PHYSICS

BOOKS - CAREER POINT

UNIT TEST 5

Physics

1. Two tuning fork when sounded together, produce 3 $beats/s$. One of the fork is in unison with $27cm$ length of sonometer wire and other with $28cm$

length of the same wire. The frequencies of the two tuning forks are

A. $87, 84Hz$

B. $49, 39Hz$

C. $81, 78Hz$

D. $84, 81Hz$

Answer: D

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2. A source of frequency 10kHz when viberted over than mouth of a closed organ is in unison at 300K. The beats produced when temperature rises by 1K

A. $30Hz$

B. $13.33Hz$

C. $16.67Hz$

D. $40Hz$

Answer: C

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3. The ratio of the velocity of sound in hydrogen gas to that in helium gas at the same temperature is

A. $\sqrt{\frac{21}{5}}$

B. $\sqrt{\frac{42}{25}}$

C. $\sqrt{\frac{42}{15}}$

D. $\sqrt{\frac{43}{23}}$

Answer: B

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4. A travelling wave is described by the equation $y = y_0 \sin\left(\left(ft - \frac{x}{\lambda}\right)\right)$. The maximum particle velocity is equal to four times the wave velocity if

A. $\lambda = \pi Y_0 / 4$

B. $\lambda = \pi Y_0 / 2$

C. $\lambda = \pi Y_0$

D. $\lambda = 2\pi Y_0$

Answer: B

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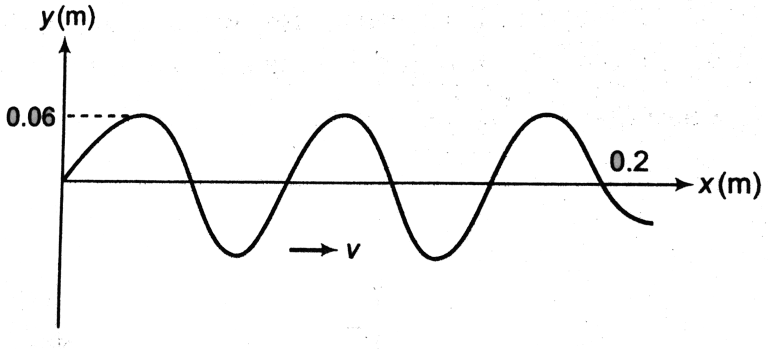
5. For the wave shown in figure, write the equation of this wave if its position is shown at $t = 0$. Speed of wave is $v = 300m/s$.



A.

$$y = (0.06m)\sin\left[\left(78.5m^{-1}\right)x + \left(23562s^{-1}\right)t\right]m$$

B.

$$y = (0.06m)\sin\left[\left(78.5m^{-1}\right)x - \left(23562s^{-1}\right)t\right]m$$

C.

$$y = (0.06m)\sin\left[\left(78.5m^{-1}\right)x + \left(23562s^{-1}\right)t\right]m$$

D.

$$y = (0.86m)\sin\left[\left(70.5m^{-1}\right)x - \left(28562s^{-1}\right)t\right]m$$

Answer: B

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6. In the experiment for the determination of the speed of sound in air using the resonance column method, the length of the air column that resonates in the fundamental mode, with a tuning

fork is $0.1m$. When this length is changed to $0.35m$, the same tuning fork resonates with the first overtone. Calculate the end correction.

A. $0.05m$

B. $0.012m$

C. $0.018m$

D. $0.025m$

Answer: D

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7. when a source of sound of frequency f crosses stationary observer with a speed $v_s($ $<$ $<$ speed of sound v) , the apparent change in frequency Δf is given by

A. $\frac{2fv_s}{v}$

B. $2fvv_s$

C. $\frac{2fv}{v_s}$

D. $\frac{fv_s}{v}$

Answer: A

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8. The frequency of a radar is 780 MHz. After getting reflected from an approaching aeroplane, the apparent frequency is more than the actual frequency by 2.6 kHz. The aeroplane has a speed of

A. $0.25 km / \sec$

B. $0.5 km / \sec$

C. $1 km / \sec$

D. $2 km / \sec$

Answer: B

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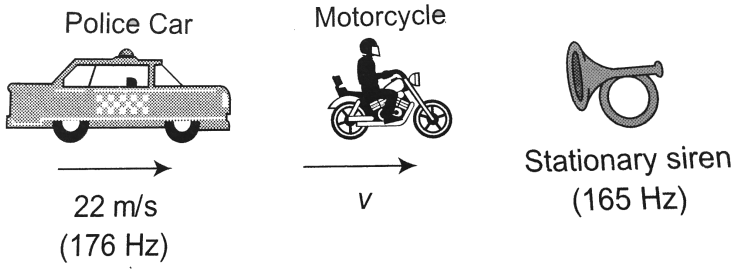

9.

A police car moving at $22m/s$, chases a motorcyclist, the police man sounds his horn at $176Hz$, while both of them move towards a stationary siren of frequency $165Hz$. Calculate the speed of the motorcycle, if it is given that he does not observes any beat

A. $11m - s^{-1}$

B. $22m - s^{-1}$

C. $33m - s^{-1}$

D. $44m - s^{-1}$

Answer: B

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10. A body of mass 25 kg is dragged on a horizontal rough road with a constant speed of $20kmh^{-1}$. If the coefficient of friction is 0.5, find the heat generated in one hour. If 50% of the heat is absorbed by the body, find the rise in temperature. Specific heat of the material of the body is 0.1 cal $g^{-1}.^{\circ} C^{-1}$.

A. $39K$

B. $59.5K$

C. $84.5K$

D. $11.6K$

Answer: D

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11. At what temperature the Fahrenheit and kelvin scales of temperature give the same reading ?

A. -40

B. 313

C. 574.25

D. 732.75

Answer: C

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12. 70 calories of heat required to raise the temperature of 2 moles of an ideal gas at constant pressure from $30^{\circ}C \rightarrow 35^{\circ}C$. The amount of heat required (in calories) to raise the temperature

of the same gas through the same range $(30^\circ C \rightarrow 35^\circ C)$ at constant volume is:

A. $50cals$

B. $70cals$

C. $60cals$

D. $65cals$

Answer: A

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13. 2kg of ice at $20^\circ C$ is mixed with 5kg of water at $20^\circ C$ in an insulating vessel having a negligible heat capacity. Calculate the final mass of water remaining in the container. It is given that the specific heats of water & ice are $1kcal/kg/^\circ C$ and 0.5 $kcal/kg/^\circ C$ while the latent heat of fusion of ice is $80kcal/kg$

A. $7kg$

B. $6kg$

C. $4kg$

D. $2kg$

Answer: B

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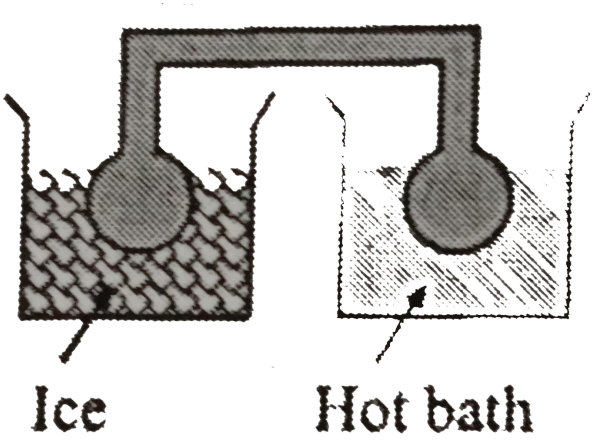
14. Two identical glass bulbs are interconnected by a thin glass tube. A gas is filled in these bulbs at $N.T.P.$ If one bulb is placed in ice and another bulb is placed in hot bath, then the pressure of the gas becomes 1.5 times. The temperature of hot

bath will be



A. $100^\circ C$

B. $182^\circ C$

C. $256^\circ C$

D. $546^\circ C$

Answer: D

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15. Work done by a system under isothermal change from a volume V_1 to V_2 for a gas which obeys Vander Waal's equation $(V-\beta n)\left(P+\frac{\alpha n^2}{V}\right)nRT$

A. $nRT\log_c\left(\frac{V_2-n\beta}{V_1-n\beta}\right)+\alpha n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$

B. $nRT\log_{10}\left(\frac{V_2-\alpha\beta}{V_1-\alpha\beta}\right)+\alpha n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$

C. $nRT\log_e\left(\frac{V_2-n\alpha}{V_1-n\alpha}\right)+\beta n^2\left(\frac{V_1-V_2}{V_1V_2}\right)$

D. $nRT\log_e\left(\frac{V_1-n\beta}{V_2-n\beta}\right)+\alpha n^2\left(\frac{V_1V_2}{V_1-V_2}\right)$

Answer: A

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16. If one mole of a monoatomic gas $(\gamma = 5/3)$ is mixed with one mole of a diatomic gas $(\gamma = 7/5)$ the value of γ for the mixture is .

A. 1.40

B. 1.50

C. 1.53

D. 3.07

Answer: B

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17. For gas at a temperature T the root-mean-square speed v_{rms}, the most probable speed v_{mp}, and the average speed v_{av} obey the relationship

A. $V_{av} > V_{rms} > V_{mp}$

B. $V_{rms} > V_{av} > V_{mp}$

C. $V_{mp} > V_{av} > V_{rms}$

D. $V_{mp} > V_{rms} > V_{av}$

Answer: B

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18. At constant temperature on increasing the pressure of a gas by 5% will decrease its volume by -

A. 5%

B. 5.26%

C. 4.26%

D. 4.76%

Answer: D

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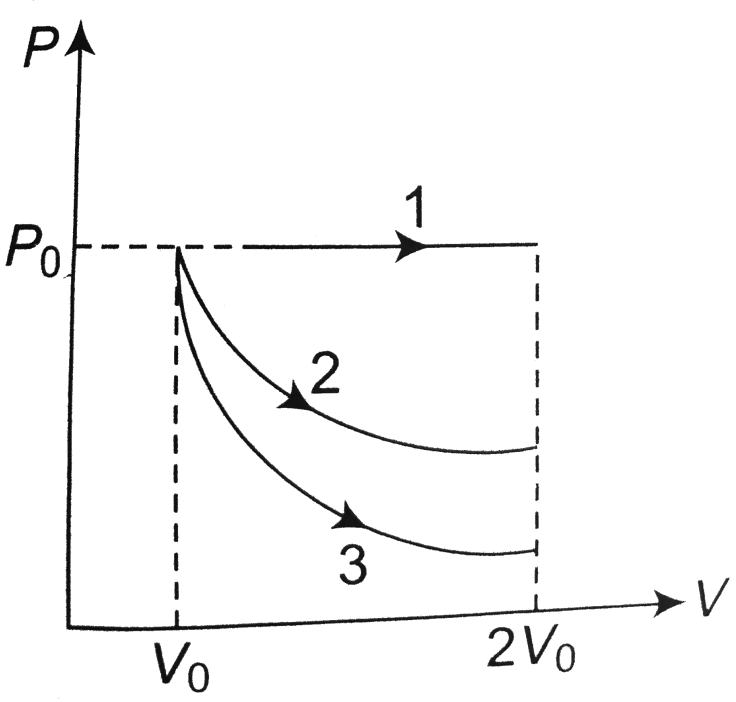
19. A gas is expanded from volume $V_0 = 2V_0$ under three different processes. Process 1 is isobaric process, process 2 is isothermal and process 3 is adiabatic. Let $\Delta U_1, \Delta U_2$ and ΔU_3 be the change in internal energy of the gas in these three processes. then



A. $\Delta U_1 > \Delta U_2 > \Delta U_3$

B. $\Delta U_1 < \Delta U_2 < \Delta U_3$

C. $\Delta U_2 < \Delta U_1 < \Delta U_3$

D. $\Delta U_2 < \Delta U_3 < \Delta U_1$

Answer: A

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20. A gas is expanded to double its volume by two different processes. One is isobaric and the other is isothermal. Let W_1 and W_2 be the respective work done, then find W_1 and W_2

A. $W_2 = W_1 \ln(2)$

B. $W_2 = \dfrac{W}{\ln(2)}$

C. $W_2 = \dfrac{W_1}{2}$

D. data is insufficient

Answer: A

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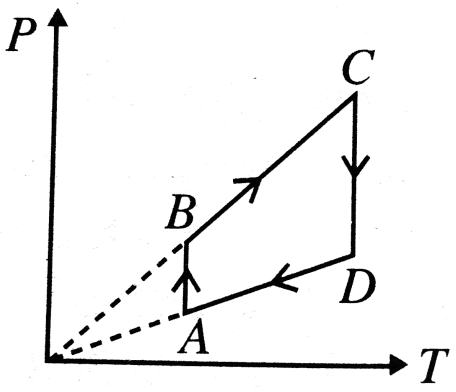
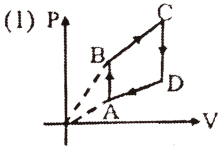
21. Pressure versus temperature graph of an ideal gas as shown in Fig.

Corresponding density (ρ) versus volume (V)

graph will be



A.



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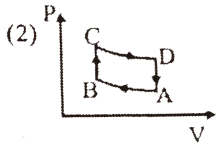

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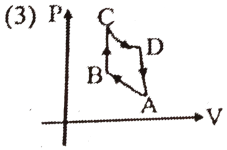
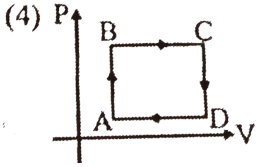


D. 

Answer: B

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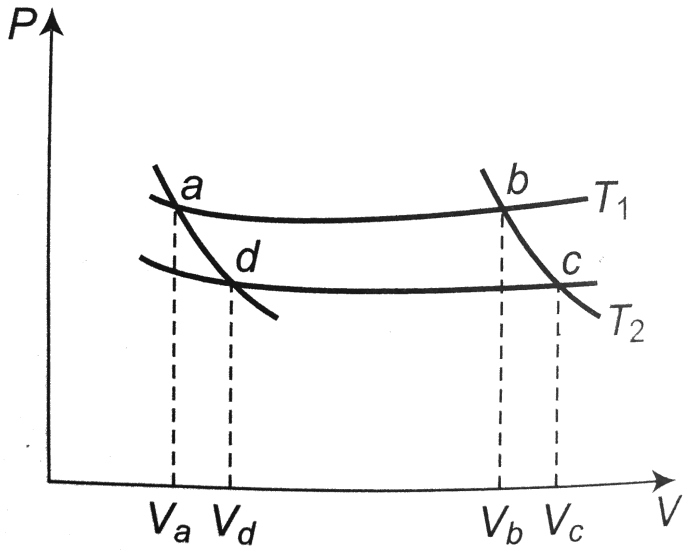
22. In the following P-V diagram two adiabatics cut two isothermals at temperature T_1 and T_2 (fig).

The value of $\frac{V_a}{V_d}$ will be



A. $\frac{V_c}{V_b}$

B. $V_C V_b$

C. $\frac{V_b}{V_c}$

D. $\frac{V_c V_b}{V_c + V_b}$

Answer: C

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23. An ideal heat engine has an efficiency η. The cofficient of performance of the engine when driven backward will be

A. $1-(1/\eta)$

B. $\eta/(1-\eta)$

C. $(1/\eta)-1$

D. $1/(1-\eta)$

Answer: C

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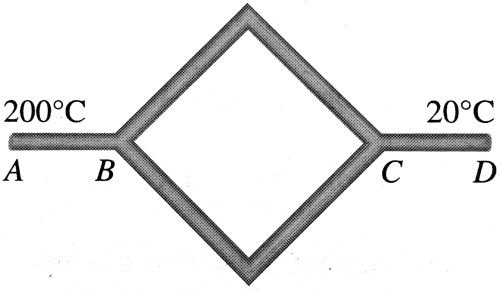

24.

Six identical cunducting rods are joined as shown in Fig. Points A and D are maintained at temperatures $200^{\circ}C$ and $20^{\circ}C$ respectively. The temperature of junction B will be

A. $120^\circ C$

B. $100^\circ C$

C. $140^\circ C$

D. $80^\circ C$

Answer: C

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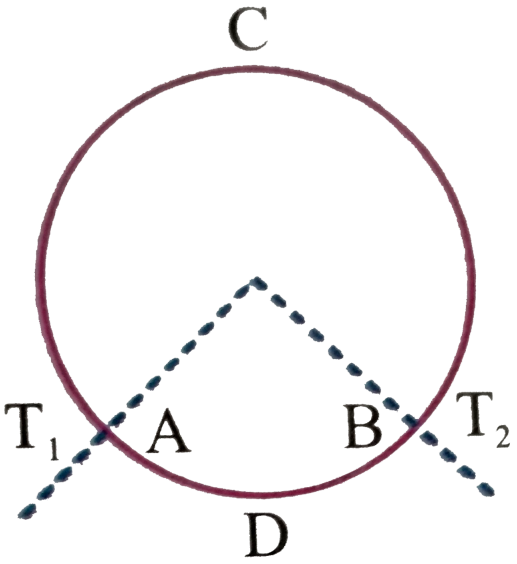
25. A ring consisting of two parts ADB and ACB of same conductivity k carries an amount of heat H The ADB part is now replaced with another metal keeping the temperature $T_{91})$ and T_2 constant The

heat carried increases to $2H$ What should be the conductivity of the new ADB Given $\frac{ACB}{ADB} = 3$



A. $\frac{7}{3}K$

B. $2K$

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

D. $3K$

Answer: A

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26. The temperature of a body is increased by $50\ \%$. The amount of radiation emitted by it would be nearly

A. $125\ \%$

B. $200\ \%$

C. $300\ \%$

D. $400\ \%$

Answer: D

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27. A body cools from $60^\circ C$ to $50^\circ C$ in 10 minutes when kept in air at $30^\circ C$. In the next 10 minut es its temperature will be

A. Below $40^\circ C$

B. $40^\circ C$

C. Above $40^\circ C$

D. Cannot be predicted

Answer: C

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28. A pendulum clock is 5 sec. Slow at a temperature $30^\circ C$ and 10 sec. fast at a temperature of $15^\circ C$, At what temperature does it give the correct time-

A. $18^\circ C$

B. $20^\circ C$

C. $25^\circ C$

D. None of these

Answer: C

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29. Driver of a truck gets his steel petrol tank filled with $75L$ of petrol at $10^{\circ}C$. If a α_{steel} is $12 \times 10^{-6}/.^{\circ} C$ and γ_{pet} is $9.5 \times 10^{-4}/.^{\circ} C$ the overflow of petrol at 30^2C is -

A. $7.31L$

B. $1.37L$

C. $13.7L$

D. $1.73L$

Answer: B

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30. The coefficient of linear expansion of crystal in one direction is α_1 and that in every direction perpendicular to it is α_2. The coefficient of cubical expansion is

A. $\alpha_1 + \alpha_2$

B. $2\alpha_1 + \alpha_2$

C. $\alpha_1 + 2\alpha_2$

D. None of these

Answer: C