

BITS, PILANI-DUBAI, ACADEMIC CITY, DUBAI

SECOND SEMESTER 2009-2010

CHE UC322 Chemical Process Technology

COMPREHENSIVE EXAMINATION

DURATION: 3 Hours

**24.05.10
MAXIMUM MARKS: 80**

Attempt ALL questions in the given order

1. a) What is an electrostatic precipitator? Where is it generally used?
b) How is raw NG purified?
c) Discuss the details of ammonia oxidation to nitric oxide (first stage of nitric acid production) with the help of a diagram of the converter.
d) Discuss any two major engineering problems in urea production through any of the recycle methods.

(3+7+7+3)
2. a).In Portland cement manufacture, dry grinding is preferred over wet grinding. Give reasons.
b) Discuss in detail the Kraft process giving all the reaction conditions up until how pulp is obtained

(4+6)
3. a) How do soaps and detergents differ in their composition?
b) Why is hydrogenation of oils done? **(2+2+2+4)**
c) Which are the two methods used for getting oils from seeds?
b) Elucidate how biodiesel is produced starting from a triglyceride.
4. a) A company owns a huge coal field. Which are the forms of fuel it can produce from the coal it mines?
b) A Gulf company has an underwater oil rig by which it gets huge quantities of crude oil. Which physical unit operations it will do at its primary refinery?
c) What is the difference between catalytic cracking and catalytic reforming of hydrocarbons?

(6+3+6)
5. a) Give an example each of the following polymers:
i) a linear polymer ii) a bifunctional polymer iii) an elastomer
b) What is Ziegler-Natta catalyst? How does it improve the process for the production of high density polyethylene?
c) Discuss briefly with a flow diagram how Nylon resin is synthesized.

(3+5+7)

- 6 a) Pharmaceutical Industry is a 'knowledge based' industry. Briefly justify.
b) Name any two major drug categories (other than antibiotics) and give an example in each.
c) Draw a labeled sketch of a bio fermenter as used in the production of penicillin with all the sensors. **(3+2+5)**

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DUBAI INTERNATIONAL ACADEMIC CITY
SECOND SEMESTER 2009-2010
TEST – 2 (OPEN BOOK)

Course No.: CHEM C322

25.04.10

Maximum Marks:

40

Course Title: Chemical Process technology

Maximum Time: 50 min

1 a) In petroleum refinery, the main focus is to get high grade/high octane petrol in good yields. Mention the processes both physical as well as chemical, with the help of a block diagram, that are done on the following crude oil fractions to achieve this goal: i) light gas fractions ii) low grade petroleum fraction and iii) gas oil fractions.

b) Differentiate between catalytic reforming and catalytic cracking.

c) Discuss how the catalyst in fluidized bed catalyst cracking unit regenerated? Sketch just the "Regenerator" part of the fluidized bed unit.

d) Draw a neatly labeled flow chart for the manufacture of vinyl chloride starting from ethylene dichloride (EDC).
(6+4+5+5)

2 a) Mention the various operations that suspended pulp having around 90% water undergo before it is converted to paper sheets having just 5-6% moisture. Indicate moisture levels in each step.

b) What are the raw material sources for pulp and paper industries?

c) Draw the Digester vessel in Kraft (Sulfate) process and discuss the reaction in it as well as the different temperature treatment.
(3+2+5)

3 a) State any one major engineering problem faced during hydrogenation of vegetable oil.

b) What is the difference between *transesterification* and *interesterification*?

c) How is glycerin produced a) naturally and b) synthetically? Give an example for each.
(2+4+4)

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SECOND SEMESTER 2009-2010
TEST – I (CLOSED BOOK)

Course No.: CHEM 322

14.03.10

Maximum Marks: 25

Course Title: Chemical Process technology

Maximum Time: 50 minutes

1. Using a sketch, show any drying operation. (2M)
2. a) Which are the two sources for producing sulfur? (2+4M)
b) Discuss any two engineering problems faced in sulfuric acid manufacturing process.
- 3 a) Give the composition of water gas. (2+3+3M)
b) Mention the treatments that the gas obtained from choking coal (coal gas) gets before it can be used.
c) Draw that part of the flow chart when the fractionated Natural Gas (NG) is getting purified of H_2S contamination.
- 4 a) What are the 3 steps for HNO_3 production starting from ammonia? Discuss the first reaction with the sketch of the shell and tube converter.
b) Discuss with the help of a block diagram, urea production by Stamicarbon method.
c) What is prilling? Mention the by-product in urea prilling operation. (3+4+2M)

BITS, PILANI – DUBAI
SECOND SEMESTER 2009 – 2010
Third Year
Quiz 2

Course Code: CHE C322
Course Title: Chemical Process Technology
Duration : 20 minutes

Date: 15/04/10
Max Marks: 14
Weightage: 7%

Name:

ID No:

- 1) a) Portland cement coded as C_3S contains (1M)
- b) Name the process used in separating unwanted minerals from crushed limestone slurry for making cement. It is based on which principle? (2M)
- 2) a) What are the products obtained during hydrolysis of fat or '*fat splitting*' as it is generally called? (1M)
- b) Which is the catalyst used in hydrogenation of unsaturated oils? (1M)
- c) What is Alfal process? (2M)

PTO

3) a) Which are the 2 main processes for pulp manufacture? Name them. (1 marks)

b) Why are fillers added to the pulp slurry in paper making? (1 M)

c) How does the pulp industry manage its effluent-water? (1M)

4) a) Hydrogenation of coal produces (1M)

b) Mention any engineering problem faced during coal gasification. (1M)

5) a) Refinery crude petroleum is classified into three bases. Name any two of them. (1M)

b) Solvent extraction used in petroleum refinery operations to obtain (1M)

BITS, PILANI – DUBAI
SECOND SEMESTER 2009 – 2010
Third Year
Quiz 1

Course Code: CHE C322
Course Title: Chemical Process Technology
Duration : 20 minutes

Date: 1/03/10
Max Marks: 16
Weightage: 8%

Name:

ID No:

- 1) Mention any two factors one needs to consider while setting up a chemical industry. (2 marks)

- 2) What is a unit operation? Give an example. (2 mark)

- 3) For the following reaction, what will be the effect of increasing i) pressure; ii) temperature? (2 marks)
$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O} \quad \Delta H = -115.6 \text{ kcal}$$

- 4) What are the raw materials used in Frasch process? (2 marks)

- 5) State the catalyst of choice during the manufacture of sulfur from H_2S giving any one reason.. (2 marks)

PTO

6) How is the effluent gases of the above process (i.e. sulfur from H_2S) treated before it is let off? (2 marks)

6) Give the reaction details that take place in the two stage catalytic converter during sulfuric acid manufacture. (3-marks)

7) What is 20% oleum? (1 mark).