## Roll No:

(1) At P = 1 atm and T = 25 °C, the molecular diffusivity of 1%-Helium in Nitrogen is given  $7 \times 10^{-5} m^2/s$ , its diffusivity at P = 1 atm and T = 50 °C will be

(a) $7 \times 10^{-5} m^2/s$	$$ (b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
(c) $14 \times 10^{-5} m^2/s$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(2) At P = 1 atm and T = 25 °C, the molecular diffusivity of 1%-Helium in Nitrogen is given  $7 \times 10^{-5} m^2/s$ , its diffusivity at P= 0.5 atm and T = 25 °C will be

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(a) $7 \times 10^{-5} m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
$\sqrt{(c)}$ 14 × 10 <sup>-5</sup> m <sup>2</sup> /s	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(3) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>1%-Helium in Nitrogen</u> is given  $7 \times 10^{-5} m^2/s$ . At P = 1 atm and T = 25 °C, molecular diffusivity of <u>10%-Helium in Nitrogen</u> will be

$\sqrt{(a)}$ 7 × 10 <sup>-5</sup> $m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
(c) $14 \times 10^{-5} m^2/s$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(4) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>1%-Helium in Nitrogen</u> is given  $7 \times 10^{-5} m^2/s$ . At P = 1 atm and T = 25 °C, molecular diffusivity <u>of1%-Nitrogen in Helium</u> will be

$\sqrt{(a)} 7 \times 10^{-5} m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than $7~ imes$ $10^{-5}m^2/s$
(c) $14 \times 10^{-5} m^2/s$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(5) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>air in water vapor</u> is  $2.6 \times 10^{-5} m^2/s$ . At <u>P = 1</u> atm and T = 25 °C, the molecular diffusivity of <u>air in liquid water</u> is approximately

(a) $2.2 \times 10^{-2} m^2/s$	(b) $2.6 \times 10^{-3} m^2 / s$
(c) $2.6 \times 10^{-5} m^2/s$	$\sqrt{(d)} 2.2 \times 10^{-9} m^2/s$

(6) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>air in water vapor</u> is  $2.6 \times 10^{-5} m^2/s$ . At <u>P = 2</u> atm and T = 25 °C, the molecular diffusivity of <u>air in liquid water</u> is approximately

(a) $2.2 \times 10^{-2} m^2/s$	(b) $2.6 \times 10^{-3} m^2/s$
(c) $2.6 \times 10^{-5} m^2/s$	$\sqrt{(d)} 2.2 \times 10^{-9} m^2/s$

(7) At a given temperature and pressure, the complete evaporation of a droplet of liquid of 2 mm diameter takes about 300 s approximately. How much time will approximately be required for the complete evaporation of a droplet of water of diameter = 4 mm.

(a) 150 <i>s</i>	(b) 300 <i>s</i>
(c) 600 <i>s</i>	√ (d) 1200 <i>s</i>

Water at 25°C is	$T = 298 K$ ; $P = 1.01325 \times 10^5 Pa$ ; $D_{AB} = 2.6 \times 10^{-5} m^2/s$ ;
flowing in a	$Area = \pi (30/1000)^2 m^2 = 7.07 \times 10^{-4} m^2$
covered irrigation	
ditch below	$p_{A1} = 3116$ Pa (Vapor pressure of water vapor at 25°C)
ground. Every 100	$p_{A2} = 0$ (Assuming dry air, <i>i.e.</i> no water vapor)
m, there is a vent	$p_{B1} = P - p_{A1} = 101.325 \times 10^3 - 3.116 \times 10^3 = 98,159 \text{ Pa}$
line 30 mm inside	$p_{B2} = P - p_{A2} = 101.325 \times 10^5 - 0 = 101,325 Pa$
diameter and 1.0	
m long to the	$p_{BM} = \frac{p_{B2} - p_{B1}}{p_{A1} - p_{A2}} = 99734 Pa$
outside	$ln\frac{p_{BM}}{m} = ln\frac{p_{B2}}{m} = ln\frac{p_{B2}}{m}$
atmosphere at	$p_{B1}$ $p_{B1}$
25°C. There are 10	$p_{B1}+p_{B2}$
vents in the 1000-	When, $p_{B1} \approx p_{B2}$ ; $p_{BM} \cong \frac{p_{B1} + p_{B2}}{2} = 99742 \ Pa$
m ditch. The	$D_{12} = P_{11} = n_{12} = 2.6 \times 10^{-5} \ 1.01325 \times 10^{5} \ (3116 - 0)$ ka mol
outside air can be	$N_A = \frac{D_{AB}}{(7-7)} \frac{1}{pT} \frac{p_{A1}}{r} \frac{p_{A2}}{r} = \frac{2.0 \times 10^{-1}}{10} \frac{1.01323 \times 10^{-1}}{(3110-0)} = 3.38 \times 10^{-8} \frac{kg m t}{m^2}$
assumed to be dry.	$(z_2 - z_1) RI p_{BM}$ 1.0 8314 × 298 99734 m <sup>2+</sup> s
Calculate the total	$n_{\rm c} = N_{\rm c} \times Area \times MW \times (s/day) \times vents$
evaporation loss of	$k_A = N_A \times III cu \times IIIV \times (3/uuy) \times vents$ ka mol $ka = ka = 86400 s$
water in kg/day.	$= 3.38 \times 10^{-8} \frac{m_s^2 + m_s^2}{m_s^2 + m_s^2} \times 7.07 \times 10^{-4} m^2 \times 18 \frac{m_s^2}{k_a m_s^2} \times \frac{10^{-100}}{day} \times 10$
Use the diffusivity	ka
data from Table	$= 3.71 \times 10^{-4} \frac{n_s}{d}$
6.2-1.	u

## Roll No:

(1) At P = 1 atm and T = 25 °C, the molecular diffusivity of 1%-Helium in Nitrogen is given  $7 \times 10^{-5} m^2/s$ , its diffusivity at P= 0.5 atm and T = 25 °C will be

(	a) $7 \times 10^{-5} m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
7	(c) $14 \times 10^{-5} m^2/s$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(2) At P = 1 atm and T = 25 °C, the molecular diffusivity of 1%-Helium in Nitrogen is given  $7 \times 10^{-5} m^2/s$ , its diffusivity at P = 1 atm and T = 50 °C will be

(a) $7 \times 10^{-5} m^2/s$	$\sqrt{(b)}$ less than 14 $\times$ 10 <sup>-5</sup> and more than 7 $\times$ 10 <sup>-5</sup> $m^2/s$
(c) $14 \times 10^{-5} m^2/s$	(d) more than $14 \times 10^{-5} m^2/s$

(3) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>1%-Helium in Nitrogen</u> is given  $7 \times 10^{-5} m^2/s$ . At P = 1 atm and T = 25 °C, molecular diffusivity of <u>10%-Helium in Nitrogen</u> will be

(a) $14 \times 10^{-5} m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
$\sqrt{(c) 7 \times 10^{-5} m^2/s}$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(4) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>1%-Helium in Nitrogen</u> is given  $7 \times 10^{-5} m^2/s$ . At P = 1 atm and T = 25 °C, molecular diffusivity <u>of1%-Nitrogen in Helium</u> will be

,	/
(a) $14 \times 10^{-5} m^2/s$	(b) less than 14 $ imes$ $10^{-5}$ and more than 7 $ imes$ $10^{-5}m^2/s$
$\sqrt{(c) 7 \times 10^{-5} m^2/s}$	(d) more than 14 $ imes$ $10^{-5}$ $m^2/s$

(5) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>air in water vapor</u> is  $2.6 \times 10^{-5} m^2/s$ . At <u>P = 1</u> atm and T = 25 °C, the molecular diffusivity of <u>air in liquid water</u> is approximately

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(a) $2.2  imes 10^{-2} m^2/s$	(b) $2.6 \times 10^{-3} m^2/s$	
(c) $2.6 \times 10^{-5} m^2/s$	$\sqrt{(d) 2.2 \times 10^{-9} m^2/s}$	

(6) At a given temperature and pressure, the complete evaporation of a droplet of liquid of 2 mm diameter takes about 300 s approximately. How much time will approximately be required for the complete evaporation of a droplet of water of diameter = 4 mm?

(a) 150 <i>s</i>	(b) 300 <i>s</i>
(c) 600 <i>s</i>	√ (d) 1200 <i>s</i>

(7) At P = 1 atm and T = 25 °C, the molecular diffusivity of <u>air in water vapor</u> is  $2.6 \times 10^{-5} m^2/s$ . At <u>P = 2</u> atm and T = 25 °C, the molecular diffusivity of <u>air in liquid water</u> is approximately

(a) $2.2 \times 10^{-2}  m^2/s$	(b) $2.6 \times 10^{-3} m^2/s$
(c) $2.6 \times 10^{-5} m^2/s$	$\sqrt{(d)} 2.2 \times 10^{-9} m^2/s$

Water at 25°C is	$T = 298 K$ ; $P = 1.01325 \times 10^5 Pa$ ; $D_{AB} = 2.6 \times 10^{-5} m^2/s$ ;
flowing in a covered	$Area = \pi (20/1000)^2 m^2 = 3.14 \times 10^{-4} m^2$
irrigation ditch	
below ground. Every	$p_{A1} = 3116$ Pa (Vapor pressure of water vapor at 25°C)
100 m, there is a	$p_{A2} = 0$ (Assuming dry air, <i>i.e.</i> no water vapor)
vent line 20 mm	$p_{B1} = P - p_{A1} = 101.325 \times 10^3 - 3.116 \times 10^3 = 98,159 \text{ Pa}$
inside diameter and	$p_{B2} = P - p_{A2} = 101.325 \times 10^5 - 0 = 101.325 Pa$
0.5-m long to the	
outside atmosphere	$p_{B2} - p_{B1} - p_{A1} - p_{A2} - 99734 Pa$
at 25°C. There are	$p_{BM} = \frac{p_{B2}}{\ln \frac{p_{B2}}{2}} = \frac{p_{B2}}{\ln \frac{p_{B2}}{2}} = \frac{p_{B2}}{100000000000000000000000000000000000$
10 vents in the	$p_{B1}$ $p_{B1}$
1000-m ditch. The	$n_{\rm Dx} + n_{\rm Dz}$
outside air can be	When, $p_{B1} \approx p_{B2}$ ; $p_{BM} \cong \frac{p_{B1} + p_{B2}}{2} = 99742 Pa$
assumed to be dry.	<b>D D n n</b> $2.6 \times 10^{-5} \pm 0.1225 \times 10^{5} (2116 \text{ O})$ ka mal
Calculate the total	$N_{A} = \frac{D_{AB}}{(1-1)^{2}} \frac{P}{P_{A1}} \frac{P}{P_{A2}} = \frac{2.0 \times 10^{-1}}{0.0523 \times 10^{-10}} \frac{1.01323 \times 10^{-10}}{(0.0000)} = 6.75 \times 10^{-8} \frac{kg m m}{2}$
evaporation loss of	$(z_2 - z_1) RT p_{BM} = 0.5 8314 \times 298 99734 m^2 \cdot s$
water in kg/day. Use	$n_A = N_A \times Area \times MW \times (s/day) \times vents$
the diffusivity data	$-6.75 \times 10^{-8} kg mol$ $\times 2.14 \times 10^{-4} m^2 \times 10$ $kg \times 86400 s \times 10^{-10}$
from Table 6.2-1.	$-0.75 \times 10^{-1} \frac{m^2 \cdot s}{m^2 \cdot s} \times 5.14 \times 10^{-1} \frac{m^2 \times 18}{kg  mol} \times \frac{10}{day} \times 10^{-1}$
	$-2.20 \times 10^{-4} kg$
	$= 5.50 \times 10^{-1} \frac{d}{d}$