Exercises

Sound and Heat

Sound

Q. 1 Do the prongs and stem of a tuning fork execute same type of vibrations?

Q.2 Is the frequency of these vibrations different?

Q.3 What about the amplitude of two kinds of vibrations?

Q.4 How does the frequency of tuning fork vary with increase of length of prong?

Q.5 Suppose you have been given two tuning forks of the same metal on which, marks of the frequency have disappeared. How will you detect the one with higher frequency?

Q.6 If the prong of the fork are rubbed with a file slightly, will it affect the frequency?

Q.7 If a prong of the tuning fork is loaded with wax, will its frequency change?

Q.8 Why are the forks made of some standard frequencies like 256, 288, 320, 341.5, 384, 426.6, 484, 512, Hz etc.?

Q.9 What is the significance of the letters of English alphabet engraved on the running forks?

Q.10 What do you mean by a note? How does it differ from a tone?

Q.11 The vibrations of a fork stop when its prongs are touched but they do not stop if the stem is touched. Why?

Q.12 Why a tuning fork has two prongs?

Q.13 Why should a tuning fork not be struck with a great force?

Q.14 Why do both the prongs vibrate when we strike only one?

Q.15 Can sound also travel in vacuum?

Q.16 In which medium is the velocity of sound higher, in oxygen or hydrogen?

Q.17 Which particular column in your apparatus, do you call resonance column?

Q.18 What is the role of water in this apparatus?

Q.19 Why do you use water; can't you use mercury instead of water?

Q.20 What types of waves are there in air above water in this resonance column?

Q.21 How are these waves produced?

Q.22 How do you get the position of first resonance?

Q.23 Where are the nodes and antinodes situated?

Q.24 Is antinode situated exactly at the open end?

Q.25 How can you get wavelength of sound by this first resonating length?

Q.26 Can we use a resonance tube of square cross-section for the experiment?

Q.27 Why do we use a long tube?

Q.28 How do you keep the vibrating tuning fork near the open end of the tube?

Q.29 What do you mean by second resonance?

Q.30 Why is the second resonance found feebler than the first?

Q.31 Where are the nodes and antinodes in this case?

Q.32 What will be the wavelength of sound in this case?

Q.33 Can't you eliminate this end correction?

Q.34 Can you also determine the velocity of sound by this method?

Q.35 If n is the frequency of the tuning fork used to excite the air column in resonating air column apparatus l_1 first resonating length and l_2 second resonating length, then the velocity of sound in air is given by the formula

(A) $v = n(l_2 - l_1)$ (B) $v = n(l_1 - l_2)$

(c) $v = 2n(l_2 - l_1)$ (d) $v = 2n(l_1 - l_2)$

Q.36 In resonating air column apparatus while comparing the frequencies of the two tuning forks, if

l_1 Is the 1st resonating length of air column with 1st fork of frequency n_1

l_2 is the 2nd resonating length of air column with 1st fork of frequency n_2

l_1' is the 1st resonating length of air column with 2nd fork of frequency n_2

l_2' is the 2nd resonating length of air column with 2nd fork of frequency n_2

Then:

(A) $\frac{n_1}{n_2} = \frac{l_2 - l_1}{l_2' - l_1'}$ (B) $\frac{n_1}{n_2} = \frac{l_2' - l_2}{l_1' - l_1}$

(C) $\frac{n_1}{n_2} = \frac{l_1' - l_1}{l_2' - l_2}$ (D) $\frac{n_1}{n_2} = \frac{l_2' - l_1'}{l_2 - l_1}$

Q.37 The end correction (e) is (l_1 = length of air column at first resonance and l_2 is length of air column at second resonance)

(A) $e = \frac{l_2 - 3l_1}{2}$ (B) $e = \frac{l_1 - 3l_2}{2}$

(C) $e = \frac{l_2 - 2l_1}{2}$ (D) $e = \frac{l_1 - 3l_2}{2}$

Q.38 In the resonating air column experiment, l_1 represents 1st resonating length and l_2 represents 1 2nd resonating length, the relation between 1st and 2nd resonating length is

(A) $l_2 = l_1$ (B) $l_2 = 2l_1$

(C) $l_2 = 3l_1$ (D) $l_2 = 4l_1$

Q.39 In resonating air column apparatus the approximate relation between end correction and diameter of the tube is

(A) 0.3d (B) 0.15d (C) 0.6d (D) 0.4d

Q.40 In resonance column apparatus the reason for hearing booming sound is because

(A) The air column in the tube and the tuning fork vibrate with the same frequency

(B) The air column in the tube vibrates with frequency which is greater than the frequency of the tuning fork

(C) The air column in the tube vibrates with frequency which is less than the frequency of the tuning fork.

(D) Velocity of sound in air column is greater than the velocity of sound in atmosphere air

Q.41 The resonating lengths of an air column in the first and second modes of vibration are 37 cm and 97 cm. If velocity of sound is $300\,ms^{-1}$ the frequency of the tuning fork is

(A) 1000 Hz (B) 500 Hz

(C) 250 Hz (D) 125 Hz

Q.42 The end correction of a resonance tube is 1cm. If shortest resonating length is 15cm, the next resonating length will be

(A) 47 cm (B) 45 cm (C) 50 cm (D) 33 cm

Q.43 A tuning fork of frequency 340Hz is excited and held above a cylindrical tube of length 120cm. It is slowly filled with water. The minimum height of water column required for resonance to be first heard (Velocity of sound=$340\,ms^{-1}$) is

(A) 25 cm (B) 75 cm (C) 45 cm (D) 105 cm

Q.44 Two unknown frequency tuning forks are used in resonance column apparatus. When only first tuning fork is excited the 1st and 2nd resonating lengths noted are 10cm and 30cm respectively. When only second tuning fork is excited the 1st and 2nd resonating lengths

noted are 30 cm and 90 cm respectively. The ratio of the frequency of the 1st to 2nd tuning fork is

(A) 1:3 (B) 1:2 (C) 3:1 (D) 2:1

Q.45 In a resonance tube, the first resonance is obtained when the level of water in the tube is at 16 cm from the open end. Neglecting end correction, the next resonance will be obtained when the level of water from the open end is

(A) 24 cm (B) 32 cm (C) 48 cm (D) 64 cm

Heat

Q.46 Is specific heat of a substance is a constant quantity?

Q.47 What is meant by thermal capacity of a body?

Q.48 What ate the units of water equivalent and thermal capacity of a body?

Q.49 Why do we use generally a calorimeter made of copper?

Q.50 In an experiment to determine the specific heat of aluminum, piece of aluminum weighing 500g is heated to 100° C. It is then quickly transferred into a copper calorimeter of mass 500g containing 300g of water 30° C. The final temperature of the mixture is found to be 46.8° C. If specific heat of copper 0.093 cal $g^{-1^\circ} C^{-1}$, then the specific heat of aluminium is

(A) 0.11 cal $g^{-1}\,{}^oC^{-1}$ (B) 0.22 cal $g^{-1}\,{}^oC^{-1}$

(C) 0.33 cal $g^{-1}\,{}^oC^{-1}$ (D) 0.44 cal $g^{-1}\,{}^oC^{-1}$

Q.51 The mass of a copper calorimeter is 40g and its specific heat in SI units is 4.2×10^2 J $kg^{-1^\circ} C^{-1}$. The thermal capacity is

(A) 4 J $^oC^{-1}$ (B) 18.6 J

(C) 16.8 J/KG (D) 16.8 J $^oC^{-1}$

Q.52 When 0.2 kg of brass at 100°C is dropped into 0.5 kg of water at 20°C, the resulting temperature 23°C. The specific heat of brass is

(A) 0.41 10^3 J $kg^{-1}\,{}^oC^{-1}$ (B) 0.41 10^2 J $kg^{-1}\,{}^oC^{-1}$

(C) 0.41 10^4 J $kg^{-1}\,{}^oC^{-1}$ (D) 0.41 J $kg^{-1}\,{}^oC^{-1}$

Q.53 In an experiment to determine the specific heat of a metal, a 0.20kg block of the metal at 105°C is dropped in a copper calorimeter (of water equivalent 0.025kg) containing 150cm^3 of water at 27°C. The final temperature is 40°C. The specific heat of the metal is

(A) 0.1 $Jg^{-1}\,{}^oC^{-1}$ (B) 0.2 $Jg^{-1}\,{}^oC^{-1}$

(C) 0.3 $calg^{-1}\,{}^oC^{-1}$ (D) 0.1 $calg^{-1}\,{}^oC^{-1}$

Q.54 Is newton's law of cooling true for all differences of temperature between the body losing heat and that of its surroundings?

Q.55 How do you express this law mathematically?

Q.56 What is the shape of the graph of log $\left(\theta - \theta_0\right)$ versus t?

Electricity and Magnetism

Q.1 What is the alternative term used for Metre Bridge?

Q.2 Name the principal on which Metre Bridge is based.

Q.3 When is the Wheatstone's bridge said to be most sensitive?

Q.4 Why is the metre bridge suitable for resistances of moderate values only?

Q.5 For determination of resistance of a coil, which of two methods is better Ohm's Law method or metre bridge method?

Q.6 Why should the battery key be pressed before the galvanometer key?

Q.7 Sometimes it is advisable to shunt the galvanometer while trying for a balance point. Why?

Q.8 What is the material of the wire of metre bridge?

Q.9 Why is constant an used for the bridge wire?

Q.10 Can we measure a resistance of the order of 0.160 Ω using a Whaeatstone's bridge? Support your answer with reasoning?

Q.11 In a Wheatstone bridge, three resistances P, Q and r connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in

parallel. The condition for the bridge to be balanced will be

(A) $\frac{P}{Q}=\frac{R(S_1+S_2)}{2S_1S_2}$ (B) $\frac{P}{Q}=\frac{R}{S_1+S_2}$

(C) $\frac{P}{Q}=\frac{2R}{S_1+S_2}$ (D) $\frac{P}{Q}=\frac{R(S_1+S_2)}{S_1S_2}$

Q.12 A square aluminium rod is 1m long and 5 mm on edge. What must be the radius of another aluminium rod whose length is 1m and which has the same resistance as the previous rod?

(A) 5.0 mm (B) 4.2 mm

(C) 2.8 mm (D) 1.4 mm

Q.13 The specific resistance and cross-section area of potentiometer wire is ρ and A respectively. If a current I is passed through the wire, the potential gradient of the wire will be

(A) $\frac{I\rho}{A}$ (B) $\frac{I}{\rho A}$ (C) $\frac{IA}{\rho}$ (D) $IA\rho$

Q.14 The resistance in the left and right gaps of a balanced metre bridge are R_1 and R_2. The balanced point is 50cm. If a resistance of 24Ω is connected in parallel to R_2, the balance point is 70cm. The value of R_1 or R_2 is

(A) 2Ω (B) 8Ω (C) 8Ω (D) 32Ω

Q.15 An unknown resistance R_1 is connected in series with a resistance of 10ohm. This combination os connected to one gap of a metre bridge, while other gap is connected to another resistance R_2 The balance point is at 50cm. Now, when the 10ohm resistance is removed, the balance point shifts to 40cm. Then, the value of R_1 is

(A) 60Ω (B) 40Ω (C) 20Ω (D) 10Ω

Q.16 Two resistances are connected in the two gaps of a metre bridge. The balance point is 20cm from the zero end. When a resistance 15Ω is connected in series with the smaller of two resistances, the null point shifts to 40cm. The smaller of the two resistances has the value.

(A) 8Ω (B) 9Ω (C) 10Ω (D) 12Ω

Q.17 In a metre bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X<Y, then the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y will be at

(A) 50 cm (B) 80 cm (C) 40 cm (D) 70 cm

Q.18 The specific resistance of a wire

(A) Varies with its length

(B) Varies with its cross-section

(C) Varies with its mass

(D) Does not depend on its length, cross-section and mass

Q.19 What do you mean by potential gradient?

Q.20 What do you mean by the sensitivity of potentiometer?

Q.21 How can it be increased?

Q.22 How can it be achieved?

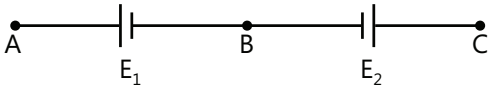
Q.23 On what factors internal resistance of a cell depends?

Q.24 In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35 cm length of the wire. If the cell is replaced by another cell, the balance point shifts to 63 cm, then emf of the second cell is:

(A) 4.25 V (B) 2.25 V

(C) 3.25 V (D) 1.25 V

Q.25 Two cells of emf E_1 and E_2 $(E_1>E_2)$ are connected as shown in figure. When a potentiometer connected between A and B, the balancing length is 100cm. The ratio E_1 and E_2 is



(A) 3:2 (B) 4:3 (C) 5:4 (D) 2:1

Q.26 In the experiment of half deflection method the resistance R should be

(A) >S (B) $\approx$ S (C) <S (D) $\approx$ G

Q.27 In the experiment of half deflection method if R= 20Ω and S= 12Ω for half deflection then the F (galvanometer resistance) is

(A) 20Ω (B) 30Ω (C) 40Ω (D) 25Ω

Q.28 Figure of merit of a galvanometer is 0.5 A per division. If the galvanometer has total 10 divisions then the current required for full deflection in one side is

(A) 5.0 A (B) 2.0A (C) 2.5 A (D) 3.0 A

Q.29 In an experiment to determine the figure of merit of a galvanometer the circuit shown is used. If E be the emf of the battery, R is the series resistance, G is the resistance of the galvanometer and θ is the deflection, then the figure of merit of galvanometer is

(A) $\frac{E}{(R-G)\theta}$ (B) $\frac{E}{(R+G)\theta}$

(C) $\frac{EG}{R\theta}$ (D) $\frac{E\theta}{R+G}$

Q.30 In half deflection method, a high resistance box is connected in series with the battery so that

(A) The deflection of the galvanometer is brought within the scale

(B) Power losses are minimized

(C) High resistance values are easily available

(D) None of the above

Vernier Callipers and Screw Gauge

Q.1 What is meant by Least Count (L.C.) of a measuring instrument?

Q.2 How do you define Least Count for Vernier Callipers?

Q.3 (a) What is the vernier constant of Vernier Callipers?

(b) What is the value of the least count of a commonly available Vernier Callipers?

Q.4 What is meant by zero error of Vernier Callipers?

Q.5 When is the zero error positive?

Q.6 What is zero correction? How does it differ from zero error?

Q.7 How is zero error taken into account for getting true reading?

Q.8 Can we use Vernier Callipers to measure the thickness of a piece of paper?

Q.9 Select the incorrect statement.

(A) If the zero of vernier scale does not coincide with the zero of the main scale, then the vernier calipers is said to be having zero error?

(B) Zero correction has a magnitude equal to zero error but sign is opposite to that of zero error.

(C) Zero error is positive when the zero of vernier scale lies to the left of the zero of the main scale.

Q.10 1 cm on the main scale of a vernier calipers is divided into 10 equal parts. If 10 divisions of vernier coincide with 8 small divisions of main scale, then the least count of the caliper is

(A) 0.01cm (B) 0.02cm

(C) 0.05cm (D) 0.005cm

Q.11 The vernier constant of a travelling microscope is 0.01cm. If 49 main scale divisions coincide with 50 vernier scale divisions, then the value of 1 main scale division is

(A) 0.1mm (B) 0.5mm (C) 0.4mm (D) 1mm

Q.12 If the error in the measurement of the diameter of the sphere is 1%, then the error in the measurement of the volume is

(A) 3% (B) 1% (C) 6% (D) 9%

Q.13 Which of the following has the largest least count?

(A) Spherometer (B) Vernier calipers

(C) Screw guage (D) Metre scale

Q.14 1 cm of main scale of a vernier caliper is divided into 10 divisions. The least count of the callipers is 0.005cm, then the vernier scale must have

(A) 10 divisions (B) 20 divisions

(C) 25 divisions (D) 50 divisions

Q.15 Each division on the main scale is 1mm. Which of the following vernier scales give vernier constant equal to 0.01mm?

(A) 9 mm divided into 10 divisions

(B) 90 mm divided into 100 divisions

(C) 99 mm divided into 100 divisions

(D) 9 mm divided into 100 divisions

Q.16 Vernier constant is the

(A) Value of one MSD divided by total number of divisions on the main scale

(B) Value of one MSD divided by total number of divisions on the vernier scale

(C) Total number of divisions on the main scale divided by total number of divisions on the vernier scale

(D) Difference between value of one main scale division and one vernier scale division

Q.17 The error in the measurement of radius of the spheres by using vernier callipers is 0.3%. The permissible error in the measurement of surface area is

(A) 0.6% (B) 1.2% (C) 1.8% (D) 0.9%

Q.18 In a Vernier callipers 1cm of the main scale is divided into 20 equal parts. 19 divisions of the main scale coincide with 20 divisions on the vernier scale. Find the least count of the instrument.

Q.19 Why is screw gauge commonly known as micrometer?

Q.20 Why is a screw guage so named?

Q.21 What is the main characteristic of a screw?

Q.22 Define the pitch of a screw.

Q.23 What is the relation between the pitch and the least count?

Q.24 What is the cause of backlash error?

Q.25 How can you minimize backlash error?

Q.26 Of what metal is the screw of the screw guage made and why?

Q.27 Which screw guage is more accurate-the one with a pitch of 0.5mm or the one with a pitch of 1 mm, both having the same number of circular scale divisions?

Q.28 What is zero error of the screw guage?

Q.29 What is negative zero error of screw guage?

Q.30 What is the principle of a screw guage?

Q.31 The pitch of screw guage is

(A) 1 mm (B) 0.1mm (C) 1cm (D) 0.1cm

Q.32 Least count of screw guage is defines as

(A) $\frac{\text{Distance moved by thimble on main scale}}{\text{Number of rotation of thimble}}$

(B) $\frac{\text{Pitch of the screw}}{\text{Number of circular scale divisions on head scale}}$

(C) $\frac{\text{Number of rotation thimble}}{\text{Number of circular scale divisions}}$

(D) None of the above

Q.33 Screw guage is said to have a negative error

(A) When head scale zeroth division coincides with base line of main scale

(B) When head scale zeroth division is above with base line of main scale

(C) When head scale zeroth division is below with base line of main scale

(D) None of the above

Q.34 For positive error, the correction is

(A) Positive (B) Negative

(C) Nil (D) None of these

Q.35 The diameter D of a wire is measured using screw guage of zero error. Then

(A) D=main scale reading + circular scale reading x L.C.

(B) D=circular scale reading + main scale reading x L.C.

(C) D=main scale reading + vernier scale reading x L.C.

(D) None of the above

Q.36 In a screw guage value of each main scale division and circular scale division is

(A) 1 mm and 0.01 cm (B) 0.01 cm and 1 cm

(C) 0.01 cm and 1 mm (D) 0.01 cm and 1 mm

Q.37 The pitch of a screw guage is 0.5 mm. Its head scale contains 50 divisions. The lease count of the screw guage is

(A) 0.01 mm (B) 0.001 mm

(C) 0.02 mm (D) 0.002 mm

Q.38 The circular scale (head scale) of a screw guage is divided into 100 equal parts and it moves 0.5 mm ahead in one revolution. Find the pitch and the least count.

Optics and Modern Physics

Q.1 How will you distinguish between two given spherical mirrors, as concave or convex?

Q.2 What is meant by 'parallax'?

Q.3 How is the parallax removed?

Q.4 Why is a concave mirror of large focal length often used as shaving glass?

Q.5 For what purpose does a surgeon use a concave mirror?

Q.6 What type of mirrors are used in headlights of vehicles and in searchlights?

Q.7 Which mirror is used as a driving mirror in automobiles and why?

Q.8 Can you determine the focal length of a convex mirror by plotting $\frac{1}{v}$ versus $\frac{1}{u}$.

Q.9 In determining focal length of a convex mirror using auxillary convex lens, can a convex lens of any focal length be used?

Q.10 What is spherical aberration?

Q.11 Which method is more accurate in the determination of f for a concave mirror.

(i) u vs. v, or (ii) $\frac{1}{u}$ vs. $\frac{1}{v}$ graphs?

Q.12 An object is placed in front of the convex mirror at a distance of 50 cm. A plane mirror is introduced covering the lower half of the convex mirror. If the distance between the two mirrors is 10 cm, it is found that there is no parallax between the images formed by the two mirrors. Then the focal length of the convex mirror is

(A) 12.5 cm (B) -12.5 cm

(C) 25 cm (D) 75 cm

Q.13 In the determination of focal length of convex mirror by using a convex lens the object is generally placed from the convex lens at a distance x times the focal length of the convex lens, then x equals

(A) 4 (B) 0.25 (C) 1.5 (D) 0.5

Q.14 In an experiment to find focal length of a concave mirror, a graph is drawn between the magnitudes of u and v. The graph look like.

Q.15 Which of the following graph is applicable between $\frac{1}{v}$ and $\frac{1}{u}$ for a concave mirror?

Q.16 The graph showing correctly the variation of image distance (v) as a function of object distance (u) in case of a concave mirror is

Q.17 How do you distinguish a convex lens from a concave lens?

Q.18 What is meant by principal axis of a lens.

Q.19 If a lens is plano-convex, what is the radius of curvature of its plane surface? Where does the centre of curvature of its plane surface lie?

Q.20 Then, how do you define principal axis for a plano-convex lens?

Q.21 A graph is drawn with $\frac{1}{u}$ along x-axis and $\frac{1}{v}$ along the y-axis. If the intercept on the x-axis is 0.5^{-1}, the focal length of the lens is (in meter)

(A) 2.00 (B) 0.50 (C) 0.20 (D) 1.00

Q.22 What happens to a ray of light when it passes through a rectangular glass slab?

Q.23 Does the lateral displacement depend upon the thickness of the slab?

Q.24 What causes earlier rise of the sun than the actual rise

Q.25 What causes formation of a rainbow after rains?

Q.26 If a plane glass plate is placed over letters different colours, then which coloured letters appears to be most raised

(A) Blue (B) Green

(C) Violet (D) Red

Q.27 A small pin fixed on a table top is viewed from above from a distance of 50 cm. The distance by which the pin appears to be raised, if it is viewed from the same point through a 15 cm thick glass slab held parallel to the table is (Refractive index of glass=1.5)

(A) 1 cm (B) 2 cm (C) 3 cm (D) 5 cm

Q.28 A mark is made at the bottom of a beaker and a microscope is focused on it. The microscope then raised through 1.5 cm. To what height water must be poured into the beaker to bring the mark again into focus? Given, Refractive index of water $= \frac{4}{3}$.

(A) 6 cm (B) 7 cm (C) 8 cm (D) 9 cm

Q.29 A glass is filled with water upto 10 cm. the apparent depth of an object lying at the bottom of the glass measured by a microscope is 8.2 cm.

(i) What is the refractive index of water?

(ii) If water is replaced by a liquid of refractive index 1.7 upto the same height, by what distance would the microscope have to be moved to focus the object again>

(A) (i) 1.2 (ii) 2.32 cm

(B) (i) 1.2 (ii) 3.32 cm

(C) (i) 1.4 (ii) 4.32 cm

(D) (i) 1.4 (ii) 5.32 cm

Q.30 A beaker of depth 20 cm is half-filled with a liquid of refractive index 1.4 and half-filled with liquid of refractive index 1.7. What is the apparent depth of a coin lying at the bottom of the beaker assuming that liquids do not mix with each other?

(A) 13 cm (B) 11 cm (C) 9 cm (D) 7.1 cm

Q.31 The diffusion dominant mechanisms for motion of charge carriers in forward and reverse biased silicon p-n junction are

(A) Drift in forward bias, diffusion in reverse bias

(B) Diffusion in forward bias, drift in reverse bias

(C) Diffusion in both forward and reverse bias

(D) Drift in both forward and reverse bias

Q.32 The cause of the potential barrier in a p-n junction diode is

(A) Depletion of positive charges near the junction

(B) Concentration of positive charges near the junction

(C) Concentration of negative charges near the junction

(D) Concentration of positive and negative charges near the junction

Q.33 The reverse voltage at which the current increases steeply is called

(A) Threshold voltage (B) Knee voltage

(C) Breakdown voltage (D) Stopping voltage

Q.34 The forward biased characteristics of a p-n junction diode is:

Q.35. The reverse biased characteristics of a p-n junction diode is.

Q.36 Zener breakdown occurs in junction which is

(A) Heavily doped and has wide depletion layer

(B) Lightly doped and has wide depletion layer

(C) Moderately doped and has narrow depletion layer

(D) Heavily doped and has narrow depletion layer

Q.37 At breakdown region of zener diode which of the following quantities does not change much?

(A) Voltage (B) Current

(C) Dynamic impedance (D) Capacitance

Q.38 The avalanche breakdown occurs at

(A) Higher reverse voltage

(B) Lower reverse voltage

(C) Lower forward voltage

(D) Higher forward voltage

Q.39 Zener diode is always used in

(A) Forward bias mode

(B) Reverse bias mode

(C) May be forward of reverse mode

(D) Unbiased mode

Q.40 Zener diode is used as a/an

(A) Amplifier (B) Rectifier

(C) Oscillator (d) Voltage regulator

Q.41 In the zener diode circuit, total current is i, load current is i_L, zener current is i_Z then

(A) $i_Z = i_L$ (B) $i_Z = i + i_L$

(C) $i_Z = i - i_L$ (D) $i_Z - i_L = i$

Q.42 In a voltage regulating circuit of Zener diode, the graph of output voltage V_0 versus input voltage V_i is

Q.43 The current gain for common emitter amplifier is 59. If the emitter current is 6.0 mA, the base current and collector current is

(A) 0.1 mA, 5.9 mA (B) 0.2 mA, 6.9 mA

(C) 0.3 mA, 3.9 mA (D) 0.4 mA, 1.9 mA

Q.44 In a transistor, the collector current is 5.488 mA for an emitter current of 5.60 mA. The value of current amplification factor (β) will be

(A) 51 (B) 48 (C) 49 (D) 50

Q.45 The value of β

(A) Is always less than 1

(B) Lies between 20 and 200

(C) Is always greater than 200

(D) Is always infinity

Q.46 The current gain α of a transistor is 0.95. The change in emitter current is 10 mA. The change in base current is

(A) 9.5 mA (B) 0.5 mA

(C) 10.5 mA (D) $\left(\frac{200}{19}\right)$mA

Q.47 In a common-emitter transistor amplifier circuit β =100, input resistance R_1 = 1kΩ, output resistance R_2 = 10kΩ. The voltage gain of circuit is

(A) 100 (B) 1000 (C) 10 (D) 5000

Q.48 While using a transistor as an amplifier

(A) The collector junction is forward biased and emitter junction reverse biased

(B) The collector junction is reverse biased and emitter junction is forward biased.

(C) Both the junctions are forward biased

(D) Both the junctions are revere biased

Q.49 For a transistor the value of α =0.9, the value if β is

(A) 1 (B) 100 (C) 90 (D) 9

Q.50 Multimeter is used to

(A) Check whether a given diode or a transistor is in working order

(B) Identify the base of a transistor and terminals of an IC.

(C) Distinguish between p-n-p and n-p-n transistor

(D) Verify all the above

Q.51 While checking the nature of components of a transistor, if multimeter shows low resistance then nature of the components connected to the positive and negative terminals of multimeter respectively are

(A) p-type, n-type (B) n-type, p-type

(C) n-type, n-type (D) p-type, p-type

Q.52 The extreme terminals of a transistor are connected with two probes of a multimeter. If it shows less deflection or more resistance, then central terminal is

(A) Base (B) Emitter

(C) Collector (D) Any one

Q.53 If a semi conductor device has more than three legs (or) pins, it is a / an:

(A) Transistor (B) Junction diode

(C) Zener diode (D) Integrated circuit

Q.54 Multimeter ends are connected to emitter base of a working order transistor, then multimeter shows

(A) Large deflection in one direction and small deflection in other direction

(B) Large deflection in both cases

(C) Small deflection in both cases

(D) None of the above

Q.55 A multimeter in connected to LED, then deflection before and after reversing the probes is

(A) Same in both cases

(B) Large and then falls to zero

(C) Almost zero in both cases

(D) Very small in one case and very large in reverse case or vice versa and emits light

Q.56 If the diode is spoiled then multimeter shows

(A) Large deflection in one case

(B) Small deflection in reverse case

(C) Deflection is large in one case and small in reverse case

(D) Large or small deflection in both cases

Q.57 How do we find whether a diode is working or not by using a multimeter?

(A) Forward bias resistance in more

(B) Reverse bias resistance is less

(C) In both the cases resistance is more

(D) Forward bias resistance is less and reverse bias resistance more

Simple Pendulum

Q.1 What is an idea simple pendulum?

Q.2 Is there any difference between gravity and acceleration due to gravity?

Q.3 What is the difference between g and G.

Q.4 What is meant by effective length of the pendulum?

Q.5 What is second's pendulum?

Q.6 What is the approximate effective length of a second's pendulum?

Q.7 Will the time period of a simple pendulum change if we take it from Earth to the surface of Moon?

Q.8 Why does it increases?

Q.9 How does the value of g vary from place to place on the surface of the Earth?

Q.10 Is g a scalar or a vector quantity?

Q.11 Why should the amplitude be small for a simple pendulum experiment?

Q.12 Does the time period depend upon the mass, the size and the material of the bob?

Q.13 What will happen to the time period if the bob is made to oscillate in water (neglect viscosity)?

Q.14 How will the amplitude of oscillation change, if the pendulum oscillate in vacuum?

Q.15 Why do you avoid rotational motion of the bob during the course of your experiment?

Q.16 What type of graph do you expect between (i) L and T and (ii) L and T^2 ?

Q.17 Why do the pendulum clocks go slow in summer and fast in winter?

Q.18 Why do we use Invar material for the pendulum of good clocks?

Q.19 A simple pendulum has a bob which is a hollow sphere full of sand and oscillates with certain period. If all that sand is drained out through a hole at its bottom, then its period

(A) Increase (B) Decreases

(C) Remains same (D) Is zero

Q.20 The second's pendulum is taken from earth to moon, to keep the time period constant

(A) The length of the second's pendulum should be decreased

(B) The length of the second's pendulum should be increased

(C) The amplitude should increase

(D) The amplitude should decrease

Q.21 The length of a second's pendulum at the surface of earth is 1 m. The length of second pendulum at the surface of moon where g is $(1/6)^{th}$ that at earth's surface is

(A) $\frac{1}{6}$ m (B) 6 m (C) $\frac{1}{36}$ m (D) 36 m

Q.22 The time period of a second's pendulum is 2 sec. The spherical bob which is empty from inside has a mass 50 g. This is now replaced by another solid bob of same radius but having a different mass of 100 g. The new time period will be

(A) 4 s (B) 1 s (C) 2 s (D) 8 s

Q.23 The time period of a simple pendulum is doubled, when

(A) its length is doubled

(B) Mass of bob is doubled

(C) Length is made four times

(D) The mass of bob and length of pendulum are double

Elasticity

Q.24 How do you differentiate between elastic and plastic bodies?

Q.25 What is meant by elastic limit?

Q.26 What is yield point?

Q.27 What is breaking point?

Q.28 What is breaking stress?

Q.29 Is there any effect of temperature change on the value of Y?

Q.30 Why do you use long wires in searle's experiment?

Q.31 Why is it advisable not to take readings of micrometer screw immediately after loading or unloading?

Q.32 Radius of the experiment wire is to be measure with _____ in Searle's experiment to determine Y.

(A) Ordinary scale (B) Vernier caliper

(C) Spherometer (D) Screw gauge

Q.33 Three identical wires A, B and C made of different materials attached with same load have $Y_A = 20\times10^{11}Nm^{-2}$ and $Y_c = 0.2\times10^{11}Nm^{-2}$. The wire having maximum elongation is

(A) A

(B) B

(C) C

(D) Same elongation for all three wires

Q.34 Approximation to perfectly elastic body is:

(A) Quartz fibre (B) Optical fibre

(C) Human bone (D) Copper rod

Q.35 Which of the following is wrong regarding Searle's apparatus method in finding Young's modulus of a given wire?

(A) Average elongation of wire will be determined with a particular load while increasing the load and decreasing the load.

(B) Reference wire will be just taut and experimental wire will undergo for elongation.

(C) Air bubble in the spirit level will be disturbed from the central position due to relative displacement between the wires due to elongation.

(D) Average elongation of the wires is to be determined by increasing the load attached to both the wires.

Q.36 Q wire of area of cross-section $10^{-6}m^2$ is increased in length by 0.1%. The tension produced is 1000N. The young's modulus of wire is

(A) $10^{12}Nm^{-2}$ (B) $10^{11}Nm^{-2}$

(C) $10^{10}Nm^{-2}$ (D) $10^{9}Nm^{-2}$

Q.37 Which of the following is most elastic?

(A) Rubber (B) Wet clay

(C) Plastic (D) Steel

Q.38 Q wire can support a load W without breaking. It is cut into equal parts. The maximum load that each part can support is

(A) $\frac{W}{4}$ (B) $\frac{W}{2}$ (C) W (D) 2W

Q.39 The following four wires are made of the same material. Which of these will have the largest extension when the same tension is applied on all?

(A) Length=50 cm, diameter=0.5 mm

(B) Length=100 cm, diameter=1.3 mm

(C) Length= 300 cm, diameter=2mm

(D) Length=300 cm, diameter=3mm

Q.40 Two wires of copper have lengths in the ratio 1:2 and radii in the ratio 2:1. Their Young's modulli are in the ratio

(A) 1:1 (B) 1:8 (C) 8:1 (D) 1:4

Q.41 Young's modulus for a perfectly rigid body is

(A) 0 (B) 1 (C) ∞ (D) None of these

Q.42 Three wires A, B and C made of different material, have same length and cross-section. They are stretched by the same force. It is found that wire A is stretched least and comes back to its original length when the force is withdrawn. Wire B is stretched more than A and also comes back to its original length. Wire C is stretched most but does not return to its original length. Which of the three materials has the largest Young's modulus?

(A) A

(B) B

(C) C

(D) No conclusion can be drawn from the given information

Principal of Moments

Q.43 What is the principal of moments?

Q.44 The bottom of a ship is made heavy. Why?

Q.45 Why does a girl lean towards right while carrying a bag in her left hand?

Q.46 Some heavy boxes are to be loaded along with some empty boxes on a cart. Which boxes should be put in the cart first and why?

Q.47 Standing is not allowed in deck of a double decker bus. Why?

Q.48 Why cannot we rise from a chair without bending a little forward?

Q.49 For determining the mass of a given body using a meter scale by principal of moments, the mass of weight in the paper pan is 30 g and the length of the weight arm is 20 cm. If the fixed length of the power arm is 25cm, then the unknown mass is

(A) 18 g (B) 20 g (C) 24 g (D) 28 g

Q.50 A balance is made of rigid rod free to rotate about a point not at the centre of the rod. When an unknown mass m is placed in the left hand pan, it is balanced by a mass m_1 placed in the right hand pan, and similarly when the mass m is placed in the right hand pan, it is balanced by a mass m_2 in the left hand pan. Neglecting the masses of the pans, m is

(A) $\frac{1}{2}(m_1 + m_2)$ (B) $\sqrt{m_1 m_2}$

(C) $\frac{1}{2}\sqrt{m_1 m_2}$ (D) $\sqrt{\frac{m_1^2 + m_2^2}{2}}$

Q.51 A false balance has equal arms. An object weights x when placed in one pan and y in the other pan. The true weight of the object is equal to

(A) $\sqrt{xy}$ (B) $\frac{x+y}{2}$

(C) $(x+y)$ (D) $\frac{\sqrt{x^2+y^2}}{2}$

Surface Tension and Viscosity

Q.52 Why are the small spheres wetted in glycerine before making them to fall through glycerine?

Q.53 Why are the small spheres centrally dropped in the glass jar?

Q.54 Why do bubbles of air or gas rise up through water or any other liquid?

Q.55 Why does the water not rise in an ordinary glass tube as it does in a capillary tube?

Q.56 What formula are you using to determine the surface tension?

Q.57 While measuring the height of water column in the capillary, up to what point of meniscus do you measure the height?

Q.58 Which of the following is a better cleaning agent?

(A) Cold water (B) Hot water

(C) Soap water (D) Hot soap water

Q.59 A capillary tube is dipped in water and the top is closed then the rise of water

(A) Increases (B) Decreases

(C) Remains same (D) Water does not rise

Q.60 If a capillary tube of insufficient length is used, the liquid

(A) Rises and over flows slowly

(B) Does not overflow

(C) Rises and comes out like fountain

(D) Does not rise into the tube

Q.61 What happens to the length of liquid column in the capillary tube if it is inclined with respect to vertical?

(A) Decreases (B) Increases

(C) Remains same (D) Overflows

Q.62 h is the height of the liquid column in the capillary tube when it is clamped vertically. If the tube is making an angle (θ) with vertical. Then length of the liquid column (l) is

(A) $l = h\cos\theta$ (B) $l = \frac{h\cos\theta}{2}$

(C) $l = 2h\cos\theta$ (D) $l = \frac{h}{\cos\theta}$

Q.63 Two students A and B determine the surface tension in summer and winter as T_A and T_B respectively 9other conditions are same in the experiment). Then:

(A) $T_A > T_B$ (B) $T_A < T_B$

(C) $T_A = T_B$ (D) $T_A = \frac{T_B}{2}$

Q.64 A student A does the capillary rise experiment at equator and gets the surface tension value T_A. Another student does the same experiment in same conditions at poles and gets the surface tension value T_B. Then:

(A) $T_A > T_B$ (B) $T_A < T_B$

(C) $T_A = T_B$ (D) None of these

Q.65 A clean capillary tube is dipped vertically in breaker containing water and the water rises 6cm in it. If another capillary tube of same radius and length 3cm is dipped vertically in the same beaker containing water (assume angle of contact of water is $0°C$) then the water

(A) Will flow out like a fountain

(B) Will rise to a height of 3cm only and angle of contacts is $0°C$

(C) Will rise to a height of 3cm only and angle of contact is $60°$ C

(D) Will not rise at all

Q.66 When a partially soluable impurity is added to a liquid, then the surface tension

(A) Increases (B) Decreases

(C) Remains same (D) Cannot be measured

Q.67 When a completely soluable impurity is added to a liquid, then the surface tension

(A) Increases (B) Decreases

(C) Remains same (D) Become zero

Q.68 If temperature is increase, then angle of contact

(A) Decreases (B) Increases

(C) Become zero (D) Remains same

Q.69 If radius of the tube is decreased, then the height of the liquid column

(A) Increases (B) Decreases

(C) Unchanged (D) May increase or decrease

Q.70 If the angle of contact is $90°$ then the liquid level in a capillary tube will

(A) Increase (B) Decrease

(C) Neither rise nor fall (D) May increase of decrease

Q.71 What happens to the surface tension if detergents are added to the water?

(A) Increases (B) Decreases

(C) Remains same (D) Become zero

Q.72 What happens to the angle of contact if detergents are added to the water?

(A) Decreases (B) Increases

(C) Become zero (D) Remains same

Q.73 A liquid rises to a height h in a capillary tube on the earth. The height to which the same liquid would rise in the same tube on the moon is about

(A) 6h (B) h (C) $\frac{h}{6}$ (D) None of these

Q.74 At critical temperature the surface tension of a liquid

(A) Is zero

(B) Is infinity

(C) Is the same as that at any other temperature

(D) Cannot be determined

Q.75 A liquid will not wet the surface of a solid if the angle of contact is

(A) Acute (B) Obtuse

(C) Zero (D) $\frac{\pi}{2}$

Q.76 A water-proofing agent changes the angle of contact from

(A) An obtuse to an acute value

(B) An acute to an obtuse value

(C) An obtuse value to $\frac{\pi}{2}$

(D) An acute value to $\frac{\pi}{2}$

Q.77 A rain drop falls near the surface of the earth with almost uniform velocity because

(A) Its weight is negligible

(B) The force of surface tension balances its weight

(C) The viscous drag and the upthrust due to air balances its weight

(D) The drops are charged and atmospheric electric field balances its weight

Q.78 A solid sphere falls with a terminal velocity of $20 ms^{-1}$ in air. If it is allowed to fall in vaccum

(A) Terminal velocity will be $20 ms^{-1}$

(B) Terminal velocity will be less than $20\ ms^{-1}$

(C) Terminal velocity will be greater than 20 ms^{-1}

(D) There will be no terminal velocity

Q.79 Eight spherical rain drops of the same mass and radius are falling down with a terminal speed v. If they coalesce to form one big drop. Its terminal speed will be (neglect buoyancy due to air)

(A) $\frac{v}{4}$ (B) v (C) 4v (D) 8v

Q.80 A spherical steel ball released at the top of a long column of glycerine of length L, falls through a distance L/2 with accelerated motion and remaining distance L/2 with a uniform velocity. If t_1 and t_2 denote the times taken to cover the first and second half and w_1 and w_2 are the respective works done against gravity in the two halves then

(A) $t_1 < t_2, w_1 > w_2$ (B) $t_1 > t_2, w_1 < w_2$

(C) $t_1 = t_2, w_1 = w_2$ (D) $t_1 > t_2, w_1 = w_2$

Q.81 A tiny sphere of mass m and density p is dropped in a tall jar of glycerine of density σ. When the sphere acquires terminal velocity, the magnitude of the viscous forecasting on it is

(A) $\frac{mgp}{\sigma}$ (B) $\frac{mg\sigma}{p}$

(C) $mg\left(1-\frac{\sigma}{p}\right)$ (D) $mg\left(1-\frac{p}{\sigma}\right)$

Q.82 The viscous force on a spherical body moving through a fluid depends upon

(i) The mass of the body

(ii) The radius of the body

(iii) The velocity of the body

(iv) The viscosity of the fluid

(A) (i), (ii), and (iii) are true

(B) (i), (iii) and (iv) are true

(C) (ii), (iii) and (iv) are true

(D) (ii) and (iv) are true

Q.83 When the upthrust on a body is negligible compared to its weight, the terminal velocity of a small spherical body falling through a viscous liquid depends upon

(i) The density of the body

(ii) The diameter of the body

(iii) The viscosity of liquid

(iv) The acceleration due to gravity

(A) (i) and (ii) are true

(B) (ii) and (iii) are true

(C) (ii), (iii) and (iv) are true

(D) All are true

Q.84 A small metal sphere of radius r and density p falls from rest in a viscous liquid of density σ and coefficient of viscosity η. Due to friction heat is produced. The expression for the rate of production of heat when the sphere has acquired the terminal; velocity is

(A) $\left[\frac{8\pi g}{27\eta}\left(p-\sigma^2\right)\right]r^5$ (B) $\left[\frac{8\pi g}{27\eta}\left(p-\sigma\right)^2\right]r^5$

(C) $\left[\frac{8\pi g^2}{27\eta}\left(p-\sigma\right)\right]r^5$ (D) $\left[\frac{8\pi g^2}{27\eta^2}\left(p-\sigma\right)\right]r^5$

Q.85 A steel ball of density ρ_1 and radius r falls vertically through a liquid of density ρ_2. Assume that viscous force acting on the ball is F=Krv, where k is a constant and v is velocity. The terminal velocity of the ball is

(A) $\frac{4\pi gr^2\left(\rho_1-\rho_2\right)}{3K}$ (B) $\frac{4\pi r^2\left(\rho_1-\rho_2\right)}{3gK}$

(C) $\frac{4\pi r\left(\rho_1+\rho_2\right)}{3gr^2K}$ (D) $\frac{4\pi gr}{3K}\left(\rho_1+\rho_2\right)$

Q.86 For a body falling with terminal velocity, the net force on it is

(A) Buoyant force

(B) Weight of the body

(C) Difference of viscous force and weight of the body

(D) Zero

Q.87 An air bubble of radius 1.0 cm rises with a constant speed of $3.5\,mms^{-1}$ through a liquid of density $1.75\times10^3\ kgm^{-3}$. Neglecting the density of air, the coefficient of viscosity of the liquid (in $kgm^{-1}s^{-1}$)

(A) 54.5 (B) 109

(C) 163.5 (D) 218

Answer Key

Sound

Q.35 C	**Q.36** D	**Q.37** A	**Q.38** C	**Q.39** A	**Q.40** A
Q.41 C	**Q.42** A	**Q.43** C	**Q.44** C	**Q.45** C	**Q.50** B
Q.51 C	**Q.53** D				

Electricity and Magnetism

Q.11 D	**Q.12** C	**Q.13** A	**Q.14** D	**Q.15** C	**Q.15** B
Q.17 A	**Q.18** D	**Q.24** B	**Q.25** A	**Q.26** A	**Q.27** B
Q.28 C	**Q.29** B	**Q.30** A			