

CONFIDENTIAL



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2013/2014**

COURSE NAME : INTRODUCTION TO CHEMICAL
ENGINEERING TECHNOLOGY

COURSE CODE : BNQ 10102

PROGRAMME : 1 BNN

TEST DATE : DECEMBER 2013 / JANUARY 2014

DURATION : 2 HOURS

INSTRUCTION : ANSWER **THREE (3)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

CONFIDENTIAL

- Q1.** (a) Discuss the contribution of chemical engineering technology in creating cleaner energy. (4 marks)
- (b) Briefly define the term *dimension* and give **four (4)** examples of base dimensions. (5 marks)
- (c) Describe the derived dimension of flowrate and of density in terms of the base dimensions. (2 marks)
- (d) Ammonia burns in oxygen to form nitric oxide (NO) and water vapor. Calculate the volumes of NO obtained from one volume of ammonia at the same temperature and pressure. (5 marks)
- (e) Calculate the volume (in liters) occupied by 60.0 g of HCl at standard temperature and pressure (STP). (7 marks)
- (f) Calculate the molar density of a gas at:
(i) ideal: 0°C and 1 atm
(ii) 70°C and 4.50 atm (2 marks)
- Q2.** (a) State the molar mass for each of the following (refer **Figure Q2**):
(i) Copper metal
(ii) Ammonia
(iii) Helium gas (3 marks)
- (b) In a 100 ml cup of water, calculate how many grams and moles of H₂O are there in the cup. (3 marks)
- (c) Calculate the volume of CO₂ produced at 37°C and 1.00 atm when 5.60 g of glucose are used up in the reaction:
$$\text{C}_6\text{H}_{12}\text{O}_6 (s) + 6\text{O}_2 (g) \longrightarrow 6\text{CO}_2 (g) + 6\text{H}_2\text{O} (l)$$
 (5 marks)
- (d) Explain about **four (4)** kinds of process units. (8 marks)
- (e) Describe and sketch a diagram for each process of the following:
(i) Batch
(ii) Continuous-flow
(iii) Semi-batch processes (6 marks)

- Q3.** (a) List **two (2)** forms of natural resources. For each form, give **two (2)** examples. (4 marks)
- (b) Define the term *biotechnology*. Explain **three (3)** applications of biotechnology with relevant examples. (9 marks)
- (c) Mr. Ahmad is planning to produce a *mudball* and market it as a product that could bioremediate low polluted water bodies such as lakes and streams. Discuss the business planning in terms of the production of the product, the processing involved and related issues with safety and ethics. Describe your answer with appropriate flow sheet. (12 marks)
- Q4.** (a) Define the following hazard analysis:
 (i) FMEA
 (ii) ETA
 (iii) HAZOP
 (iv) HEA (8 marks)
- (b) A fault tree for a failure of a processing unit is shown in **Figure Q4**. Relevant data is presented in **Table 1**.

Table 1: Failure Data / Probability of Events

Item	Failure Data / Probability of Events
1. Failure of Automatic ESD	0.055 per year
2. Failure of Manual ESD	0.008 per year
3. Failure of Operator	3 per 1000 demands, 3 demands per year
4. Failure of Relief Valve	3 per 1000 demands, 3 demands per year

- (i) Based on the fault tree (**Figure Q4**), discuss how the top event may occur. (4 marks)
- (ii) Determine the probability of the top event. (13 marks)

- END OF QUESTION -

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 20132014
 COURSE NAME : INTRODUCTION TO CHEMICAL ENGINEERING TECHNOLOGY
 COURSE NAME : BNQ 10102

PROGRAMME : 1 BNN

Periodic Table of the Elements

<http://chemistry.about.com>
 ©2012 Todd Helmenstine
 About Chemistry

																		8A																					
																		He	10																				
																		9	Ne																				
																		8	F																				
																		7A	17																				
																		6A	16																				
																		5A	15																				
																		4A	14																				
																		3A	13																				
																		2	1																				
																		1A	2A																				
1	2																	3	4																				
H	He																	Li	Be																				
1.00784	4.002602																	6.941	9.012182																				
3	4																	11	12																				
Li	Be																	Na	Mg																				
6.941	9.012182																	22.989769	24.3050																				
																		3B		4B		5B		6B		7B		8B		1B		2B							
																		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36						
																		Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr						
																		44.955912	47.887	50.9415	51.9961	54.938045	55.845	58.933195	58.9332	63.546	65.38	69.723	72.64	74.92160	75.96	79.904	83.798						
																		39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54						
																		Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe						
																		88.90585	91.224	92.90638	95.90	[98]	101.07	102.90550	106.42	107.8682	112.411	114.818	118.710	121.760	127.60	132.9047	131.293						
																		55	56																	63	64	65	66
																		Cs	Ba																	Bi	Po	At	Rn
																		132.90545196	137.327																	208.98040	209	210	222
																		Lanthanides																		Actinides			
																		87	88																	89-103	Admirides		
																		Fr	Ra																	[223]	[226]	[287]	
																		57	58	59	60	61	62	63	64	65	66	67	68	69	70	71							
																		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu							
																		138.90547	140.116	140.90765	144.242	[145]	151.964	157.25	158.92535	162.500	164.93032	167.259	168.93421	171.9668									
																		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103							
																		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr							
																		[227]	232.03772	231.03688	238.02891	[227]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]	[262]							

Figure Q2

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 20132014 PROGRAMME : 1 BNN
COURSE NAME : INTRODUCTION TO CHEMICAL ENGINEERING TECHNOLOGY
COURSE NAME : BNQ 10102

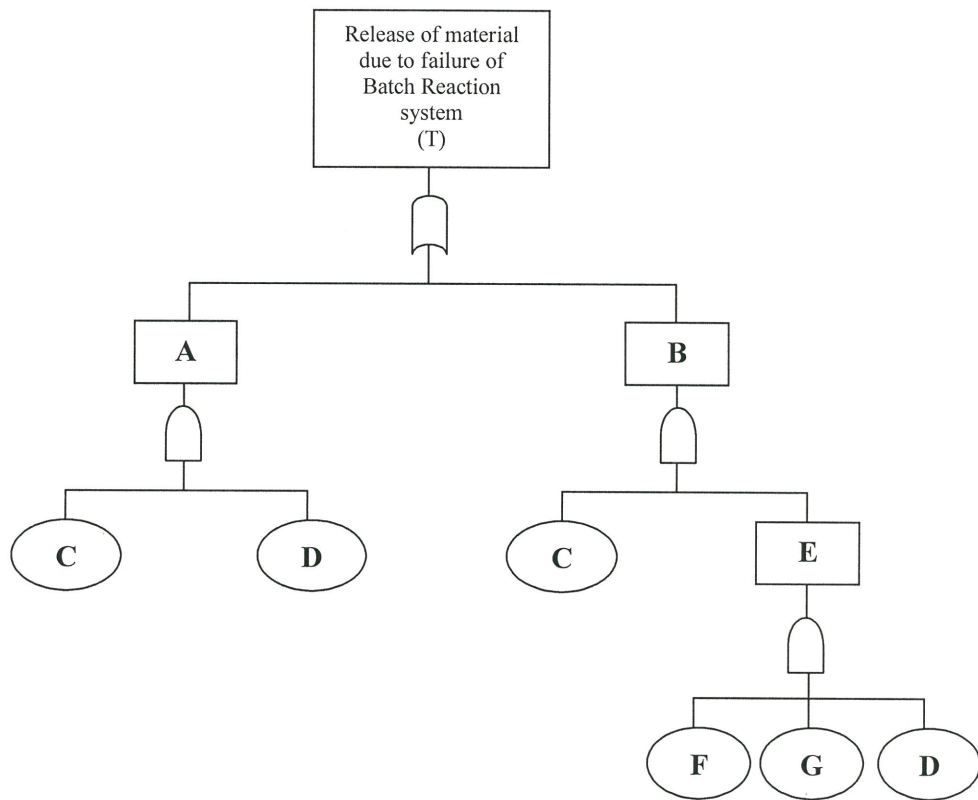


Figure Q4: A fault tree diagram for the top event of “Release of material due to failure of Batch Reaction system”.