REV-01
BSP/01/03

2024/11

SET A

B.SC. PHYSICS
THIRD SEMESTER
THERMAL PHYSICS
BSP – 302 OLD COURSE [REPEAT]
[USE OMR FOR OBJECTIVE PART]

Duration : 3 hrs. **Full Marks : 70**

[Objective]

Time : 30 min. **Marks : 20**

Choose the correct answer from the following: ***1×20=20***

The quantity $\frac{RT_c}{P_cV_c}$ has a value of

a. 3/8
b. 8/3
c. /8
d. 8/5

2. W ı of the following is correct?
a. $T_1 = Q_2T_2$
b. $Q_1Q_2 = T_1T_2$
c. $Q_1 - Q_2T_1$
d. None

3. What is th. ·io of specific heats for a triatomic gas?
a. 1.25
b. 1.66
c. 1.33
d. 1.4

4. The entropy of an ·ted system always ____ and becomes a ____ at the state of equilibrium.
a. decreases, maximu.
b. decreases, minimum
c. increases, minimum
d. increases, maximum

5. Which of the following is the · ·tropy change in Carnot's cycle?
a. Zero
b. Negative
c. Positive
d. Anything between 0 and 1

6. Which of the following quantities is inc. · in Clausius- Clapeyron equation?
a. Entropy
b. Latent heat
c. Internal energy
d. Enthalpy

7. Which of the following is the correct mathematica. ·ession of Gibb's function, G? Symbols have usual meaning.
a. G=T-HS
b. G=H+TS
c. G = S-TH
d. G = H-TS

8. Which of the following quantities determine thermal equilibriu.
a. Entropy
b. Volume
c. Temperature
d. Pressure

9. Adiabatic demagnetization in a paramagnetic salt result in
a. Temperature increase
b. Temperature decrease

c. Constant temperature
d. Decrease, then rise

10. The correct relation between efficiency of heat engine and coefficient of performance is
a. $\beta = \frac{1-\eta}{\eta}$
b. $\eta = \frac{\beta}{1-\beta}$
c. $\eta = \frac{1-\beta}{\beta}$
d. $\beta = \frac{\eta}{1-\eta}$

11. Joule per calorie is the unit of which of the following quantities?
a. Enthalpy
b. Entropy
c. Gibbs free energy
d. Mechanical equivalent of heat

12. Transport of energy gives rise to which phenomenon?
a. Brownian motion
b. Viscosity
c. Thermal Conductivity
d. Diffusion

13. Boyle's temperature is related to critical temperature as
a. $T_C = 3.5T_B$
b. $T_B = 3.38T_C$
c. $T_B = T_C$
d. $T_B = 3.83T_C$

14. In a first order phase transition,
a. Volume changes
b. Volume remains constant
c. Entropy remains constant
d. Both volume and entropy are constants

15. In a second order phase transition
a. Volume changes
b. Entropy changes
c. Both volume and entropy change
d. Specific heat changes

16. With increase in pressure, melting point of ice
a. Remains same
b. Increases
c. Decreases
d. Can both increase or decrease

17. Specific heats are related as
a. $C_P + R + C_V = 0$
b. $C_P - C_V = R$
c. $C_P + C_V = R$
d. $C_P + R = C_V$

18. Which one of the following is an extensive thermodynamic variable?
a. Volume
b. Pressure
c. Temperature
d. Density

19. The work done is ..... when it is done by a perfect gas
a. unchanged
b. negative
c. positive
d. none of above

20. In an isobaric process
a. Temperature is constant
b. Volume is constant
c. Entropy is constant
d. Pressure is constant

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Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

[Answer question no.1 & any four (4) from the rest]

1. Find an expression for the most probable speed of ideal gas molecules using Maxwell- Boltzmann law of velocity distribution. **10**

2. a. What are reversible and irreversible thermodynamic processes? Give examples. **4+2+4 =10**

   b. What is a heat engine? Explain zeroth and first laws of thermodynamics.

3. a. What are extensive and intensive thermodynamic variables? Give examples. **4+2+4 =10**

   b. Define work and heat.

   c. Establish the general relationship between the specific heats.

4. a. Derive Clausius-Clapeyron equation from Maxwell's thermodynamic relations. **3+7=10**

   b. With transport phenomenon consideration, obtain an expression for coefficient of viscosity.

5. a. Write Maxwell's four thermodynamic relations. **4+6=10**

   b. Derive an expression for entropy of a perfect gas in terms of volume and temperature.

6. a. What is a refrigerator? Establish an expression for coefficient of performance of a refrigerator. **2+3+5 =10**

   b. A motor in a refrigerator has a power output of 200 watt. If the freezing compartment is at 270 K and outside air is at 300 K, assuming ideal efficiency, what is the maximum amount of heat that can be extracted from the freezing compartment?

7. a. Show that Joule-Thomson's porous plug experiment is an isenthalpic process. **4+6=10**

   b. Obtain values of different critical constants.

8. a. How are real gases different from ideal gases? **3+7=10**

   b. Establish Van der Waals equation of state for a real gas.

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