CLASS 11 PHYSICS

MOST IMPORTANT NUMERICALS

1. A structural steel rod has a radius of 10 mm and a length of 1 m. A 100 kN force F stretches it along its length. Calculate (a) the stress, (b) elongation, and (c) strain on the rod. Given that the Young's modulus, Y, of the structural steel is $2.0 \times 10^{11} Nm^{-2}$.

   [**Ans.** (a) $3.18 \times 10^{8} Nm^{-2}$ (b) 1.59 m (c) 0.16%]

2. The breaking stress for a metal is $7.8 \times 10^{9} Nm^{-2}$. Calculate the maximum length of the wire made of this metal which may be suspended without breaking. The density of the metal = $7.8 \times 10^{3} kgm^{-3}$. Take $g = 10 Nkg^{-1}$.

   [**Ans.** $10^{5} m$]

3. Find the stress to be applied to a steel wire to stretch it by 0.025% of its original length. Y for steel is 9×10^{9} Nm^{-2}.

   [**Ans.** 2.25×10^{9} Nm^{-2}]

4. Two wires are made of the same material are subjected to forces in the ratio 1:4. Their lengths are in the ratio 8:1 and diameter in the ratio 2:1. Find the ratio of their extensions.

   [**Ans.** 1:2]

5. The average depth of indian ocean is about 3000 m. Calculate the fractional compression $\frac{\Delta V}{V}$, of water at the bottom of the ocean, given that the bulk modulus of water is $2.2 \times 10^{9} Nm^{-2}$.

   [**Ans.** 1.36 %]

6. A solid cube is subjected to a pressure of $5 \times 10^{5} Nm^{-2}$. Each side is shortened by 1%. Find volumetric strain and bulk modulus of elasticity of the cube.

   [**Ans.** $-0.03, 1.67 \times 10^{7} Nm^{-2}$]

7. Calculate the increase in energy of a brass bar of length 0.2 m and cross sectional area $1 cm^{2}$ when compressed with a load of 5 kg along its length. Y = $1.0 \times 10^{11} Nm^{-2}$.

   [**Ans.** $2.4 \times 10^{-5} J$]

8. The two thigh bones, each of cross sectional area 10 cm^2 support the upper part of a human body of mass 40 kg. Estimate the average pressure sustained by the femurs.

[**Ans.** $2 \times 10^5 J$]

9. In a car lift compressed air exerts a force F1 on a small piston having a radius of 5 cm. The pressure is transmitted to a second piston of radius 15 cm. If the mass of the car to be lifted is 1350 kg, what is F1? What is the pressure necessary to accomplish this task?

[**Ans.** F1 = 1500N, $1.9 \times 10^5 Pa$]

10. In a hydraulic press used for compressing cotton, the area of the piston is 0.1 m^2 and the force exerted along the piston rod is 200 N. If the area of the larger cylinder is $0.8 m^2$, find the pressure produced in the cylinder and the total crushing force exerted on the bale of cotton?

[**Ans.** 2000 Nm^{-2}, 1600 N]

11. What is the pressure on a swimmer 10 m below the surface of a lake?

[**Ans.** 2 atm]

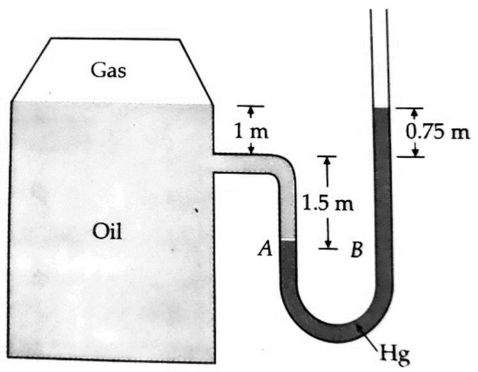
12. The density of the atmosphere at sea level is 1.29 kgm^{-3}. Assume that it does not change with altitude. Then how high would the atmosphere extend?

[**Ans.** 8 km]

13. At a depth of 1000 m in an ocean (a) what is the absolute pressure? (b) What is the gauge pressure? (c) Find the force acting on the window of area 20 cm x 20 cm of a submarine at this depth, the interior of which is maintained at sea-level atmosphere pressure. (The density of a sea water is $1.03 \times 10^3 kgm^{-3}$)

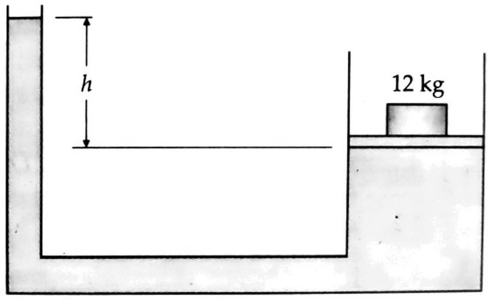
[**Ans.** 104 atm, 103 atm, $4.12 \times 10^5 N$]

14. What is the absolute and gauge pressure of the gas above the liquid surface in the tank shown in fig. Density of oil = 820 kgm^{-3}, density of mercury = 13.6 x 10^3 kgm^{-3}.



[**Ans.** gauge pressure = 2.8 x 10^5 Pa, absolute pressure = 3.81 x 10^5 Pa]

15. The area of cross section of the wider tube shown in fig. is 800 cm^2. If the mass of 12 kg is placed on the massless piston, what is the difference h in the level of water in the two tubes?

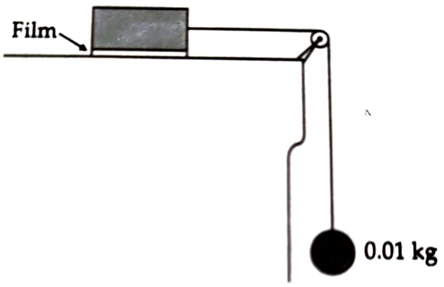


16.

[**Ans.** 15 cm]

A barometer kept in an elevator accelerating upwards reads 76 cm of Hg. If the elevator is accelerating upwards at 4.9 ms^{-2}, what will be the air pressure in the elevator? [114 cm of hg]

17. A square metal plate of 10 cm side moves parallel to another plate with a velocity of 10 cm/s, both plates immersed in water. If the viscous force is 200 dyne and viscosity of water is 0.01 poise, what is their distance apart?



[**Ans.** 0.05 cm]

18. A metal plate of area 0.10m^2 is connected to a 0.01 kg mass via a string that passes over an ideal pulley (considered massless and frictionless), as shown. A liquid film of thickness of 0.3 mm is placed between the plate and table. When released the plate moves to the right with a constant speed of 0.085 m/s. Find the coefficient of viscosity of the liquid.

[**Ans.** $3.45 \times 10^{-3} \text{Pa}$]

19. A rain drop of radius 0.3 mm falls through air with a terminal velocity of 1 m/s. The viscosity of air is 18×10^{-5} poise. Find the viscous force on the rain drop.

[**Ans.** 1.018 dyne]

20. An iron ball of radius 0.3 cm falls through a column of oil of density 0.094 gcm^{-3}. It is found to attain a terminal velocity of 0.5 cm/s. Determine the viscosity of the oil. Given that density of iron is 7.8 gcm^{-3}.

[**Ans.** 268.9 poise]

21. Eight rain drops of radius 1 mm each falling down with terminal velocity of 5 cm/s coalesce to form a bigger drop. Find the terminal velocity of the bigger drop.

[**Ans.** 20 cm/s]

22. A sphere is dropped under gravity through a fluid of viscosity η. Taking the average acceleration as half of the initial acceleration, show that the time taken to attain the terminal velocity is independent of the fluid density.

23. Water flows at a speed of 6 cm/s through a pipe of radius 1 cm. coefficient of viscosity of water at room temperature is 0.01 poise. What is the nature of flow?

[**Ans.** 1200 < 2000, so slow is laminar]

24. The flow rate of water from a tap of diameter 1.25 cm is 0.48 L/min. The coefficient of viscosity of water is 10^{-3}Pas. After some time the rate flow is increased to 3 L/min. Characteristise the flow for both the flow rates.

[**Ans.** 815 steady, 5096 turbulent]

25. Water flows through a horizontal pipe whose internal diameter is 2.0 cm, at a speed of 1.0 m/s. What should be the diameter of the nozzle, if the water is to emerge at a speed of 4.0 m/s?

[**Ans.** 1 cm]

26. The reading of pressure meter attached with a closed pipe is 3.5×10^{5} Nm^{-2}. ON opening the valve of the pipe, the reading of the pressure meter is reduced to 3.0×10^{5} Nm^{-2}. Calculate the speed of the water flowing in the pipe.

[**Ans.** 10 m/s]

27. The cross sectional area of water pipe entering the basement is 4.0×10^{-4} m^{-2}. The pressure at this point is 3.0×10^{5} Nm^{-2} and the speed of water is 2 m/s. This pipe tapers to a cross sectional area of 2.0×10^{-4} Nm^{-2} when it reaches the floor 8 m above. Calculate the speed and pressure at second floor.

[**Ans.** 4 m/s, 21500 Pa]

28. The flow of blood in a large artery of an anesthetized dog is diverted through a venturimeter. The wiser part of the meter has a cross sectional area equal to that

of the artery, A = 8 mm^2. The narrower part has an area a = 4 mm^2. The pressure drop in the artery is 24 Pa. What is the speed of the blood in the artery?

[**Ans.** 0.125 m/s]

29. A wire of ring of radius 3 cm is rested on the surface of a liquid and then raised. The pull required is 3.03 g more before the film breaks than it is afterwards. Find the surface tension of the liquid.

[78.84 dyne/cm]

30. Calculate the work done in blowing a soap bubble from a radius of 2 cm to 3 cm. The surface tension of the soap is 30 dyne/cm.

[**Ans.** 3770.4 erg]

31. A liquid drop of diameter 4 mm breaks into 1000 drops of equal size. Calculate the resultant change in surface energy, the surface tension of the liquid is 0.07 N/m.

[**Ans.** 3168×10^{-8} J]

32. What should be the pressure inside a small air bubble of 0.1 mm radius, situated just below the surface? Surface tension of the water = $7.2 \times 10^{-2} Nm^{-1}$.

[**Ans.** $1.027 \times 10^{5} Nm^{-1}$]

33. Two soap bubbles have radii in the ratio 2:3. Compare the excess of pressure inside these bubbles. Also compare the work done in blowing these bubbles.

[**Ans.** 3:2, 4:9]

34. The lower end of a capillary tube of diameter 2.00 mm is dipped 8.00 cm below the surface of water in a beaker. What is the pressure required in the tube in order to blow a hemispherical bubble at its end in water? Also, calculate the access pressure. Given the surface tension of water is $7.30 \times 10^{-2} Nm^{-1}$.

[**Ans.** 146 Pa, 10^3 Pa]

35. A liquid rises to a height of 7.0 cm in a capillary tube of radius 0.1 mm. The density of the liquid is $0.8 \times 10^{3} kgm^{-3}$. If the angle of contact between the liquid and the surface of the tube be zero, calculate the surface tension of the liquid.

[**Ans.** $2.8 \times 10^{-2} Nm^{-1}$]

36. Water rises in a capillary tube to a height of 2.0 cm. In another capillary whose radius is one third of it, how much the water will rise? If the first capillary is inclined at an angle of 60° with the vertical, then what will be the position of water in the tube?

[**Ans.** 6 cm, 4 cm]

37. At what temperature, do the readings of Celsius and Fahrenheit scales coincide?

[**Ans.** -40°]

38. A platinum wire has a resistance of 10Ω at $0^\circ C$ and 20Ω at $273^\circ C$. Find the value of coefficient of resistance

[**Ans.** $\frac{1}{273}\,^\circ C^{-1}$]

39. A thermometer has wrong calibration. It reads the melting point of ice $-10^\circ C$. It reads $60^\circ C$ in place of $50^\circ C$. Calculate the temperature of boiling point of water on this scale.

[**Ans.** 130°]

40. Show that the coefficient of area expansion of a rectangular sheet of the solid is twice its coefficient of linear expansion.

41. A blacksmith fixes iron ring on the rim of the wooden wheel of a bullock cart. The diameters of the rim and the iron ring are 5.243 m and 5.231 m respectively at $27^\circ C$. To what temperature should the ring be heated so as to fit the rim of the wheel?

[**Ans.** $218^\circ C$]

42. A sphere of aluminium of 0.047 kg is placed for sufficient time in a vessel containing boiling water, so that the sphere is at $100^\circ C$. It is then immediately transferred to 0.14 kg copper calorimeter containing 0.25 kg of water at 20°C. The temperature of water rises and attains a steady state at 23°C. Calculate the specific heat capacity of aluminium. Given c for Cu is 0.38 x 10^3 $Jkg^{-1}K^{-1}$.

[**Ans.** 0.911 $kJkg^{-1}K^{-1}$]

43. Calculate the hear required to convert 3 kg of ice at $-12^\circ C$ kept in a calorimeter to steam at $100^\circ C$ at atmospheric pressure.

Given

Specific heat of ice = 2100 $Jkg^{-1}K^{-1}$

Specific heat capacity of water = 4186 $Jkg^{-1}K^{-1}$

Latent heat of fusion of ice = $3.35\times10^5 Jkg^{-1}$

Latent heat of steam = $2.256\times10^6 Jkg^{-1}$

[**Ans.** $9.1\times10^6 J$]

44. Calculate the rate of loss of heat through a glass window of area 1000 cm^2 and thickness 0.4 cm when temperature inside is $37^\circ C$ and outside $-5^\circ C$.

[**Ans.** 231 cal/s]

45. An ideal monoatomic gas is taken round the cycle ABCDA, where coordinates of A, B, C, D on P-V diagram are A(p,V), B(2p, V), C(2p, V) and D(p, 2V). Calculate the work done during the cycle.

[**Ans.** pV]

46. The volume of steam produced by 1 g of water at 100°C is 1650 cm^3. Calculate the change in internal energy during the change of state. Given $J = 4.2 \times 10^7 \text{ erg cal}^{-1}$, latent heat of steam = 540 cal g^{-1}.

[**Ans.** $2.1 \times 10^{10} \text{erg}$]

47. An ideal gas has a specific heat at a constant pressure, $C_p = (5/2)R$. The gas is kept in a closed vessel of volume 0.0083 m^3 at a temperature of 300 K and a pressure of $1.6 \times 10^6 \text{Pa}$. An amount of $2.49 \times 10^4 \text{J}$ of heat energy is supplied to the gas. Calculate the final temperature and pressure of the gas.

[**Ans.** 375 K, $3.6 \times 10^6 \text{Pa}$]

48. A tyre is pumped to a pressure of 3.375 atmosphere and at 27°C suddenly bursts. Calculate temperature of the escaping air. Given $\gamma = 1.5$.

[**Ans.** $-73°\text{C}$]

49. Calculate fall in temperature of helium initially at 15°C, when it is suddenly expended to 8 times its volume. $\gamma = 5/3$

[**Ans.** 216 K]

50. Three moles of an ideal gas kept at a constant temperature of 300 K are compressed from a volume of 4 litre to 1 litre. Calculate the work done in the process.

[**Ans.** $-1.037 \times 10^4 \text{J}$]

51. A sample of gas having gamma = 1.5 is compressed adiabatically from a volume of 1600 cm^3 to 400 cm^3. If the initial pressure is 150 kPa, what is the final pressure and how much work is done on the gas in the process?

[**Ans.** 1200 kPa, - 480 J]

52. A Carnot engine takes $3 \times 10^6 \text{cal}$ of heat from a reservoir at $627°\text{C}$ and gives it to a sink at $27°\text{C}$. Find the work done by the engine.

[**Ans.** $8.4 \times 10^6 \text{J}$]

53. The efficiency of a Carnot cycle is 1/6. If on reducing the temperature of the sink by 65°C, the efficiency becomes 1/3, find the initial and final temperatures between which the cycle is working.

[**Ans.** $117^\circ C$ and $52^\circ C$]

54. A reversible engine converts one fifth of heat which it absorbs from source into work. When the temperature of the sink is reduced by 70°C, its efficiency is doubled. Calculate the temperature of source and sink.

[**Ans.** 350 K, 280 K]

55. Five moles of an ideal gas are taken in a Carnot engine working between 100°C and 30°C. The useful work done in one cycle is 420 J. Calculate the ratio of the volume of the gas at the end and beginning of the isothermal expansion.

[$\frac{V_2}{V_1} = 1.153$]

56. In a refrigerator, heat from inside at 277 K is transferred to a room at 300 K. How many joules of heat shall be delivered to the room for each joule of electrical energy consumed ideally?

[**Ans.** 13 J]

57. Ice in a cold storage melts at the rate of 2 kg per hour when the external temperature is 20°C. Find the minimum power output of the motor used to drive the refrigerator which just prevents the ice from melting. Latent heat of ice = 80 cal/g, J = 4.2 J/cal.

[**Ans.** 13.67 W]

58. Refrigerator A works between $-10^\circ C$ and $27^\circ C$, while refrigerator B works between $-27^\circ C$ and $17^\circ C$ both removing heat equal to 2000 J from the freezer. Which of the two is the better refrigerator?

[**Ans.** A]

59. A vessel containing two non-reacting gases: neon (monoatomic) and oxygen (diatomic). The ratio of their partial pressures is 3:2. Estimate the ratio of (i) number of molecules and (ii) mass density of neon and oxygen in the vessel. Atomic mass of Neon = 20.2, Molecular mass of O_2 = 32.0

[**Ans.** 1.5, 0.947]

60. Calculate the kinetic energy of one mole of Argon at 127°C.

[**Ans.** 4988.2 J]

61. A vessel A contains hydrogen and another vessel B whose volume is twice of A contains same mass of oxygen at the same temperature. Compare (i) average kinetic energies of hydrogen and oxygen molecules (ii) root mean square speeds of the molecules and (iii) pressure of gases in A and B. Molecular weights of hydrogen and oxygen are 2 and 32 respectively.
[**Ans.** (i) 1:1, (ii) 4:1 (iii) 32:1]

62. Four molecules of gas have speeds 2, 4, 6 and 8 km/s respectively. Calculate their average speed and rms speed.
[**Ans.** 5 m/s, 5.48 m/s]

63. Calculate the rms velocity of oxygen molecules at S.T.P. The molecular weight of oxygen is 32.
[**Ans.** 461.23 m/s]

64. Calculate the total number of degrees of freedom possessed by the molecules in 1 cm3 of H2 gas at N.T.P.
[**Ans.** 1.34375×10^{20}]

65. A cylinder of fixed capacity 44.8 litres contains helium gas at standard pressure and temperature. What is the amount of heat needed to raise the temperature of the gas by 15^{o}C?
[**Ans.** 373.95 J]

66. A simple harmonic motion is represented by
$$x = 10\sin(20t + 0.5)$$
Write down the amplitude, angular frequency, frequency, time period and initial phase, if the displacement is measured in m and time in s.
[**Ans.** 10 m, 20 rad/s, 3.18 Hz, 0.314 s, 0.5 rad]

67. A particle executes SHM with a time period of 2 s and amplitude 5 cm. Find (i) displacement (ii) velocity and (iii) acceleration, after 1/3 second; starting from the mean position.
[**Ans.** 4.33 cm, 7.85 cm/s, 42.77 cm/s]

68. A body oscillates with SHM according to the equation,
$$x = (5.0\text{m})\cos[(2\pi \text{rads}^{-1})t + \frac{\pi}{4}]$$
At t = 1.5 s, calculate (a) displacement, (b) speed and (c) acceleration of the body.
[**Ans.** -3.535 m, 22.22 m/s, 139.56 m/s]

69. A particle executes SHM of amplitude 25 cm and time period 3 s. What is the minimum time required for the particle to move between two points 12.5 cm on either side of the mean position?

[**Ans.** 0.5 s]

70. The shortest distance travelled by a particle executing SHM from mean position in 2 s is equal to $\frac{\sqrt{3}}{2}$ times its amplitude. Determine its time period.

[**Ans.** 12 s]

71. A particle executing SHM along a straight line has a velocity of 4 m/s when at a distance 3 m from the mean position and 3 m/s when at a distance of 4 m from it. Find the time it takes to travel 2.5 m from the positive extremity of its oscillation.

[**Ans.** 1.047 s]

72. A particle executing linear SHM has a maximum velocity of 40 cm/s and a maximum acceleration of 50 cm/s. Find its amplitude and the period of oscillation.

[**Ans.** 32 cm, 5.03 s]

73. A body executes SHM of time period 8 s. If its mass be 0.1 kg, its velocity 1 second after it passes through its mean position be 4 m/s, find its (i) kinetic energy (ii) potential energy (iii) total energy

[**Ans.** 1.6 J, 0.8 J, 0.8 J]

74. At a time when displacement is half the amplitude, what fraction of the total energy (E) is kinetic and what fraction is potential?

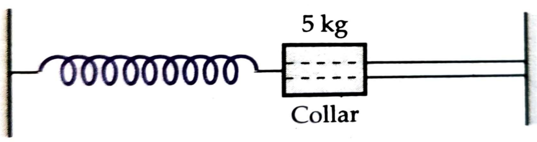
[**Ans.** (3/4)E, (1/4)E]

75. A particle is executing SHM of amplitude A. At what displacement from the mean position, is the energy half kinetic and half potential?

[**Ans.** $\pm\frac{A}{\sqrt{2}}$]

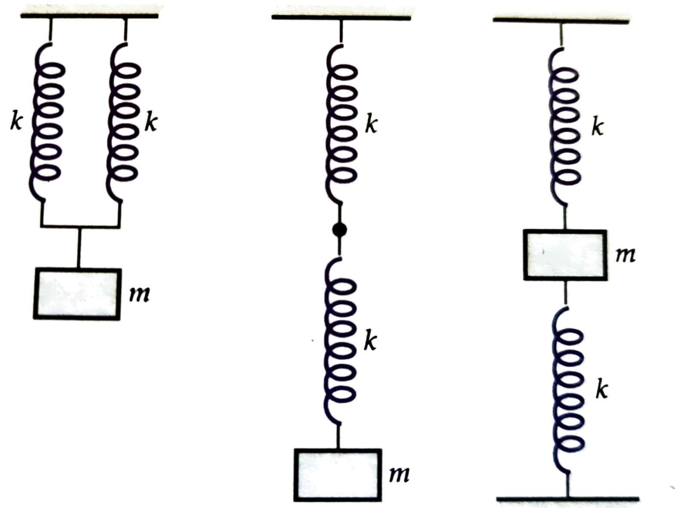
76. A 5 kg collar is attached to a spring of force constant 500 N/m. It slides without friction on a horizontal rod as shown. The collar is displaced from its equilibrium position by 10 cm and then released. Calculate

   a. The period of oscillation
   b. Maximum speed
   c. Maximum acceleration of collar.



[**Ans.** 0.628 s, 1.0 m/s, 10 m/s^2]

77. Two identical springs, each of spring factor k, may be connected in the following ways. Deduce the spring factor of the oscillation of the body in each case:



[**Ans.** 2k, k/2, 2k]

78. A steel wire 0.72 m long has a mass of 5.0×10^{-3} kg. If the wire is under a tension of 60 N, what is the speed of transverse waves on the wire?

[**Ans.** 93 m/s]

79. Estimate the speed of sound in air at standard temperature and pressure by using (i) Newton's formula and (ii) Laplace formula. The mass of one mole of air is 29×10^{-3} kg, for air $\gamma = 1.4$.

[**Ans.** 280 m/s, 331.5 m/s]

80. At what temperature will the speed of sound be double its value at 273 K?

[**Ans.** 1092 K]

81. Find the temperature at which sound travels in hydrogen with the same velocity as in oxygen at $1000^\circ C$. Density of oxygen is 16 times that of hydrogen.

[**Ans.** $-193.44^\circ C$]

82. Find the ratio of velocity of sound in hydrogen gas $(\gamma = 7/5)$ to tthat in helium gas $(\gamma = 5/3)$ at the same temperature. Given that molecular weights of hydrogen and helium is 2 and 4 respectively.

[**Ans.** 1.68]

83. The displacement y of a particle in a medium can be expressed as

$y = 10^{-6} \sin\left(100t + 20x + \frac{\pi}{4}\right)$. What is the speed of the wave?

[**Ans.** 5 m/s]

84. A wave travelling along a string is described by

$y(x,t) = 0.005 \sin(80.0x - 3.0t)$ in which the numerical constants are in SI units.

Calculate (i) amplitude (ii) wavelength (iii) time period and frequency. Also calculate the displacement y of the wave at a distance x = 30.0 cm and time t = 20 s.

[**Ans.** 0.005 m, 7.85 cm, 2.09 s, 045 Hz, zero]

85. The speed of wave in a stretched string is 20 m/s and its frequency is 50 Hz. Calculate the phase difference in radian between two points situated at a distance of 10 cm on the string.

[**Ans.** $\frac{\pi}{2}$]

86. A stretched wire emits a fundamental note of 256 Hz. Keeping the stretching force constant and reducing the length of wire by 10 cm, the frequency becomes 320 Hz. Calculate the original length of wire the wire.

[**Ans.** 50 cm]

87. The length of a wire between two ends of a sonometer is 105 cm. Where should be the two bridges be placed so that the fundamental frequencies of the three segments are in the ratio 1:3:15?

[**Ans.** 75 cm and 100 cm]

88. The fundamental frequency of a sonometer wire increases by 5 Hz if its tension is increased by 21%. How will the frequency be affected if its length is increased by 10%?

[**Ans.** 45.45 Hz]

89. A pipe 30 cm long is open at both ends. Which harmonic mode of pipe is resonantly excited by a 1.1 kHz source? Will resonance with the same source be observed if one end of the pipe is closed? Take the speed of sound in air as 330 m/s.

[**Ans.** No resonance will be observed]

90. Find the frequencies of the fundamental note and the first overtone in an open air column of length 34 cm. The velocity of sound at room temperature is 340 m/s.

[**Ans.** 500 Hz, 1000 Hz, 250 Hz, 750 Hz]

91. The fundamental frequency of a closed organ pipe is equal to the first overtone of an open organ pipe. If the length of the open organ pipe is 60 cm, what is the length of the closed pipe?
[**Ans.** 15 cm]

92. A tuning fork of frequency 341 Hz is vibrated just over a tube of length 1 m. Water is being poured gradually in the tube. What height of water column will be required for resonance? The speed of sound in air is 341 m/s.
[**Ans.** 25 cm, 75 cm]

93. The points of the prong of a tuning fork B originally in unison with a tuning fork A of frequency 384 Hz are filed and the fork produces 3 beats per second, when sounded together with A. What is the pitch of B after filing?
[**Ans.** 387 Hz]

94. A tuning fork arrangement produces 4 beats/s with one fork of frequency 288 cps. A little wax is placed on the unknown fork and it then produces 2 beats/s. What is the frequency of the unknown fork?

95. [**Ans.** 292 cps]

96. A source and an observer are approaching one another with a relative velocity 40 m/s. If the true source frequency is 1200 Hz, deduce the observed frequency under the following conditions:
   a. All velocity is in the source alone
   b. All velocity is in the observer alone
   c. The source moves in air at 100 m/s towards the observer, but the observer also moves with the velocity v_o in the same direction.

[**Ans.** a. 1360 Hz, b. 1341 Hz, c. 1400 Hz]

97. A railway engine and a car are moving on parallel tracks in opposite directions with speed of 144 km/h and 72 km/h. The engine is continuously sounding a whistle of frequency 500 Hz. The velocity of sound is 340 m/s. Calculate the frequency of sound heard in the car when
   a. The car and the engine are approaching each other,
   b. The two are moving away from each other.

[**Ans.** 600 Hz, 421 Hz]

98. A policeman blows a whistle with a frequency of 500 Hz. A car approaches him with a velocity of 15 m/s. Calculate the change in frequency as heard by the driver of the car as he passes the policeman. Speed of sound in air is 300 m/s.
[**Ans.** 50 Hz]