Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2015/2016

COURSE NAME	:	INTRODUCTION TO CHEMICAL ENGINEERING TECHNOLOGY
COURSE CODE	:	DAK 10202
PROGRAMME	:	1 DAK
EXAMINATION DATE	:	DECEMBER 2015 / JANUARY 2016
DURATION	:	2 HOURS
INSTRUCTION	:	SECTION A) ANSWER ALL QUESTIONS SECTION B) ANSWER **TWO (2)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **EIGHT (8)** PAGES

SECTION A

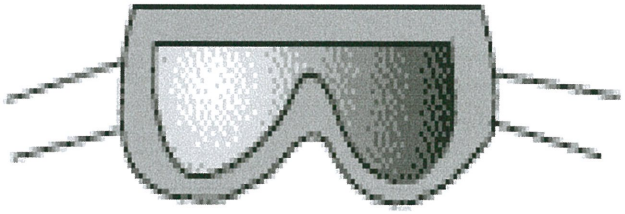
Q1 (a) Define hazard.

(2 marks)

(b) Briefly describe hazards reduction steps.

(8 marks)

(c) Identify following safety signs and explain its use:

Safety sign	Safety description
 (i)	
 (ii)	
 (iii)	

(6 marks)

(d) Classification of dangerous goods is broken down into nine classes according to the type of danger materials or items present. State all **nine (9)** classes of hazardous substances.

(9 marks)

Q2 (a) (i) Bioproducts or bio-based products are materials, chemicals and energy derived from renewable biological resources. Briefly explain on how bioproducts were made.

(4 marks)

(ii) Clarify **three (3)** categories in bioproduct. Give **one (1)** example of product for each category.

(9 marks)

(b) (i) Natural resources are materials that can be found in the environment. Define renewable and non-renewable resources.

(2 marks)

(ii) List **five (5)** examples for renewable and non-renewable energy. Redraw the following table in the answer paper.

Non-renewable resouces	Renewable resources
i.	i.
ii.	ii.
iii.	iii.
iv.	iv.
v.	v.

(10 marks)

SECTION B

Q3 (a) (i) Define chemical engineering and give **two (2)** example of products manufactured by chemical engineers.

(3 marks)

(ii) Identify **four (4)** future challenges in engineering.

(4 marks)

(iii) Chemical engineers play an important role in determining our standard of living and quality of life. Briefly desribe all **four (4)** main roles of chemical engineering technologist.

(12 marks)

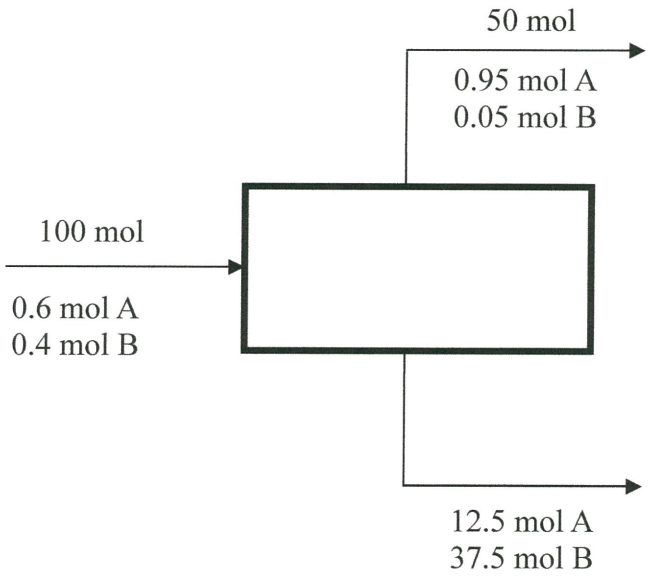
(b) As a future chemical engineer technologist, proposed **one (1)** technology and discuss briefly about the advantages of proposed technology.

(6 marks)

Q4 (a) Explain **three (3)** process classification in material balances.

(6 marks)

(b) A feed stream consisting of 60% mole A and 40% mole B is separated into two streams. A flowchart of the process is shown. It is desired to achieve the same separation with a continuous feed of 1000 kg.moles/h. Scale the flowchart accordingly.



(7 marks)

(c) An aqueous solution of NaOH contains 20% NaOH by mass. It is desired to produce an 8 % NaOH solution by diluting a stream of the 20 % solution with a stream of pure water. Draw and label a flowchart of the process and calculate the ratios (liters H_2O/kg feed solution) and (kg product solution/ kg feed solution).

(12 marks)

Q5 (a) (i) Determine the properties of gases.

(4 marks)

(ii) The 1L of a bubble starting at the bottom of a lake at 3.75°C increases by a factor of 10 as it rises to the surface where the temperature is 19°C and the air pressure is 0.89 atm. Assume the density of the lake water is 1.00 g/mL. Determine the depth of the lake. Convert answer in pascal and mmHg.

(6 marks)

(b) What is the total pressure exerted by a mixture of 2.00 g of H_2 8.00 g of N_2 and 12.0 g of Ar at 273 K in a 10.0 L vessel?

(7 marks)

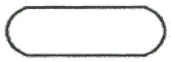
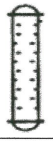
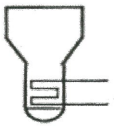
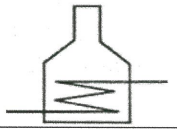
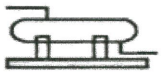
(c) (i) Calculate the molarity of a solution if an amount of 11.5 g NaOH dissolved in a 1500 mL of solution.

(4 marks)

(ii) Calculate the desired volume (in mL) of 18.0 M H_2SO_4 to contain 2.45 g of H_2SO_4.

(4 marks)

Q6 (a) Identify each symbol in Process Flow Diagram (PFD) and redraw the table below in your answer paper.

Symbol	i.	ii.	iii.	iv.	v.	vi.
						
Symbol name						

(6 marks)

(b) (i) Describe block flow diagrams.

(3 marks)

(ii) Describe process flow diagrams.

(3 marks)

(iii) Describe piping and instrumention diagrams.

(3 marks)

(c) Chemical processes consist of a number of sequential and integrated operations carried out in appropriate equipment. State the example of operations and equipments used in a chemical process.

Operation	**Equipment**

(10 marks)

- END OF QUESTION -

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Periodic Table of the Elements

	IA	IIA	IIIB	IVB	VB	VIB	VIIB		VIII		IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1	1.008 H 1																1.008 H 1	4.003 He 2
2	6.941 Li 3	9.012 Be 4											10.811 B 5	12.011 C 6	14.007 N 7	15.999 O 8	18.998 F 9	20.179 Ne 10
3	22.990 Na 11	24.305 Mg 12											26.982 Al 13	28.086 Si 14	30.974 P 15	32.06 S 16	35.453 Cl 17	39.948 Ar 18
4	39.098 K 19	40.08 Ca 20	44.956 Sc 21	47.90 Ti 22	50.942 V 23	51.996 Cr 24	54.938 Mn 25	55.847 Fe 26	58.933 Co 27	58.71 Ni 28	63.546 Cu 29	65.37 Zn 30	69.72 Ga 31	72.59 Ge 32	74.922 As 33	78.96 Se 34	79.904 Br 35	83.80 Kr 36
5	85.468 Rb 37	87.62 Sr 38	88.906 Y 39	91.22 Zr 40	92.906 Nb 41	95.94 Mo 42	98.906 Tc 43	101.07 Ru 44	102.91 Rh 45	106.4 Pd 46	107.87 Ag 47	112.41 Cd 48	114.82 In 49	118.69 Sn 50	121.75 Sb 51	127.60 Te 52	126.90 I 53	131.30 Xe 54
6	132.91 Cs 55	137.33 Ba 56	138.91 *La 57	178.49 Hf 72	180.95 Ta 73	183.85 W 74	186.2 Re 75	190.2 Os 76	192.22 Ir 77	195.09 Pt 78	196.97 Au 79	200.59 Hg 80	204.37 Tl 81	207.2 Pb 82	208.98 Bi 83	(209) Po 84	(210) At 85	(222) Rn 86
7	(223) Fr 87	226.03 Ra 88	(227) †Ac 89	(261) Rf 104	(262) Db 105	(263) Sg 106	(262) Bh 107	(265) Hs 108	(266) Mt 109	(269) Uun 110	(272) Uuu 111	(277) Uub 112						

*	140.12 Ce 58	140.91 Pr 59	144.24 Nd 60	(145) Pm 61	150.4 Sm 62	151.96 Eu 63	157.25 Gd 64	158.93 Tb 65	162.50 Dy 66	164.93 Ho 67	167.26 Er 68	168.93 Tm 69	173.04 Yb 70	174.97 Lu 71
†	232.04 Th 90	231.03 Pa 91	238.03 U 92	237.05 Np 93	(244) Pu 94	(243) Am 95	(247) Cm 96	(247) Bk 97	(251) Cf 98	(254) Es 99	(257) Fm 100	(256) Md 101	(255) No 102	(257) Lr 103

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Gas Law	**Equations**
Boyle's Law	$P_1V_1=P_2V_2$
Charles's Law	$V_1T_2 = V_2T_1$ Temperature in kelvin
Gay Lussac's Law	$P_1T_2=P_2T_1$ Temperature in kelvin
Conversion of Temperature	x °C + 273.15 = y K
Combined Gas Law	$P_1V_1T_2=P_2V_2T_1$ Temperature in kelvin
Dalton's Law of Partial Pressure	Total Pressure = $P_1 + P_2 + P_3$
Molar volume of a gas at STP	22.41 L at 273.15 K (0.0°C) and 101,325 pascals (1 atm)
Ideal Gas Law	PV = nRT R=0.08206 atm L / mol K; 8.314 kPa L / mol K; 62,364 mmHg L/ mol K
Unit	**Equations**
Molarity	Mol/Volume, Volume in Liter
Pressure	1 atm= 101,325 Pa 1 atm = 760 mm Hg = 760 torr 1 atm = 29.9213 in Hg 1 atm = 14.7 lb/in2 (psi)