

Model Question Paper & Solutions - Real Gases (UG Sem 3)

MODEL QUESTION PAPER (UG SEMESTER 3)

Topic: Real Gases

Section A Very Short Answer (2 marks each)

1. Define an ideal gas and a real gas.
2. What is Boyle's temperature?
3. State the van der Waals equation for one mole of a gas.

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Section B Short Answer (5 marks each)

8. Derive the van der Waals equation for n moles of a gas.
9. Explain deviations of real gases using compressibility factor.

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Section C Long Answer (10 marks each)

15. Derive the expressions for the critical constants of a van der Waals gas.
16. Show that $P_c V_c / RT_c = 3/8$.

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MODEL ANSWERS / SOLUTIONS

Section A Sample

1. Ideal gas: $PV=nRT$; Real gas deviates due to finite molecular size and forces.
2. Boyle's temperature: T at which second virial coefficient vanishes, gas $\sim$ ideal.
3. Van der Waals: $(P + a/V^2)(V - b) = RT$.

Section B Sample

- Q8. Derivation of van der Waals equation: $(P + a n^2/V^2)(V - nb) = nRT$.
- Q9. Deviations: compressibility factor $Z=PV/nRT$, if $Z \neq 1$ deviation.

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Section C Sample

Q15 16. Critical constants: $V_c=3b$, $P_c=a/(27b^2)$, $T_c=8a/(27Rb)$, $P_cV_c/RT_c=3/8$.

Q20. Numerical: $V=1.632$ L/mol, Z 0.994 (<1) attractive forces dominate.
