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SAMPLE QUESTION PAPER

CLASS XI PHYSICS THEORY

TERM II

SESSION 2021-22

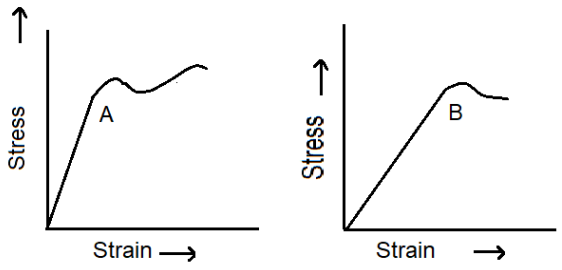
MM 35 **TIME 2 HOURS**

GENERAL INSTRUCTIONS:

(i) There are 12 questions in all. All questions are compulsory.
(ii) This question paper has three sections: Section A, Section B and Section C.
(iii) Section A contains three questions of two marks each, Section B contains eight questions of three marks each, and Section C contains one case study-based question of five marks.
(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks and two questions of three marks. You have to attempt only one of the choices in such questions.
(v) You may use log tables if necessary but use of calculator is not allowed.

SECTION A

Q1. The stress-strain graphs of materials A and B are shown in fig.



(i) Which of the materials has the greater Young's modulus?
(ii) Which of the two is stronger material?

Q2. The soldiers marching on a suspended bridge are advised to go out of steps. Why?

Q3. A simple pendulum executing SHM is falling freely along with the support. How will its time period change?

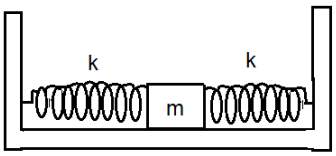
OR

The equation of motion of a particle executing SHM is a = -bx, where a is the acceleration of the particle and x is the displacement from the mean position and b is constant. What is the time period of the particle?

SECTION B

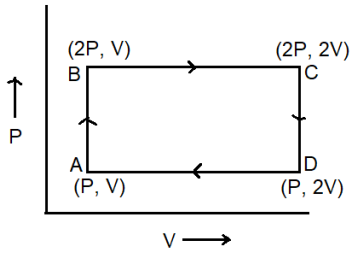
Q4. At what temperature is the root mean square speed of an atom in an argon gas cylinder equal to the rms speed of helium gas at -20^{O}C? (Atomic mass of argon = 39.9 u and of helium = 4.0 u)

Q5. Two identical springs each of spring constant k are attached to a block of mass m and two fixed supports as shown in the fig. When the mass is displaced from its equilibrium position on either side, it executes SHM. Find the period of oscillations.



Q6. (i) An ideal gas is compressed at constant temperature. Will its internal energy increase or decrease?

(ii)An ideal monoatomic gas is taken round the cycle ABCDA as shown on PV diagram. What is the work done during the cycle?



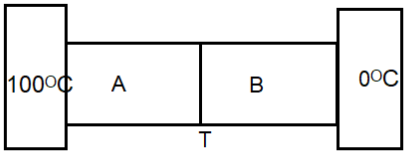
Q7. Explain why:

(i) Water on a clean glass surface tend to spread out while mercury on the same surface tend to form drops.
(ii) A spinning cricket ball in air does not follow a parabolic path.
(iii) The blood pressure in humans is greater at the feet than at the brain.

Q8. Two spherical bodies A (radius 6 cm) and B (radius 18 cm) are at temperatures T_1 and T_2 respectively. The maximum intensity in the emission spectrum of A is at 500 nm and in that of B is 1500 nm. Considering them to be black bodies, what will be the ratio of total energy radiated by A to that of B?

OR

Two metal cubes A and B of same size are arranged as shown in fig. The extreme ends of the combination are maintained at the indicated temperatures. The arrangement is thermally insulated. The coefficients of thermal conductivity of A and B are 300 W/m^{O}C and 200 W/m^{O}C, respectively. After steady state is reached, what will be the temperature T of the interface?



Q9. Define degrees of freedom. Prove that for a diatomic gas at high temperature, the ratio of the two specific heats is 9/7.

Q10. Applying the first law of thermodynamics, obtain the relation between the two molar specific heats of a gas. Why C_P is greater than C_V? Explain.

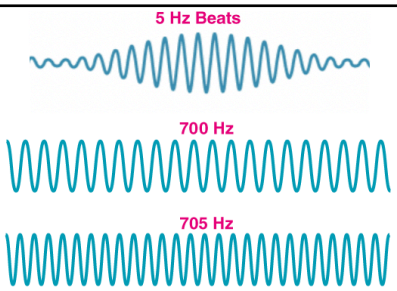
OR

Define isothermal process. What are the essential conditions for an isothermal process to occur? Give the equation of state of isothermal process.

Q11. Define terminal velocity. A metallic sphere of M falls through glycerine with a terminal velocity v. If we drop a ball of mass 8M of same metal into a column of glycerine. Find the terminal velocity of the ball?

SECTION C

Q12. **CASE - STUDY : BEATS**



The phenomenon of regular variation in intensity of sound with time at a particular position due to superposition of two sound waves of slightly different frequencies is called beats.
For waves

$$y = 2a\cos cos\,\pi\left(\nu_1 - \nu_2\right)t\sin sin\,\pi\left(\nu_1 + \nu_2\right)t$$

Is the required equation of beats.
Beat frequency is given by $\nu_{beat} = \nu_1 - \nu_2$
Beat period is given by

$$T = \frac{1}{Beat\ frequency} = \frac{1}{\nu_1 - \nu_2}$$

(a)	Which of the following phenomenon is used by the musicians to tune their musical instruments? (i)Interference; (ii) Diffraction (iii)Beats; (iv)Polarisation	1
(b)	The phenomenon of beats can take place (i)for longitudinal waves only; (ii)for transverse waves only (iii)for sound waves only; (iv)for both longitudinal and transverse waves	1
(c)	When two waves of almost equal frequencies ν_1 and ν_2 reach at a point simultaneously, the time interval between successive maxima is (i) $\nu_1 + \nu_2$; (ii) $\nu_1 - \nu_2$ (iii) $\frac{1}{\nu_1 + \nu_2}$; (iv) $\frac{1}{\nu_1 - \nu_2}$	1
(d)	Two tuning forks of frequencies n_1 and n_2 produce n beats per second. If n_2 and n are known, n_1 may be given by (i) $\frac{n_2}{n} + n_2$; (ii) $n_2 n$ (iii) $n_2 \pm n$; (iv) $\frac{n_2}{n} - n_2$	1
(e)	P and Q are two wires whose fundamental frequencies are 256 Hz and 382 Hz respectively. How many beats in two seconds will be heard by the third harmonic of A and second harmonic of B? (i)4; (ii)8 (iii)16; (iv)zero	1