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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
 First Semester B.Sc Degree Examination, November 2017
 BPHY1C01 – Properties of matter & thermodynamics
 (2017 Admission onwards)

Time: 3 hours

Max. Marks : 64

PART- A (One word/One Phrase/ True or False)
Answer all questions. Each question carries one mark

- 1 If a body under tension suffers no lateral contraction, the value of Poisson's ratio for this is-----
 a) Zero b) Infinity c) 0.5 d) None of these
- 2 The only elasticity possessed by liquids and gases is -----
 a) Young's Modulus b) Bulk Modulus c) Rigidity Modulus d) None of these
- State whether True or False**
- 3 For materials having large Young's Modulus, bending is larger.
- 4 The dimensional formula of coefficient of viscosity is given by -----
 a) $ML^{-1}T^{-2}$ b) $ML^{-1}T^{-1}$ c) $ML^{-2}T^{-2}$ d) $ML^{-2}T^{-1}$
- 5 Falling rain drops are spherical in shape due to -----
- 6 The excess pressure inside a bubble is given
 a) $P=4T/r$ b) $P=2T/r$ c) $P=3T/r$ d) $P=T/r$
- 7 Surface Tension forces arise due to -----
 a) Adhesive forces b) Cohesive forces c) Neutral forces d) None of these.
- 8 ----- of thermodynamics is based on the principle of conservation of energy of a system.
 a) Second law b) First law c) Zeroth law d) none of these.
- 9 The change in entropy of a mole of an ideal gas, when the gas undergoes free expansion is -----
 a) Zero b) positive c) negative d) none of these
10. The efficiency of a Carnot's engine working between $100^{\circ}C$ and $50^{\circ}C$ is -----
 a) 13.4% b) 15.2% c) 50% d) 100%

(1×10=10 Marks)

PART-B (Short answer-one or two sentences)
Answer all questions. Each carries two marks

11. Why Iron girders used in buildings are made I form?
12. Define the term Rigidity modulus. Write the expression for rigidity modulus of a wire using Torsion Pendulum.
13. Oil is used for spraying on the surface of water in pools and ponds, in order to prevent the breeding of mosquitoes during rainy season. Specify your answer connecting Surface Tension.
14. State Stoke's law.
15. What is an indicator diagram? State its importance.
16. State the Kelvin-Planck statement of the Second law of thermodynamics.
17. Define Helmholtz function.

(2×7=14 Marks)

Part C (Paragraph/Half page)

Answer any three questions, each question carries four marks

18. Explain Stress-Strain Diagram.
19. Define Young's modulus, Bulk modulus and Poisson's ratio. Derive a relation among them.
20. Determine the coefficient of viscosity of a liquid using Stoke's method?
21. Using Maxwell's thermodynamical relations, show that
 $(\partial C_p / \partial P) = T(\partial^2 S / \partial P \partial T) = -T(\partial^2 V / \partial T^2)_p$
22. What do you mean by enthalpy H and Gibbs function G?
Show That $(\partial H / \partial T)_p = C_p$.where C_p is the molar specific heat at constant pressure.

(4 × 3=12 Marks)

Part -D (Problems)

Answer any three questions. Each question carries four marks

23. The Young's Modulus of a metal is $2 \times 10^{11} \text{ N/M}^2$ and its breaking stress is $1.088 \times 10^8 \text{ N/M}^2$. Calculate the maximum amount of energy / unit volume which can be stored in the metal when stretched?
24. Calculate the amount of energy needed to break a drop of petrol of volume 10^{-3} m^3 into a hundred million drops of equal size? Surface Tension of petrol is $26 \times 10^{-3} \text{ N/M}$.
25. Calculate the terminal velocity of an air bubble of radius 0.6 mm rising in liquid of viscosity 0.30 NS/M^2 ? Density of liquid is 900 kg/m^3 . Neglect density of air in comparison to that of liquid.
26. A certain mass of gas at NTP is expanded to four times its volume under adiabatic conditions. Calculate the resulting temperature and pressure? γ for the gas is 1.40.
27. Find the change in entropy when 1 gm of ice at 0°C changes to water at 10°C ?

(4 × 3=12 Marks)

PART - E (Essay- within two pages)

Answer any two questions. Each question carries eight marks

28. Derive Poiseuille's equation for a liquid flowing through a capillary tube.
29. A thin uniform bar fixed horizontally at one end and loaded at the other end. Obtain an expression for the depression produced at its free end when the weight of the beam is negligible.
30. (a) Describe the working of a Carnot's heat engine with the help of suitable diagram.
(b) Also deduce its efficiency.
31. Deduce Clausius-Clayperon equation

$$\partial P / \partial T = L / T(V_2 - V_1)$$

On the basis of above equation explain the effect of pressure (a) on the Boiling point of liquids (b) on the Melting point of solids.

(8×2=16 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

First Semester B.Sc Degree Examination, November 2017

BPHY1B01 – Methodology & Tools of Physics

(2017 Admission onwards)

Time: 3 hours

Max. Marks : 80

PART A

(Answer in a word or phrase)

Answer all questions. Each question carries 1 mark.

Give an example for a null vector

If a vector has $\nabla \times F = 0$, F is called-----.

What is a Hermitian matrix has ----- eigen values.

A matrix will have an inverse only if -----.

The period of a simple pendulum -----, if kept in a lift moving upwards.

When two sounds of slightly different frequencies are sounded together ---- is produced.

The result of which experiment was described as “ as astonishing as a tissue paper returning a bullet”?

Who gave a theoretical explanation of photoelectric effect?

Imitation of a process or a condition in the lab or computer is called -----.

The quantum theory of radiation was proposed by -----.

(10 x 1 = 10 Marks)

PART B

(Answer in Two or three sentences)

Answer all questions. Each question carries 2 marks.

1. Show that area is a vector whereas volume is a scalar.

2. Check the orthogonality of the matrix $\begin{bmatrix} -8 & 4 & 1 \\ 1 & 4 & -8 \\ 4 & 7 & 4 \end{bmatrix}$

3. Show on a graph the variation of potential energy and kinetic energy as a function of displacement for a harmonic oscillator.

4. How did Planck's hypothesis overcome ultraviolet catastrophe?

5. What are the characteristics of a good model?

6. Explain with an example mass variation in Relativity.

7. Describe the process of peer reviewing.

(7 x 2 = 14 Marks)

PART - C

Answer in a paragraph of about half a page to one page)

Answer any five questions. Each question carries 4 marks

18. Discuss the heat flow equation.
19. State Green's theorem.
20. Define adjoint of a matrix.
21. What are Eigen values and eigenvectors of a matrix?
22. Discuss the behaviour of a two dimensional harmonic oscillator.
23. Distinguish between transverse and longitudinal waves with examples.
24. Give the arguments that lead to the concept of matter waves.
25. What are Pauli spin matrices?

(5 x 4 = 20 Marks)

PART - D

(Problems-write all relevant formulas. All important steps carry separate marks)

Answer any four questions. Each question carries 4 marks.

26. Find grad ϕ where $\phi = x^3 + y^3 + 3xyz$
27. If $r = xi + yj + zk$ find divergence and curl of r .
28. Find the Eigen values and eigen vectors of the matrix $A = \begin{pmatrix} 1 & -2 \\ -5 & 4 \end{pmatrix}$
29. Write down the rotation matrix and explain its significance.
30. Find the kinetic energy of Photoelectrons if light of wavelength 350nm is incident on a surface having work function 2.2 eV.
31. A particle executes SHM with $x = 10 \sin\left(\pi t + \frac{\pi}{2}\right)$. Find amplitude, frequency and time period of oscillations.
32. If a particle acted upon by a force $F = 6i + 3j - 2k$ is displaced from point P(1,2,3) to Q(5,4,1) find the work done.

(4 x 4 = 16 Marks)

PART-E

(Essays - Answer in about two pages)

Answer any two questions. Each question carries 10 marks.

33. a) What do you mean by Linear transformation.
b) Deduce commutation relation $[\sigma_x, \sigma_y]$ and $\sigma_x^2, \sigma_y^2, \sigma_z^2$
34. Explain how and why existing theories had to be modified to develop quantum mechanics.
35. Derive an expression for time period of a mass suspended vertically on a spring.
36. State and prove Gauss's divergence theorem. How will you convert a line integral to a surface integral?

(2 x 10 = 20 Marks)