PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

QUESTIONS ASKED IN JEE - 2020

Question

1. A non-isotropic solid metal cube has coefficient of linear expansion as

$5 \times 10^{-5} / {}^{\circ} C$ along the x-axis and $5 \times 10^{-6} / {}^{\circ} C$ along y-axis and z-axis. If the coefficient of volumetric expansion of the solid is $n \times 10^{-6} / {}^{\circ} C$ then the value of n is....

A. 5.5

B. 6.5

C. 60

D. 55

Answer: C

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2. An ideal fluid flows (laminar flow) through a pipe of non-uniform diameter. The maximum and minimum diameters of the pipes are 6.4cm and 4.8cm, respectively. The ratio of minimum and maximum velocities of fluid in this pipe is

A. $\frac{81}{256}$

B. $\frac{9}{16}$

C. $\frac{3}{4}$

D. $\frac{3}{16}$

Answer: B

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3. A cylinder of height 1m is floating in water at $0^{\circ}C$ with 20cm height in air. Now the temperature of water is raised to $4^{\circ}C$, the height of the cylinder in air becomes 21cm. The ratio of density of water at $4^{\circ}C$ to that at $0^{\circ}C$ is (Consider expansion of the cylinder is negligible)

A. 1.01

B. 1.03

C. 1.04

D. 2.01

Answer: A

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4. A solid sphere of density $\rho = \rho_0\left(1 - \frac{r^2}{R^2}\right), 0 < r \leq R$ just floats in a

liquid, then the density of the liquid is (r is the distance from the centre of the sphere)

A. ρ_0

B. $\frac{2}{5}\rho_0$

C. $\frac{5}{2}\rho_0$

D. $\frac{3}{5}\rho_0$

Answer: B

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5. Two moles of an ideal gas with $\frac{C_P}{C_V} = \frac{5}{3}$ are mixed with 3 moles of another ideal gas with $\frac{C_P}{C_V} = \frac{4}{3}$. The value of $\frac{C_P}{C_V}$ for the mixture is

A. 1.38

B. 1.42

C. 1.5

D. 1.7

Answer: B

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6. M grams of steam at $100^{\circ}C$ is mixed with 200g of ice at its melting point in a thermally insulated container. If it produces liquid water at 40°C [heat of vaporization of water is 540cal/g and heat of fusion of ice is 80 cal/gl, the value of M is

A. 30

B. 40

C. 50

D. 60

Answer: B

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7. 1 liter dry air at STP expands adiabatically to a volume of 3L. If $\gamma = 1.4$, the work done by air is ($3^{1.4}$= 4.655) (Take air to be an ideal gas)

A. 18J

B. 45J

C. 90.5J

D. 100.8J

Answer: C

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8. A carnot engine opeates between two reservoirs of temperature 900K and 300K. The engine performs 1200J of work per cycle. The heat energy in (J) delivered by the engine to the low temperature reservoir in a cycle is

A. 800J

B. 600J

C. 1800J

D. 900J

Answer: B

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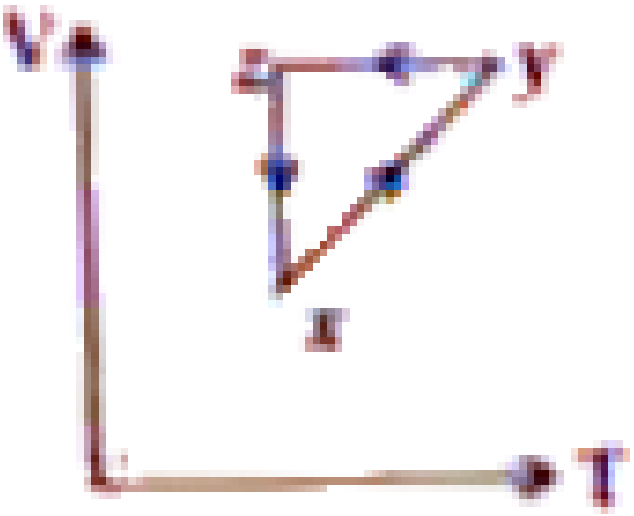
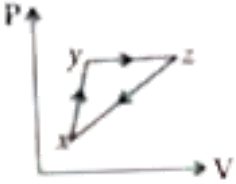
9. Choose the correct P-V graph of an ideal gas for the given V-T graph

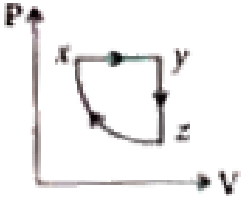


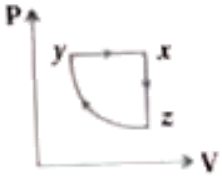
A.

B.



C.



D. 

Answer: A

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10. Two ideal Carnot engines opeate in cascade (all heat given up by one engine is used by the other engine to produce work) between temperatures T_1 and T_2. The temperature of the hot reservoir of the first engine is T_1 and

the temperature of the cold reservoir of the second engine is T_2. T is the temperature of the sink of first engine which isi also the source for the second engine. How is T related to T_1 and T_2 if both the engines perform equal amount of work?

A. $\frac{2T_1T_2}{T_1+T_2}$

B. $\frac{T_1+T_2}{2}$

C. 0

D. $\sqrt{T_1T_2}$

Answer: B

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11. Under an adiabatic process, the volume of an ideal gas gets doubled. Consequently, the mean collision time between the gas molecules changes from τ_1 to τ_2. If $\frac{C_P}{C_V} = \gamma$ for this gas, then a good estimate for $\frac{\tau_2}{\tau_1}$ is given by

A. $\frac{1}{2}$

B. 2

C. $\left(\frac{1}{2}\right)^{\gamma}$

D. $\left(\frac{1}{2}\right)^{\frac{\gamma}{2}+1}$

Answer:

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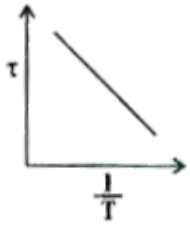
12. Which graph correctly represents the variation between relaxation time (τ) of gas molecules with absolute temperature (T) of the gas?

A.

B.



C.

D.

Answer: A

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13. A LCR circuit behaves like a damped harmonic oscillator. Comparing it with a physical spring- mass damped oscillator having damping constant b, mass m and oscillating with a force constant k, the correct equivalence will be

A. $L \leftrightarrow k, C \leftrightarrow b, R \leftrightarrow m$

B. $L \leftrightarrow m, C \leftrightarrow \frac{1}{k}, R \leftrightarrow b$

C. $L \leftrightarrow \frac{1}{b}, C \leftrightarrow \frac{1}{m}, R \leftrightarrow \frac{1}{k}$

D. $L \leftrightarrow m, C \leftrightarrow k, R \leftrightarrow b$

Answer: B

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14. Speed of transwerse wave of a straight wire having mass 6.0g length 60cm and area of cross- section $1.0mm^2$ is 90 m/s. If the Young's modulus of wire is $1.6 \times 10^{11} Nm^{-2}$, the extension of wire over its natural length is

A. 0.1mm

B. 0.2mm

C. 0.3mm

D. 0.4mm

Answer: C

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15. A stationary observer receives sound from two identical tuning forks, one of which approaches and the other one receded with the same speed (much less than the speed of sound). The observer hears 2 beats/sec. The

oscillation frequency of each tuning fork is $v_0 = 1400Hz$ and the velocity of sound in air is 350m/s. The speed of each tuning fork is close to

A. $\frac{1}{4}$

B. 4

C. 2

D. $\frac{1}{2}$

Answer: A

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16. An open organ pipe of length 1m contains a gas whose density is twice the density of the atmosphere at STP. Find the difference between its fundamental and second harmonic frequencies if the speed of sound in atmosphere is 300m/s.

A. 150.75Hz

B. 106.08Hz

C. 105.75 Hz

D. 212.16 Hz

Answer: B

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