

義守大學九十二學年度轉學生入學招生考試

『質能均衡』參考試題

請就題號依序作答，並於答案卷上註明題號

一、仔細判斷下列的陳述，選出正確的陳述，於題號後寫出編號即可（無須抄題）；正確者每個 5 分；答錯一個倒扣五分，直至 0 分為限。

- (1) Work can always be calculated as (ΔPV) for a process going from state 1 to state 2.
- (2) A closed system is one for which no reaction occurs.
- (3) For a fixed outlet flue gas temperature from a heater, increasing the excess air reduces the outlet flue gas temperature.
- (4) For a fixed amount of excess air, increasing the return of the flue gas to preheat the entering air reduces the fuel consumption for a fixed load on the heater.
- (5) The density and specific gravity of mercury are the same.
- (6) Absolute pressure is measured upward relative to atmospheric pressure.
- (7) If a chemical reaction occurs, the total masses entering and leaving the system for a steady-state process are equal.
- (8) The critical state is the state in which gas and liquid properties merge to become the same.
- (9) Raoult's law is used for hardly soluble gases.
- (10) The adiabatic reaction temperature is the temperature of the outlet stream of products assuming that none of work and heat for the process.

二、某氣相混合物中含有 A、B 和 C 三種物質，含率分別為 A(40 mole %), B(20 mass%) 及 C(20 mole%), 現已知 A 的分子量為 40, C 的分子量為 50。試求該氣相混合物的平均分子量？ $<20%>$

三、次氯酸鈉(sodium hypochlorite)生成反應如下式



如果有 710 lb 的氯氣(Cl_2)與 1200 lb 的氫氧化鈉($NaOH$)反應，並產生了 745 lb of $NaCl$ (Cl 原子量：35.5； Na 原子量：23)，試問

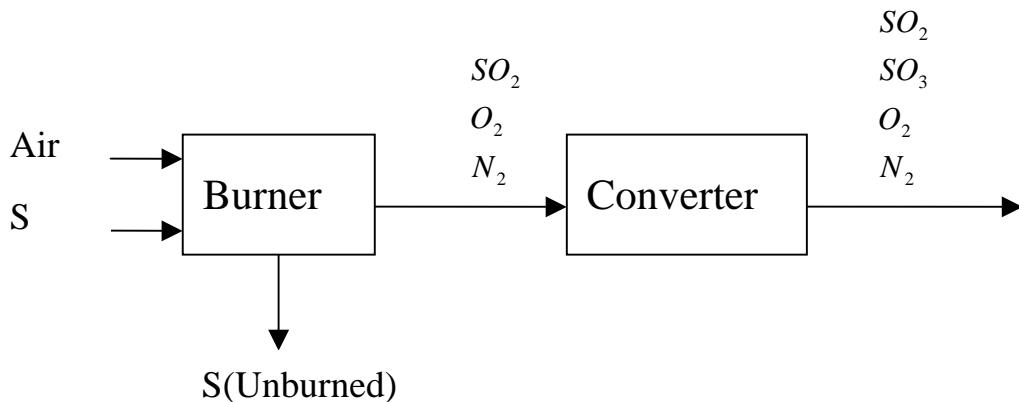
- (1) 何者為限制反應物(the limiting reactant)(5%)

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- (2) the percentage excess of the excess reactant used(5%)
 (3) the yield of $NaOCl$ per mole of chloride on the molar basis(5%)

四、有一製造 SO_3 的流程，分為氧化程序(Burner, $S + O_2 \rightarrow SO_2$)及轉化程序(Converter, $SO_2 + \frac{1}{2}O_2 \rightarrow SO_3$)，如下圖所示



其中各程序中的條件如下

Burner : 100% excess air , 80% conversion of the S to SO_2 is achieved.

Converter : 50% conversion of the SO_2 to SO_3 is completed.

假設空氣中的莫爾數比 $\frac{N_2}{O_2} = 4$, 32 Kg 的 S 進入 burner , 試問

- (1) 需用多少公斤的空氣 ? <10%>
- (2) 經過氧化程序後 , O_2 在氣體中的比例為何(in mole fraction) ? <5%>
- (3) 最後產生多少公斤的 SO_3 ? <5%>

五、What is the enthalpy change that takes place when 10 Kg of water at 4.718 kPa and 300 K are vaporized to 10 kPa and 800 K ? <20%>(可利用下列表格查詢所需資料)

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PROPERTIES OF GASEOUS WATER

p, kPa (T _{sat} , K)		Sat	350	400	450	500	550	600	650	T, K	700	750	800	850
1.0 (280.1)	V, m ³ /kg	129.2	161.5	184.6	207.7	230.7	253.8	276.9	300.0	323.1	346.1	369.2	392.3	
	h, kJ/kg	2513.7	2644.4	2739.0	2834.7	2931.8	3030.2	3130.1	3231.7	3334.8	3439.6	3546.1	3654.3	
	u, kJ/kg	2384.5	2482.9	2554.4	2627.1	2701.0	2776.4	2853.2	2931.7	3011.7	3093.5	3176.9	3262.0	
2.0 (290.7)	V, m ³ /kg	67.00	80.73	92.28	103.8	115.4	126.9	138.4	150.0	161.5	173.1	184.6	196.1	
	h, kJ/kg	2533.0	2644.3	2738.9	2834.7	2931.7	3030.2	3130.1	3231.6	3334.8	3439.6	3546.1	3654.3	
	u, kJ/kg	2399.0	2482.8	2554.4	2627.0	2701.0	2776.4	2853.2	2931.7	3011.7	3093.5	3176.9	3262.0	
4.0 (302.1)	V, m ³ /kg	34.80	40.35	46.13	51.91	57.68	63.45	69.22	74.99	80.76	86.53	92.30	98.07	
	h, kJ/kg	2553.9	2644.0	2738.8	2834.6	2931.7	3030.1	3130.1	3231.6	3334.8	3439.6	3546.1	3654.3	
	u, kJ/kg	2414.7	2482.6	2554.2	2627.0	2700.9	2776.3	2853.2	2931.6	3011.7	3093.4	3176.9	3262.0	
7.0 (312.2)	V, m ³ /kg	20.53	23.04	26.35	29.66	32.96	36.25	39.55	42.85	46.15	49.45	52.74	56.04	
	h, kJ/kg	2572.0	2643.5	2738.5	2834.4	2931.5	3030.0	3130.0	3231.6	3334.7	3439.5	3546.0	3654.3	
	u, kJ/kg	2428.3	2482.2	2554.0	2626.8	2700.8	2776.3	2853.2	2931.6	3011.7	3093.4	3176.9	3262.0	
10 (319.0)	V, m ³ /kg	14.67	16.12	18.44	20.75	23.07	25.38	27.69	29.99	32.30	34.61	36.92	39.23	
	h, kJ/kg	2584.2	2643.0	2738.2	2834.2	2931.4	3030.0	3130.0	3231.5	3334.7	3439.5	3546.0	3654.3	
	u, kJ/kg	2437.5	2481.8	2553.8	2626.7	2700.8	2776.2	2853.1	2931.6	3011.7	3093.4	3176.8	3262.0	
20 (333.2)	V, m ³ /kg	7.649	8.044	9.210	10.37	11.53	12.68	13.84	14.99	16.15	17.30	18.46	19.61	
	h, kJ/kg	2609.3	2641.4	2737.3	2833.7	2931.0	3029.7	3129.7	3231.3	3334.5	3439.4	3545.9	3654.2	
	u, kJ/kg	2456.3	2480.6	2553.1	2626.3	2700.5	2776.0	2852.9	2931.4	3011.6	3093.3	3176.8	3261.9	
40 (349.0)	V, m ³ /kg	3.993	4.005	4.595	5.179	5.759	6.339	6.917	7.495	8.073	8.650	9.228	9.805	
	h, kJ/kg	2636.3	2638.2	2735.5	2832.5	2930.3	3029.1	3129.3	3231.0	3334.3	3439.2	3545.7	3654.0	
	u, kJ/kg	2476.6	2478.0	2551.7	2625.4	2699.9	2775.6	2852.6	2931.2	3011.3	3093.1	3176.6	3261.8	

PROPERTIES OF SATURATED WATER

T K	Press. kPa	Volume, m ³ /kg		H _I	Enthalpy, kJ/kg	
		V _I	V _R		H _{I_R}	H _R
273.16	0.6113	0.001000	206.1	0.0	2500.9	2500.9
275	0.6980	0.001000	181.7	7.5	2496.8	2504.3
280	0.9912	0.001000	130.3	28.1	2485.4	2513.5
285	1.388	0.001001	94.67	48.8	2473.9	2522.7
290	1.919	0.001001	69.67	69.7	2462.2	2531.9
295	2.620	0.001002	51.90	90.7	2450.3	2541.0
300	3.536	0.001004	39.10	111.7	2438.4	2550.1
305	4.718	0.001005	29.78	132.8	2426.3	2559.1
310	6.230	0.001007	22.91	153.9	2414.3	2568.2
315	8.143	0.001009	17.80	175.1	2402.0	2577.1
320	10.54	0.001011	13.96	196.2	2389.8	2586.0
325	13.53	0.001013	11.04	217.3	2377.6	2594.9
330	17.21	0.001015	8.809	238.4	2365.3	2603.7
335	21.71	0.001018	7.083	259.4	2353.0	2612.4
340	27.18	0.001021	5.737	280.5	2340.5	2621.0
345	33.77	0.001024	4.680	301.5	2328.0	2629.5
350	41.66	0.001027	3.844	322.5	2315.4	2637.9
355	51.05	0.001030	3.178	343.4	2302.9	2646.3
360	62.15	0.001034	2.643	364.4	2290.1	2654.5
365	75.21	0.001037	2.211	385.3	2277.3	2662.6