20U120S (Pages: 2) Name: …………..................

Reg. No: …..........................

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2020
(CUCBCSS-UG)
CC15U PH1 C01 - PROPERTIES OF MATTER AND THERMODYNAMICS
(Physics - Complementary)
(2015 to 2018 Admissions – Supplementary)

Time: Three Hours　　　　　　　　　　　　　　　　　　　　　Maximum: 64 Marks

Section A
Answer *all* questions. Each question carries 1 mark.

1. Entropy is a measure of ....

2. Name the process in which dQ=dU

3. In reversible thermodynamic process the change in entropy dS is ....

4. The efficiency of a reversible Carnot's engine working between T_1 and T_2 ($T_1 > T_2$) is ....

5. Write down the expression of Clausius-Clapeyron's equation.

6. Poisson's ratio is ....

7. The strain produced in a stretched spring is ....

8. A single drop of liquid is split in to 8 equal drops. The excess pressure in each drop becomes ....

9. The addition of detergents in water .... its surface tension.

10. Kerosene rises up in the wick of a lantern because of ....

(10 × 1 = 10 Marks)

Section B
Answer *all* questions. Each question carries 2 marks.

11. Explain the terms 1) open systems 2) closed systems 3) isolated systems with example.

12. Explain the concept of entropy and disorder.

13. Define Hooke's law.

14. What is meant by adhesive force and cohesive force?

15. What do you understand by viscous force?

16. Explain surface energy. How is it related to surface tension?

17. Explain the effect of pressure and temperature on the viscosity of gases.

(7 × 2 = 14 Marks)

Section C
Answer any *three* questions. Each question carries 4 marks.

18. Explain the concepts of reversible and irreversible processes.

19. Establish the relation for efficiency of a Carnot's engine using T-S diagram.

20. Show that the elastic energy stored in a wire of original length L and cross sectional area A, that has been stretched by a force is $\frac{1}{2} Fx$

21. Derive the relation connecting Young's modulus and applied force per unit area. Explain Bulk modulus.

22. Derive an expression for work done by an ideal gas during an isothermal expansion.

(3 x 4 = 12 Marks)

Section D

Answer any *three* questions. Each question carries 4 marks.

23. A Carnot's engine is operated between two reservoirs at temperatures of 450K and 350K. If the engine receives 1000 calories of heat from the source in each cycle, calculate the amount of heat rejected to the sink in each cycle. Calculate the efficiency of the engine and work done by the engine in each cycle.

24. Calculate the change in entropy when 0.0273 Kg of ice of 0^OC is converted into water at the same temperature.

25. Calculate the change in temperature of boiling water when the pressure is increased by 2.712 cm of Hg. Normal boiling point of water at atmospheric pressure is 100^OC. Latent heat of steam -540 Cal/gram.

26. A metal rod of length 0.5m and radius 1cm is clamped at one end and loaded at the free end with 6 Kg. Calculate the depression of the free end. Y= $0.9×10^{11}$N/m^2 and g=9.8m/s^2.

27. Calculate the excess of pressure inside a soap bubble of radius 2cm. Given surface tension of soap solution is 0.032N/m.

(3 × 4 = 12 Marks)

Section E

Answer any *two* questions. Each question carries 8 marks.

28. State and prove Carnot's theorem.

29. Derive Maxwell's four thermo dynamical relations. Use one of them to obtain Clausius- Clapeyron's latent heat equation.

30. Derive Stokes formula for the velocity of a small sphere falling through a viscous fluid.

31. What are the factors affecting surface tension? Explain variation of surface tension with these factors.

(2 × 8 = 16 Marks)

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