

**B.Sc. PHYSICS
THIRD SEMESTER
THERMAL PHYSICS
BSP – 302**
[USE OMR FOR OBJECTIVE PART]

**SET
A**

Duration: 1:30 hrs.

Full Marks: 35

Time: 15mins.

(Objective)

Marks: 10

Choose the correct answer from the following:

1×10=10

1. In case of specific heat of a gas, which statement holds true?
 - a. It becomes zero when the gas is expanded.
 - b. It becomes infinite when the gas is compressed.
 - c. It becomes zero when the gas is compressed.
 - d. It remains constant when the gas is compressed or expanded.
2. Work done in a complete Carnot cycle is given by.....?
 - a. $W = R \log_e \left(\frac{V_2}{V_1} \right) (T_1 - T_2)$
 - b. $W = R \log_e \left(\frac{V_2}{V_1} \right) (T_1 - T_2)$
 - c. $W = R \log_e \left(\frac{V_2}{V_1} \right) (T_2 - T_1)$
 - d. $W = R \log_e \left(\frac{V_2}{V_1} \right) (T_2 - T_1)$
3. Heat is defined as?
 - a. Energy in transit
 - b. Energy at rest
 - c. Internal Energy
 - d. Work done
4. Which of the following is Maxwell's third thermodynamic relation?
 - a. $\left(\frac{\partial S}{\partial V} \right)_T = \left(\frac{\partial P}{\partial T} \right)_V$
 - b. $\left(\frac{\partial T}{\partial V} \right)_S = \left(\frac{\partial P}{\partial S} \right)_V$
 - c. $\left(\frac{\partial T}{\partial S} \right)_S = \left(\frac{\partial P}{\partial S} \right)_T$
 - d. $\left(\frac{\partial T}{\partial P} \right)_S = \left(\frac{\partial V}{\partial S} \right)_P$
5. Which of the following is the expression of pressure exerted by a gas?
 - a. $c = \sqrt{\frac{3\rho}{P}}$
 - b. $c = \sqrt{\frac{3P}{\rho}}$
 - c. $c = \sqrt{\frac{3}{\rho}}$
 - d. $c = \sqrt{\frac{P}{3\rho}}$
6. Which of the following criteria for a gas to behave like plasma is incorrect?
 - a. $\lambda = \frac{1}{\pi \sigma^2 n}$
 - b. $\lambda = \frac{1}{\sqrt{2} \sigma^2 n}$
 - c. $\lambda = \frac{1}{\sqrt{2} \pi \sigma^2 n}$
 - d. $\lambda = \frac{\pi}{2 \sigma^2 n}$

7. Which of the following terms in the Van der Waals equation accounts for the attractive forces between gas molecules?
- | | |
|--------|--------------------|
| a. P | b. $\frac{a}{V^2}$ |
| c. b | d. RT |
8. In the Van der Waals equation, what does the parameter b represent?
- | | |
|---------------------------------|-------------------------------------|
| a. Attraction between molecules | b. Volume occupied by gas molecules |
| c. Correction for temperature | d. Correction for ideal gas law |
9. In Joule-Thompson experiment, which of the following thermodynamic variable remains invariant?
- | | |
|-------------|----------------------|
| a. Entropy | b. Internal Energy |
| c. Enthalpy | d. None of the above |
10. Which of the following is true?
- | | |
|--------------------------|-----------------------------|
| a. $\frac{C_p}{C_v} > 1$ | b. $\frac{C_p}{C_v} < 1$ |
| c. $\frac{C_p}{C_v} = 1$ | d. $\frac{C_p}{C_v} \neq 1$ |

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(Descriptive)

Time : 1 hr. 15mins.

Marks : 25

[Answer question no.1 & any two (2) from the rest]

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|---|--------|
| 1. Explain the Vander Waal's equation for a real gas and derive its expression. | 5 |
| 2. Derive Maxwell's generalized expression of thermodynamic relation and deduce its six counterparts. | 4+6=10 |
| 3. a. Explain the concept of Carnot's heat engine.
b. Elaborate the complete Carnot cycle and find out its work done and efficiency. | 4+6=10 |
| 4. a. State and explain the 1 st law of thermodynamics.
b. Derive the Mayer's relation using the above law. | 3+7=10 |
| 5. a. Derive the thermodynamic potentials using the laws of thermodynamics.
b. Explain the Joule-Thompson effect and describe elaborately the Joule-Thompson experiment. | 4+6=10 |

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