135. Embryological support for evolution was disapproved by :

(1) Karl Ernst von Baer

(2) Alfred Wallace

(3) Charles Darwin

(4) Oparin

136. The increase in the width of the depletion region in a p-n junction diode is due to :

(1) forward bias only

(2) reverse bias only

(3) both forward bias and reverse bias

(4) increase in forward current

137. Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled ?

(1) doubled

(2) four times

(3) one-fourth

(4) zero

138. A resistance wire connected in the left gap of a metre bridge balances a 10 Ω resistance in the right gap at a point which divides the bridge wire in the ratio 3 : 2. If the length of the resistance wire is 1.5 m, then the length of 1 Ω of the resistance wire is :

(1) 1.0×10^{-2} m

(2) 1.0×10^{-1} m

(3) 1.5×10^{-1} m

(4) 1.5×10^{-2} m

139. The energy required to break one bond in DNA is 10^{-20} J. This value in eV is nearly :

(1) 6

(2) 0.6

(3) 0.06

(4) 0.006

140. The phase difference between displacement and acceleration of a particle in a simple harmonic motion is :

(1) π rad

(2) $\frac{3\pi}{2}$ rad

(3) $\frac{\pi}{2}$ rad

(4) zero

141. A ball is thrown vertically downward with a velocity of 20 m/s from the top of a tower. It hits the ground after some time with a velocity of 80 m/s. The height of the tower is : ($g = 10$ m/s^2)

(1) 360 m

(2) 340 m

(3) 320 m

(4) 300 m

142. A short electric dipole has a dipole moment of 16×10^{-9} C m. The electric potential due to the dipole at a point at a distance of 0.6 m from the centre of the dipole, situated on a line making an angle of 60° with the dipole axis is :

$\left(\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2\right)$

(1) 50 V

(2) 200 V

(3) 400 V

(4) zero

143. An iron rod of susceptibility 599 is subjected to a magnetising field of 1200 A m^{-1}. The permeability of the material of the rod is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) $2.4\pi \times 10^{-4}$ T m A^{-1}

(2) 8.0×10^{-5} T m A^{-1}

(3) $2.4\pi \times 10^{-5}$ T m A^{-1}

(4) $2.4\pi \times 10^{-7}$ T m A^{-1}

144. Two cylinders A and B of equal capacity are connected to each other via a stop cock. A contains an ideal gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stop cock is suddenly opened. The process is :

(1) isothermal

(2) adiabatic

(3) isochoric

(4) isobaric

145. A spherical conductor of radius 10 cm has a charge of 3.2×10^{-7} C distributed uniformly. What is the magnitude of electric field at a point 15 cm from the centre of the sphere ?

$\left(\frac{1}{4\pi\epsilon_0}=9\times10^9\ \text{N m}^2/\text{C}^2\right)$

(1) 1.28×10^4 N/C

(2) 1.28×10^5 N/C

(3) 1.28×10^6 N/C

(4) 1.28×10^7 N/C

146. The mean free path for a gas, with molecular diameter d and number density n can be expressed as :

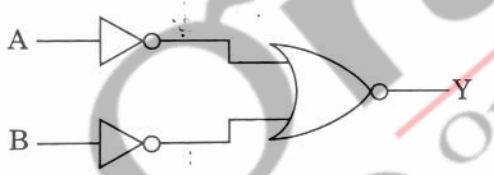
(1) $\frac{1}{\sqrt{2}\,n\pi d}$

(2) $\frac{1}{\sqrt{2}\,n\pi d^2}$

(3) $\frac{1}{\sqrt{2}\,n^2\pi d^2}$

(4) $\frac{1}{\sqrt{2}\,n^2\pi^2 d^2}$

147. For the logic circuit shown, the truth table is :



(1)

A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

(2)

A	B	Y
0	0	0
0	1	1
1	0	1
1	1	1

(3)

A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

(4)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

148. The energy equivalent of 0.5 g of a substance is :

(1) 4.5×10^{16} J

(2) 4.5×10^{13} J

(3) 1.5×10^{13} J

(4) 0.5×10^{13} J

149. Light with an average flux of 20 W/cm^2 falls on a non-reflecting surface at normal incidence having surface area 20 cm^2. The energy received by the surface during time span of 1 minute is :

(1) 10×10^3 J

(2) 12×10^3 J

(3) 24×10^3 J

(4) 48×10^3 J

150. A ray is incident at an angle of incidence i on one surface of a small angle prism (with angle of prism A) and emerges normally from the opposite surface. If the refractive index of the material of the prism is μ, then the angle of incidence is nearly equal to :

(1) $\frac{A}{2\mu}$

(2) $\frac{2A}{\mu}$

(3) μA

(4) $\frac{\mu A}{2}$

151. The solids which have the negative temperature coefficient of resistance are :

(1) metals

(2) insulators only

(3) semiconductors only

(4) insulators and semiconductors

152. When a uranium isotope $^{235}_{92}U$ is bombarded with a neutron, it generates $^{89}_{36}Kr$, three neutrons and :

(1) $^{144}_{56}Ba$

(2) $^{91}_{40}Zr$

(3) $^{101}_{36}Kr$

(4) $^{103}_{36}Kr$

153. A capillary tube of radius r is immersed in water and water rises in it to a height h. The mass of the water in the capillary is 5 g. Another capillary tube of radius 2r is immersed in water. The mass of water that will rise in this tube is :

(1) 2.5 g
(2) 5.0 g
(3) 10.0 g
(4) 20.0 g

154. In a certain region of space with volume 0.2 m^3, the electric potential is found to be 5 V throughout. The magnitude of electric field in this region is :

(1) zero
(2) 0.5 N/C
(3) 1 N/C
(4) 5 N/C

155. A long solenoid of 50 cm length having 100 turns carries a current of 2.5 A. The magnetic field at the centre of the solenoid is :

($\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1})

(1) 6.28×10^{-4} T
(2) 3.14×10^{-4} T
(3) 6.28×10^{-5} T
(4) 3.14×10^{-5} T

156. Assume that light of wavelength 600 nm is coming from a star. The limit of resolution of telescope whose objective has a diameter of 2 m is :

(1) 3.66×10^{-7} rad
(2) 1.83×10^{-7} rad
(3) 7.32×10^{-7} rad
(4) 6.00×10^{-7} rad

157. An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

(1) 10 V
(2) 10^2 V
(3) 10^3 V
(4) 10^4 V

158. Dimensions of stress are :

(1) $[MLT^{-2}]$
(2) $[ML^2T^{-2}]$
(3) $[ML^0T^{-2}]$
(4) $[ML^{-1}T^{-2}]$

159. The capacitance of a parallel plate capacitor with air as medium is 6 μF. With the introduction of a dielectric medium, the capacitance becomes 30 μF. The permittivity of the medium is :

($\epsilon_0 = 8.85 \times 10^{-12}$ C^2 N^{-1} m^{-2})

(1) 0.44×10^{-13} C^2 N^{-1} m^{-2}
(2) 1.77×10^{-12} C^2 N^{-1} m^{-2}
(3) 0.44×10^{-10} C^2 N^{-1} m^{-2}
(4) 5.00 C^2 N^{-1} m^{-2}

160. The ratio of contributions made by the electric field and magnetic field components to the intensity of an electromagnetic wave is : (c = speed of electromagnetic waves)

(1) c : 1
(2) 1 : 1
(3) 1 : c
(4) 1 : c^2

161. For which one of the following, Bohr model is **not** valid ?

(1) Hydrogen atom
(2) Singly ionised helium atom (He^+)
(3) Deuteron atom
(4) Singly ionised neon atom (Ne^+)

162. A cylinder contains hydrogen gas at pressure of 249 kPa and temperature 27°C.

Its density is : (R = 8.3 J mol^{-1} K^{-1})

(1) 0.5 kg/m^3
(2) 0.2 kg/m^3
(3) 0.1 kg/m^3
(4) 0.02 kg/m^3

163. For transistor action, which of the following statements is **correct** ?

(1) Base, emitter and collector regions should have same doping concentrations.
(2) Base, emitter and collector regions should have same size.
(3) Both emitter junction as well as the collector junction are forward biased.
(4) The base region must be very thin and lightly doped.

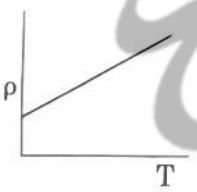
164. The Brewsters angle i_b for an interface should be :
(1) $0° < i_b < 30°$
(2) $30° < i_b < 45°$
(3) $45° < i_b < 90°$
(4) $i_b = 90°$

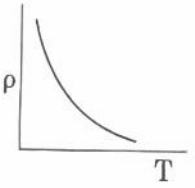
165. The average thermal energy for a mono-atomic gas is : (k_B is Boltzmann constant and T, absolute temperature)
(1) $\frac{1}{2} k_B T$
(2) $\frac{3}{2} k_B T$
(3) $\frac{5}{2} k_B T$
(4) $\frac{7}{2} k_B T$

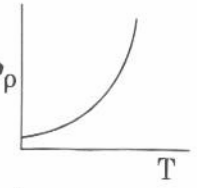
166. Taking into account of the significant figures, what is the value of 9.99 m − 0.0099 m ?
(1) 9.9801 m
(2) 9.98 m
(3) 9.980 m
(4) 9.9 m

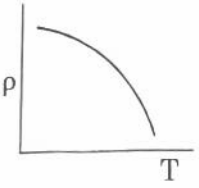
167. A screw gauge has least count of 0.01 mm and there are 50 divisions in its circular scale. The pitch of the screw gauge is :
(1) 0.01 mm
(2) 0.25 mm
(3) 0.5 mm
(4) 1.0 mm

168. Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper ?

(1) 

(2) 

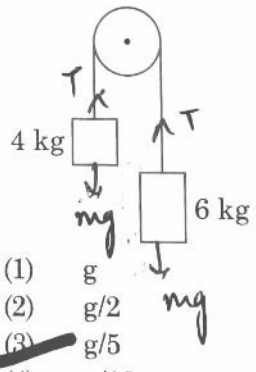
(3) 

(4) 

169. Find the torque about the origin when a force of $3\hat{j}$ N acts on a particle whose position vector is $2\hat{k}$ m .
(1) $6\hat{i}$ N m
(2) $6\hat{j}$ N m
(3) $-6\hat{i}$ N m
(4) $6\hat{k}$ N m

170. A series LCR circuit is connected to an ac voltage source. When L is removed from the circuit, the phase difference between current and voltage is $\frac{\pi}{3}$. If instead C is removed from the circuit, the phase difference is again $\frac{\pi}{3}$ between current and voltage. The power factor of the circuit is :
(1) zero
(2) 0.5
(3) 1.0
(4) −1.0

171. Two bodies of mass 4 kg and 6 kg are tied to the ends of a massless string. The string passes over a pulley which is frictionless (see figure). The acceleration of the system in terms of acceleration due to gravity (g) is :



(1) g
(2) g/2
(3) g/5
(4) g/10

172. The quantities of heat required to raise the temperature of two solid copper spheres of radii r_1 and r_2 ($r_1 = 1.5\ r_2$) through 1 K are in the ratio :
(1) $\frac{27}{8}$
(2) $\frac{9}{4}$
(3) $\frac{3}{2}$
(4) $\frac{5}{3}$

173. A 40 μF capacitor is connected to a 200 V, 50 Hz ac supply. The rms value of the current in the circuit is, nearly :

(1) 1.7 A

(2) 2.05 A

(3) 2.5 A

(4) 25.1 A

174. A body weighs 72 N on the surface of the earth. What is the gravitational force on it, at a height equal to half the radius of the earth ?

(1) 48 N

(2) 32 N

(3) 30 N

(4) 24 N

175. Two particles of mass 5 kg and 10 kg respectively are attached to the two ends of a rigid rod of length 1 m with negligible mass.

The centre of mass of the system from the 5 kg particle is nearly at a distance of :

(1) 33 cm

(2) 50 cm

(3) 67 cm

(4) 80 cm

176. In Young's double slit experiment, if the separation between coherent sources is halved and the distance of the screen from the coherent sources is doubled, then the fringe width becomes :

(1) double

(2) half

(3) four times

(4) one-fourth

177. A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in $m^2 V^{-1} s^{-1}$ of :

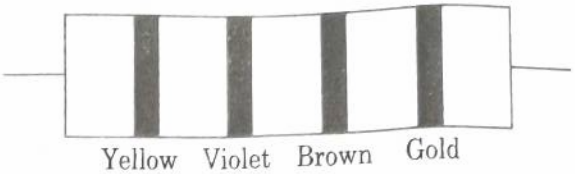
(1) 2.25×10^{15}

(2) 2.5×10^{6}

(3) 2.5×10^{-6}

(4) 2.25×10^{-15}

178. The color code of a resistance is given below :



The values of resistance and tolerance, respectively, are :

(1) 470 kΩ, 5%

(2) 47 kΩ, 10%

(3) 4.7 kΩ, 5%

(4) 470 Ω, 5%

179. A wire of length L, area of cross section A is hanging from a fixed support. The length of the wire changes to L_1 when mass M is suspended from its free end. The expression for Young's modulus is :

(1) $\frac{MgL_1}{AL}$

(2) $\frac{Mg(L_1 - L)}{AL}$

(3) $\frac{MgL}{AL_1}$

(4) $\frac{MgL}{A(L_1 - L)}$

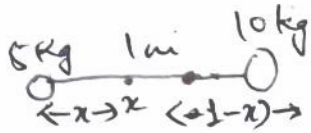
180. In a guitar, two strings A and B made of same material are slightly out of tune and produce beats of frequency 6 Hz. When tension in B is slightly decreased, the beat frequency increases to 7 Hz. If the frequency of A is 530 Hz, the original frequency of B will be :

(1) 523 Hz

(2) 524 Hz

(3) 536 Hz

(4) 537 Hz



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$COM = \frac{5x + 10(1-x)}{5+10}$

$= \frac{5x + 10 - 10x}{15}$

$= \frac{-5x + 10}{15}$