0 7 . 2 When a d electron moves from the ground state to the excited state in a copper complex, the energy change is 3.98×10^{-19} J

The Planck constant, $h = 6.63 \times 10^{-34}$ J s

Calculate the frequency, in s^{-1}, of the light absorbed.

[2 marks]

Frequency _____ s^{-1}

0 7 . 3 State **three** ways in which a transition metal complex can be changed to alter its colour.

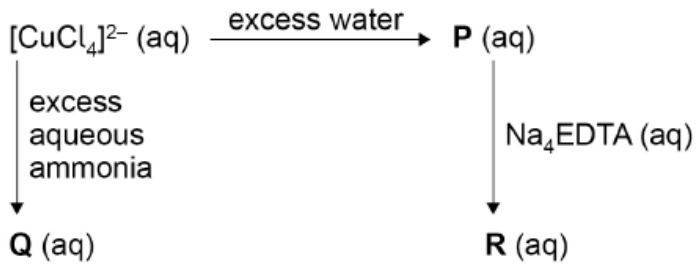
[3 marks]

1 _____

2 _____

3 _____

Consider the following reaction scheme in which **P**, **Q** and **R** are different complex ions of copper.



0 7 . 4 Name the shape of the $[CuCl_4]^{2-}$ ion.

[1 mark]

0 7 . 5 Give an ionic equation for the conversion of $[CuCl_4]^{2-}$ to complex ion **P**.

[1 mark]

0 7 . 6 State the colour of the solution containing the complex ion **Q**.

Give an ionic equation for the conversion of $[CuCl_4]^{2-}$ to **Q**.

[2 marks]

Colour _____

Equation

0 7 . 7 Identify complex ion **R**.

[1 mark]

2. June/2022/Paper_7405/3/No.19

Which pair of reagents reacts to form a tetrahedral complex?

[1 mark]

A $CoCl_2(aq)$ and concentrated $NH_3(aq)$ ⬭

B $CuSO_4(aq)$ and concentrated $NH_3(aq)$ ⬭

C $CuSO_4(aq)$ and sodium ethanedioate(aq) ⬭

D $FeCl_3(aq)$ and concentrated $HCl(aq)$ ⬭