IIT JEE 2009 Test Series 4
Chemistry Part-I

SECTION I
STRAIGHT OBJECTIVE TYPE

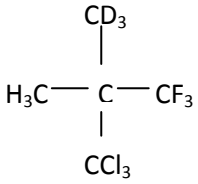
This section contains 6 multiple choice questions. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer.

1. Bond order of NO is equal to
   (a) CO
   (b) NO^+
   (c) NO^{2+}
   (d) NO^-

2. The nature of the reaction will be spontaneous if
   (a) ΔH is positive and ΔS is negative
   (b) ΔH is negative and ΔS is positive
   (c) ΔH is negative and ΔS is negative
   (d) ΔH is positive and ΔS is positive

3. When excess of SnCl2 is added to a solution of HgCl2, a white precipitate turning to grey, is obtained. The gray colour is due to
   (a) Hg2Cl2
   (b) SnCl2
   (c) Sn
   (d) Hg

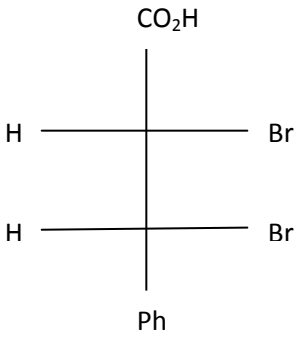
4. Consider all type of C-C bond rotation in the following molecule



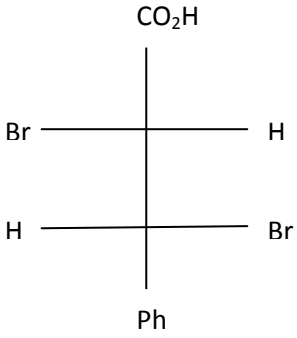
   The number of different types of eclipsed conformations possible is
   (a) 2
   (b) 4
   (c) 6
   (d) 8

5. The structure of 2R, 3S-dibromocinnaic acid is

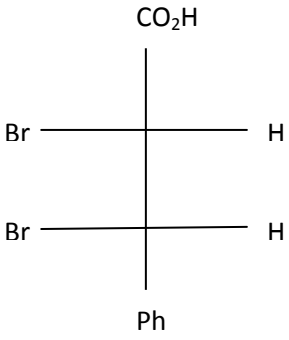
(a)



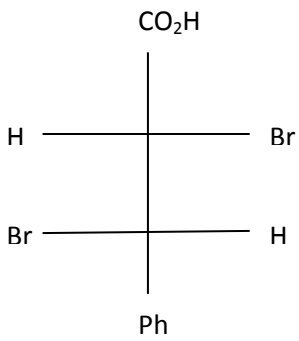
(b)



(C)



(d)



6. For the reaction
$\frac{4}{3}Al + O_2 \rightarrow \frac{2}{3}Al_2O_3, \Delta G = -827 KJmol^{-1}$
Minimum e.m.f required to carry out electrolysis of Al2O3 is (F = 96500 C mol-1)
(a) 8.56 V
(b) 2.14 V
(c) 4.28 V
(d) 6.41 V

SECTION II
MULTIPLE CHOICE TYPE QUESTIONS

This section contains 4 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which ONLY ONE is correct. NO NEGATIVE marking.

7. For $2SO_2 + O_2 \leftrightarrow 2SO_3$
(a) at constant volume, equilibrium is not effected
(b) at constant pressure, equilibrium shift to the right
(c) decrease in volume shift the equilibrium to the left
(d) increase in pressure shift the equilibrium to the right

8. Which statement is correct
(a) reducing property are in the order Fe+2 > Co+2 > Ni+2
(b) Stability is the order Fe+3 > Co +3 > Ni+3
(c) Fe, Co and Ni are ferromagnetic
(d) None of these

9. Which of the reaction is possible by the reduction of NaBH4
(a)C6H5COCH2CH2COOH ⟶ C6H5CH(OH)CH2CH2COOH
(b) C6H5COCH2CH2COOH ⟶ C6H5CH(OH)CH2CH2CH2OH
(c)NCCH2CH2CHO ⟶ NH2CH2CH2CH2CH2OH
(d) NCCH2CH2CHO ⟶ NCCH2CH2CH2OH

10. which of these is not formed
(a) XeF
(b) XeF3
(c) XeF4
(d) XeF5

SECTION III
ASSERTION-REASON TYPE

This question contains 4 reasoning type questions. Each question has 4 choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 3 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

11. Statement-1: dil. H_2SO_4 acid is not used in the preparation of hydrogen in the laboratory from the granular zinc
    Statement-2: dil. H2SO4 reacts with the hydrogen and produce water and sulfur dioxide
    a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
    b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
    c) STATEMENT-1 is True, STATEMENT-2 is False
    d) STATEMENT-1 is False, STATEMENT-2 is true

12. Statement-1: HBr is a strong reducing agents and it reduces H_2SO_4 to SO_2
    Statement-2: HBr is not formed by H_2SO_4 by heating bromides.
    a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
    b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
    c) STATEMENT-1 is True, STATEMENT-2 is False
    d) STATEMENT-1 is False, STATEMENT-2 is true

13. Statement-1: when a solution of (+)-2-methyl-1-phenlbutan-1-one is aqueous ethanol is heated with the acid or base, the solution gradually losses optical activity.
    Statement-2: the ketone slowly but reversibly changes to its enol and when the enol reverts to keto form, it produces equal amount of two enantiomers.
    a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
    b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
    c) STATEMENT-1 is True, STATEMENT-2 is False
    d) STATEMENT-1 is False, STATEMENT-2 is true

14. Statement-1: Acetylene on reacting with sodamide gives sodium acetylide and ammonia.
    Statement-2: sp hybridised carbon atom of acetylene are considerably electronegative.

a) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is a correct explanation for STATEMENT 1
b) STATEMENT-1 is True, STATEMENT-2 is true; STATEMENT-2 is NOT a correct explanation for STATEMENT-1
c) STATEMENT-1 is True, STATEMENT-2 is False
d) STATEMENT-1 is False, STATEMENT-2 is true

SECTION IV
LINKED COMPREHENSION TYPE

This section contains 2 paragraphs. Based upon each paragraph, 3 multiple choice questions have to be answered. Each question has four choices (a), (b), (c) and (d), out of which ONLY ONE is correct. 4 MARKS will be awarded for correct answer. 1 MARK will be deducted for wrong answer. NO MARKS WILL BE GIVEN OR DEDUCTED IF A QUESTION IS NOT ANSWERED.

Paragraph for Questions numbers 15 to 17

For every reaction at a specific temperature, there is only one value of K. A large value of K implies that there are more products than reactants and that the equilibrium lies to the right. A small K value implies there are more reactants and the equilibrium lies to the left. The value of K changes with the change of temperature. For the reaction in the gas phase, equilibrium position can also be expressed in terms of pressure. K_P the equilibrium constant in terms of pressure is related to K_C by the equation: $K_P = K_C (RT)^{\Delta n}$, where Δn is the sum of the coefficients of the gaseous products minus the sum of the coefficients of the gaseous reactants.
The reaction quotient, Q, is an expression which deals with the initial values instead of the equilibrium value that K deals with. We compare Q and K to determine which direction the reaction will proceed to obtain the equilibrium. If Q is equal to K then the system is already at equilibrium so it will not shift in either direction.

15. If K_P for a reaction $A_{(g)} + 2B_{(g)} \longleftrightarrow 3C_{(g)} + D_{(g)}$ is 0.05 atm at 1000K. its K_C in terms of R will be
(a) 20000R
(b) 0.02R
(c) $5x10^{-5}R$
(d) $5x10^{-5}/R$

16. For the recation $Pcl_{3(g)} + Cl_{2(g)} \longleftrightarrow Pcl_{5(g)}$, the value of K_C at 250^{oC} is 26. The value of K_P at this temperature will be
(a) 0.61
(b) 0.83
(c) 0.57
(d) 0.46

17. K_C for the reaction $N_{2(g)} + O_{2(g)} \longleftrightarrow 2NO_{(g)}$ at 300K is $4.0x10^{-6}$. K_P at this temperature will be
(a) $2.4x10^{-3}$
(b) $4x10^{-6}$
(c) $4x10^{-6}(RT)^2$
(d) $16x10^{-12}$

Paragraph for Questions numbers 18 to 20

The variety of colours among transition metal complexes has always fascinated the observers. For example, aqueous solutions of octahedral $[Co(H_2O)_6]^{2+}$ are pink in colour but those of tetrahedral $[Co(Cl)_4]^{2-}$ are blue. The green colour of aqueous $[Ni(H_2O)_6]^{2+}$ turns blue when ammonia is added to the solution to give $[Ni(NH_3)_6]^{2+}$. The reduction of violet $[Cr(H_2O)_6]^{3+}$ gives bright blue $[Cr(H_2O)_6]^{2+}$. As with all colours, these arise from electronic transition between levels whose spacing correspond to the wavelength available in the visible light. The magnitude of spacing depends upon the factors such as geometry of the complex, the nature of the ligands and the oxidation state of central atom.

18. Identify the complexes which is/are expected to be coloured?
(a) $[Ti(NO_3)_4]$
(b) $[Cu(NCCH_3)_4]^+BF^{4-}$
(c) $[Cr(NH_3)_6]^{3+}3Cl^-$
(d) $[Zn(H_2O)_6]^{2+}$

19. the complex which has no d electrons in the central metal atom is
(a) $[MnO_4]^-$
(b) $[Fe(CN)_6]^{3-}$
(c) $[Co(NH_3)_6]^{3+}$
(d) $[Cr(H_2O)_6]^{3+}$

20. Among TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$, the colourless species are
(a) CoF_6^{3-} and $NiCl_4^{2-}$
(b) TiF_6^{2-} and CoF_6^{3-}
(c) Cu_2Cl_2 and $NiCl_4^{2-}$
(d) TiF_6^{2-} and Cu_2Cl_2

Paragraph for Questions numbers 21 to 23

The electrons ion atoms occupy atomic orbitals (AOs) that are represented as the regions around the nuclei where there is high probability of finding the electrons. In LCAO (linear combination of atomic orbitals) approach, when AOs come close together, they overlap forming MOs (molecular orbitals). Two AOs can overlap to form two MOs, one of which lies at lower energy level, called bonding molecular orbital (BMO) than the other at a higher energy level called anti-bonding molecular orbital (ABMO). Each MO can hold one or two electrons in accordance with Pauli's expulsion principle. MOT can explain the paramagnetism of molecules. Answer the following questions based on this paragraph:

21. When two AO combine, they form
(a) one MO
(b) two MOs
(c) two BMOs
(d) two ABMOs

22. According to MOT O_2^+ possesses
(a) bond order of 2.5
(b) three unpaired electrons
(c) diamagnetic character
Stability lower then O_2

23. Which of the following has unpaired electron in ABMO?
(a) C_2
(b) N_2
(c) O_2
(d) both C_2 and N_2