Anjuman Islam Janjira Degree College of Science Murud-Janjira, Raigad-402401 Affiliated to University of Mumbai	
Class: -S.Y.B.Sc	**Subject: - Physics - I**
Semester:- III	**Course code: -USPH301**
Exam Event:- Winter 2023 (SH)	**Marks: -75**
Date:- 21/10/2023	**Duration:- 2.30 Hours**

Q1. Attempt any Four of the following. (20)

1) What is Carnot's Refrigerator? explain it derive the relation of coefficient of performance.
2) Interpret the working of Otto engine using PV diagram.
3) Find the efficiency of Carnot's engine working between the steam point and ice point.
4) Write the four Maxwell's thermodynamic relation.
5) Find the Coefficient of performance of Carnot's refrigerator working between temperature 227^0C and 27^oC.
6) Explain temperature change in adiabatic process using Maxwell's thermodynamic relations.

Q 2. Attempt any Four of the following. (20)

1) Define entropy, explain why adiabatic process is called as isentropic process.
2) State third law of thermodynamics and explain zero-point energy.
3) Calculate the change in entropy when 8 gm of Ice at 0^oC is converted in awater at the same temperature (latent heat of ice is 80 Cal/gm)
4) Calculate increase in entropy of 5 kg of water at 100^oC when it changes to vapor. (latent heat of vaporization 540 Cal/gm)
5) Explain gas expansion machine along with diagram.
6) What are the different methods of liquefaction of gases explain one of its method.

Q 3. Attempt any Four of the following. (20)

1) What is temperature transducer. Explain Resistance temperature detectors.
2) Explain the working of thermistor along with advantage and disadvantage.
3) A platinum resistance thermometer has a resistance of 180 ohm at 20^oC calculate its resistance at 60^oC ($\propto_{20} = 0.00392$)
4) What is resistance thermometer explain it with advantage and disadvantage.
5) Draw the labeled diagram optical pyrometer.
6) Describe the concept of pyrometer.

Q4. A) Select correct answer. (Solve any 8 out of 12) (08)

1) What is a characteristic of reversible processes in thermodynamics?
a) They occur spontaneously
b) They are idealized and theoretical
c) They always result in an increase in entropy
d) They violate the laws of thermodynamics

2) In which thermodynamic cycle does the engine operate with the highest theoretical efficiency?
a) Diesel Cycle
b) Carnot Cycle
c) Otto Cycle
d) Rankine Cycle

3) What do Maxwell's thermodynamic relations describe?

a) Fluid dynamics b) Electromagnetism

c) Thermodynamic properties d) Particle physics

4) An adiabatic process occurs at constant…….

a) Temperature b) Pressure c) Heat d) none of these.

5) What does entropy measure in thermodynamics?

a) Disorder or randomness of a system b) Temperature of a system

c) Pressure of a system d) Volume of a system

6) How is the change in entropy (ΔS) defined in a thermodynamic process?

a) $\Delta S=Q/T$ b) $\Delta S=W/T$ c) $\Delta S=Q/T+W$ d) $\Delta S=Q-W$

7) In the process of adiabatic expansion, a gas cools down when it expands because:

a) Heat is added to the system b) Work is done on the system

c) Work is done by the system d) Heat is removed from the system

8) What is the primary purpose of liquefying gases in low-temperature physics?

a) To increase their volume b) To store them for longer periods

c) To study their properties at low temperatures d) To increase their density

9) What material is commonly used for Resistance Temperature Detectors (RTDs)?

a) Copper b) Iron c) Platinum d) Aluminum

10) Thermocouples generate a voltage based on:

a) Change in resistance b) Change in capacitance

c) Seebeck effect d) Faraday's law

11) What is the primary function of a temperature transducer?

a) To measure pressure b) To measure temperature and convert it into an electrical signal

c) To measure humidity d) To measure velocity

12) Total Radiation Pyrometers measure the:

a) Visible light radiation only b) Ultraviolet radiation only

c) Total radiation across all wavelengths d) Infrared radiation only

Q4. B) Answer in one sentence (Solve any three out of five) (03)

1) Write any one method to increase the efficiency of Carnot's cycle.
2) Write the Clausius statement of State second law of thermodynamics.
3) Define entropy.
4) State third law of thermodynamics.
5) Write any two advantage of thermistor.

Q4. C) Fill in the Blanks (Solve any four out of six) (04)

1) An adiabatic process occurs at constant_______.
2) Carnot's cycle consists of _______________ adiabatic and two isothermal processes.
3) Entropy is maximum in _____ State.
4) Adiabatic Process is also called as_____.
5) Devices that convert temperature variations into electrical signals is called_______.
6) ________Pyrometers measure the total radiation from an object, including visible and non-visible wavelengths.