

BITS, PILANI-DUBAI, ACADEMIC CITY, DUBAI

SECOND SEMESTER 2007-2008

CHE UC322 Chemical Process Technology

Third Year Chemical Engineering

Comprehensive Examination

(Closed Book)

28.05.08

DURATION: 3 Hours

MAXIMUM MARKS: 120

Note: Attempt ALL questions.

- 1 Describe in detail about elemental sulfur mining by Frasch process with a neat flow sheet. (flow sheet (with all conditions) – 10 marks, process description - 2 marks, MEP – 3 marks) (15 marks)
- 2 a) What is synthesis gas? (2 marks)
b) Mention the safest process for the production of ammonium nitrate and describe the process in brief. (2 + 2 marks)
c) How pyrophosphoric and metaphosphoric acids were prepared? (1 + marks)
- 3 Discuss in detail about manufacture of wood pulp by sulfate process with a neat flow sheet. (flow sheet (with all conditions) – 10 marks, chemical reactions – 3marks, process description - 2 marks, MEP – 3 marks) (18 marks)
4. a) Discuss in detail about the reactions in cement kiln. (8 marks)
b) What is alite and belite? (2 marks)
5. a) Mention the kinetic rate resistances involved in the process of hydrogenation of oil. (7 marks)
b) What are the major components of detergents and its functions? (6 marks)
6. Why coal is preferred to convert in to variety of fuels? (5 marks)

7. With the help of a neat flow chart, describe the manufacture of butadiene from ethanol. (flow sheet (with all conditions) – 10 marks, chemical reactions – 3 marks, process description - 2 marks, MEP – 3 marks) (18 marks)
8. Describe in detail about various unit operations and conversion operations involved to produce the numerous refinery products in the refinery operation. (7+ 8 marks)
9. With a neat flow sheet, describe the various stages involved in the manufacture of viscose rayon production. (flow sheet (with all conditions) – 10 marks, chemical reactions - 5, process description - 3 marks) (18 marks)



3/2/08

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SECOND SEMESTER 2007-2008

CHE UC322 Chemical Process Technology

Third Year Chemical Engineering

Test - 2

(Open Book)

Paper + Answering scheme

20.04.08

DURATION: 50 MINUTES

MAXIMUM MARKS: 60

Attempt ALL questions

1. Mention the material of construction for storage of ammonia (3 marks)
Carbon steel or stainless steel construction for the tank is recommended
2. What is Glassine and Sanfordized paper? (6 marks)
Sanfordized - Colour fast and pre shrunk
Glassine is a paper product which is grease, air, and water resistant
3. Is ammonia flammable, if yes specify the condition. (4 marks)
Yes ammonia vapor will burn when mixed in air at concentrations between 15% to 28%.
4. Mention the pollution and its control in essential oil production. (7 marks)
Refer class notes
5. What is biuret? (3 marks)
Biuret is a condensation compound of urea, equivalent to two molecules of urea less one of ammonia. It is a white solid soluble in hot water and decomposes at 186–189 °C. The parent compound can be prepared by heating urea above the melting point at which temperature ammonia is expelled. All Urea contains biuret, an impurity in urea that can cause agronomic problems
6. Specify the significance of adding fillers in paper and pulp industry. Give examples of fillers. (4 marks)
All papers except the absorbent ones require a filler to give a smoother surface, a more brilliant whiteness, improved smoothness and printability and improved opacity. Examples: talc, special clays, TiO₂.
7. Describe in detail the production of urea (Snamprogetti Process) with a neat flow sheet. (flow sheet (with all conditions) – 10 marks, process description - 2 marks, MEP – 2 marks and comparison with other methods – 6 marks) (20 marks)
Refer class notes

8. What type of mill can be used for grinding the clinker in cement industry other than the ball mill and mention its advantages than ball mill? (6 marks)
Vertical roller mill 3
Cost saving, quality and process simplification. 3
9. From a cement performance viewpoint, faster cooling of the clinker enhances silicate reactivity. (2 marks)
10. What is trans fats? (2 marks)
Partial hydrogenation of vegetable oil results in the formation of trans fats, which have increasingly been viewed as unhealthy.
11. Mention various extraction methods and its percentage extracted in oil industry. (3marks)
Ghani – 20-30%, Expeller – 34-37% and solvent 40-43%

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SECOND SEMESTER 2007-2008

CHE UC322 Chemical Process Technology
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Test - 1

(Closed Book)

DURATION: 50 MINUTES

**09.03.08
MAXIMUM MARKS: 60**

Attempt ALL questions

- Producer gas mainly consists of (1 mark)
- a) CO, CO₂, N₂, H₂ b) CO, H₂ c) H₂, CH₄ d) C₂H₂, CO₂, H₂
2. In a reaction $2\text{SO}_2 + \text{O}_2 \leftrightarrow 2\text{SO}_3$, the reverse reaction becomes appreciable at a temperature of (1 mark)
- a) 400°C b) 450°C c) 550°C d) 650°C
3. 30% Oleum means that (1 mark)
- a) 30 kg SO₂ and 70 kg H₂SO₄ b) 30 kg H₂SO₄ and 70 kg SO₃ c) 30 kg SO₃ and 70 kg H₂SO₄ d) 30 kg H₂SO₄ and 70 kg SO₂
- e) None of the above f) all of the above
4. Fransch Process is for (1 mark)
- a) Producing oxygen b) Producing sulfuric acid c) mining sulphur d) Producing nitrogen
5. Sketch the schematic representation for the following unit operations. (5 × 3 = 15 marks)
- A Bag filter
B Tunnel drier
C Centrifuge
D Wet scrubber
E Filter press
6. Mention the uses of sulphuric acid. (5 marks)
7. What is steam reforming? Explain with reaction. (5 marks)

8. Specify the conditions for the synthesis of ammonia. (2 marks)
9. Specify the conditions which increase NO_x emissions in the nitric acid production. (6 marks)
10. What are the major engineering problems come across when producing producer gas. (3 marks)
11. Describe in detail the production of nitric acid with a neat flow sheet. (20 marks)