INDIAN SCHOOL SOHAR
UNIT TEST 2 (2023-24)
CHEMISTRY THEORY (043)
SET-2

CLASS : XI MAX. MARK : 20
DATE : 18 /01 /24 TIME : 40 MINUTES

General instructions:

1. There are **10** questions in this question paper with internal choice.
2. **SECTION A-** consists of 6 multiple-choice questions carrying **1**mark each.
3. **SECTION B-** consists of 1 very short answer questions carrying **2** marks each.
4. **SECTION C-** consists of 1 short answer questions carrying **3** marks each.
5. **SECTION D-** consists of 1 case-based question carrying **4** marks.
6. **SECTION E-** consists of 1 long answer questions carrying **5** marks with internal choice.
7. **All questions are compulsory.**
8. **Use of log tables and calculators is not allowed**

SECTION- A

Question no. 1 to 6 are multiple choice (MCQ) type questions, carrying 1mark each.

1. **Presence of a nitro group in a benzene ring**: 1
   (a) Activates the ring towards electrophilic substitution
   (b) Renders the ring basic
   (c) Deactivates the ring towards nucleophilic substitution
   (d) Deactivates the ring towards electrophilic substitution.

2. **Which molecule has zero dipole moment?** 1
   (a) ClF
   (b) PCl_3
   (c) $SiCl_4$
   (d) $CHCl_3$

3. **Benzene reacts with CH_3Cl in the presence of anhydrous $AlCl_3$ to form:** 1
   (a) toluene
   (b) chlorobenzene
   (c) benzylchloride
   (d) xylene

4. **Which molecule/ion out of the following does not contain unpaired electrons?** 1
   (a) N_2^+
   (b) 0_2
   (c) O_2^{2-}
   (d) B_2

In the following questions (Q.No.5 and 6) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices:

(a) Assertion and Reason both are correct statements and Reason is the correct explanation for assertion.
(b) Assertion and Reason both are correct statements but reason is **not** the correct explanation for assertion.
(c) Assertion is correct statement, but Reason is wrong statement.
(d) Assertion and reason both are wrong statements.

5. **Assertion :** Toluene on Friedal Crafts methylation gives o– and p–xylene. 1
Reason: CH_3-group bonded to benzene ring increases electron density at o– and p–position.

6. **Assertion:** Though the central atom of both NH_3 and H_2O molecules are sp3 hybridised, yet H–N–H bond angle is greater than that of H–O–H. 1
Reason : This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.

SECTION- B

7. Balance the following equation in basic medium by oxidation number method. 2

$$Cl_2O_7\,(g) + H_2O_2\,(aq) \longrightarrow ClO_2^-\,(g) + O_2(g)$$

SECTION- C

8. a) Using VSEPR theory draw the structure of BrF_5. 3
b) Using molecular orbital theory compare the bond energy and magnetic character of O_2^+ and O_2^- species.
c) Explain why PCl_5 is trigonal bipyramidal whereas IF_5 is square pyramidal.

SECTION- D

This question is a case-based questions. Read the case carefully and answer the question that follow.

9. Oxidation-reduction was primarily used to describe the reaction of combination and /or removal of oxygen or from chemical substances, respectively. Simultaneously, the removal and /or the addition of hydrogen were also used to differentiate among oxidation and reduction, respectively. The definition were extended to a broader level, and the changes in the oxidation number or oxidation state of elements were considered to define oxidation and reduction. The increase in the oxidation number leads to oxidation and its alternative process yields reduction. This vast definition encompasses the recent and exact interpretation of "redox" reaction that is acceptance and donation of the electrons between the reacting entities. Consequently, the redox phenomenon indicates a simple reaction, formation of carbon dioxide as a consequence of the oxidation of carbon and /or formation of methane by the reduction of carbon, for example, and the complex reaction consisting of a number of electron transfer reactions during the oxidation of sugar in the human body to produce energy. 4
The redox reaction involves an oxidant or oxidizing agent and a reductant or reducing agent. The oxidant takes the electron and oxidizes the reductant. The reductant, however, donates the electron and reduces the oxidant.

a. $CaCO_3 \longrightarrow CaO + CO_2$ is a redox reaction or not. Explain.
b. Calculate the oxidation number of 'S' in $KAl(SO_4)_2 .H_2O$
Write the anode and cathode reaction from the given electrode potential value. Also write the net reaction involved.
[$E^\circ_{Zn2+/Zn}$ = -0.76 V, $E^\circ_{Pb^{2+}/Pb}$ = -0.13V]

OR

Calculate the standard electrode potential value for the Fe -Cd cell, and write the cell representation.
[$E^\circ_{Zn2+/Zn}$ = -0.76 V, $E^\circ_{Pb^{2+}/Pb}$ = -0.13V]

SECTION- E

The following question is long answer type, carrying 5 marks with an internal choice.

10. a) Change in internal energy is a state function while work is not, why? 5

b) Calculate the standard enthalpy change($\Delta rH°$) and standard Internal energy change ($\Delta rU°$) for the following reaction at 300 K.

$OF_2(g) + H_2O(g) \rightarrow O_2(g) + 2HF(g)$.

Standard enthalpy of formation($\Delta_fH°$) of various species are given below.

$\Delta_fH°$ /kJmol^{-1} ; OF_2 (g) = 23.0 , H_2O(g) = -241.8 , HF(g) = -268.6.

OR

a) The combustion of one mole of benzene takes place at 298 K and 1atm. After combustion, CO_2(g) and H_2O(l) are produced and 3267.0 kJ of heat is liberated. Calculate the standard enthalpy of formation of benzene ($\Delta_fH°$) .

$\Delta_fH°CO_2(g)$ = -393.5 kJmol^{-1} and $\Delta_fH°H_2O(l)$ = -285.83 kJmol^{-1} .

b) Calculate the standard Gibbs energy change for the formation of propane at 298 K.

$3C\ (graphite) + 4H_2(g) \rightarrow C_3H_8(g)$.

$\Delta_fH°$for propane C_3H_8 is -103.8 kJmol^{-1}

Given : $S°_m\ C_3H_8(g)$ = 270.2 JKmol^{-1} ,

$S°_m\ C_{(graphite)}$ = 5.70 JKmol^{-1} and

$S°_mH_2(g)$ = 130.7 JKmol^{-1}

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