ENGINEERING CHEMISTRY (SEMESTER - 2)

CS/B.Tech/SEM-2/CH-201/09

1. ....
Signature of Invigilator

2. ....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | | |

CS/B.Tech/SEM-2/CH-201/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

ENGINEERING CHEMISTRY (SEMESTER - 2)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

....

Head-Examiner/Co-Ordinator/Scrutineer

2361 (13/06)

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ENGINEERING CHEMISTRY

SEMESTER - 2

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GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following : 10 × 1 = 10

i) van der Waals type of bond is formed by

a) sharing of electrons

b) transferring of electrons from one atom to the other

c) sharing of electrons by one atom only

d) weak electrostatic force of attraction among fluctuating dipoles. ☐

ii) Which of the following defects arises due to misplace of ions in a crystal lattice ?

a) Schottky defect b) Frenkel defect

c) Metal excess defect d) Non-stoichiometric defect. ☐

iii) The coupling between base units of DNA is through

a) Covalent bonding b) Electrovalent bonding

c) van der Waals forces d) Hydrogen bonding. ☐

iv) CO_2 is isostructural with

a) C_2H_2 b) $HgCl_2$

c) NO_2 d) NH_3 .

v) ZnO is white when cold and yellow when hot, this is due to

a) charge transfer b) *d-d* transition

c) metal excess defect d) none of these.

vi) The phenomenon of superconductivity was coined by

a) Carnot b) C.V. Raman

c) Einstein d) Kammerlingh Onnes.

vii) The presence of intermolecular and intramolecular hydrogen bonding is distinguished by

a) UV-Visible spectroscopy

b) IR-spectroscopy

c) ^{1}H-NMR spectroscopy

d) Both IR and ^{1}H-NMR spectroscopy.

viii) Caprolactum is a monomer of

a) Bakelite b) PVC

c) Nylon-66 d) Teflon.

ix) The ion conductance of an ion depends on its

a) charge only b) speed only

c) charge and speed d) charge, speed and hydration.

x) Anomalous expansion of water from 0°-4°C occurs due to

a) van der Waals interaction

b) hydrogen bonding

c) non-covalent weak interaction

d) dipole-induced dipole interaction. ☐

xi) The hybridization of Xe in XeF_2 is

a) sp b) $sp^3 d^2$

c) sp^3 d) $sp^3 d$. ☐

xii) $[Co(NH_3)_5CN]Cl_2$ and $[Co(NH_3)_5NC]Cl_2$ are

a) coordination isomers b) geometrical isomers

c) linkage isomers d) ionization isomers. ☐

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. Define ionic mobility. Mention the unit of equivalence conductance and ionic mobility. How does equivalence conductance vary with concentration for both strong and weak electrolytes ? 1 + 1 + 3

3. Write down the possible products on the dehydration of neopentyl alcohol. Write down the main features of transition state theory. What is the unit of rate constant of a second order reaction ? 2 + 2 + 1

4. a) What is pseudo-unimolecular reaction ? Give one example.

b) Explain the physical significance of activation energy. 3 + 2

5. Define lattice energy and hybridization. Arrange the following ionic crystals in order of their increasing lattice energy : LiF, CaF_2 and Mg S. 3 + 2

6. What is LPG ? Why is it used as a domestic fuel ? Define Octane number of a fuel and explain how the Octane number can be improved ? 1 + 1 + 3

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7 a) Distinguish between SN^1 and SN^2 mechanisms with suitable examples. Discuss the role of solvents in SN^1 reactions.

b) State and explain Hess's law with examples. How does it follow the first law of thermodynamics ?

c) Using Carnot cycle, prove that the efficiency of a heat engine is always less than one. 6 + 4 + 5

8. a) What is fingerprint region ? Why is methanol a good solvent for UV but not for IR determination ? What solvents are generally used for IR technique ? Which groups are detected if absorption data are 2841(w), 2755(w), 1686(s), 1605, 1460(m) cm^{-1} ?

b) What is synthetic metal ? What is electronic polymer ? Write notes on conducting polymers and their importance. 9 + 6

9. a) What are rectifiers ? Where are they used ?

b) Why ZnO is white but changes colour on heating ?

c) What are photovoltaic cells ?

d) What is the effect of temperature on the conductivity of *p*-type and *n*-type semiconductors ? 4 + 3 + 4 + 4

10. a) 'Phosphorous forms both PF_3 and PF_5 but nitrogen forms only NF_3.' Explain.

b) Arrange the following in increasing order of bond lengths : O_2, O_2^+, O_2^-.

c) Using Kohlrausch's law how do we determine the equivalent conductance of acetic acid at infinite dilution ?

d) 'Carboxylic acid is stronger acid than phenol.' Explain.

e) What is calorific value of fuel ? Distinguish between gross and net calorific values.

f) What are the constituents of coal as determined by proximate analysis ?

[3 + 2 + 3 + 2 + 3 + 2]

11. Write notes on any *three* of the following : 3 × 5

a) Biodegradable polymers.

b) Mass spectroscopy and its applications

c) Straight run gasoline and jet fuel

d) Calomel electrode

e) LDPE and HDPE

f) Clausius – Cleyperon equation.

OR

Gibbs – Helmholtz equation.

END