Industry Program in

Petrochemical & Refining

Examination Assignment

April 2011

ICIS

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INSTRUCTIONS FOR EXAMINATION ASSIGNMENTS

- Electronic (email, fax) submission of the assignments is not acceptable.
- The assignments have to be submitted by the student on standard A4 size paper in legible hand written, typed or printed format only.
- Do not copy from the answers of other participants. If it is noticed the assignment of such participants will not be accepted.
- The assignment for each paper should be written separately. Do not write the assignment for all the papers in continuity. However, all the assignments are to be submitted together.
- No two or more participants should submit their assignments in one envelope.
- The participants should mention their name and enrollment number on each page of submitted assignment copy.
- The last date of submission of Assignments is 30th April 2011.

  The assignments have to be submitted to:
  The Program Coordinator
  Institute of Cheminformatics Studies
  C-56A/28, Sector-62, Noida-201301
  U.P. INDIA

- Participants are advised to keep a photocopy of submitted assignments.
- The participants should mention their name and enrollment number at the top of the envelope.
- The participant should also mention **Examination Assignment** at the top of the envelope.

Introduction to Petroleum Industry

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. Define the term organic theory. Explain the origin and formation of hydrocarbon deposit. Write the biological processes responsible for hydrocarbon deposition.

2. a. Mention the chemical composition and properties of the crude oil in detail.
   b. Name all the classes of petroleum and what is meant by American Petroleum Institute (API)?

3. a. Write short notes on:
      i. Calorific Value
      ii. Boiling Point
      iii. Column Reboiler
   b. Mention the curve of Vapour- Liquid- Equilibrium (VLE) and boiling point curve.

4. Explain the following:
   a. Rheological parameters
   b. Waxy crude oil and its flow properties
   c. Pumpability characteristics of waxy crude oil and finishing of waxes

5. Write short notes on the following:
   a) Effects of the number of trays or stages.
   b) Factors affecting distillation column operation.
   c) Impurities in crude oil.

6. Explain the following:
   a) Electrical desalting of crude oils.
   b) Atmospheric distillation of crude oil.
   c) Vacuum distillation of reduced crude oil.

7. Explain the following
   a) Miscellaneous petroleum products
   b) Lackquar
   c) Fuel safety.

Petroleum and Petrochemicals

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. Explain the composition 0f petroleum in detail and describe polymerization and isomerization in it.

2. What are saturated hydrocarbons? Explain the methods used to extract from natural gases. Mention the various uses of saturated hydrocarbons.

3. Write short notes on the following:
   a) Hydrogenation and dehydrogenation.
   b) Nitration.
   c) Hydration and hydrolysis.

4. a. What is meant by solvent deasphalting? Discuss the purpose and process variable of it.
   b. What are the different levels of quality assurance in case of lubricating oils?

5. Write note on the following:
   a) CH_3COOH.
   b) $CH_3CHOHCH_3$.
   c) $CH_2OH.CH_2OH$.

6. Write short notes on the following:
   a) Water in jet fuel.
   b) Additives.
   c) Surfactants

7. Write short notes on the following:
   a) Isooctane and malefic anhydride.
   b) Methanol and its application.
   c) LMP and TMA.

Chemical Information Sources

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. A. What are basic necessaries of chemical safety and toxiclogy information? Describe.
   B. Why National Library of Medicine's TOXNET System and the Canadian centre for occupational Health and Safety Database help in Chemical safety.

2. Write a short note on Chemistry on the WWW.

3. Explain Chemical Abstracts in the following headings:
   a) CA index guide
   b) CAS Nomenclature
   c) Alphabetization of Compounds

4. Explain the following:
   a) Spectral complications
   b) Biomolecule sequence and structure databases
   c) Physical property information
   d) Beilstein and Gmelin

5. Give detail account on the contents of the abstract record.

6. Write note on the following:
   a) Patent
   b) Chemical abstracts in print
   c) Molecular formula index.

7. Write notes on "current science on internet". Give a list Chemical application of world wide web.

Petrochemical Production System

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. Explain the following:
   a) Liquefied petroleum gases.
   b) Naphthas.
   c) Motor sprit.

2. Write short notes on the following:
   a) Pipeline transportation.
   b) Flow properties of waxy crude oils.
   c) Pumpability characteristics of waxy crude oils.

3. Explain the following:
   a) Atmospheric distillation of crude oils.
   b) Vacuum distillation of reduced crude oils.
   c) Operation of fractionating clumn.

4. Explain the following:
   a) Distillation and vapour pressure.
   b) Flash point and fire point.
   c) Performance number and cetane number.

5. Write note on the following:
   a) Uses of bitumens.
   b) Properties and uses of petroleum cokes.
   c) Electrical desalting of crude oils.

6. Write short notes on the following:
   a) Corrosion in thermal cracking.
   b) Corrosion control in Fluid catalytic cracking.
   c) Corrosion and cracking in amine gas processing

7. a) What is meant by calcinations of green coke? Describe each steps of calcinations of coke.
   b) Explain the procedure used for the development of fluid catalytic cracking with the help of suitable diagram .

Petroleum Refining Technology & Process

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. Explain the origin and formation of petroleum in nature.

2. Write notes on the following refineries and modernization
   a. Mathura Refinery
   b. Digboi Refinery
   c. Guwahati Refinery
   d. BPCL
   e. Kochi refineries Ltd.

3. Estimate the viscosity of phenol at 80^0C (= 0.9692) and viscosity of benzene at 20^0C ((= 0.875).

4. Write short notes on the following:
   a) Naphthas and kerosene.
   b) ATF and lube oil.
   c) Diesel fuel.

5. a. What is meant by U.O.P. Characterization factors $(K)^{2a}$? State the relation of K with specific gravity (r).
   b. How the average boiling point is calculated? Also mention the molal and cubic average.

6. Explain the following terms:
   a. Latent Heat of vaporization
   b. Spontaneous Ignition Temperatures
   c. Viscosity Index (VI)

7. a. Explain the treatment of lubes. Mention the effect of temperature and S/F ratio in Dimethyl Sulfonide.
   b. What processes have been established for the improvement in quality of lubes? Name them and explain.

Computational Chemistry

Max. Marks: 100

Attempt any five Questions: 5 × 20 Marks

1. Write short note on Ramachandran Map/Plot.

2. Write a short note on the application of Computational Chemistry.

3. a. Give an idea about the important targets of performance. List the principle barriers to achieve accuracy on small to medium size system.
   b. Write short notes on the following:
      1. Carcinogenicity
      2. Photo induced toxicity

4. a. What is meant by linear TI and Non-linear TI? Differentiate between linear and non- linear TI with the help of important equations.
   b. Write a short note on perturbation method.

5. Explain the following:
   a) SCRF
   b) PCM
   c) COSMO

6. a. What is the important software used in computational chemistry? Give a brief introduction of each.
   b. How the following tools help in computational chemistry?
      1. COLUMBUS 2. DB Watcher
      3. MODELLER 4. PROCHECK

7. Give detail account on the photo induced toxicity and carcinogenicity.