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Physical\_Chemistry\_2<sup>nd</sup>\_YUGS\_EV\_ST

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2<sup>nd</sup> SEM-2026\_Bologna\_Process  
Mid\_Exam\_Class\_A\_Paper\_A

01/MCO test (Answer the following)

(Marks 50 %)

1: Depression of freezing point of a solution associated an increasing in?  
Answer: a) T b) H c)  $\mu$  d) S

2: When applying the reduced phase rule to condensed systems, the pressure is assumed to be ----- atm?  
Answer: a) zero b) 1 c) 2 d) 3

3: The reduced phase rule applies when which variable is kept constant?  
Answer: a) T b) conc c)  $p$  d)  $\chi$

4: Which One of the following expressions represents a negative deviation from Raoult's law?  
Answer: a)  $P_A^* \neq \chi_A P_A$  b)  $P_A = \chi_A P_A^*$  c)  $P_A > \chi_A P_A^*$  d)  $P_A < \chi_A P_A^*$

5: Addition of a non-volatile solute to a pure solvent results in a change in?  
Answer: a)  $\Delta_{mix}H$  b)  $\Delta_{mix}S$  c)  $\Delta_{mix}V$  d) all of these

6: The difference between pure and impure solvent is?  
Answer: a)  $\mu^* = \mu$  b)  $\mu^* > \mu$  c)  $\mu^* < \mu$  d)  $\mu^* \neq \mu$

7: The relationship between  $\Delta T_f$  and  $\chi_B$  is?  
Answer: a) direct b) inverse c) disordered d) none of these

8: With the two-component system (A & B), one part of the solid phase consists of?  
Answer: a) A + B b) A + solution c) B + solution d) A + eutectic

9: If you add a solute to a pure solvent, then there is a decrease in the ----- of the solution.  
Answer: a) S b) H c) T d)  $\mu$

10: Dalton's law is used to calculate the partial pressure of which phase?  
Answer: a) liquid b) gas c) solid d) plasma

02 A solution contains 4.0 g of an unknown substance in 0.5 dm<sup>3</sup> of solution. Its osmotic pressure is 103 torr at 34.0 °C. Calculate the molar mass of the unknown substance. (Marks 25%)

03 Using the diagram below and the appropriate phase rule, fill in all the blanks and determine the composition of the all-eutectic mixture, all equilibria, all reversible and irreversible processes, and the name of the regions located to the right and left of points C, E & AB? (Marks 25%)

$\pi = \frac{103}{760} = 0.1355 \text{ atm}$   
 $V = 0.5 \text{ dm}^3 = 0.5 \text{ L}$   
 $T = 34 + 273 = 307 \text{ K}$   
 $w_t = 4 \text{ g}$   
 $\pi = 103 \text{ torr}$   
 $T = 34^\circ \text{C}$   
 $M.w.t = ?$   
 $V = 0.5 \text{ dm}^3$   
Sun\_05-04-2026 With my best wishes Dr Abduljabbar I. R. Rushdi



Name of a student \_\_\_\_\_ Signature \_\_\_\_\_ No. \_\_\_\_\_

$\pi = RT[B]$

$0.1355 \text{ atm} = 0.082 \text{ L-atm/K.mol} \times 307 \text{ K} [B] \Rightarrow [B] = \frac{0.1355}{25.174}$

$[B] = 5.38 \times 10^{-3} \text{ M (mol/L) OR mol L}^{-1}$

$n = M \times V \Rightarrow n = 5.38 \times 10^{-3} \times 0.5 \Rightarrow n = 2.69 \times 10^{-3} \text{ mol}$

$n = \frac{wt}{M.wt} \Rightarrow M.wt = \frac{wt}{n} \Rightarrow M.wt = \frac{4g}{2.69 \times 10^{-3} \text{ mol}} = 1486 \text{ g/mol}$

$F = C - P + 1$

C = (30%B, 70%A) نقطة انصهار  
E = (80%B, 20%A) نقطة انصهار

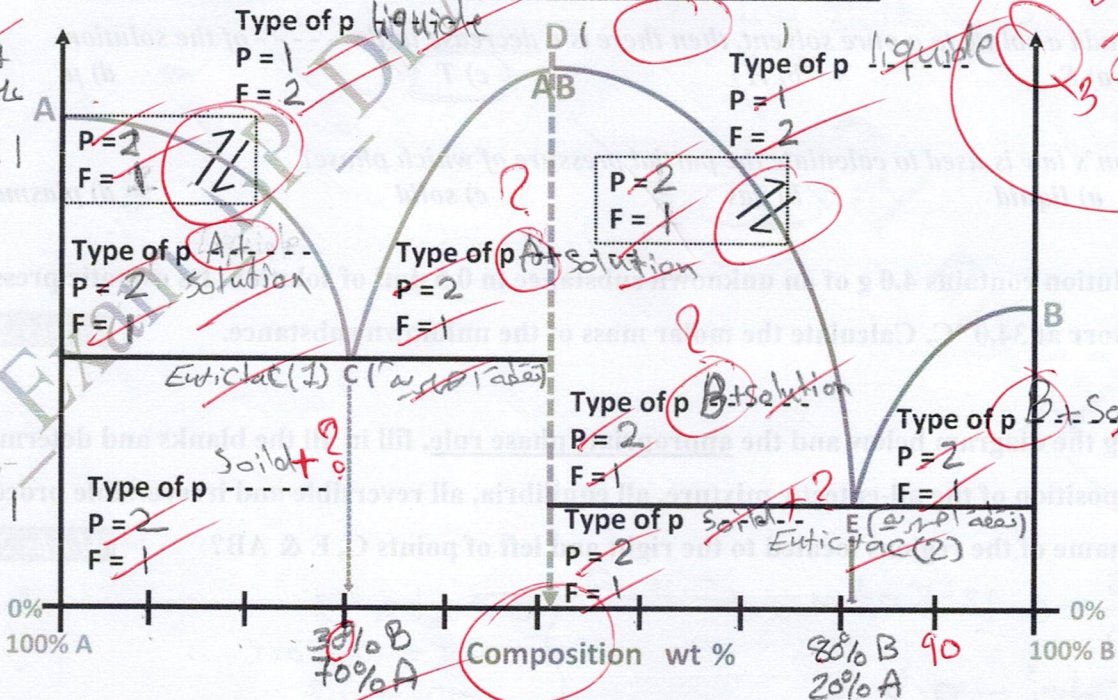
C=2, P=3, F=0  
نظام غير متغير عند النقاط C و E

P=2, C=2 Phase Boundary  
F=2-2+1=1

C=2, P=1, F=2  
نظام انصهار

Handwritten notes and calculations in a red circle:  $2/25$

Two component system (bivariant)



Handwritten notes and calculations in a red circle:  $20/25$