PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 36

Total Marks : 30

Max. Time : 32 min.

Topic : Gaseous State

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.6	(3 marks, 3 min.)	[18, 18]
Multiple choice objective ('–1' negative marking) Q.7	(4 marks, 4 min.)	[4, 4]
Match the Following (no negative marking) (2 × 4) Q.8	(8 marks, 10 min.)	[8, 10]

1. At the critical point for H_2 gas, value of Z = 3/8. Then, the value of Z under the similar conditions for CO_2, O_2, SO_2 at their respective critical points will be :

(A) greater than 3/8 (B) smaller than 3/8 (C) equal to 3/8 (D) nothing can be said

2. Critical temperature of a gas is _____ Boyle temperature :

(A) higher than (B) equal to (C) lower than (D) no relation between them

3. For the four gases A, B, E and D, the value of the excluded volume per mole is same. If the order of the critical temperature is $T_B > T_D > T_A > T_E$, then the order of their liquefaction pressure at a temperature T ($T < T_E$) will be :

(A) $P_A < P_B < P_E < P_D$ (B) $P_B < P_D < P_A < P_E$ (C) $P_E < P_A < P_D < P_B$ (D) $P_D < P_E < P_A < P_B$

4. The critical pressure P_C and critical temperature T_C for a gas obeying Vander Waal's equation are 80 atm and 87°C. Molar mass of the gas is 130 g/mole. The compressibility factor for the above gas will be smaller than unity under the following conditions :

(A) 1 atm and 800 °C (B) 1 atm and 1200 °C (C) 1 atm and 1000 °C (D) 1 atm and 1100 °C

5. Given that the critical temperature of oxygen is 154K and its critical pressure is 50 atm. Which of the following statements is/are true :

I. In a closed container at 154K and 50 atm, the solid, liquid, and gaseous phase of oxygen are in equilibrium.

II. Oxygen gas can be liquefied at room temperature.

III. It can be reasoned that ammonia has a critical temperature above 154 K.

(A) I is true (B) II and III are true (C) III is true (D) I and III are true

6. The virial equation for 1 mole of a real gas is written as : $PV = RT\left[1+\frac{A}{V}+\frac{B}{V^2}+\frac{C}{V^3}+.....\text{to higher power of n}\right]$

Where A,B and C are known as virial cofficients. If Vander waal's equation is written in virial form, then what will be the value of B :

(A) $a - \frac{b}{RT}$ (B) b^3 (C) $b - \frac{a}{RT}$ (D) b^2

7.* Critical temperature for a particular gas is – 177°C. Then for which of the following case, value of compressibility factor of the gas may be more than unity :

(A) at 0°C and 0.01 atm (B) at 0°C and 2000 atm (C) at 60°C and 0.01 atm (D) at 60°C and 10 atm

8. **Match the following :**

Column I	Column II
(A) For a gas, repulsive tendency dominates	(p) Effects of 'a' and 'b' compensate each other.
(B) At T_B = – 3 °C for a gas in high pressure region	(q) There is no difference between physical properties in liquid and gas state.
(C) At T_C	(r) Z > 1
(D) For He gas at 0°C in all pressure region	(s) T_C = 80 K

Answer Key

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1.	(C)	**2.**	(C)	**3.**	(B)	**4.**	(A)	**5.**	(C)
6.	(D)	**7.***	(B,C,D)	**8.**	[A – r] ; [B – r,s] ; [C – q] ; [D – r].				

Hints & Solutions

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4. Under low pressure region and below the boyle temperature, $Z < 1$.

5. Refer class notes.

7.* at very high Pressure $Z = 1 + \frac{Pb}{RT}$

$Z > 1$

for particular realgas above boyle temp $Z > 1$.

8. [A – r] ; [B – r,s] ; [C – q] ; [D – r].