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India's Number 1 Education App

PHYSICS

BOOKS - SAI PHYSICS (TELUGU ENGLISH)

MECHANICAL PROPERTIES OF SOLIDS AND FLUIDS

MCQ

1. Two closed pipes have the same fundamental frequency. One is filled with oxygen and the other with hydrogen at the same temperature. Ratio of their lengths respectively is

A. $1:4$

B. $4:1$

C. $1:2$

D. $2:1$

Answer: A

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2. The length og two metal wire is l_1 when the tension in it is F_1 and l_2 when the tension is F_2 .then the original length of the wire is

A. $\frac{l_1F_1 + l_2F_2}{F_1 + F_2}$

B. $\frac{l_2 - l_1}{F_2 - F_1}$

C. $\frac{l_1 F_2 - l_2 F_1}{F_2 - F_1}$

D. $\frac{l_1 F_1 - l_2 F_2}{F_2 - F_1}$

Answer: C

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3. the average depth of indian ocean is about 3000m.Thevalue of frictional compression $\left(\frac{\Delta V}{V}\right)$ of water at the bottom of the ocean is (given that the bulk modulus of water is $\left(2.2 \times 10^9 Nm^{-2}, g = 9.8 ms^{-2}, PH_2O = 1000 kg.\, m^{-3}\right)$

A. 3.4×10^{-2}

B. 1.34×10^{-2}

C. 4.13×10^{-2}

D. 13.4×10^{-2}

Answer: B

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4. The length og two metal wire is l_1 when the tension in it is F_1 and l_2 when the tension is F_2 .then the original length of the wire is

A. $\frac{L_1F_1 + L_2F_2}{F_1 + F_2}$

B. $\frac{L_2 - L_1}{F_1 + F_2}$

C. $\frac{F_1 L_2 - F_2 L_1}{F_1 - F_2}$

D. $\frac{L_1 F_1 - F_2 L_2}{F_1 - F_2}$

Answer: C

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5. 1000 spherical drop of water each 10^-8m in diameter coalesce to form one large spherical drop the amount of energy liberated in this process in joules is (surface tension of the water is 0.075M/m)

A. $10.75\pi \times 10^{-15}$

B. $6.75\pi \times 10^{-15}$

C. $8.65\pi \times 10^{-15}$

D. $3.88\pi \times 10^{-15}$

Answer: B

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6. A wire of Aluminium and a wire of Germanium are cooled to a temperature of 77° K.

A. Resistance of each of them decreases

B. Resistance of each of them increases

C. Resistance of Aluminium wire increases and that of Germanium wire decreases

D. Resistance of Aluminium wire decreases and that of Germanium wire increase

Answer: D

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7. Two wires of the same material and length but diameters in the ratio 1:2 are stretched by the same force. The elastic potential energy per unit volume for the wires, when stretched by the same force will be in the ratio

A. $4:01$

B. $1:01$

C. $2:01$

D. $4:01$

Answer: A

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8. The Volume of one mole of the gas is changed from V to 2V at constant pressure p. If γ is the tatio of specific heats of the gas, change in internal energy of the gas is,

A. $\frac{r.pV}{\gamma-1}$

B. $\frac{r}{\gamma-1}$

C. pV

D. $\frac{pV}{\gamma-1}$

Answer: A

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9. A tension of 20 N is applied to a copper wire of cross sectional area 0.01 cm^2, Young's modulus of copper is $1.1 \times 10^{11} N/m^2$ and Poisson's ratio is 0.32. The decrease in cross sectional area of the wire is

A. $1.16 \times 10^{-6} cm^2$

B. $1.16 \times 10^{-5} m^2$

C. $1.16 \times 10^{-4} m^2$

D. $1.16 \times 10^{-3} cm^2$

Answer: A

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10. A capillary tube of radius 'r' is immersed in water and water rises to a height of 'h'. Mass of water in the capillary tube is $5 \times 10^{-3} kg$. The same capillary tube is now immersed in a liquid whose surface tension is sqrt2 times the surface tension of water. The angle of

contact between the capillarv tube and this liauid is 45°. The mass of liquid which rises into the capillary tube now is (in kg)

A. 5×10^{-3}

B. 2.5×10^{-3}

C. $5\sqrt{2} \times 10^{-3}$

D. 3.5×10^{-3}

Answer: A

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11. The terminal velocity of a liquid drop of radius 'r falling through air is v. If two such drops are combined to form a bigger drop, the terminal velocity with which the bigger drop falls through air is (ignore any buoyant force due to air)

A. $\sqrt{2}v$

B. 2v

C. $\sqrt[3]{4}v$

D. $\sqrt[3]{2}v$

Answer: C

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12. A glass flask of volume one litre is filled completely with mercury at 0° C. The flask is now heated to 100° C. Coefficient of volume expansion of mercury is $1.82 \times 10^{-4}c$ and coefficient of linear expansion of glass is $0.1 \times 10^{-4}c$. During this process, amount of mercury which overflows is

A. 21.2CC

B. 15.2CC

C. 2.12CC

D. 18.2CC

Answer: B

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13. A tension of 22N is applied to copper wire of crosssectional area $0.02cm^2$,Young's modulus of copper is $1.1 \times 10^{11} \frac{N}{m^2}$ and poisson's ratio 0.32.The decrease in cross-sectional area will be

A. $1.28 \times 10^{-6} cm^2$

B. $1.6 \times 10^{-6} cm^2$

C. $2.56 \times 10^{-6} cm^2$

D. $0.64 \times 10^{-6} cm^2$

Answer: A

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14. Drops of liquid of density d are floating half immersed in a liquid of density p. If the surface tension of the liquid is T, then the radius of the drop is

A. $\sqrt{\frac{3T}{g(3d-p)}}$

B. $\sqrt{\frac{6T}{g(2d-p)}}$

C. $\sqrt{\frac{3T}{g(2d-p)}}$

D. $\sqrt{\frac{3T}{g(4d-p)}}$

Answer: A

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15. A pipe having an internal diameter D is connected to another pipe of same size. Water flows into the second pipe through 'n' holes, each of diameter d. If the water in the first pipe has speed v, the speed of water leaving the second pipe is

A. $\frac{D^2v}{nd^2}$

B. $\frac{nD^2v}{d^2}$

C. $\frac{d^2v}{D^2}$

D. $\frac{d^2v}{d^2}$

Answer: A

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16. When a liquid is heated in a copper vessel its coefficient of apparent expansion is $6 \times 10^{-6} /^{\circ} C$. When the same liquid is heated in a steel vessel its coefficient of apparent expansion is $24 \times 10^{-6} /^{\circ} c$. If coefficient of linear expansion for copper is $18 \times 10^{-6} /^{\circ} c$, the coefficient of linear expansion for steel is

A. $20 \times 10^{-6} /^{\circ} c$

B. $24 \times 10^{-6} /^{\circ} c$

C. $36 \times 10^{-6} /^{\circ} c$

D. $12 \times 10^{-6} /^{\circ} c$

Answer: D

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17. Two block of masses 1 kg 2 are connected by a metal wire going over a smooth pulley. The breaking stress of metal is $\frac{40}{3\pi} \times 10^6 Mm^{-2}$. What should be the minimum radius of wire used if it should not break? $\left(g = 10ms^{-2}\right)$

A. 0.5mm

B. 1mm

C. 1.5mm

D. 2mm

Answer: C

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18. If two soap bubbles of different radii are connected by a tube, then

A. Air flows from bigger bubble to the smaller bubble till sizes become equal

B. Air flows from bigger bubble to the smaller bubble till sizes are interchanged

C. Air flows from smaller bubble to bigger

D. There is no flow of air

Answer: C

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19. A non-conducting body floats in a liquid at $20^{\circ}C$ with $\frac{2}{3}$ of its volume immersed in the liquid. when liquid temperature increased to$100^{\circ}c$, $\frac{3}{4}$ of body's volume 3. 4 is immersed in the liquid. Then the coefficient of real expansion of the liquid is (neglecting the expansion of container of the liquid)

A. $15.6 \times 10^{-4 \circ} c^{-1}$

B. $156 \times 10^{-4 \circ} c^{-1}$

C. $1.56 \times 10^{-4 \circ} c^{-1}$

D. $0.156 \times 10^{-4 \circ} c^{-1}$

Answer: A

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20. The thermo emf of a hypothetical thermocouple varies with the temperature 0 of hot junction as $E = a\theta + b\theta^2$ in volts, where the ratio $\frac{a}{b}$ is $700^\circ c$. If the cold junction is kept at $0^\circ c$, then the neutral temperature is

A. $700^\circ c$

B. $1400^\circ c$

C. $390^\circ c$

D. No neutral temperature is possible for this thermocouple

Answer:

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21. Match the following

Column I	Column II
A. Hooke's law	1. Tangential strain
B. Shearing strain	2. Temporary loss of elastic property
C. Bulk strain	3. Elastic limit
D. Elastic fatigue	4. 3 times the linear strain

A. $\begin{matrix} A & B & C & D \\ 2 & 1 & 4 & 3 \end{matrix}$

B.
A	B	C	D
3	4	1	2

C.
A	B	C	D
3	1	4	2

D. $(A, B, C, D), (, 1, 2, 3, 4)$

Answer: C

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22. The excess pressure inside a spherical soap bubble of radius 1 cm is balanced by a column of oil (Specific gravity = 0.8), 2 mm high, the surface tension of the bubble is

A. $3.92N/m$

B. $0.0392N/m$

C. $0.392N/m$

D. $0.00392N/m$

Answer: B

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23. Water from a tap emerges vertically downwards with initial velocity $4ms^{-1}$. The cross-sectional area of the tap is A. The flow is steady and pressure is constant throughout the stream of water. The distance h vertically below the tap, where the cross-sectional area of the stream becomes) $(2/3)$A,is $(g = 10m/s^2)$

A. 0.5m

B. 1m

C. 1.5m

D. 2.2m

Answer: B

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24. A bimetallic strip is formed out of two identical strips, one of copper and the other of brass. The coefficients of linear expansion of the two metals are α_c and α_B. On heating, the temperature of strip

increases by ΔT and the strip bends to form an arc of radius R. Then R is proportional to

A. ΔT

B. $\frac{1}{\Delta T}$

C. $\sqrt{\Delta T}$

D. $\frac{1}{\sqrt{\Delta T}}$

Answer: B

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25. Three rods of equal lengths are joined to form an equilateral triangle ABC. D is the mid-point of AB. The

coefficient of linear expansion is α_1, for material of rod AB and α_2, for material of rods of rods AC and BC. If the distance DC remains constant for small changes in temperature, then

A. $\alpha_1 = 2\alpha_2$

B. $\alpha_1 = 4\alpha_2$

C. $\alpha_1 = 8\alpha_2$

D. $\alpha_1 = \alpha_2$

Answer: B

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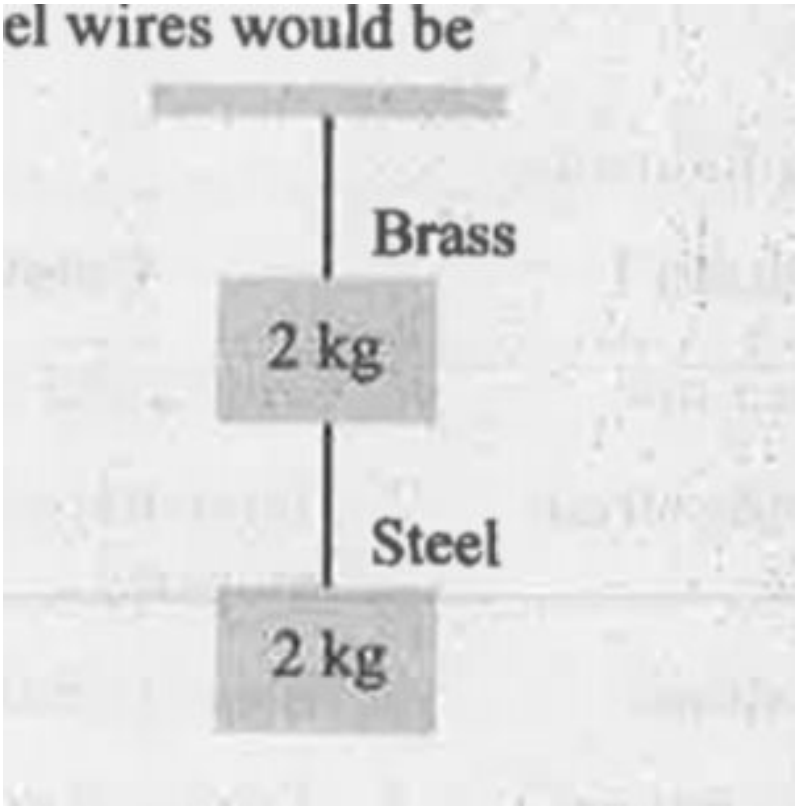
26. If the ratio of lengths, radii and Young's modulus of steel and brass wires shown in the figure are a, b and c respectively, the ratio between the increase in lengths of brass and steel wires would be Brass and steel wire would be



A. $\frac{b^2ac}{2c}$

B. $\frac{bc}{2a^2}$

C. $\frac{ba^2}{2}c$

D. $\frac{a}{b^2c}$

Answer: D

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27. A soap bubble of radius r is blown up to form a bubble of radius 2r under isothermal conditions . If T is the surface tension of soap solution , the energy spent in blowing

A. $3\pi Tr^2$

B. $6\pi Tr^2$

C. $12\pi Tr^2$

D. $24\pi Tr^2$

Answer: D

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28. Eight spherical rain drops of the same mass and radius are falling down with a terminal speed of $6cms^{-1}$. If they coalesce to form one big drop , what will be the terminal speed of bigger drop ? (Neglect the buoyancy of the air)

A. $1.5cms^{-1}$

B. $6cms^{-1}$

C. $24cms^{-1}$

D. $32cms^{-1}$

Answer: C

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29. A steel wire can withstand a load up to 2940 N. A load of 150 kg is suspended from a rigid support . The maximum angle through which the wire can be displaced from the mean position , so that the wire

does not break when the load passes through the position of equilibrium , is

A. 30°

B. 60°

C. 80°

D. 85°

Answer: B

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30. A load of 1 kg weight is a attached to one end of a steel wire of area of cros-section $3mm^2$ and Young's

modulus $10^{11} Nm^{-2}$. The other end is suspended vertically from a hook on a wall, then the load is pulled horizontally and released. When the load passes through its lowest position the fractional change in length is $\left(10ms^{-2}\right)$

A. 0.3×10^{-4}

B. 0.3×10^{-3}

C. 0.3×10^{3}

D. 0.3×10^{4}

Answer: A

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31. The surface tension of soap solution is $0.03Nm^{-1}$. The work done in blowing to form a soap bubble of surface area $40cm^2$, (in J), is

A. 1.2×10^{-4}

B. 2.4×10^{-4}

C. 12×10^{-4}

D. 24×10^{-4}

Answer: B

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32. Two rain drops reach the earth with different terminal velocities having ratio 9:4. Then, the ratio of their volumes is

A. $3:2$

B. $4:9$

C. $9:4$

D. $27:8$

Answer: D

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33. 1 L of oxygen at a pressure of 1 atm and 2 L of nitrogen at a pressure of 0.5 atm, are introduced into a vessel of volume 1 L. If there is no change in temperature, the final pressure of the mixture of gas (in atm) is

A. 1.5

B. 2.5

C. 2

D. 4

Answer: C

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34. There is some change in length when a 33000 N tensile force is applied on a steel rod of area of cross-section $10^{-3}m^2$. The change of temperature required to produce the same elongation, if the steel rod is heated, is (The modulus of elasticity is $3 \times 10^{11} Nm^{-2}$ and the coefficient of linear expansion of steel is $1.1 \times 10^{-5}/^{\circ} c$)

A. $20^{\circ} C$

B. $15^{\circ} C$

C. $10^{\circ} C$

D. $0^{\circ} C$

Answer: C

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35. When a wire of length 10 m is subjected to a force of 100 N along its length, the lateral strain produced is $0.01 \times 10^3 m$. The Poisson's ratio was found to be 0.4. If the area of cross-section of wire is 0.025 m^2, its Young's modulus is

A. $1.6 \times 10^8 Nm^{-2}$

B. $2.5 \times 10^{10} Nm^{-2}$

C. $1.25 \times 10^{11} Nm^{-2}$

D. $16 \times 10^9 Nm^{-2}$

Answer: A

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36. A liquid does not wet the solid surface if the angle of contact is

A. zero

B. Equal to 45°

C. Equal to 90°

D. Greater than 90°

Answer: D

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37. A horizontal pipe of non-uniform cross-section allows water to flow through it wwith a velocity $1ms^{-1}$ when pressure is 50 kPa at a point. If the velocity of flow has to be $2ms^{-1}$ at some other point, the pressure at that point should be

A. 50kPa

B. 100kPa

C. 48.5kPa

D. 24.25kPa

Answer: C

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38. Two gases A and B having same pressure p, volume V and absolute temperature T are mixed. If the mixture has the volume and temperature as V and T respectively, then the pressure of the mixture is

A. 2_p

B. p

C. $\frac{p}{2}$

D. 4p

Answer: A

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39. Assertion (A) Ductile metals are used to prepare thin wires.

Reason (R) In the stress-strain curve of ductile metals, the length between the points representing elastic limit and breaking point is very small.

A. Both (A) and (R) are true and (R) is the correct explanation of (A)

B. Both (A) and (R) are true but (R) is not the correct explanation of (A)

C. (A) is true but (R) is false

D. (A) is false but (R) is true

Answer: C

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40. Two soap bubbles combine to form a single bubble. In this process, the change in volume and surface arca are respectively V and A. If p is the atmospheric pressure and T is the surface tension of the soap solution, the following relation is true.

A. $4_pV + 3TA = 0$

B. $3_pV - 4TA = 0$

C. $4_pV - 3TA = 0$

D. $3_pV + 4TA = 0$

Answer: D

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41. An air bubble of radius 1 cm rises from the bottom portion through a liquid of density $1.5gcc^{-1}$ at a constant speed of $0.25cms^{-1}$. If the density of air is neglected, the coefficient of viscosity of the liquid is approximately, (in Pa-s)

A. 13000

B. 1300

C. 130

D. 13

Answer: D

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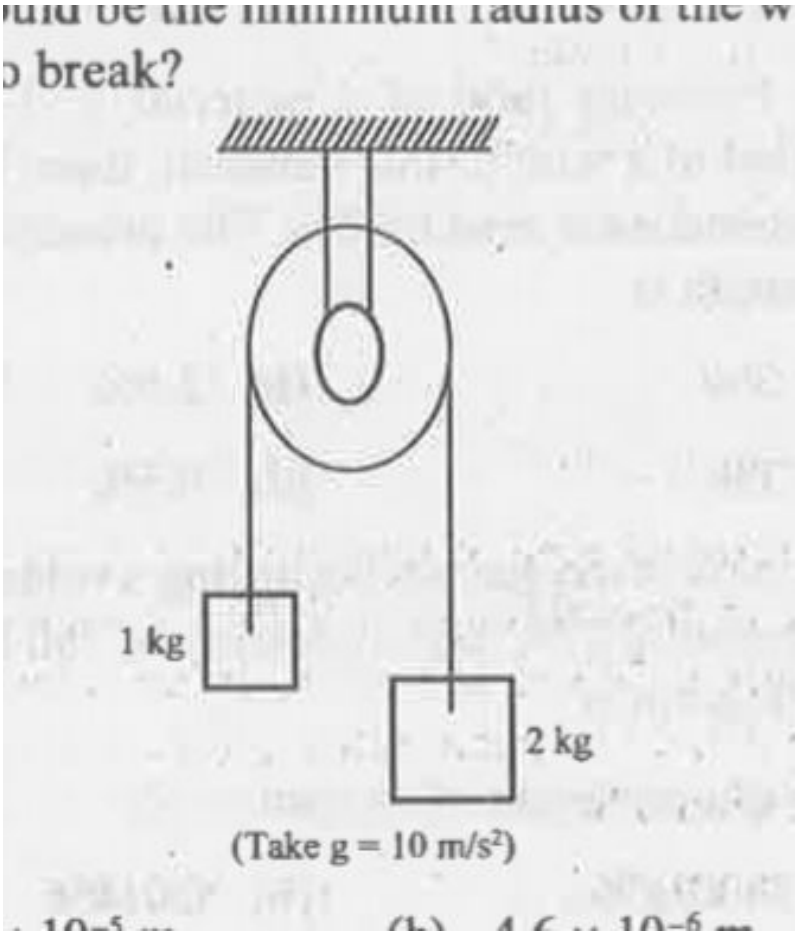
42. Two blocks of masses 1 kg and 2 kg are connected by a metal wire going over a smooth pulley as shown in figure. The breaking stress of the metal is $2 \times 10^9 Nm^{-2}$. What should be the minimum radius of

the wire used if it is not to break?



A. $4.6 \times 10^{-5} m$

B. $4.6 \times 10^{-6} m$

C. $2.5 \times 10^{-6} m$

D. $2.5 \times 10^{-5} m$

Answer: A

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43. The radii and Young's moduli of two uniform wires A and B are in the ratio 2:1 and 1: 2 respectively. Both. wires are subjected to the same longitudinal force. If the increase in length of the wire A is one percent, the percentage increase in length of the wire B is

A. 1

B. 1.5

C. 2

D. 3

Answer: C

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44. The heal evolved for the rise of water when one cnd of the capillary tube of radius r is immersed vertically into water is (Assume surface tension = T and density of water to be rho)

A. $\frac{2\pi T}{\rho g}$

B. $\frac{2\pi T^2}{\rho g}$

C. $\frac{\pi T^2}{\rho g}$

D. None of these

Answer: C

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45. An iron sphere of mass 20×10^{-3}kg falls through a viscous liquid with terminal velocity 0.5 ms^{-1} The terminal velocity (in ms^{-1}) of another iron sphere of mass 54×10^2 kg is

A. 4.5

B. 3.5

C. 2.5

D. 1.5

Answer: A

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46. The relation between the coefficient of real expansion (γ_r) and coefficient of apparent expansion (γ_a) of a liquid and the coefficient of lincar expansion (α_g) of the material of the container is

A. $\gamma_r = \alpha_g + \gamma_a$

B. $\gamma_r = \alpha_g + 3\gamma_a$

C. $\gamma_r = 3\alpha_g + \gamma_a$

D. $\gamma_r = 3(\alpha_g + \gamma_a)$

Answer: C

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47. The difference between volume and pressure coefficients of an ideal gas is

A. $\frac{1}{273}$

B. 273

C. $\frac{2}{273}$

D. zero

Answer: D

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48. The tyre of a motor car contains air at $15^\circ C$. If the temperature increases to $35^\circ C$, the approximate percentage increase in pressure is (ignore expansion of tyre)

A. 7

B. 9

C. 11

D. 13

Answer: A

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49. A metallic ring of radius r and cross-sectional area A is fitted into a wooden circular disc of radius $R(R > r)$. If the Young's modulus of the material of the ring is Y, the force with which the metal ring expands is

A. $\frac{AYR}{r}$

B. $\frac{AY(R-r)}{r}$

C. $\frac{Y(R-r)}{Ar}$

D. $\frac{YR}{AR}$

Answer: B

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50. One end ofauniform glass capillary tube of radius r = 0.025 cm is immersed vertically in water to a depth h= 1 cm. The excess pressure in Nm required to blow an air bubble out of the tube (Surface tension of water = $7 \times 10^{-2} Nm^{-1}$ Density of water $10^{-3} kgm^{-3}$ Acceleration due to gravity =$10 ms^{-2}$)

A. 0.0048×10^5

B. 0.0066×10^5

C. 1.0048×10^5

D. 1.0066×10^5

Answer: B

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51. Water in a river 20 m deep is flowing at a speed of 10 ms^{-1}. The shearing stress between the horizontal layers of water in the river in Nm^{-2} is (Coefficient of viscosity of water = 10^{-3} SI units)

A. 1×10^{-2}

B. 0.5×10^{-2}

C. 1×10^{-3}

D. 0.5×10^{-3}

Answer: D

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52. There are two holes one each along the opposite sides of a wide rectangular tank. The cross-section of each hole is 0.01 m^2 and the vertical distance between the holes is 1 m. The tank is filled with water. The net force on the tank in newton when the water flows out of the holes is (Density of water = 1000 kgm^{-3})

A. 100

B. 200

C. 300

D. 400

Answer: B

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53. Two identical vessels A and B with frictionless pistons contain the same ideal gas at the same temperature and the same volume V. The masses of gaş in A and B are m_A and m_B respectively. The gases are allowed to expand isothermally to the same final volume 2 V. The change in pressures of the gas in A and B are found to be Δp and 1.5 Δp respectively. Then

A. $9m_A = 4m_B$

B. $3m_A = 2m_B$

C. $2m_A = 3m_B$

D. $4m_A = 9m_B$

Answer: B

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54. Bulk modulus of water is $2 \times 10^9 Nm^{-2}$, The pressure required to increase the volume of water by 0.1% in Nm^{-2} is

A. 2×10^9

B. 2×10^0

C. 2×10^6

D. 2×10^4

Answer: C

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55. Two spherical soap bubbles of radii r_1 and r_2 in vacuum combine under isothermal conditions. The resulting bubbles has a radius equal to

A. $\frac{r_1 + r_2}{2}$

B. $\frac{r_1 r_2}{r_1 + r_2}$

C. $\sqrt{r_1 r_2}$

D. $\sqrt{r_1^2 + r_2^2}$

Answer: C

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56. The rate of steady volume flow of water through of capillary tube of length 1 and radius r, under a pressure difference of p is V. This tube is connected with another tube of the same length but half the radius, in series. Then, the rate of steady volume flow through them is (The pressure difference across the combination is p)

A. $\frac{V}{16}$

B. $\frac{V}{17}$

C. $\frac{16V}{17}$

D. $\frac{17V}{16}$

Answer: B

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57. A large tank filled with water to a height h is to be emptied through a small hole at the bottom. The ratio of times taken for the level of water to fall from h to $\frac{h}{2}$ and $\frac{h}{2}$ to zero is

A. sqrt2

B. $\sqrt{2}$

C. $\frac{1}{\sqrt{2}}$

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

Answer: C

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58. A horizontal uniform glass tube of 100 cm length, sealed at both ends contains 10 cm mercury column in the middle. The temperature and pressure of air on either side of mercury column are respectively 31°C and 76 cm of mercury. If the air column at one end is kept at

$0^\circ C$ and the other end at $273^\circ C$, the pressure of air which is at $0^\circ C$ is (in cm of Hg)

A. 76

B. 88.2

C. 102.4

D. 122

Answer: C

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59. Tanks A and B open at the top contain two different liquids upto certain height in them. A hole is made to

the wall of each tank at a depth h from the surface of the liquid. The area of the hole in B is twice that of in A. If the liquid mass flux through each hole is equal, then the ratio of the densities of the liquids respectively, is

A. 1

B. $\frac{3}{2}$

C. $\frac{2}{3}$

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

Answer: A

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60. A water barrel having water upto a depth d is placed on a table of height h. A small hole is made on the wall of barrel at its bottom. If the stream of water coming out of the hole falls on the ground at a horizontal distance R from the barrel, then the value of d is

A. $\frac{4h}{R^2}$

B. $4hR^2$

C. $\frac{R^2}{4h}$

D. $\frac{h}{4R^2}$

Answer: C

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61. A glass capillary tube of inner diameter 0.28 mm is lowered vertically into water in a vessel. The pressure to be applied on the water in the capillary tube so that water level in the tube is same as that in the vessel (in Nm^{-2}) is Surface tension of water = $0.07Nm^{-1}$

Atmospheric pressure = $10^5 Nm^{-2}$

A. 10^3

B. 99×10^3

C. 100×10^3

D. 101×10^3

Answer: A

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62. The Poisson's ratio of a material is 0.4. If a force is applied to a wire of this material, there is a decrease of cross-sectional area by 2%. The percentage increase in its length is

A. 0.03

B. 0.025

C. 0.01

D. 0.005

Answer: B

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63. The mass of oxygen gas occçupying a volume of 11.2 L at a temperature 27°C and a pressure of 760 mm of mercury in kilogram is [Molecular weight of oxygen = 32]

A. 0.001456

B. 0.01456

C. 0.1456

D. 1.1456

Answer: B

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64. When an air bubble of radius r rises from the bottom (the to the surface of a lake. Its radius becomes $\frac{5r}{4}$ pressure of the atmosphere is equal to the 10 m height of water column). If the temperature is constant and the surface tension is neglected the depth of the lake is

A. 5.53m

B. 6.53m

C. 9.53m

D. 12.53m

Answer: C

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65. An insulated cylinderical vessel filled with an insulated piston of negligible weight and negligible thickness at the mid point of the vessel . The cylinder contains a gas at $0^\circ C$.When the gas is heated to $100^\circ C$, the piston moves through a length of 5 cm . Length of the cylindrical vessel in cm is

A. 15.65cm

B. 27.3cm

C. 38.6cm

D. 64.6cm

Answer: D

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66. The length of an elastic string is 'a' metres when the longitudinal tension is 4 N and 'b' meters when the longitudinal tension is 5 N. The length of the string in meters when the longitudinal tension is 9 N is

A. a-b

B. 5b-4a

C. $2b - \frac{1}{4}$

D. 4a-3b

Answer: B

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67. A mercury drop of radius 1 cm is sprayed into 10^6 drops of equal size. The energy expended in joule is (Surface tension of mercury is $460 \times 10 Nm^{-1}$)

A. 0.057

B. 5.7

C. 5.7×10^{-4}

D. 5.7×10^{-3}

Answer: A

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68. Water is conveyed through a uniform tube of 8 cm in diameter and 3140 m in length at the rate $2 \times 10^{-3} m^3 s^{-1}$. The pressure required to maintain the flow is (Viscosity of water 10^{-3} SI units)

A. $6.25 \times 10^3 Nm^{-2}$

B. $0.65 Nm^{-2}$

C. $0.0625 Nm^{-2}$

D. $0.00625 Nm^{-2}$

Answer: A

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69. A tank with vertical walls is mounted so that its base is at a height H above the horizontal ground. The tank is filled with water to a depth h. A hole is punched in the side wall of the tank at depth x below the water surface. To have maximum range of the emerging stream, the value of x is

A. $\frac{H+h}{4}$

B. $\frac{H+h}{2}$

C. $\frac{H+h}{3}$

D. $\frac{3(H+h)}{4}$

Answer: B

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70. When a uniform wire of radius r, is stretched by a 2 kg weight, the increase in its length is 2.00 mm. If the radius of the wire is $\frac{R}{2}$ and other conditions remaining the same, the increase in its length is

A. 2.00mm

B. 4.00mm

C. 6.00mm

D. 8.00mm

Answer: D

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71. 8000 identical water drops are combined to form a big. drop. Then, the ratio of final surface energy to the initial surface energy of all the drops together is

A. $1:10$

B. $1:15$

C. $1:20$

D. $1:25$

Answer: C

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72. When a liquid in a glass vessel is heated its apparent expansion is $10.30 \times 10^{-4} / ^{\circ} C$ same liquid when heated in a metal its apparent expansion $10.06 \times 10^{-4} / ^{\circ} C$. The coefficient of linear expansion of the metal is (Coefficient of linear expansion of glass = $9 \times 10^{-6} / ^{\circ} C$)

A. $51 \times 10^{-6} / ^{\circ} C$

B. $43 \times 10^{-6} / ^{\circ} C$

C. $25 \times 10^{-6} / ^{\circ} C$

D. $17 \times 10^{-6} / ^{\circ} C$

Answer: D

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73. A vessel is filled with an ideal gas at a pressure of 10 atm and temperature $27^\circ C$. Half of the mass of the gas is removed from the vessel and temperature of the remaining gas is increased to $87^\circ C$. Then, the pressure of the gas in the vessel will be

A. 5atm

B. 24atm

C. 7atm

D. 8atm

Answer: B

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74. A flask is filled with 1.3 g of an ideal gas at $27^\circ C$ and its temperature is raised to $52^\circ C$. The mass of the gas that has to be released to maintain the temperature of the gas in the flask at $52^\circ C$ and the pressure remaining the same is

A. 2.5g

B. 20g

C. 1.5g

D. 0.1g

Answer: D

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75. The mass of a balloon with its contents is 1.5 kg. It is descending with an acceleration equal to half that of acceleration due to gravity. If it is to go up with the same acceleration keeping the volume same, its mass should be decreased by

A. 1.2kg

B. 1kg

C. 0.75kg

D. 0.5kg

Answer: B

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76. The elongation of a steel wire stretched by a force is 'e'. If a wire of the same material of double the length, and half the diameter is subjected to double the force, its elongation will be

A. 16e

B. 4e

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

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

Answer: A

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77. When a cylindrical tube is dipped vertically into liquid then the angle of contact is 140°, if the tube is dipped with an inclination of 40 then angle of contact is

A. 100°

B. 140°

C. 180°

D. 60°

Answer: B

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78. In a compensated pendulum, two rods of different metals are used with their lengths in ratio of 2 : 3. The coefficients of linear expansions for metals in the ratio is

A. $1:01$

B. $2:3$

C. $3:2$

D. $9:4$

Answer: C

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79. For a perfect gas, if α, β are the volume and pressure coefficients of expansions, then

A. $\alpha = \beta$

B. $\alpha > \beta$

C. $\alpha > \beta$

D. $\alpha > \beta, \alpha < \beta$

Answer: A

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80. The Poisson's ratio o should satisfy the relation

A. $-1 < \sigma < 0.5$

B. $-0.5 < \sigma < 1$

C. $0.5 < \sigma < 1.0$

D. $-1 < \sigma < 0.5$

Answer: A

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81. Neglecting gravity, the potential energy of a molecule of a liquid on the surface of the liquid when compared to the potential energy of a molecule inside the liquid is

A. Greater

B. Less

C. Equal

D. Depending on the liquid,sometimes more

Answer: A

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82. A real gas can be approximated to an idcal gas at

A. Low density

B. High pressure

C. High density

D. Low temperature

Answer: A

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83. One litre of helium gas at a pressure of 76 cm-Hg and temperature $27^{\circ}C$ is heated till its pressure and

volume are doubled. The final temperature attained by the gas is

A. 900°

B. 927°

C. 627°

D. 327°

Answer: B

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84. A copper solid cube of 60 mm side is subjected to a pressure of 2.5×10^7 Pa. If the bulk modulus of copper

is $1.25 \times 10^{11} Nm^{-2}$, the change in the volume of cube is

A. $-43.2m^3$

B. $-43.2mm^3$

C. $-43cm^3$

D. $-432mm^3$

Answer: B

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85. A gas at temperature $27^\circ C$ and pressure 30 atm is allowed to expand to atmospheric pressure. If the

volume becomes 10 times its initial volume, the final temperature becomes

A. $100^\circ c$

B. $373^\circ K$

C. $373^\circ C$

D. $-173^\circ C$

Answer: D

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86. The modulus of elasticity is dimensionally equivalent to

A. Stress

B. Surface tension

C. Strain

D. Coefficient of viscosity

Answer: A

Watch Video Solution

87. If the temperature of a liquid is increased, then its surface tension

A. Decrease

B. Increase

C. Remains the same

D. Increases and then decreases

Answer: A

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88. The variation of density of a solid with temperature is given by the formula

A. $d_2 = \frac{d_1}{1 + \gamma(t_2 - t_1)}$

B. $d_2 = \frac{d_1}{1 - \gamma(t_2 - t_1)}$

C. $d_2 = \frac{d_1}{1 - 2\gamma(t_2 - t_1)}$

D. $d_2 = \frac{d_1}{1 + 2\gamma(t_2 - t_1)}$

Answer: A

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89. A wire whose cross-sectional area is $2mm^2$ is stretched by 0.1 mm by a certain load. If a similar wire of triple. the area of cross-section is stretched by the same load, the elongation of the second wire would be

A. 0.33mm

B. 0.033mm

C. 3.3mm

D. 0.0033mm

Answer: B

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90. The pressure of a gas in a closed vessel is increased by 0.4% when heated by 1° C, the initial temperature of the gas is

A. $23^\circ C$

B. $250^\circ C$

C. $-23^\circ C$

D. 300K

Answer: C

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91. A cube is subjected to a uniform volume.compression, if the side of the cube decreases by 1% the bulk strain is

A. 0.01

B. 0.06

C. 0.02

D. 0.03

Answer: D

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92. A wire stretched by 0.01 m when it is stretched by a certain force. Another wire of the same material but double the length and double the diameter is stretched by the same force. The elongation is

A. 0.005m

B. 0.01m

C. 0.02m

D. 0.04m

Answer: A

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93. If the temperature of a liquid is increased, then its surface tension

A. Increase

B. Decrease

C. Remains unchanged

D. Varies depending upon the nature of the liquid

Answer: B

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94. A diatomic gas molecule has translational, rotational and vibrational degrees of freedom.

The ratio of specific heats $\frac{C_p}{C_v}$ is

A. 1.67

B. 1.4

C. 1.29

D. 1.33

Answer: B

Watch Video Solution

95. One mole of a gas occupies 100 ml at 50 mm pressure. The volume of 2 mole of the gas at 100 mm pressure and same temperature is

A. 50ml

B. 100ml

C. 200ml

D. 500ml

Answer: B

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96. Under the application of force, a steel wire ($Y = 19 \times 10^{10} Nm^{-2}$) of 5 m in length suffers an elongation of 1 mm. The potential energy stored per unit volume in this process, in J/m^3 is

A. 1.9×10^3

B. 9.4×10^3

C. 9.5×10^3

D. 3.8×10^3

Answer: D

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97. Water film of thickness 0.5 mm exists between two flat circular glass plates of diameter 10 cm each. If the surface tension of water is $7 \times 10 Nm^{-1}$, the force in Newton required to pull the plates apart is

A. $1.75\pi \times 10^{-6}$

B. $7\pi \times 10^{-3}$

C. $\frac{7}{\pi} \times 10^{-5}$

D. $\frac{7}{10} \times 10^{-4}$

Answer: B

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98. The extension of a wire by application of a load is 0.3 cm. The extension in a wire of same material, but of double the length and half the radius of cross-section, by the same load will be, in cm

A. 0.3

B. 0.6

C. 1.2

D. 2.4

Answer: D

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99. A quantity of heat Q is supplied to a monoatomic ideal gas which expands at constant pressure. The fraction of heat that goes into work done by the gas is

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{2}{3}$

D. 1

Answer: A

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100. If for a material

Young's modulus = $6.6 \times 10^{10} Nm^{-2}$ and Bulk modulus

$=11 \times 10^{10} Nm^{-2}$, its Poisson's ratio is

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: D

Watch Video Solution

101. A spherical soap bubble of radius 1 cm is formed inside another of radius 3 cm. The radius of a single soap bubble which maintains the same pressure difference as inside the smaller and outside the larger soap bubble is

A. 0.5cm

B. 1.0cm

C. 1.5cm

D. 2.0cm

Answer: C

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102. A plastic tube containing few stones is floating in a tank of water. If the stones are unloaded, the water level

A. Remains same

B. Rises

C. Falls

D. Rises or fall depending on the number of stones unloaded

Answer: C

Watch Video Solution

103. A vessel is filled with an ideal gas at a pressure of 20 atm and is at a temperature of $27 \circ C$. One-half of the mass is removed from the vessel and the temperature of the remaining gas is increased to $87^{\circ} C$ .At this temperature the pressure of the gas will be

A. 10atm

B. 12atm

C. 14atm

D. 8atm

Answer: B

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104. If the work done in stretching a wire by 1 mm is 2 J, the work necessary for stretching another wire of same material but with double radius of cross-section and half the length by 1 mm (in joule) is

A. 16

B. 8

C. 4

D. frac{1}frac{4}

Answer: A

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105. The work done to get n smaller equal size spherical drops from a bigger size spherical drop of water is proportional to

A. $\left(\frac{1}{n^{2/3}} - 1\right)$

B. $\left(1-\frac{1}{n^{1/3}}\right)$

C. $\left(n^{2/3}-1\right)$

D. $\left(n^{\frac{4}{3}}-1\right)$

Answer: B

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106. If surface tension of H,O is 7.3 x 102 Nm^-1. The excess pressure inside spherical drop of radius 1 mm is

A. $146Nm^{-2}$

B. $126Nm^{-2}$

C. $256Nm^{-2}$

D. $746Nm^{-2}$

Answer: A

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107. A car tyre has air at 1.5 atm at 300 K. Ifp increases to 1.75 atm with V remaining same. The temperature will be

A. 150K

B. 350K

C. 250K

D. 376K

Answer: B