

Get Ready to Crack CSIR NET 2021

(Important Questions on d-block)



Important Questions on d-Block

1. Which of the following is colourless?
 - A. $[\text{Cu}(\text{NH}_3)_4]\text{SO}_4$
 - B. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$
 - C. CuSO_4
 - D. CuCl_2
2. AgCl on fusion with sodium carbonate gives:
 - A. Ag_2CO_3
 - B. Ag_2O
 - C. Ag
 - D. None of the above
3. Which compound is formed when excess of KCN is added to an aqueous solution of copper sulphate?
 - A. $\text{Cu}(\text{CN})_2$
 - B. CuCN
 - C. $\text{K}_2[\text{Cu}(\text{CN})_4]$
 - D. $\text{K}_3[\text{Cu}(\text{CN})_4]$
4. Which of the following can be reduced by Zn ?
 - A. Na $[\text{Ag}(\text{CN})_2]$
 - B. Na $[\text{Au}(\text{CN})_2]$
 - C. (A) & (B) Both
 - D. None of these
5. According to Frost diagram, which element lies in the upper part?
 - A. Sc
 - B. Ti
 - C. V
 - D. Cr
6. The simple aqua ions Cu^+ and Ag^+ undergo which reaction in aqueous solution?

A. Oxidation	B. Reduction
C. Disproportionation	D. None of the above

7. The conversion of an aqua ligand to an oxido ligand is favoured by:

- A. High pH
- B. Low pH
- C. Moderate pH
- D. Any pH

8. The Irving-Williams Series summarizes:

- A. Stability of complexes formed by M^+ ions
- B. Stability of complexes formed by M^{2+} ions
- C. Stability of complexes formed by M^{3+} ions
- D. Stability of complexes formed by M^{5+} ions

9. Determine the term symbol of an atom having s^1 configuration.

- A. 1S
- B. 2S
- C. Both can be possible
- D. None

10. What terms in a complex having O_h symmetry correlate with 3P term of a free atom with d^2 configuration?

- A. ${}^3A_{1g}$
- B. ${}^3T_{1g}$
- C. ${}^3T_{2g}$
- D. ${}^3A_{2g}$

Answer Key:

- | | |
|------|-------|
| 1. C | 6. C |
| 2. C | 7. A |
| 3. D | 8. B |
| 4. C | 9. B |
| 5. D | 10. B |

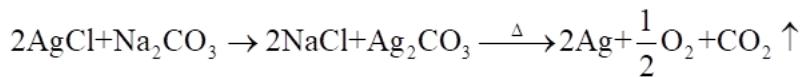
Solutions:

Solution 1.

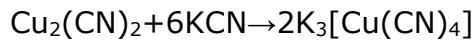
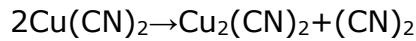
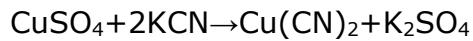
CuSO_4 is colourless because it is anhydrous and does not have water of crystallisation.

A and B are blue in colour while D is green in colour.

Solution 2.

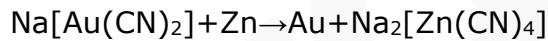
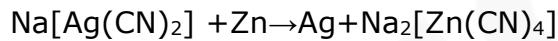


Solution 3.



(Note: CN^- is acting both as complexing and reducing agent)

Solution 4.

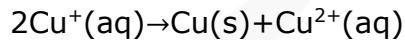


Solution 5.

According to Frost diagram, species in the group oxidation state for Cr that is +6 lies in the upper part.

Solution 6.

The simple aqua ions Cu^+ and Ag^+ undergo disproportionation reaction in aqueous solution.



Solution 7.

The formation of an oxido complex is favoured at high pH because the OH^- ions which are formed in basic solution will remove protons from the aqua ligands. Aqua ligands act as a weak proton donor.

Solution 8.

The Irving-Williams Series generally summarizes the relative stabilities of complexes that are formed by bivalent ion that is M^{2+} and reflects a combination of LFSE with electrostatic effects.

Solution 9.

The single s electron has $l=0$ and $s=1/2$.

As there is only one electron, so,

$L=0$ (an S term)

$S=s=1/2$

$2S+1=2$ (a doublet term)

Hence, the term symbol is 2S .

Solution 10.

For an octahedral complex, the three-p orbital will become triply degenerate that is T_{1u} . In the point group O_h , a P term of many electrons' atom becomes T_1 term. As d orbitals have even parity, the overall term should be g. The multiplicity remains unchanged in the correlation, so, 3P term will become $^3T_{1g}$.

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