

# Transition Elements

## A Level only

### Question Paper 2

Level	A Level
Subject	Chemistry
Exam Board	OCR
Module	Physical Chemistry & Transition Elements
Topic	Transition Elements
Paper	A Level only
Booklet	Question Paper 2

**Time allowed:** 20 minutes

**Score:** /15

**Percentage:** /100

**Grade Boundaries:**

A*	A	B	C	D	E
>85%	73%	60%	47%	34%	21%

## Question 1

Which electron configuration(s) is/are correct?

- 1 Cr atom:  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
- 2 Cu atom:  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$
- 3  $Fe^{2+}$  ion:  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

- A. 1, 2 and 3
- B. Only 1 and 2
- C. Only 2 and 3
- D. Only 1

[1]

## Question 2

Copper(II) ions form an aqueous complex ion, **X**, with chloride ions.

Which statement about **X** is true?

- A **X** has optical isomers
- B **X** has a square planar shape
- C **X** has the formula  $\text{CuCl}_4^{2+}$
- D **X** has a yellow colour

[1]

### Question 3

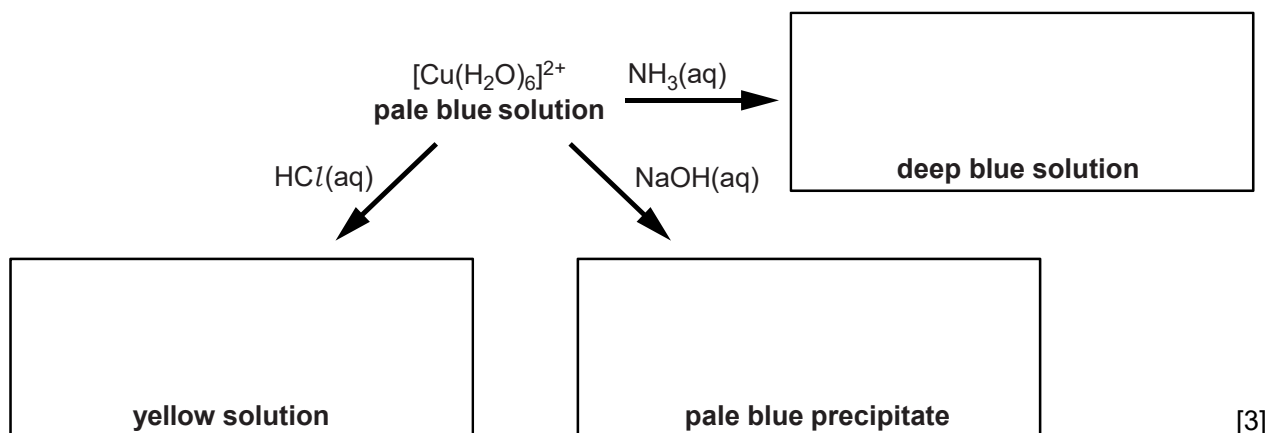
This question refers to chemistry of d-block elements in Period 4 (Sc–Zn).

(a) For each statement below, select the symbols of the correct element(s).

- (i) The element that has atoms containing six electrons in the 3d sub-shell. [1]
- (ii) Two elements that have atoms with two unpaired d electrons. [2]
- (iii) The element with ions that form a blue complex with chloride ions. [1]
- (iv) The element **X** that forms an oxide with the formula  $\text{X}_3\text{O}_4$  with the molar mass of  $228.7 \text{ g mol}^{-1}$ . [1]
- (v) The element that has atoms with an average mass of  $8.64 \times 10^{-23} \text{ g}$ . [1]

(b) The flowchart below shows three reactions of the complex ion  $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ .

In the boxes below, write down the formulae of the species formed.



(c) The answers to this question all refer to complex ions of nickel.

(i) State the shape of the complex ion  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ . [1]

(ii) What is the formula of the complex ion of  $\text{Ni}^{2+}$  containing six fluoride ligands? [1]

(iii) Show the 3-D shapes of the stereoisomers of the complex ion  $[\text{Ni}(\text{en})_3]^{2+}$ .  
(en =  $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$ )

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[2]

[Total 13 Marks]