**SINDHI HIGH SCHOOL, HEBBAL**

**UNIT TEST II-2024-25**

**PHYSICS (042)**

**Grade: XI Max. Marks: 25**

**Date:18/11/2024 Reading time: 8.10am-8.20am**

**No of sides: 2 Writing time: 8.20am-9.20am**

**General Instructions:**  
(1) There are 14 questions in all. All questions are compulsory.  
(2) This question paper has five sections: Section A, Section B, Section C, Section D and  
 Section E.  
(3) All the sections are compulsory.  
(4) Section A contains nine questions, seven MCQ and two Assertion Reasoning based of 1

mark each, Section B contains two questions of two marks each, Section C contains one

question of three marks, Section D contains one case study based question of four marks

and Section E contains one long answer questions of five marks.

(5) Use of calculators is not allowed.

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| **SECTION A** | | |
| 1. | When a sphere is taken to the bottom of a sea 1km deep, it contracts by 0.01%. The bulk modulus of elasticity of the material of the sphere is (Given: Density of water=1g/cm3)  a) 9.8 X 1010 N/m2  b) 9.8 X 1012 N/m2 c) 9.8 X 109N/m2 d) 9.8 X 1015 N/m2 | **1** |
| 2. | Two wires are made of the same material and have the same volume. However, wire A has a cross-sectional area A and wire2 has cross sectional area 3A. If the length of the wire 1 increases by Δx on applying force F, how much force is needed to stretch wire 2 by the same amount  a) F b) 4F c) 6F d) 9F | **1** |
| 3. | One large soap bubble of diameter D breaks into 27 bubbles having surface tension T. The change in surface energy is  a) 2πTD2 b) 4πTD2 c) πTD2 d) 8πTD2 | **1** |
| 4. | A bubble is at the bottom of a lake of depth h. As the bubble comes to sea level, its radius increases three times. If the atmospheric pressure is equal to l metre of water column, then h is equal to  a) 26 l b) l c) 25 l d) 30 l | **1** |
| 5. | Three identical rods A , B and C of equal lengths and equal diameters are joined in series as shown in the figure. Their thermal conductivities are 2K, K and K/2 respectively. Calculate the temperature at two junction points  a) 85.7, 57.10C b) 80.85, 50.30C c) 77.3, 48.30C d) 75.8, 49.30C | **1** |
| 6. | The volume of gas at 200C is 100cm3 at normal pressure. If it is heated to 1000C, its volume becomes 125cm3 at the same pressure, then volume coefficient of gas (at normal pressure) is  a) 0.0033/0C b) 0.033/0C c) 0.33/0C d) 33/0C | **1** |
| 7. | The unit of Stefan’s constant is  a) Wm-2K-1 b) WmK-4 c) Wm-2K-4 d) Nm-2K-4 | **1** |
| **For Questions 8 and 9, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.**  **a) If both Assertion and Reason are true and Reason is correct explanation of Assertion.**  **b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion.**  **c) If Assertion is true but Reason is false.**  **d) If both Assertion and Reason are false**  **e) If Assertion is false but Reason is true** | | |
| 8. | **Assertion (A):** In a pressure cooker the water is brought to boil. The cooker is then removed from the stove. Now on removing the lid of the pressure cooker, in the water starts boiling again.  **Reason (R):**The impurities in water bring down its boiling point. | **1** |
| 9. | **Assertion (A):** Clothes containing oil or grease stains cannot be cleaned by water wash.  **Reason (R):** Because the angle of contact between the oil/grease and water is obtuse. | **1** |
| **SECTION B** | | |
| 10. | A large open tank has two holes in the wall. One is a square hole of side L at a depth y from the top and the other is a circular hole of radius R at a depth 4y from the top. When the tank is completely filled with water, the quantities of water flowing out per second from both holes are the same. Then, what is the value of R? | **2** |
| 11. | The temperature of the two outer surfaces of a composite slab, consisting of two materials having coefficients of thermal conductivity K and 2 K and thickness x and 4x, respectively are T2 and T₁ (T₂ > T₁). Find the rate of transfer of heat through the slab in the steady state. | **2** |
| **SECTION C** | |  |
| 12. | i) Derive an expression for the excess pressure inside a liquid drop.  ii) A glass tube of 1 mm bore is dipped vertically into a container of mercury, with its lower end 2 cm below the mercury surface. What must be the gauge pressure of air  in the tube to blow a hemispherical bubble at its lower end? Given density of mercury = 13600 kg m-3 and surface tension of mercury=35 × 10-3 Nm-1 | **3** |
| **SECTION D** | | |
| 13. | **Case study:** Elasticity  When an external force is applied to a rigid body, there is a change in its length, volume (or) shape. When external forces are removed, the body tends to regain its original shape and size. Such a property of a body by virtue of which a body tends to regain its original shape (or) size when external forces are removed is called **elasticity**.  When the body is deformed by the application of external forces, forces within the body are brought into play. Elastic bodies regain their original shape due to internal restoring forces. The internal forces and external forces are opposite in direction.  i)If in a wire of Young's modulus Y, longitudinal strain X is produced, then the value of potential energy stored in its unit volume will be  a)YX2  b) 2YX2  c) 0.5Y 2X d) 0.5YX2  ii) If the work done in stretching a wire by 1 mm is 2J, the work necessary for stretching another wire of same material but with double radius of cross-section and half the length by 1 mm is  a) 16 J b) 8J c) J d) J    iii) A boy's catapult is made of rubber cord which is 42 cm long, with 6 mm diameter of cross-section and of negligible mass. The boy keeps a stone weighing 0.02 kg on it and stretches the cord by 20 cm by applying a constant force. When released, the stone flies off with a velocity of 20 m/s. Neglect the change density of in the area of cross-section of the cord while stretched. The Young's modulus of rubber is closest to  a) 104 Nm-2 b) 103 Nm -2  c) 108 Nm-2 d) 106 Nm-2  iv) A steel wire having a radius of 2.0 mm, carrying a load of 4 kg, is hanging from a ceiling. Given that g=3.1лms-2, what will be the tensile stress that would be developed in the wire ?  a) 4.8 x 106 Nm-2  b) 3.1 x 106 Nm-2 c) 5.2 x 106 Nm-2 d) 6.2 x 106 Nm-2 | **1X4=4** |
| **SECTION E** | | |
| 14. | i) Prove that for an ideal liquid in streamline flow the sum of static pressure and dynamic pressure is a constant.  ii) Water from a tap emerges vertically downward with an initial speed of 1.0 m/s. The cross sectional area of the tap is 10-4 m². Assume that the pressure is constant throughout the stream of water, and that the flow is steady. What is the cross-sectional area of the stream 0.15m below the tap? | **5** |