



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER II
SESSION 2016/2017**

COURSE NAME : FUNDAMENTAL TO PLANT TECHNOLOGY

COURSE CODE : BNL 20102

PROGRAMME CODE : BNL

EXAMINATION DATE : JUNE 2017

DURATION : 2 HOURS

INSTRUCTION : ANSWERS ALL QUESTIONS

THIS QUESTION PAPER CONSISTS OF FIVE (5) PAGES

- Q1** (a) Define the term endothermic and exothermic process. (4 marks)
- (b) Calculate the energy/enthalpy required or consumed for the following reactions by using the bond energy as shown in **Table Q1 (b)**, and estimate either the reactions is exothermic or endothermic process.

- (i) Bromination of alkene



(10 marks)

- (ii) Combustion of butane



(11 marks)

- Q2** An aqueous solution of sodium hydroxide contains 30 % NaOH by mass. It is desired to produce an 12 % NaOH solution by diluting a stream of the 30 % solution with a stream of pure water as shown in **Figure Q2**.

- (a) Calculate the ratios of (g H₂O / g feed solution) and (g product solution / g feed solution) (13 marks)

- (b) Determine the feed rates of 30% solution and diluting water needed to produce 1048 kg/min of the 12 % solution (12 marks)

- Q3** (a) Describe the difference between process flow diagram (PFD) and process & instrumentation diagram (P&ID). (10 marks)

- (b) Name the following process symbols shows in **Figure Q3(b)** and briefly explain the function of each equipment. (12 marks)

- (c) Identify the primary difference between a pump and a compressor. (3 marks)

- Q4** (a) Describe:
- (i) Dalton's Law (5 marks)
 - (ii) Raoult's Law (5 marks)
- (b) Determine the volume of 500 g of iodine that will occupy under the conditions of temperature is 300 °C and the pressure is 740 mm Hg, respectively. (15 marks)

– END OF QUESTIONS –

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Table Q1(b)

Table of Bond Enthalpies (kJ/mole) at 25 °C					
Bond	Enthalpy	Bond	Enthalpy	Bond	Enthalpy
H-H	435	C-N	301	P≡P	490
H-F	569	C-O	352	Br-Br	193
H-Cl	431	C=O	532	Cl-Cl	243
H-Br	364	C-Br	234	H-Se	276
H-I	297	C-Cl	331	H-Te	243
H-C	414	C-F	440	S=S	427
H-N	460	N≡N	950	C-S	260
H-O	465	N-N	297	H-Si	393
H-S	377	O=O	498	H-P	318
C-C	368	O-O	213	C-Si	289
C=C	724	F-F	159	I-I	151
C≡C	963	Si-Si	339		

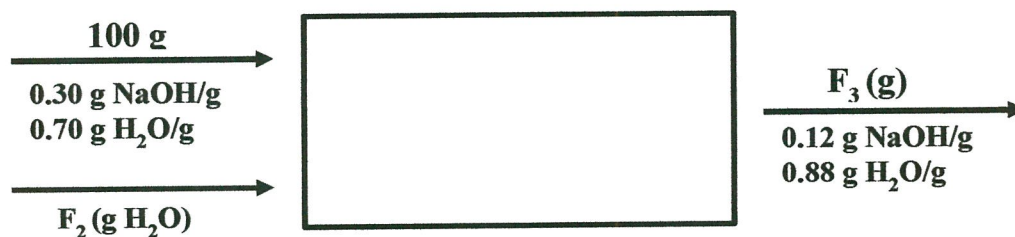


Figure Q2

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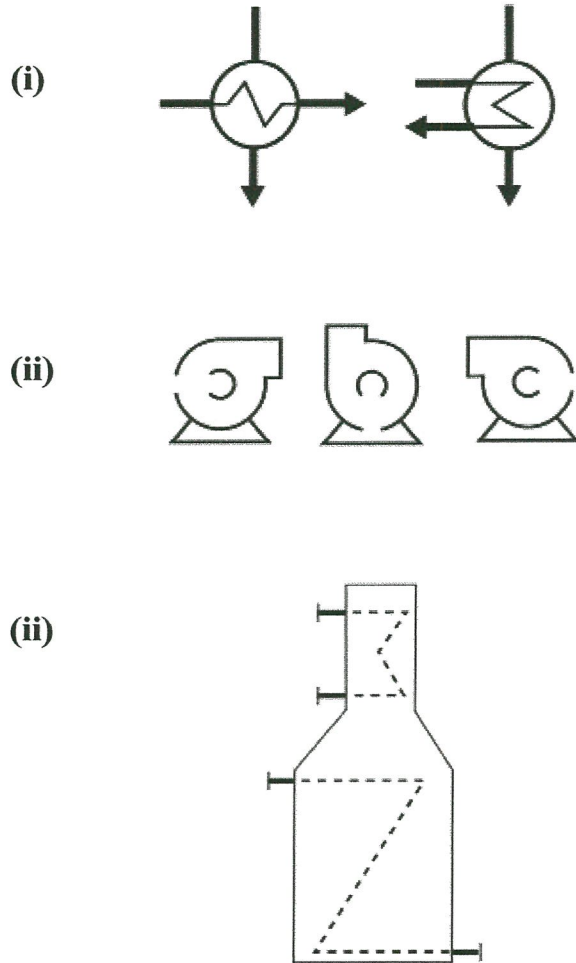


Figure Q3(b)