



**NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**FACULTY OF APPLIED SCIENCES**

**DEPARTMENT OF APPLIED CHEMISTRY**

**Quality Assurance Management and Control**

**SCH 2211**

**Supplementary Examination Paper**

**August 2015**

This examination paper consists of 5 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Special Requirements:**

**Examiner's Name: Mr Donatus Dube**

**INSTRUCTIONS**

1. Answer all questions from Section A and any three (3) questions from Section B.
2. Each question in Section B carries 20 marks.
3. Use of calculators is permissible.

**MARK ALLOCATION**

<b>QUESTION</b>	<b>MARKS</b>
1.	<b>25</b>
2.	<b>15</b>
3.	<b>20</b>
4.	<b>20</b>
5.	<b>20</b>
6.	<b>20</b>
<b>TOTAL POSSIBLE MARKS</b>	<b>100</b>

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**SECTION A** [Answer All Questions from this Section. This Section carries forty (40) marks].

Study the attached case and answer all the questions that follow.

1. You have been appointed as the TQM co-ordinator for MCL, after 10 years as product development manager;

- a) Identify the change driver at MCL. (2 marks)
- b) TQM entails bringing disparate individuals together. But how do you handle opposition which is bound to exist at various levels to a change initiative? (6 marks)
- c) How would you secure the CEO support for the programme? (3 marks)
- d) How should you link TQM to the employees' larger concepts and customer satisfaction? (8 marks)
- e) Is it prudent to appoint an outside consultant who can give TQM initiatives the necessary focus and set the ball rolling in the right direction? Discuss. (6 marks)

2. Use the TQMX Model to explain the importance of the following:

- a) Quality Circles (5 marks)
- b) Japanese 5S (5 marks)
- c) Autonomous maintenance (5 marks)

**SECTION B** [Answer any three (3) questions from this Section. Each question carries twenty (20) marks].

- 3. a) Compare and contrast the **cause- and effect- analysis** and the **scamper technique** of problem solving. (12 marks)
- b) Suggest the boundaries of application of the two techniques stating your reasons thereof. (4 marks)
- c) State 2 shortcomings of force-field analysis as a strategy generation tool. (4 marks)

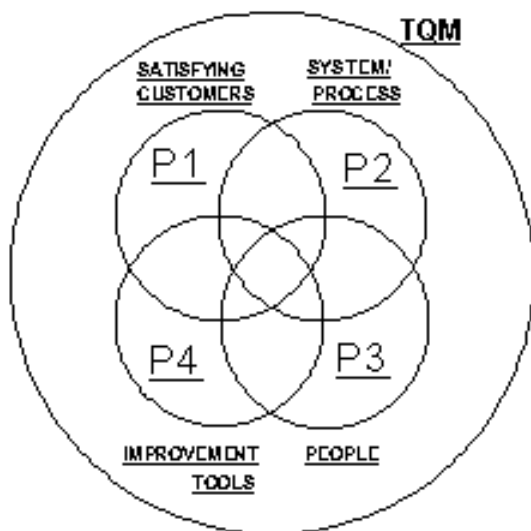
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4. The following are the objectives of a Six Sigma training course:

- Use proven Six Sigma problem-solving methods and statistical tools
- Master processes for collecting and analyzing data
- Lead and coach quality improvement initiatives
- Analyze process parameters using statistical and non-statistical techniques
- Apply Lean Six Sigma in any type of business or industry

Explain, using one practical example, how each of these objectives can be achieved. (20 marks)

5. a) Explain the diagram that follows;



(14 marks)

b) Discuss the primary applications of control charts. (6 marks)

6. a) What is benchmarking? Classify benchmarking based on the nature of firms against which benchmarking could be done. (6 marks)

b) In an acceptance sampling plan developed for lots containing 1,000 units, the sample size  $n$  is 85 and  $c$  is 3. The percent defective of the incoming lots is 2%, using the OC curve prove that the probability of acceptance is 0.64. (8 marks)

c) Suggest ways in which lean production can be implemented at a pulp and paper manufacturing plant. (6 marks)

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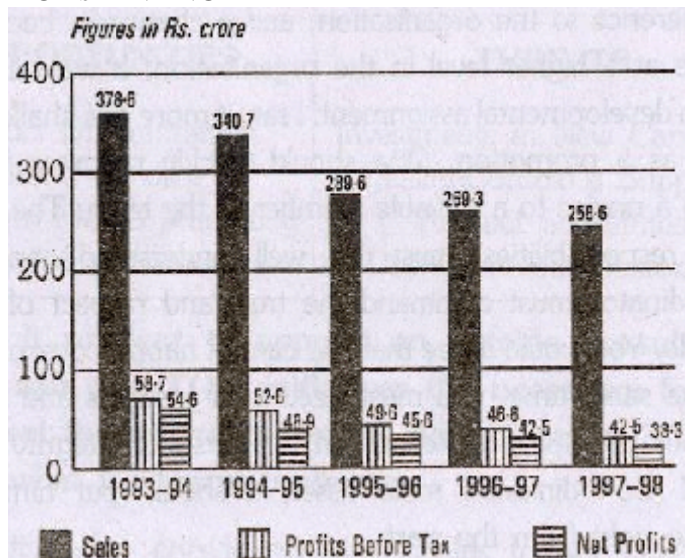
## THE CASE

For decades, MCL has been known as a caustic soda company --- a perception that's bound to change soon. The imperatives of value addition and the nature of our production processes are forcing us to change tack. Today, our 13 per cent market-share makes us the second-largest producer of caustic soda in our country. Our manufacturing facilities are located at Vadodara, a city located in our main market Gujrat which consumes over 60 per cent of our production.

Caustic soda is obtained by the electrolysis of salt --- a process which also yields chlorine as a by-product. The ratio of caustic soda is usually 1:5:1, the combination is termed as an Electro-Chemical Unit (ECU). Caustic Soda and chlorine, incidentally, have separate markets. Paper, Aluminum, Textiles, and Soaps & Detergents are caustic soda's primary user-industries; chlorine is sold mostly to petrochemical units. They convert chlorine into ethylene dichloride or a vinyl chloride monomer, which is used to produce Poly-Vinyl Chloride (PVC) which, in turn, is used in the manufacture of plastics. As you see, the scope for value-addition lies in the chlorine component of an ECU. Surely, the price-realisation of an ECU is higher when there is greater emphasis on chlorination. But an increase in demand for chloride leads to glut in caustic soda.

There is an oversupply of caustic soda. Against a demand of 1:10 million tonnes per annum (tpa), the current capacity in the country stands at 2.20 million tpa --- not to mention the licenses issued for another 1 million tpa. With most producers operating at 50 per cent capacity, the situation is bad. For, caustic soda is a commodity business, where volumes are crucial; so, capacity utilisation is a critical parameter of profitability and cost-efficiency. Of course, MCL has some advantages. It has captive salt works, which meet 75 per cent of its requirements of sodium chloride, the main raw material, And it has an in-house power generation facility which offers power at Rs. 2.60 per unit against Rs. 4.70 from the state power grid. Naturally, since power constitutes 67 per cent of the cost of production, we are able to save a lot of money....

### MCL's FINANCIAL



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For decades, MCL has been in the commodity business. But the supply overhang in the caustic soda industry has forced us to look for alternative growth routes. We have taken 2 critical measures: consumer marketing and value-addition. We are increasing our salt-works capacity not only to meet 100 per cent of our raw material requirements from within, but to market branded salt to domestic consumers as well. This is a new area for us, and a paradigm shift in our conventional approach to marketing. Historically, we have always looked at chlorine as a byproduct. With opportunities for value addition opening up in the chlorine segment --- thanks to massive additions to petrochemical capacities in the country --- our new thrust is to look for ways in which MCL can add value to our customers' supply chain. That calls for a different marketing approach in which customer requirements, both current and future, become the focal point of all that we do. We asked ourselves: what would happen if we did not venture into these 2 areas? The answer was that, sooner or later we would be wiped out of business. That was the change-driver.

MCL has decided to implement Total Quality Management (TQM). But therein lies the crux of the issue: implementation is never easy. One has to be careful and cautious; it is the first few months that make all the difference to the success of an organizational transformation like TQM.