

C 33328

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Name.....

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

PHY 1C 01—PROPERTIES OF MATTER AND THERMODYNAMICS

Time : Three Hours

Maximum : 64 Marks

Part A

Answer all questions.

Each carries 1 mark.

1. If Young's modulus of iron is $2 \times 10^{11} \text{ Nm}^{-2}$ and the interatomic spacing between two molecules is $3 \times 10^{-10} \text{ m}$, the interatomic force constant is _____.
2. The length of a rubber cord is L_1 metres when the tension is 4N and L_2 metres when the tension is 5 N. The length in metres when the tension is 9N is _____.
3. Two small spherical drops having radii in the ratio 1 : 2 fall from a great height through the atmosphere. Their moments on reaching the earth are in the ratio _____.
4. With increase in temperature the viscosity of a gas _____.
5. A liquid rises to a height h in a capillary tube on the earth. The height to which the same liquid would rise in the same tube on the moon is about _____.
6. Melting point of ice _____ with increase of _____.
7. If the pressure in a closed vessel is reduced by a drawing some gas, the mean free path of the molecules will _____.
8. A hot body will radiate _____ energy if its surface is white and polished.
9. If the absolute temperature of a perfectly black body is doubled, then the rate of radiation increases by a factor of _____.
10. The internal energy of a system remains constant if the system undergoes _____ process.

(10 × 1 = 10 marks)

Part B

Answer all seven questions.

Each question carries 2 marks.

11. Poisson ratio cannot have a negative value. Why ?
12. Which is more elastic, air or water ? Why ?

Turn over

13. What is meant by tube of flow ?
14. Why should we apply correction to the length and pressure head in Poiseuille's formula ?
15. What is Quasi static processes ?
16. What is Carnot's theorem ?
17. Give the concept of entropy.

(7 × 2 = 14 marks)

Part C

Answer any three questions.

Each question carries 4 marks.

18. Derive an expression for the excess pressure inside a liquid drop and bubble.
19. What is torsion pendulum ? With necessary theory obtain the expression for rigidity modulus.
20. What is Brownian motion ? Briefly explain viscosity of gases.
21. Discuss the meaning and significance of the term heat death of the universe.
22. Derive Maxwell's second thermo dynamical relation and give its importance.

(3 × 4 = 12 marks)

Part D

Answer any three problems.

Each problems carries 4 marks.

23. A torsion pendulum with a wire of length 1m, diameter 1.22 mm and rigidity modulus 80 GPa oscillates with a period 1.25 s. Find the moment of inertia of the suspended body about the axis of suspension.
24. A liquid flows through two capillary tubes under the same the pressure head. The lengths of the tubes are in the ratio 2 : 1 and the ratio of their diameters is 2 :3. Compare the rate of flow of liquid through the tubes.
25. Calculate the work done to increase the radius of a soap bubble from 4cm to 5 cm. S.T of soap bubble is 25×10^{-3} N/m.
26. Calculate the change in entropy when 100 gms of water at 50°C are mixed with 200 gms of water at 0° C assuming that specific heat of water is constant between these temperatures and has a value 4190 J /kg-K.
27. Calculate the depression of melting point of ice produced by increase of pressure of 2 atmospheres. Given that latent heat of ice = 80 cal/gm and specific volume of ice and water at 0°C are $1.091 \times 10^{-3} \text{ m}^3 \text{ kg}^{-1}$ and $1.0 \times 10^{-3} \text{ m}^3 \text{ kg}^{-1}$ respectively.

(3 × 4 = 12 marks)

Part E

*Answer any **two** problems.*

Each problems carries 8 marks.

28. Define bending moment. Derive an expression for it. What is flexural rigidity ?
29. Derive Poiseuille's formula and give its limitations
30. Show by mathematical analysis that adiabatic expansion produces cooling and adiabatic compression produces heating. Obtain the expression for the change in temperature.
31. Show that the process of :
 - (i) Expansion of a gas and
 - (ii) Diffusion of one gas into another is irreversible and is always accompanied by an increase of entropy.

(2 × 8 = 16 marks)