

# 108 學年度四技二專第一次聯合模擬考試

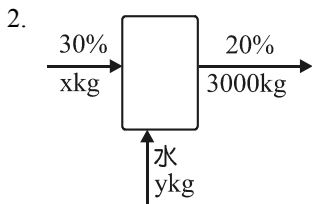
## 化工群 專業科目(二) 詳解

108-1-05-5

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| A  | B  | B  | D  | C  | A  | B  | B  | D  | C  | B  | D  | A  | B  | C  | C  | C  | A  | B  | B  | A  | C  | C  | A  | C  |
| 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| B  | C  | B  | D  | D  | D  | A  | C  | C  | A  | A  | A  | D  | B  | D  | A  | D  | B  | B  | C  | D  | D  | B  | D  | D  |

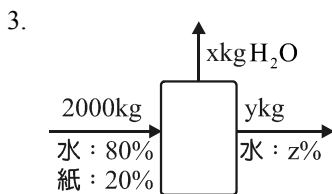
### 第一部分：基礎化工

1. 無化學反應，質量生成 = 0，質量消失 = 0  
穩定狀態，沒有累積質量，故選(A)



$$\begin{cases} x + y = 3000 \\ x \cdot 30\% = 3000 \cdot 20\% \end{cases}$$

$$\therefore x = 2000 \text{ kg}, y = 1000 \text{ kg}$$



$$\begin{aligned} \text{除去水量} &= x = (2000 \cdot 80\%) \cdot 50\% = 800 \text{ kg} \\ y &= 1200 \text{ kg} \end{aligned}$$

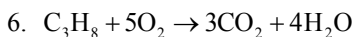
4.  $2000 \cdot 80\% = 800 + 1200 \cdot z\%$   
 $z\% = 67\%$

5.  $\frac{\eta_{\text{乙醇}}}{\eta_{\text{水}}} = \frac{\rho_{\text{乙醇}} \cdot t_{\text{乙醇}}}{\rho_{\text{水}} \cdot t_{\text{水}}}$ ,  $\frac{\eta_{\text{乙醇}}}{1} = \frac{0.75 \times 80}{1 \times 50}$ ,  $\eta_{\text{乙醇}} = 1.2 \text{ cP}$

$$\eta_{\text{水}} = 10 \times 10^{-4} \text{ kg/m} \cdot \text{s} = 0.01 \text{ g/cm} \cdot \text{s} = 1 \text{ cP}$$

$$\rho_{\text{乙醇}} = 750 \text{ kg/m}^3 = 0.75 \text{ g/cm}^3$$

$$\rho_{\text{水}} = 1000 \text{ kg/m}^3 = 1 \text{ g/cm}^3$$



$$\text{丙烷} = \frac{44}{44} = 1 \text{ kmol}$$

$$\text{理論需 O}_2 \text{ 量: } 1 \times 5 = 5 \text{ kmol}$$

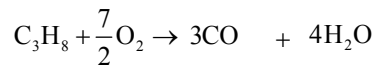
$$\text{理論需 air 量: } \frac{5}{0.2} = 25 \text{ kmol} \times 28.8 = 720 \text{ kg}$$

$$\text{過量 air\%} = \frac{800 - 720}{720} \times 100\% = 11\%$$

7.



$$\frac{44}{44} = 1$$



$$\frac{14}{28} = \frac{1}{2}$$

$$\therefore \text{C}_3\text{H}_8 \text{ 的轉化率} = \frac{1 \times \frac{1}{3} + \frac{1}{2} \times \frac{1}{3}}{1 \text{ kg}} \times 100\% = 50\%$$

8.  $\text{CO}_2$  產率:  $\frac{\frac{1}{3}}{1} \times 100\% = 33\%$

$$\text{CO 產率: } \frac{\frac{1}{6}}{1} \times 100\% = 17\%$$

$$\text{CO}_2 \text{ 選擇性: } \frac{\frac{1}{3}}{\frac{1}{3} + \frac{1}{6}} = 67\%$$

$$\text{CO 選擇性: } \frac{\frac{1}{6}}{\frac{1}{3} + \frac{1}{6}} = 33\%$$

9. 正常沸點 =  $69^\circ\text{C} = 342\text{K}$  此時壓力為  $1 \text{ atm}$   
即  $P_1 = 1 \text{ atm}$ , 求  $T_2 = 70^\circ\text{C} = 343\text{K}$  時  $P_2 = ?$

$$\ln \frac{P_2}{P_1} = \frac{\Delta H_v}{R} \times \left( \frac{1}{T_1} - \frac{1}{T_2} \right), \ln \frac{P_2}{1} = \frac{6840}{2} \times \left( \frac{1}{342} - \frac{1}{343} \right)$$

$$\ln P_2 = \frac{6840}{2} \times \left( \frac{1}{342 \times 343} \right) = \frac{10}{343}$$

10.  $PV = ZnRT$ ,  $1.23 \times 10 = Z \times 1 \times 0.082 \times 300$ ,  $Z = \frac{1}{2}$

11.  $\dot{m}_s \cdot \lambda_s = \dot{m}_c \cdot c \cdot \Delta T$ ,  $\dot{m}_s \cdot 2250 = 4 \times 4 \times (65 - 20)$

$$\dot{m}_s = 0.32 \text{ kg/s}$$

12. 分子量愈大，氣體臨界溫度愈高

13. ①  $Z = \frac{PV}{nRT}$ , ②  $Z$  無單位

14. 高溫、低壓

15. 氣體液化的條件為低溫、高壓

16. 沸點愈低，其在  $25^\circ\text{C}$  下蒸氣壓愈大

17.  $\frac{\Delta H_v}{T_b} = 25$ ,  $\frac{\Delta H_v}{87 + 273} = 25$

$$\Delta H_v = 9000 \text{ cal/mol} \times \frac{1}{120 \text{ g/mol}} = 75 \text{ cal/g}$$

18. 降溫：表面張力&黏度均增加  
 19. 壓力對液體的表面張力影響最小  
 20.  $\gamma = \frac{\rho ghR}{2} = \frac{1 \times 980 \times 10 \times 0.01}{2} = 49 \text{ dyne/cm}$   
 21.  $0.01 \times 10 = 0.02 \times h_2$  ,  $h_2 = 5 \text{ cm}$   
 22.  $\frac{\gamma_{某}}{\gamma_{水}} = \frac{\frac{\rho_{某}}{n_{某}}}{\frac{\rho_{水}}{n_{水}}}$  ,  $\frac{\gamma_{某}}{75} = \frac{\frac{0.8}{1}}{\frac{1}{100}}$  ,  $\gamma_{某} = 40 \text{ dyne/cm}$   
 23. 非極性分子量愈小，結構愈對稱的物質，表面張力愈小  
 24. (A) 將液態空氣進行蒸餾，氮氣會最先氣化而被分離  
 25.  $\frac{\eta_i}{\eta_{水}} = \frac{(\rho_s - \rho_l)t_i}{(\rho_s - \rho_{水})t_{水}}$  ,  $\frac{\eta_i}{1} = \frac{(4-2) \times 20}{(4-1) \times 10}$  ,  $\eta_i = \frac{4}{3} = 1.33 \text{ cP}$

## 第二部分：化工裝置

26. 單元操作：萃取、吸收、混合、蒸發  
 單元程序：燃燒、聚合、酯化、苛性化  
 27.  $\frac{J}{kg} = \frac{m^2}{s^2}$  ∴ 因次為  $L^2\theta^{-2}$   
 28. ①莫耳，③燭光為基本單位  
 29. ④帕斯卡(Pa)為壓力單位  
 30. 控制閥為管路系統  
 31.  $1 \text{ kg/m} \cdot \text{s} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ m}}{100 \text{ cm}} = 10 \text{ g/cm} \cdot \text{s}$   
 32.  $\dot{V} = 2.16 \frac{\text{m}^3}{\text{hr}} \times \frac{1 \text{ hr}}{3600 \text{ s}} = 6 \times 10^{-4} \text{ m}^3/\text{s}$   
 $\dot{m} = \rho \dot{V} = 1500 \times 6 \times 10^{-4} = 0.9 \text{ kg/s}$   
 33.  $Re = \frac{D\bar{u}\rho}{\mu} = \frac{\rho \dot{V}}{\mu \times \frac{\pi}{4} \times D} = \frac{1500 \times 6 \times 10^{-4}}{7.5 \times 10^{-3} \times \frac{3}{4} \times 0.02} = 8000$   
 ∴ 為亂流  
 34.  $\frac{P_1}{\rho} + gh_1 + \frac{1}{2}\bar{u}_1^2 + W_s = \frac{P_2}{\rho} + gh_2 + \frac{1}{2}\bar{u}_2^2 + \sum h_f$   
 $P_1 = P_2 = P_{atm}$  ,  $\bar{u}_1 \doteq \bar{u}_2 \doteq 0$   
 $W_s = g(h_2 - h_1) + \sum h_f = 10 \times 10 + 900 = 1000 \text{ J/kg}$   
 $P_b = 2 \text{ hp} \times \frac{750 \text{ Watt}}{1 \text{ hp}} = 1500 \text{ Watt}$   
 $\therefore \eta = \frac{W_s \times \dot{m}}{P_b} = \frac{1000 \times 0.9}{1500} = 0.6 = 60\%$   
 35. 層流：  $Re = \frac{D\bar{u}\rho}{\mu} = \frac{0.02 \times 1 \times 800}{5 \times 10^{-3}} = 3200$   
 $f = \frac{16}{Re} = \frac{16}{3200} = 0.005$   
 36.  $h_f = 4f \frac{L}{D} \times \frac{1}{2}\bar{u}^2 = 4 \times 0.005 \times \frac{1000}{0.02} \times \frac{1}{2} \times 1^2 = 500 \text{ J/kg}$   
 $= 0.5 \text{ kJ/kg}$   
 37. (A) 為巴斯噶原理  
 38.  $P_{底} = P_{大} + \rho gh = 1.013 \times 10^5 + 800 \times 10 \times 2$

- $= 1.173 \times 10^5 \text{ Pa} = 117.3 \text{ kPa}$   
 39.  $(-\Delta P) = (\rho_m - \rho)gh = (1600 - 1000) \times 10 \times 0.03 = 180 \text{ Pa}$   
 40.  $\dot{V} = \frac{\pi}{4} D^2 \times C_0 \times \sqrt{\frac{2(-\Delta P)}{\rho}} = \frac{\pi}{4} \times 0.02^2 \times 0.64 \times \sqrt{\frac{2 \times 180}{1000}}$   
 $= 1.2 \times 10^{-4} \frac{\text{m}^3}{\text{s}} \times \frac{1000 \text{ L}}{1 \text{ m}^3} \times \frac{60 \text{ s}}{1 \text{ min}} = 7.2 \text{ L/min}$   
 41. (A) 皮托管量測流體內某點的點速度  
 42. (D) 往復活塞容積流量計為排量式流量計的一種  
 43. (A) 90°肘管 > 45°肘管  
 (C) 4 吋球閥 > 2 吋球閥  
 (D) 球閥 > 閘閥  
 44. ①銅管為抽製管  
 ④不鏽鋼管屬於鐵金屬管的形式  
 故正確為(B) ②③  
 45. (A) 離心泵有氣結現象  
 (B) 往復泵有脈動現象  
 (D) 離心泵適用輸送含固體懸浮物的液體  
 46. (D) 球閥安裝時具方向性，閘閥沒有  
 47. (D) 油擴散真空泵可達超高真空  
 48. ①管套節—連接管子 ③T型管—增加支流  
 49. (D) 高溫、高壓或危害性流體的輸送，應盡量使用焊接接合  
 50. (D) 隔膜泵可輸送腐蝕性液體