

Examrace

Competitive Exams: Chemistry MCQs (Practice_Test 20 of 31)

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1. Iron with an oxidation number of zero can be represented as: $[\text{Ar}] 4s^2 3d^6$. Based on the valence bond theory of bonding in coordination compounds, which of the following would be the correct representation of the electron configuration of the central metal ion and the hybrid bonds formed in the complex ion, $[\text{Fe}(\text{CN})_6]^{3-}$ (Answer format: Electron configuration; hybrid bonds) ?
 - a. $[\text{Ar}] 4s^2 3d^6$; sp^2
 - b. $[\text{Ar}] 4s^3 d^4$; sp^2
 - c. $[\text{Ar}] 3d^5$; $sp^3 d^2$
 - d. $[\text{Ar}] 3d^6$; $sp^3 d^2$
 - e. $[\text{Ar}] 3d^5$; sp^2

2. Note: You must answer BOTH Part A and Part B of this question. Some old weather forecasting devices utilized the following equilibrium between $\text{Co}(\text{OH})_2$ and CoCl_4^{2-} :

$$\text{Co}(\text{OH})_2 + 4 \text{Cl}^- \rightleftharpoons \text{CoCl}_4^{2-} + 6 \text{H}_2\text{O}$$
 (pink) + (dark blue)
 - a. Draw the crystal field splitting diagrams for BOTH $\text{Co}(\text{OH})_2$ and CoCl_4^{2-} . You may assume that water is a strong-field ligand, and that CoCl_4^{2-} has a tetrahedral structure.
 - b. Which of these complex ions (i.e. ... $\text{Co}(\text{OH})_2$ or/and CoCl_4^{2-} .) is/are paramagnetic? Briefly explain your reasoning.

3. What is the coordination number, CN, for the central metal ion in the coordination compound, $\text{K}_3[\text{Fe}(\text{CN})_6]$?
 - a. CN = 3
 - b. CN = 4
 - c. CN = 5
 - d. CN = 6
 - e. The correct response is not given.

4. Which of the following are all features of optical isomers? Optical isomers are:

- a. superimposable mirror images with identical chemical formulae and the same chemical reactivities with other compounds that are not optical isomers.
 - b. nonsuperimposable mirror images with identical chemical formulae and the same chemical reactivities with other compounds that are not optical isomers.
 - c. nonsuperimposable mirror images with dissimilar chemical formulae but similar chemical reactivities with other compounds that are not optical isomers.
 - d. superimposable mirror images with identical chemical formulae and similar physical properties.
 - e. The correct response is not given.
5. The magnetic moment of the fluoride complex is expected to be:
- a. the same as the magnetic moment of the cyanide complex.
 - b. larger than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex.
 - c. smaller than the magnetic moment of the cyanide complex because there are more unpaired electrons in the fluoride complex.
 - d. larger than the magnetic moment of the cyanide complex because there are fewer unpaired electrons in the fluoride complex.
 - e. The correct response is not given.
6. The energy of light absorbed by the cyanide complex will be:
- a. greater than that of the fluoride complex because the crystal-field splitting is larger in the cyanide complex.
 - b. less than that of the fluoride complex because the crystal-field splitting is larger in the cyanide complex.
 - c. greater than that of the fluoride complex because the crystal-field splitting is smaller in the cyanide complex.
 - d. similar to that of the fluoride complex because the energy of light absorbed depends only on the central metal ion and is independent of the ligand field strength.
 - e. The correct response is not given.
7. Which of the following is the correct electronic configuration for a Mn^{4+} ion?
- a. $[Ar] 4s^2 3d^1$
 - b. $[Ar] 4s^2 3d^4$
 - c. $[Ar] 3d^4$

d. [Ar] 3d³

e. [Ar] 4s¹ 3d²

8. Use the facts that fluoride ion (F⁻) is a weak field ligand, cyanide ion (CN⁻) is a strong field ligand and that iron in the plus three oxidation state has five 3 – d electrons to answer questions 23 and 24 related to the complex ions, FeF₆³⁻ and Fe (CN)₆³⁻. How many unpaired electrons are there in [Co (NH₃)₄Cl₂] Cl? You may assume that this is a strong-field compound.

a. zero

b. one

c. two

d. three

e. four

9. Use the facts that fluoride ion (F⁻) is a weak field ligand, cyanide ion (CN⁻) is a strong field ligand and that iron in the plus three oxidation state has five 3 – d electrons to answer questions 23 and 24 related to the complex ions, FeF₆³⁻ and Fe (CN)₆³⁻. Which of the following best explains why coordination compounds containing Cu²⁺ are colored but coordination compounds containing Cu⁺ are not?

a. The 3d orbitals in Cu⁺ are completely empty so the transfer of an electron cannot occur.

b. The 3d orbitals in Cu²⁺ are completely filled so the transfer of an electron can occur.

c. The 3d orbitals in Cu⁺ are completely filled so the transfer of an electron cannot occur.

d. Cu⁺ absorbs all wavelengths of visible light which makes it appear colorless.

e. Cu²⁺ does not absorb any wavelengths of visible light.

10. What are the oxidation number (ON) and coordination number (CN) of iron in the coordination compound K₄ [Fe (CN)₆] ?

a. ON = 2, CN = 2

b. ON = 2, CN = 4

c. ON = 2, CN = 6

d. ON = 3, CN = 6

e. no response is correct

Frequently Asked Questions (FAQs)

Chemistry

(- Ko...@ on 30-Sep-2019)

1 Answer

For practice questions including realexam online tests answers you may visit [DoorStepTutor](#) (for GATE Chemistry) and [DoorStepTutor](#) (NEET Chemistry) . The contents are easy to understand and extremely effective while preparing for the exam in the shortest time possible.

- Ko...@ on 30-Sep-2019

Please arrange to provide mcqs in chemistry, i am preparing for a test?

(- in...@ on 10-Dec-2014)

1 Answer

For MCQs in Chemistry please refer <https://www.examrace.com/Sample-Objective-Questions/Chemistry-Questions>

- in...@ on 10-Dec-2014

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