LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **PHYSICS**

FIRST SEMESTER – **APRIL 2023**

UPH 1501 – PROPERTIES OF MATTER AND ACOUSTICS

Date: 06-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A

Answer ALL the Questions

1.	**Select the right choice**	**(5 x 1 = 5)**	
a)	The SI unit of Young's Modulus. a) N/m^2 b) N/m^{-2} c) N/m^3 d) N/m	K1	CO1
b)	The viscosity of gases increases with a) Increase in temperature b) Decrease in temperature c) Increase in volume d) Decrease in volume	K1	CO1
c)	Dancing of a small pieces of camphor on the surface of water is due to a) Viscosity b) Surface tension c) Brownian motion d) Lifting force	K1	CO1
d)	Which of the following does not exhibit polarization a) Longitudinal wave in a gas b) Transverse wave in a gas c) Electromagnetic waves d) None of the above	K1	CO1
e)	The speed of the wave is equal to the product of frequency and a) vibration b) amplitude c) wave length d) time period	K1	CO1
2.	**Fill in the blanks**	**(5 x 1 = 5)**	
a)	The density of mercury is _____	K1	CO1
b)	In a CGS system, the kinematic viscosity is expressed in _____	K1	CO1
c)	Bernoulli's theorem is applicable only for _____liquid	K1	CO1
d)	Time period of simple pendulum inside the satellite orbiting earth is _____	K1	CO1
e)	SONAR is the abbreviation of _____	K1	CO1
3.	**Match the following**	**(5 x 1 = 5)**	
a)	Pressure - Hertz	K2	CO2
b)	Bernoulli's theorem - Newton	K2	CO2
c)	Viscosity - Pa	K2	CO2

d)	Force - Conservation of energy	K2	CO2
e)	Frequency - Poiseiulle	K2	CO2
4.	**State True or False**	**(5 x 1 = 5)**	
a)	If the temperature of the wire is increased, then the Young's modulus will decrease.	K2	CO2
b)	Continuity equation based on the conservation of momentum	K2	CO2
c)	Coefficient of viscosity of the liquid depends upon the nature of the fluids	K2	CO2
d)	The intensity of sound depends on the ear of the listener	K2	CO2
e)	The ultrasonic waves travel with a larger velocity than sound waves.	K2	CO2
	SECTION B		
Answer any TWO of the following		**(2 x 10 = 20)**	
5.	(a) Draw the stress- strain diagram of an elastic material (3 marks) (b) Derive an expression for bending moment of a beam. (7 marks)	K3	CO2
6.	With relevant theory, demonstrate Jaegar's method of finding surface tension of a liquid at different temperatures.	K3	CO2
7.	Define simple harmonic motion. Derive the differential equation describing simple harmonic motion. Sketch it graphically.	K3	CO2
8.	State and explain Bernoulli's theorem, mention its application.	K3	CO2
	SECTION C		
Answer any ONE of the following in 50 words		**(2 x 10 = 20)**	
9.	(a) Deduce an expression for the twisting couple of a cylinder fixed at one end. (4 marks) (b)A cylindrical wire of radius 1.8 x 10^{-4} m and length 4 m extends by 1.8 x 10^{-3} m under a load of 1 kg and twists by 1.2 radians when subjected to a total torsional torque of 4 x 10^{-5} Nm at one end. Find the rigidity modulus. (6 marks)	K4	CO3
10.	Analyse the theory of excess pressure inside curved liquid surface for different special cases.	K4	CO3
11.	a) Define stationary waves and explain the properties of stationary longitudinal waves. (6 marks) b) Distinguish between longitudinal and transverse waves. (4 marks)	K4	CO3
12.	Discuss how to design an auditorium with good acoustics.	K4	CO3
	SECTION D		
Answer any ONE of the following		**(1 x 20 = 20)**	
13.	Summarize the three moduli of elasticity and Poisson's ratio. Obtain the relations connecting them.	K5	CO4
14.	(a) Formulate Poiseuille's equation for the rate of flow of a liquid through a capillary tube. (12 marks)	K5	CO4

	(b) Water flows through a horizontal tube of length 0.2 metre and internal radius 8.1×10^{-4} metre under a constant head of the liquid 0.2 metres high. In 12 minutes 8.64×10^{-4} m^3 of liquid comes out from the tube. Calculate the coefficient of viscosity of water. (The density of water = 1000 kg m^{-3} and g = 9.8 m/s^2) (8 marks)		
	SECTION E		
	Answer any ONE of the following	**(1 x 20 = 20)**	
15.	a) Write interfacial surface tension. Discuss the experimental method to determine the interfacial surface tension of water and liquid. (15 Marks) (b) 50 drops of water falling down a tube of external radius 1.75 mm are collected under oil of specific gravity 0.8. Determine the interfacial surface tension between water and oil if the water collected weighs 6.175 g. (5 Marks)	K6	CO5
16.	Describe reverberation and derive Sabine's formula for reverberation time.	K6	CO5

&&&&&&&&&&