

Department: Chemical Engineering
 Stage/ Year: 3rd Stage / 5th Semester
 Total Mark: 100

Final Examination
 Academic Year 2021-2022



Course Title: Chemical Industries
 Course Code: KOU20444
 Time Allowed: 120 minutes
 Attached Sheet: No attached sheet

Answer All Questions

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- (30 Marks)
- Permanent hardness is due to the existence of the following dissolved salts in water (1. Calcium or Magnesium bicarbonate, 2. Calcium and Magnesium chlorides and sulphates, 3. Sodium and Potassium chlorides)
 - The trickling filter is a fixed bed, biological filter that operates under (1. Mostly aerobic microorganism conditions, 2. Nonaerobic microorganism conditions, 3. Without microorganism)
 - When compare Chemical Oxygen Demand COD with Biological Oxygen Demand BOD, it is (1. The same value, 2. Lower value, 3. Higher value)
 - The Acetylene gas industry factory should be (1. Adjacent to the Acetylene gas users, 2. Far from the users, 3. Near the users but not adjacent to the Acetylene gas factory)
 - In the filtering and transportation of molten Sulphur, all the equipment is jacketed by (1. High pressure super-heated steam, 2. Medium pressure steam, 3. Boiled water)
 - Increasing the concentration of P_2O_5 in Phosphoric acid industry is done by (1. Vacuum Evaporator, 2. Higher Pressure Evaporator, 3. Normal Pressure Evaporator)
 - The refractory brick that are used in lining cement rotary kiln is (1. Silica Brick, 2. Kaolin Brick, 3. Magnesium Oxide MgO Brick)
 - The temperature of the furnace in manufacturing of glass reach maximum to (1. $1000^\circ C$, 2. $180^\circ C$, 3. $1600^\circ C$)
 - In the Dairy industries the removing of fat is done by (1. Freezing system, 2. Paper filter, 3. Disc bowl centrifugal separator)
 - Sterilization of milk and canned food is done at a temperature (1. higher than $100^\circ C$, 2. $60^\circ C$, 3. Normal room temperature)

For sewage water treatment, draw in details Trickling Bed Filter operation process? (20 Marks)

For Construction materials industry, draw the PFD for industry of Thermostone block? (20 Marks)

For Food industries, draw the PFD for industry of Acetylene? (20 Marks)

For Detergent industry, draw the PFD for industry of Gel Sanitizer? (10 Marks)

Examiner's Name: Fakhri Hamdullah Ibraheem

Answer All Questions

1. Select the correct answer of the following statements?

(30 Marks)

- The hydrophobic side in soap chemical structure is dissolved in (1. Water, 2. Hydrocarbons or dirty, 3. Caustic Soda).
- The main composition of cheese is (1. Whey Protein, 2. Casein Protein, 3. Fat content).
- For the sterilizing of milk, it is required to heat it to 1. 140 °C for 2 minutes, 2. 140 °C for 15 minutes, 3. 140 °C for 2 seconds).
- The rotary kiln in cement industry is 2. inclined in order to achieve (1. Good raw materials mixing, 2. Efficient distribution of temperature, 3. Transferring of material by gravity).
- A magnesite brick (80 %) is used in lining fire facing layer in cement rotary kiln because it is (1. Low dense alkaline brick, 2. Low hard insulated brick, 3. High hard dense alkaline brick).
- Vacuum evaporator is used to increase the concentration of P_2O_5 in the industry of Phosphoric acid because it provides (1. Higher productivity, 2. The acid from high temperature dissociation, 3. Higher Removal of Sulphur).
- A cathodic protection system is used in the industry of Sulphuric Acid by contact process in order to (1. Reduce acid mist air pollution, 2. Increase absorption rate of SO_3 by acid, 3. Keep equipment from corrosion).
- The transportation of Acetylene gas is done by (1. Low pressure very short pipe, 2. Double pipe, 3. Track with covered vessel).
- For the treatment of nonacceptable taste and odor for drinking water, it is recommended to install (1. Activated carbon bed followed by softener, 2. Distillation process, 3. Ultra high filtration system).
- The flocculation materials that are added to the raw water in the industry of drinking water should be done under (1. Fast mixing, 2. Gentle mixing, 3. Without mixing)

2. Draw the manufacturing process for the industry of liquid dishes, and liquid hand detergent? (15 marks)

3. Draw the PFD for the industry of low fat cheese? (15 marks)

4. A. What is the parameters that can increase the separation efficiency of Disk Bowl Centrifugal separator?
Support your answer by drawing. (10 marks)

B. What is the parameters that increase the grinding efficiency of Ball Mill? (10 marks)

5. Determine the types of the raw materials, furnaces and operating conditions (Temp., Pressure, Humidity) for the furnaces of the following industries?

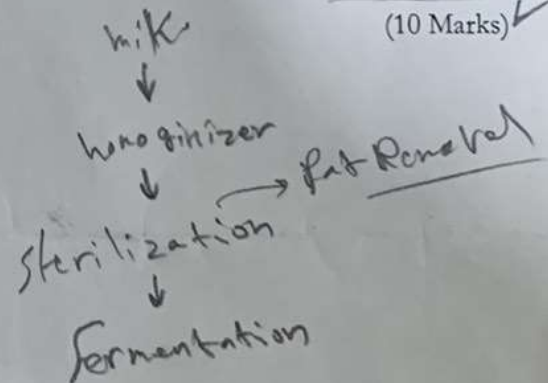
a. Portland Normal Cement. b. Clay brick. c. Thermostone block. d. Glass (20 marks)

Answer All Questions

1.
 - a) Draw the wet Process Flow Diagram for the industry of Phosphoric Acid? (15 Marks) ✓
 - b) Determine the types (segments) of phosphate fertilizers? (10 Marks) ✓
2.

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 - a) Draw the block diagram for the industry of Portland Cement? (15 Marks) ✓
 - b) What are the types of mills that are used in cement industry? Where is the location of each type of mill in the production process? And why? (10 Marks) ✓
 - c) What is the equipment that are used to keep the cement industry factory air environment free from dust? And why? (10 Marks) ✓
 - d) Draw the preheating process of cement raw materials? (5 Marka) ✓
3. For the food industries determine the followings:
 - a) Draw the block diagram for the industry of Dairy Products? (15 Marks) ✓
 - b) What is the milk sterilization temperature and time? What is the equipment that used for milk sterilization? What are the parameters that can be justified to increase its efficiency? Support your answer by drawing. (10 marks) ✓
 - c) What is the equipment that used to separate fat from milk? What are the parameters that can be justified to increase its efficiency? Support your answer by drawing. (10 Marks) ✓



FACULTY OF ENGINEERING

First Semester Examination
2023-2024



Department: Chemical Engineering Department
Stage/ Year: 3rd – 5th semester
Total Mark: 100

Course Title: Chemical Industries
Course Code: KOU20444
Time Allowed: 90 minutes
Attached Sheet: No attachment

Answer All Questions

1. Draw the process flow diagram for the industry of drinking water from saline underground water that includes solid impurities and suspended materials? *doesn't need chlorine* (25 Marks)
2. Draw the Production of sulfur by Frasch Process? (15 Marks)
3. Draw the Production of liquefied Oxygen, Nitrogen, and Argon by Cryogenic Process (20 Marks)
4. Determine the function of the following equipment, and in which industries it is used? Support your answers with drawings. (30 Marks)
 - a. Trickle bed filter.
 - b. Economizer.
 - c. Packed bed absorption tower.
 - d. Expander.
 - e. Ro membrane.
5. Determine the meaning of BOD, COD, and suspended Solid (SS) in sewage water? (10 Marks)

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1. Draw the process flow diagram (PFD) for treating clean saline and/or bitter water to make it suitable for drinking. (2) (10 marks)
2. Determine the reason for the following: (15 marks)
 - a. The calcium carbide enters the acetylene reactor in a position under the water. (4)
 - b. Using Expander in the industry of liquefied oxygen. (2)
 - c. Using Nitrogen gas in the canned Food industries. (5)
3. Draw the Process Flow Diagram (PFD) of sewage water treatment? (10) (20 marks)
4. Draw the Process Flow Diagram (PFD) of the Ammonia industry with its operating conditions? (15) (20 marks)
5. Draw the block diagram for the industry of Portland cement? (15) (20 marks)
6. What equipment is used to clean dust in a cement factory, what principles does it operate on, and what is the maximum particle size it can capture? (5) (15 marks)

Answer All Questions

1. What are the raw material compositions and their percentages for the following industries? Additionally, what are the operating conditions (temperature, pressure, humidity) for each industry? (16 Marks)
 - a) Portland Cement Industry
 - b) Glass Industry
 - c) Lightweight Concrete (Thermostone)
 - d) Clay Brick
2. Select the correct answer from the options provided for the following statements. (10 Marks)
 - a) Permanent hardness is due to the existence of the following dissolved salts in water (1 Calcium or Magnesium bicarbonate, 2. Calcium and Magnesium chlorides and sulphates, 3. Sodium and Potassium chlorides)
 - b) The hydrophobic side in soap chemical structure is dissolved in (1 Water, 2. Hydrocarbons or dirty, 3. Caustic Soda).
 - c) The main composition of cheese is (1. Whey Protein, 2. Casein Protein, 3. Fat content).
 - d) For the sterilizing of milk, it is required to heat it to (1. 140 °C for 2 minutes, 2. 140 °C for 15 minutes, 3. 140 °C for 2 seconds).
 - e) The refractory bricks used for lining cement rotary kilns are (1 Silica Brick, 2. Kaolin Brick, 3. Magnesium Oxide MgO Brick).
3. A. Draw the block diagram for the industry of skimmed fat yogurt. (10 Marks)
B. Draw the process flow diagram for the industry of cheese? (10 marks)
4. Draw the Frasch process for mining of Sulfur? (12) (14 Marks)
5. Draw the process flow diagram (PFD) for industry of Sulfuric acid by contact method? (18) (20 Marks)
6. Explain the function of the following? and in which industries it is used? (20 Marks)
 - a) Metal balls mill.
 - b) Plate heat exchanger.
 - c) Disc bowl centrifugal separator. *fat from milk*
 - d) Cadmium control rod. *power plant reactor*
 - e) Cooling towers. *power plant to cool the uranium stuff*