

## Transition Elements (MCQ)

1. Which statement(s) for the complex ion  $[\text{Co}(\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2)_3]^{2+}$  is/are correct?

- 1 It has *cis* and *trans* isomers.
- 2 It has optical isomers.
- 3 It is six-fold coordination.

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

Your answer

[1]

2. Which statement about elements in the d block of Period 4 of the periodic table is correct?

- A Cr atoms have the electron configuration:  $1s^22s^22p^63s^23p^63d^54s^1$ .
- B  $\text{Cu}^+$  ions contain an incomplete 3d sub-shell.
- C  $\text{Fe}^{2+}$  ions contain 3 unpaired electrons.
- D Sc forms ions with different oxidation states.

Your answer

[1]

3. What is the number of stereoisomers that  $\text{Ni}(\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2)_2\text{Cl}_2$  can form?

- A 2
- B 3
- C 4
- D 6

Your answer

[1]

### 5.3.1 Transition Elements MCQ

4. Which property/properties is/are correct for a transition element?

- 1 The element has atoms with a partially filled d sub-shell.
- 2 The existence of more than one oxidation state in its compounds.
- 3 The formation of coloured ions.

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

Your answer

[1]

5. Which statement(s) is/are correct for the complex  $\text{Pt}(\text{NH}_3)_2\text{Cl}_2$ ?

- 1 One of its stereoisomers is used as an anti-cancer drug.
- 2 It has bond angles of  $109.5^\circ$ .
- 3 It has optical isomers.

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

Your answer

[1]

6. Aqueous  $\text{Cr}^{3+}$  ions are reacted with an excess of aqueous sodium hydroxide.

Which product is formed?

- A**  $\text{Cr}(\text{OH})_6^{3-}$   
**B**  $\text{Cr}(\text{OH})_3$   
**C**  $[\text{Cr}(\text{OH})_4(\text{H}_2\text{O})_2]^-$   
**D**  $[\text{Cr}(\text{OH})_4]^{3-}$

Your answer

[1]

### 5.3.1 Transition Elements MCQ

7. 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:  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^1$

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

Your answer

[1]

8. What is the bonding between the ligands and the metal ion in  $[Fe(H_2O)_6]^{2+}$ ?

- A** Metallic  
**B** Ionic  
**C** Hydrogen  
**D** Dative covalent

Your answer

[1]

9. Which statement(s) is/are correct for copper(II) ions?

- 1 They form a copper(II) complex ion with chloride ions that has a square planar shape.
- 2 They can be reduced to copper(I) by iodide ions.
- 3 They have the electron configuration of  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^9$ .

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

Your answer

[1]

10. What is the reason that zinc is **not** classified as a transition element?

- A Zinc atoms contain a full d-sub-shell.
- B There are no zinc ions with an incomplete d-sub-shell.
- C Zinc does not form complex ions.
- D Zinc ions are colourless.

Your answer

[1]

END OF QUESTION PAPER

# Mark scheme – Transition Elements (MCQ)

Question			Answer/Indicative content	Marks	Guidance
1			C	1 (AOB 1.1)	
			<b>Total</b>	<b>1</b>	
2			A	1 (AO 1.1)	
			<b>Total</b>	<b>1</b>	
3			B	1 (AO 2.1)	<p><b><u>Examiner's Comments</u></b></p> <p>This was a challenging question, with only the most able candidates giving the correct response of B (one trans isomer and two optical cis isomers). Many candidates drew out the shapes of the isomers but some missed the two optical cis isomers (giving option A) while others thought there were two cis and two trans optical isomers, giving option C.</p>
			<b>Total</b>	<b>1</b>	
4			C	1 (AO 1.1)	<p><b><u>Examiner's Comments</u></b></p> <p>Only the highest attaining candidates chose the correct answer of C. Many candidates thought all 3 statements were correct (giving option A as their answer), not realising that statement 1 referred to atoms not ions</p>
			<b>Total</b>	<b>1</b>	
5			D	1 (AO 1.1)	<p><b><u>Examiner's Comments</u></b></p> <p>The drawing of many (incorrect) shapes based upon a tetrahedral arrangement around the central Pt ion suggested many were unaware of the square planar shape of the complex.</p>
			<b>Total</b>	<b>1</b>	
6			A	1	
			<b>Total</b>	<b>1</b>	
7			B	1	
			<b>Total</b>	<b>1</b>	

## 5.3.1 Transition Elements MCQ

8			<b>D</b>	1	
			<b>Total</b>	<b>1</b>	
9			<b>C</b>	1	
			<b>Total</b>	<b>1</b>	
10			<b>B</b>	1	
			<b>Total</b>	<b>1</b>	