Physics

1. A launching vehicle carrying an artificial satellite of mass m is set for launch on the surface of the earth of mass M and radius R. If the satellite is intended to move in a circular orbit of radius 7R, the minimum energy required to be spent by the launching vehicle on the satellite is (Gravitational constant = G)

(a) $\frac{GMm}{R}$ (b) $-\frac{13GMm}{14R}$

(c) $\frac{GMm}{7R}$ (d) $\frac{GMm}{14R}$

2. The displacements of two particles of same mass executing SHM are represented by the equations $x_1 = 4\sin\left(10t+\frac{\pi}{6}\right)$ and $x_2 = 5\cos(\omega t)$. The value of ω for which the energies of both the particles remain same is

(a) 16 unit (b) 6 unit

(c) 4 unit (d) 8 unit

3. 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 B C D
(a) 2 1 4 3
(b) 3 4 1 2
(c) 3 1 4 2
(d) 1 2 3 4

4. 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) 3.92 N/m (b) 0.0392 N/m

(c) 0.392 N/m (d) 0.00392 N/m

5. Water from a tap emerges vertically downwards with initial velocity 4 ms^{-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 $\left(\frac{2}{3}\right)$ A, is $\left(g = 10\ m/s^2\right)$

(a) 0.5 m (b) 1 m

(c) 1.5 m (d) 2.2 m

6. 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 the 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) $\frac{1}{\sqrt{\Delta T}}$

7. 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 AC and BC. If the distance DC remains constant for small changes in temperature, then

(a) $\alpha_1 = 2\alpha_2$ (b) $\alpha_1 = 4\alpha_2$

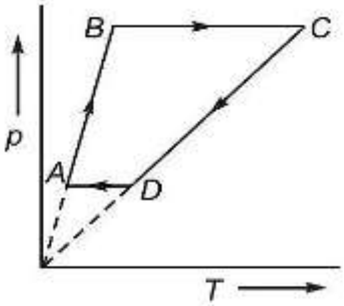
(c) $\alpha_1 = 8\alpha_2$ (d) $\alpha_1 = \alpha_2$

8. An ideal gas expands isothermally from volume V_1 to volume V_2. It is then compressed to the original volume V_1 adiabatically. If p_1, p_2 and W represent the initial pressure, final pressure and the net work done by the gas respectively during the entire process, then

(a) $p_1 > p_2, W = 0$ (b) $p_1 > p_2, W > 0$

(c) $p_2 > p_1, W > 0$ (d) $p_2 > p_1, W < 0$

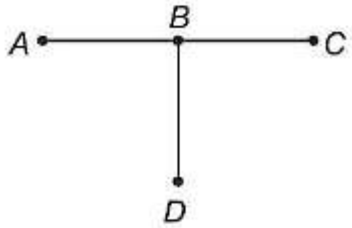
9. 3 moles of an ideal monoatomic gas performs ABCDA cyclic process as shown in figure below. The gas temperatures are $T_A = 400$ K, $T_B = 800$ K, $T_C = 2400$ K and $T_D = 1200$ K. The work done by the gas is (approximately) ($R = 8.314$ J/molK)



(a) 10 kJ (b) 20 kJ

(c) 40 kJ (d) 100 kJ

10. Three rods AB, BC and BD made of the same material and having the same cross-section have been joined as shown in the figure.



The ends A, C and D are held at temperatures of 20°C, 80°C and 80°C respectively. If each rod is of same length, then the temperature at the junction B of the three rods is

(a) 90°C (b) 60°C

(c) 40°C (d) 30°C

11. An organ pipe P_1, closed at one end and containing a gas of density ρ_1 is vibrating in its first harmonic. Another organ pipe P_2, open at both ends and containing a gas of density ρ_2 is vibrating in its third harmonic. Both the pipes are in resonance with a given tuning fork. If the compressibility of gases is equal in both pipes, the ratio of the lengths of P_1 and P_2 is (assume the given gases to be monoatomic)

(a) $\frac{1}{3}$ (b) 3

(c) $\frac{1}{6}\sqrt{\frac{\rho_1}{\rho_2}}$ (d) $\frac{1}{6}\sqrt{\frac{\rho_2}{\rho_1}}$

12. A sonometer wire has a length of 114 cm , between two fixed ends. Where should two bridges be placed so as to divide the wire into three segments (in cm) whose fundamental frequencies are in the ratio $1:3:4$?

(a) $l_1, l_2, l_3 = 18,24,72$

(b) $l_1, l_2, l_3 = 24,18,72$

(c) $l_1, l_2, l_3 = 72,18,24$

(d) $l_1, l_2, l_3 = 72,24,18$

13. In an optical fibre, core and cladding were made with materials of refractive indices 1.5 and 1.414 respectively. To observe total internal reflection, what will be the range of incident angle with the axis of optical fibre?

(a) $0^\circ - 60^\circ$ (b) $0 - 48^\circ$

(c) $0^\circ - 30^\circ$ (d) $0^\circ - 82^\circ$

14. A ray of light passes through an equilateral prism such that the angle of incidence is equal to the angle of emergence and each one is equal to 3/4th the angle of prism. The angle of deviation is
(a) 45° (b) 39° (c) 20° (d) 30°

15. The diameter of objective of a telescope is 1 m . Its resolving limit for the light of wavelength 4538Å, will be
(a) 5.54×10^{-7} rad (b) 2.54×10^{-4} rad
(c) 6.54×10^{-7} rad (d) None of these

16. Two coherent sources whose intensity ratio is 64: 1 produce interference fringes. The ratio of intensities of maxima and minima is
(a) 9: 7 (b) 8: 1
(c) 81: 49 (d) 81: 7

17. The frequncy of vibration in a vibration magnetometer of the combination of two bar magnets of magnetic moments M_1 and M_2 is 6 Hz when like poles are tied and it is 2 Hz when the unlike poles are tied together, then the ratio $M_1 : M_2$ is
(a) 4: 5 (b) 5: 4
(c) 1: 3 (d) 3: 1

18. A short magnetic needle is pivoted in a uniform magnetic field of induction 1 T . Now, simultaneously another magnetic field of induction $\sqrt{3}$ T is applied at right angles to the first field; the needle deflects through an angle θ whose value is
(a) 30° (b) 45° (c) 90° (d) 60°

19. The potential difference between two parallel plates is 10^4 V. If the plates are separated by 0.5 cm , the force on an electron between the plates is
(a) 32×10^{-13} N (b) 0.32×10^{-13} N
(c) 0.032×10^{-13} N (d) 3.2×10^{-13} N

20. Two capacitors of capacities 1μ F and Cμ F are connected in series and the combination is charged to a potential difference of 120 V . If the charge on the combination is 80μC, the energy stored in the capacitor of capacity C in μJ is
(a) 1800 (b) 1600
(c) 14400 (d) 7200

21. 6Ω and 12Ω resistors are connected in parallel. This combination is connected in series with a 10 V battery and 6Ω resistor. What is the potential difference between the terminals of the 12Ω resistor?
(a) 4 V (b) 16 V
(c) 2 V (d) 8 V

22. Charge passing through a conductor of cross-section area $A = 0.3\ m^2$ is given by $q = 3t^2 + 5t + 2$ in coulomb, where t is in second. What is the value of drift velocity at t = 2 s ? (Given, $n = 2 \times 10^{25}/m^3$)
(a) 0.77×10^{-5} m/s
(b) 1.77×10^{-5} m/s
(c) 2.08×10^{-5} m/s
(d) 0.57×10^{-5} m/s

23. The thermo emf of a thermocouple is given by, $E = aT + bT^2$, where $\frac{a}{b} = -200$°C. If the cold function is kept at 30°C, then the inversion temperature is (ε in volt, T in centigrade)
(a) 103 K (b) 143 K
(c) 333 K (d) 443 K

24. The intensity of the magnetic induction field at the centre of a single turn circular coil of radius 5 cm carrying current of 0.9 A .
(a) $36\pi \times 10^{-7}$ T (b) $9\pi \times 10^{-7}$ T
(c) $36\pi \times 10^{-6}$ T (d) $9\pi \times 10^{-6}$ T

25. A capacitor of capacity 0.1μ F connected in series to a resistor of $10M\Omega$ is charged to a certain potential and then made to discharge through the resistor. The time in which the potential will take to fall to half its original value is (Given, $\log_{10} 2 = 0.3010$)

(a) 2 s (b) 0.693 s

(c) 0.5 s (d) 1.0 s

26. The time constant of inductance coil is 3 m s . When a 90Ω resistance is joined in series, then the time constant becomes 0.5 ms . The inductance and the resistance of the coil are

(a) $54mH, 18\Omega$ (b) $14mH, 42\Omega$

(c) $42mH, 14\Omega$ (d) $14mH, 60\Omega$

27. In Thomson's experiment to determine $\frac{e}{m}$ of an electron, it is found that an electron beam having a kinetic energy of 45.5 eV remains undeflected, when subjected to crossed electric and magnetic fields. If $E = 1 \times 10^3 Vm^{-1}$, the value of B is (mass of the electron is 9.1×10^{-31} kg)

(a) 2.5×10^{-3} Wb m^{-2}

(b) 5.0×10^{-4} Wb m^{-2}

(c) 2.5×10^{-4} Wb m^{-2}

(d) 1.0×10^{-4} Wb m^{-2}

28. Photoelectric emission is observed from a metallic surface for frequencies v_1 and v_2 of the incident light $(v_1 > v_2)$. If the maximum values of kinetic energy of the photoelectrons emitted in the two cases are in the ratio $1:n$, then the threshold frequency of the metallic surface is

(a) $\frac{(v_1-v_2)}{(n-1)}$ (b) $\frac{(nv_1-v_2)}{(n-1)}$

(c) $\frac{(nv_2-v_1)}{(n-1)}$ (d) $\frac{(v_1-v_2)}{n}$

29. A proton, a deutron and an α-particle having the same momentum, enters a region of uniform electric field between the parallel plates of a capacitor. The electric field is perpendicular to the initial path of the particles. Then the ratio of deflections suffered by them is

(a) $1:2:8$ (b) $1:2:4$

(c) $1:1:2$ (d) None of these

30. A transistor having a β equal to 80 has a change in base current of 250μ A, then the change in collector current is

(a) 20,000 mA (b) 200 mA

(c) 2000 mA (d) 20 mA

31. If the force is given by $F = at + bt^2$ with t as time. The dimensions of a and b are

(a) $[MLT^{-4}], [MLT^{-2}]$

(b) $[MLT^{-3}], [MLT^{-4}]$

(c) $[ML^2 T^{-3}], [ML^2 T^{-2}]$

(d) $[ML^2 T^{-3}], [ML^3 T^{-4}]$

32. $\vec{A}$ and $\vec{B}$ are two vectors of equal magnitudes and θ is the angle between them. The angle between $\vec{A}$ or $\vec{B}$ with their resultant is

(a) $\frac{\theta}{4}$ (b) $\frac{\theta}{2}$ (c) 2θ (d) zero

33. An athelete completes one round of a circular track of radius R in 40 s . What will be his displacement at the end of 2 min 20 s ?

(a) 7R (b) 2R

(c) 2πR (d) 7πR

34. A ball is falling freely from a height. When it reaches 10 m height from the ground its velocity is v_0. It collides with the ground and loses 50% of its energy and rises back to height of 10 m . Then the velocity v_0 is

(a) 7 m/s (b) 10 m/s
(c) 14 m/s (d) 16 m/s

35. A bomb moving with velocity $(40\hat{i}+50\hat{j}-25\hat{k})$m/s explodes into two pieces of mass ratio 1:4. After explosion the smaller piece moves away with velocity $(200\hat{i}+70\hat{j}+15\hat{k})$m/s. The velocity of larger piece after explosion is

(a) $45\hat{j}-35\hat{k}$ (b) $45\hat{i}-35\hat{j}$
(c) $45\hat{k}-35\hat{j}$ (d) $-35\hat{i}+45\hat{k}$

36. A body of mass $m_1 = 4$ kg moves at $5\hat{i}$ m/s and another body of mass $m_2 = 2$ kg moves at $10\hat{i}$ m/s. The kinetic energy of centre of mass is

(a) $\frac{200}{3}$ J (b) $\frac{500}{3}$ J
(c) $\frac{400}{3}$ J (d) $\frac{800}{3}$ J

37. A ball falls from a height h and rebounds after striking the floor. The coefficient of restitution is e. The maximum distance covered before it comes to rest is

(a) $\frac{(1-e^2)h}{e^2}$ (b) $\frac{(1+e^2)h}{e^2}$
(c) $\left(\frac{1+e^2}{1-e^2}\right)h$ (d) $\frac{e^2h}{1-e^2}$

38. An object takes n times as much time as to slide down a 45° rough inclined plane as it takes to slide down a perfectly smooth inclined plane of the same inclination. The coefficient of kinetic friction between the object and the rough incline is given by

(a) $\left(1-\frac{1}{n^2}\right)$ (b) $\left(\frac{1}{1-n^2}\right)$
(c) $\sqrt{1-\frac{1}{n^2}}$ (d) $\sqrt{1+\frac{1}{n^2}}$

39. The moment of inertia of a disc, of mass M and radius R, about an axis which is a tangent and parallel to its diameter is

(a) $\frac{1}{2}MR^2$ (b) $\frac{3}{4}MR^2$
(c) $\frac{1}{4}MR^2$ (d) $\frac{5}{4}MR^2$

40. A fly-wheel of mass 25 kg has a radius of 0.2 m . It is making 240 rpm .What is the torque necessary to bring to rest in 20 s ?

(a) 2πNm (b) 0.4πNm
(c) $\frac{2}{\pi}$Nm (d) 4πNm

Chemistry

41. A solution of concentration Cg equiv/L has a specific resistance R. The equivalent conductance of the solution is

(a) $\frac{R}{C}$ (b) $\frac{C}{R}$
(c) $\frac{1000}{RC}$ (d) $\frac{1000R}{C}$

42. Assertion (A) White tin is an example of tetragonal system.
Reasoning (R) For a tetragonal system $a = b = c$ and $\alpha = \beta = \gamma \neq 90°$. The correct answer is

(a) (A) and (R) are true and (R) is the correct explanation of (A).
(b) Both (A) and (R) are true and (R) is not the correct explanation of (A).
(c) (A) is true but (R) is not true.
(d) (A) is not true but (R) is true.

43. What is the slope of the straight line for the graph drawn between ln k and $\frac{1}{T}$, where k is the rate constant of a reaction at temperature T ?

(a) $\frac{-E_a}{2.303R}$ (b) $\frac{-E_a}{R}$
(c) $\frac{E_a}{R}$ (d) $\frac{R}{E_a}$

44. If the equilibrium constant for the reaction, $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$ is K what is the equilibrium constant of

$HI(g) \rightleftharpoons \frac{1}{2}H_2(g) + \frac{1}{2}I_2(g)$?

(a) $\frac{1}{K}$ (b) $\sqrt{K}$

(c) K (d) $\frac{1}{\sqrt{K}}$

45. The pH of 0.01 M solution of acetic acid is 5.0. What are the values of $[H^+]$ and K_a respectively?

(a) $1 \times 10^{-5} M, 1 \times 10^{-8}$

(b) $1 \times 10^{-5} M, 1 \times 10^{-9}$

(c) $1 \times 10^{-4} M, 1 \times 10^{-8}$

(d) $1 \times 10^{-3} M, 1 \times 10^{-8}$

46. A system is provided with 50 J of heat and the work done on the system is 10 J . What is the change in internal energy of the system in joules?

(a) 60 (b) 40

(c) 50 (d) 10

47. A micelle formed during the cleansing action by soap is

(a) a discrete particle of soap

(b) aggregated particles of soap and dirt

(c) a discrete particle of dust

(d) an aggregated particle of dust and water

48. The orange coloured compound formed when H_2O_2 is added to TiO_2 solution acidified with conc H_2SO_4 is

(a) Ti_2O_3 (b) $H_2Ti_2O_8$

(c) H_2TiO_3 (d) H_2TiO_4

49. Solvay process is used in the manufacture of

(a) K_2CO_3 (b) $KHCO_3$

(c) Na_2CO_3 (d) $CaCl_2$

50. Diborane reacts with ammonia under different conditions to give a variety of products. Which one among the following is not formed in these reactions?

(a) $B_2H_6 \cdot 2NH_3$ (b) $B_{12}H_{12}$

(c) $B_3 N_3H_6$ (d) $(BN)_n$

51. Which one of the following is the mineral for tin?

(a) Galena (b) Cerussite

(c) Cassiterite (d) Anglesite

52. The oxide of nitrogen formed by thermal decomposition of NH_4NO_3 is

(a) NO (b) N_2O

(c) N_2O_5 (d) NO_2

53. Which one of the following is most acidic?

(a) H_2O (b) $H_2 S$

(c) H_2Te (d) H_2Se

54. Which one of the following is formed apart from sodium chloride when chlorine reacts with hot concentrated sodium hydroxide?

(a) NaOCl (b) $NaClO_3$

(c) $NaClO_2$ (d) $NaClO_4$

55. Helium mixed with oxygen is used in the treatment of

(a) beriberi (b) burning feet

(c) joints burning (d) asthma

56. Which of the following is a correct statement?

(a) Aqueous solutions of Cu^+ and Zn^{2+} are colourless

(b) Aqueous solutions of Cu^{2+} and Zn^{2+} are colourless

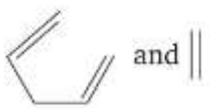
(c) Aqueous solution of Fe^{3+} is green in colour
(d) Aqueous solution of MnO_4^- is colourless

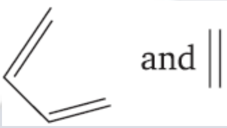
57. The chemical reaction that involves roasting process is
(a) $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$
(b) $2Al + Fe_2O_3 \longrightarrow 2Fe + Al_2O_3$
(c) $2ZnS + 3O_2 \longrightarrow 2ZnO + 3SO_2$
(d) $FeO + SiO_2 \longrightarrow FeSiO_3$

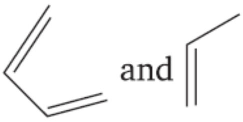
58. The acceptable level of carbon monoxide gas (CO) in the atmosphere in ppm level is
(a) 9 (b) 250
(c) 49 (d) 850

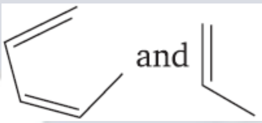
59. The conversion of O -acylated phenol in presence of $AlCl_3$ to C -acylated phenol is an example for this type of organic reaction
(a) addition reaction
(b) substitution reaction
(c) molecular rearrangement
(d) elimination reaction

60. Diels-Alder reaction will not take place with which of the following reactants?

(a) 

(b) 

(c) 

(d) 

61. In which of the following, ortho/para substitution by an electrophile is very facile?
(a) Nitrobenzene (b) Phenol
(c) Benzoic acid (d) Acetophenone

62. Which one of the following of 2,3-butane diol is enantiomeric?
(a) 2R, 3R and 2S, 3S
(b) 2S, 3S and 2S, 3R
(c) 2R, 3R and 2R, 3S
(d) 2S, 3S and 2R, 3S

63. The two enantiomers of secondary butyl chloride differ from each other in which one of the following properties?
(a) Boiling point
(b) Specific rotation
(c) Density
(d) Cl − Cl bond length

64. Identify the product (A) of the following reaction,

$$C_2H_5{-}O{-}C_2H_5 + CO \xrightarrow[500\text{ atm}]{BF_3/150^\circ C} A$$

(a) ethyl alcohol (b) ethyl propionate
(c) ethanoic acid (d) ethyl acetate

65. Which one of the following gives yellow precipitate with iodine and NaOH solution?
(a) CH_3-CHO (b) $C_6H_5COC_6H_5$
(c) HCHO (d) CH_3OH

66. Identify A, B and C in the following reactions

$CH_3Cl \xrightarrow{KCN} A \xrightarrow[H_3O^{\oplus}]{hydrolysis} B$

$\xrightarrow[\Delta]{C_2H_5OH/H^+} C$

	A	B	C
(a)	CH_3NC	CH_3NHCH_3	$CH_3-N(CH_3)-C_2H_5$

(b) $CH_3CNCH_3CONH_2CH_3CO_2H$
(c) CH_3CN CH_3CO_2H $CH_3CO_2C_2H_5$
(d) CH_3CN CH_3CO_2H $(CH_3CO)_2O$

67. Reduction of nitrobenzene with Zn and alcoholic KOH solution results in the formation of the following compound

(a) hydrazobenzene
(b) azobenzene
(c) aniline
(d) phenyl hydroxyl amine

68. If the number average molecular weight and weight average molecular weight of a polymer are 40000 and 60000 respectively, the polydispersity index of the polymer will be

(a) > 1 (b) < 1
(c) 1 (d) zero

69. The AT/GC ratio in human beings is (where A = adenine, T = thymine, G = Guanine, C = cytosine)

(a) 1 (b) 1.52
(c) 9.3 (d) 2

70. Identify the non-narcotic analgesic from the following

(a) diazepam (b) ibuprofen
(c) formalin (d) terpineol

71. Which one of the following transitions of an electron in hydrogen atom emits radiation of the lowest wavelength?

(a) $n_2 = \infty$ to $n_1 = 2$ (b) $n_2 = 4$ to $n_1 = 3$
(c) $n_2 = 2$ to $n_1 = 1$ (d) $n_2 = 5$ to $n_1 = 3$

72. Which one of the following conditions is incorrect for a well- behaved wave function (ψ) ?

(a) ψ must be finite
(b) ψ must be single valued
(c) ψ must be infinite
(d) ψ must be continuous

73. The electron affinity values of elements A, B, C and D are respectively $-135, -60, -200$ and -348 kJ mol $^{-1}$. The outer electronic configuration of element B is

(a) $3s^2 3p^5$ (b) $3s^2 3p^4$
(c) $3s^2 3p^3$ (d) $3s^2 3p^2$

74. Match the following.

	Column I (Molecules)		Column II (Number of lone pairs on central atom)
(A)	NH_3	(1)	Two
(B)	H_2O	(2)	Three
(C)	XeF_2	(3)	Zero

(D)	CH_4	(4)	Four

A B C D A B C D

(a) 5 1 3 2 (b) 3 1 2 5

(c) 5 1 2 3 (d) 1 5 3 4

75. The ratio of anion radius to cation radius of a crystal is 10 : 9.3. Then, the coordination number of the cation in the crystal is

(a) 2 (b) 4 (c) 6 (d) 8

76. The number of molecules of CO_2 liberated by the complete combustion of 0.1 g atom of graphite in air is

(a) 3.01×10^{22} (b) 6.02×10^{23}

(c) 6.02×10^{22} (d) 3.01×10^{23}

77. CH_4 diffuses two times faster than a gas X. The number of molecules present in 32 g of gas X is (N is Avogadro number)

(a) N (b) $\frac{N}{2}$ (c) $\frac{N}{4}$ (d) $\frac{N}{16}$

78. If $BaCl_2$ ionizes to an extent of 80% in aqueous solution, the value of van't Hoff factor is

(a) 2.6 (b) 0.4

(c) 0.8 (d) 2.4

79. X is a non-volatile solute and Y is a volatile solvent. The following vapour pressures are observed by dissolving X in Y.

$X/mol\ L^{-1}$	Y/mm of Hg
0.10	p_1
0.25	p_2
0.01	p_3

The correct order of vapour pressures is

(a) $p_1 < p_2 < p_3$ (b) $p_3 < p_2 < p_1$

(c) $p_3 < p_1 < p_2$ (d) $p_2 < p_1 < p_3$

80. At a certain temperature and at infinite dilution, the equivalent conductances of sodium benzoate, hydrochloric acid and sodium chloride are 240,349 and 229ohm^{-1} cm^2 equiv $^{-1}$ respectively. The equivalent conductance of benzoic acid in ohm $^{-1}$ cm^2 equiv $^{-1}$ at the same conditions is

(a) 80 (b) 328

(c) 360 (d) 408

Mathematics

81. Let $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$, $\vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{c} = \lambda\hat{i} + \hat{j} + (2\lambda - 1)\hat{k}$. If $\vec{c}$ is parallel to the plane containing $\vec{a}, \vec{b}$, then λ is equal to

(a) 0 (b) 1 (c) -1 (d) 2

82. If three unit vectors $\vec{a}, \vec{b}, \vec{c}$ satisfy $\vec{a} + \vec{b} + \vec{c} = \vec{0}$, then the angle between $\vec{a}$ and $\vec{b}$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{5\pi}{6}$ (c) $\frac{\pi}{3}$ (d) $\frac{\pi}{6}$

83. $(\vec{a} + 2\vec{b} - \vec{c}) \cdot (\vec{a} - \vec{b}) \times (\vec{a} - \vec{b} - \vec{c})$ is equal to

(a) $-[\vec{a}\vec{b}\ \mathbf{c}]$ (b) $2[\vec{a}\vec{b}\vec{c}]$

(c) $3[\vec{a}\vec{b}\vec{c}]$ (d) $\vec{0}$

84. If $\vec{u} = \vec{a} - \vec{b}, \vec{v} = \vec{a} + \vec{b}, |\vec{a}| = |\vec{b}| = 2$, then $|\vec{u} \times \vec{v}|$ is equal to

(a) $2\sqrt{16 - (\vec{a} \cdot \vec{b})^2}$ (b) $\sqrt{16 - (\vec{a} \cdot \vec{b})^2}$

(c) $2\sqrt{4 - (\vec{a} \cdot \vec{b})^2}$ (d) $\sqrt{4 - (\vec{a} \cdot \vec{b})^2}$

85. If the angle θ between the vectors $\vec{a} = 2x^2\hat{i} + 4x\hat{j} + \hat{k}$ and $\vec{b} = 7\hat{i} - 2\hat{j} + x\hat{k}$ is such that $90° < \theta < 180°$, then x lies in the interval

(a) $\left(0, \frac{1}{2}\right)$ (b) $\left(\frac{1}{2}, 1\right)$
(c) $\left(1, \frac{3}{2}\right)$ (d) $\left(\frac{1}{2}, \frac{3}{2}\right)$

86. Let OA, OB, OC be the co-terminal edges of a rectangular parallelopiped of volume V and let P be the vertex opposite to O. Then, $[\overrightarrow{AP}\overrightarrow{BP}\overrightarrow{CP}]$ is equal to
(a) 2V (b) 12 V
(c) $3\sqrt{3}$V (d) 0

87. An urn A contains 3 white and 5 black balls. Another urn B contains 6 white and 8 black balls. A ball is picked from A at random and then transferred to B. Then, a ball is picked at random from B. The probability that it is a white ball is
(a) $\frac{14}{40}$ (b) $\frac{15}{40}$ (c) $\frac{16}{40}$ (d) $\frac{17}{40}$

88. If $A_i (i = 1, 2, 3, \ldots, n)$ are n independent events with $P(A_i) = \frac{1}{1+i}$ for each i, then the probability that none of A_i occurs is
(a) $\frac{n-1}{n+1}$ (b) $\frac{n}{n+1}$
(c) $\frac{n}{n+2}$ (d) $\frac{1}{n+1}$

89. Suppose A and B are two events such that $P(A \cap B) = \frac{3}{25}$ and $P(B - A) = \frac{8}{25}$. Then, P(B) is equal to
(a) $\frac{11}{25}$ (b) $\frac{3}{11}$ (c) $\frac{1}{11}$ (d) $\frac{9}{11}$

90. Suppose that a random variable X follows Poisson distribution. If $P(X = 1) = P(X = 2)$ then $P(X = 5)$ is equal to
(a) $\frac{2}{3}e^{-2}$ (b) $\frac{3}{4}e^{-2}$
(c) $\frac{4}{15}e^{-2}$ (d) $\frac{7}{8}e^{-2}$

91. If the mean and variance of a binomial variable X are 2 and 1 respectively, then $P(X \geq 1)$ is equal to
(a) $\frac{2}{3}$ (b) $\frac{15}{16}$ (c) $\frac{7}{8}$ (d) $\frac{4}{5}$

92. If a straight line L is perpendicular to the line $4x - 2y = 1$ and forms a triangle of area 4 sq unit with the coordinate axes, then the equation of the line L is
(a) $2x + 4y + 7 = 0$ (b) $2x - 4y + 8 = 0$
(c) $2x + 4y + 8 = 0$ (d) $4x - 2y - 8 = 0$

93. The image of the point $(4, -13)$ with respect to the line $5x + y + 6 = 0$ is
(a) $(-1, -14)$ (b) $(3,4)$
(c) $(1,2)$ (d) $(-4,13)$

94. The image of the line $x + y - 2 = 0$ in the y-axis is
(a) $x - y + 2 = 0$ (b) $y - x + 2 = 0$
(c) $x + y + 2 = 0$ (d) $x + y - 2 = 0$

95. A straight line which makes equal intercepts on positive X and Y axes and which is at a distance 1 unit from the origin intersects the straight line $y = 2x + 3 + \sqrt{2}$ at (x_0, y_0). Then $2x_0 + y_0$ is equal to
(a) $3 + \sqrt{2}$ (b) $\sqrt{2} - 1$
(c) 1 (d) 0

96. The distance between the two lines represented by
$8x^2 - 24xy + 18y^2 - 6x + 9y - 5 = 0$ is
(a) 0 (b) $\frac{3}{4\sqrt{13}}$
(c) $\frac{6}{\sqrt{13}}$ (d) $\frac{7}{2\sqrt{13}}$

97. A pair of perpendicular lines passes through the origin and also through the points of intersection of the curve $x^2 + y^2 = 4$ with $x + y = a$, where $a > 0$. Then a is equal to
(a) 2 (b) 3 (c) 4 (d) 5

98. If $3x^2 - 11xy + 10y^2 - 7x + 13y + k = 0$
denotes a pair of straight lines, then the point of intersection of the lines is
(a) $(1,3)$ (b) $(3,1)$
(c) $(-3,1)$ (d) $(1,-3)$

99. The equation of the radical axis of the pair of circles $7x^2+7y^2-7x+14y+18=0$ and $4x^2+4y^2-7x+8y+20=0$ is

(a) $x-2y-5=0$ (b) $2x-y+5=0$

(c) $21x-68=0$ (d) $23x-68=0$

100. If the lengths of tangents drawn to the circles

$$x^2+y^2-8x+40=0$$
$$5x^2+5y^2-25x+80=0$$
$$x^2+y^2-8x+16y+160=0$$

From the point P are equal, then P is equal to

(a) $\left(8,\frac{15}{2}\right)$ (b) $\left(-8,\frac{15}{2}\right)$

(c) $\left(8,\frac{-15}{2}\right)$ (d) $\left(-8,\frac{-15}{2}\right)$

101. The equation of the circle concentric with the circle $x^2+y^2-6x+12y+15=0$ and of double its area is

(a) $x^2+y^2-6x+12y-15=0$

(b) $x^2+y^2-6x+12y-30=0$

(c) $x^2+y^2-6x+12y-25=0$

(d) $x^2+y^2-6x+12y-20=0$

102. If the circle $x^2+y^2+2x+3y+1=0$ cuts another circle $x^2+y^2+4x+3y+2=0$ in A and B, then the equation of the circle with AB as a diameter is

(a) $x^2+y^2+x+3y+3=0$

(b) $2x^2+2y^2+2x+6y+1=0$

(c) $x^2+y^2+x+6y+1=0$

(d) $2x^2+2y^2+x+3y+1=0$

103. The length of the common chord of the circles of radii 15 and 20, whose centres are 25 unit of distance apart, is

(a) 12 (b) 16 (c) 24 (d) 25

104. Let M be the foot of the perpendicular from a point P on the parabola $y^2=8(x-3)$ onto its directrix and let S be the focus of the parabola. If $\triangle$ SPM is an equilateral triangle, then P is equal to

(a) $(4\sqrt{3},8)$(b) $(8,4\sqrt{3})$

(c) $(9,4\sqrt{3})$ (d) $(4\sqrt{3},9)$

105. The equation of the hyperbola which passes through the point $(2,3)$ and has the asymptotes $4x+3y-7=0$ and $x-2y-1=0$ is

(a) $4x^2+5xy-6y^2-11x+11y+50=0$

(b) $4x^2+5xy-6y^2-11x+11y-43=0$

(c) $4x^2-5xy-6y^2-11x+11y+57=0$

(d) $x^2-5xy-y^2-11x+11y-43=0$

106. The product of the perpendicular distances from any point on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ to its asymptotes is

(a) $\frac{a^2b^2}{a^2-b^2}$ (b) $\frac{a^2b^2}{a^2+b^2}$

(c) $\frac{a^2+b^2}{a^2b^2}$ (d) $\frac{a^2-b^2}{a^2b^2}$

107. If the lines $2x+3y+12=0, x-y+k=0$ are conjugate with respect to the parabola $y^2=8x$, then k is equal to

(a) 10 (b) $\frac{7}{2}$ (c) -12 (d) -2

108. Find the equation to the parabola, whose axis parallel to the y-axis and which passes through the points $(0,4),(1,9)$ and $(4,5)$ is

(a) $y=-x^2+x+4$ (b) $y=-x^2+x+1$
(c) $y=\frac{-19}{12}x^2+\frac{79}{12}x+4$ (d) $y=\frac{-19}{12}x^2+\frac{89}{12}+1$

109. The point dividing the join of $(3,-2,1)$ and $(-2,3,11)$ in the ratio $2:3$ is
(a) $(1,1,4)$ (b) $(1,0,5)$
(c) $(2,3,5)$ (d) $(0,6,-1)$

110. If α,β,γ are the roots of the equation $x^3-6x^2+11x-6=0$ and if $a=\alpha^2+\beta^2+\gamma^2$, $b=\alpha\beta+\beta\gamma+\gamma\alpha$ and $c=(\alpha+\beta)(\beta+\gamma)(\gamma+\alpha)$, then the correct inequality among the following is
(a) $a<b<c$ (b) $b<a<c$
(c) $b<c<a$ (d) $c<a<b$

111. A plane meets the coordinate axes at A, B, C so that the centroid of the triangle ABC is $(1,2,4)$. Then, the equation of the plane is
(a) $x+2y+4z=12$ (b) $4x+2y+z=12$
(c) $x+2y+4z=3$ (d) $4x+2y+z=3$

112. If $(2,3,-3)$ is one end of a diameter of the sphere $x^2+y^2+z^2-6x-12y-2z+20=0$, then the other end of the diameter is
(a) $(4,9,-1)$ (b) $(4,9,5)$
(c) $(-8,-15,1)$ (d) $(8,15,5)$

113. $\lim_{x\to 0}\frac{\tan x-\sin x}{x^2}$ is equal to
(a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

114. If $f:R\to R$ defined by $f(x)=\begin{cases}\frac{1+3x^2-\cos 2x}{x^2}, & \text{for } x\neq 0\\ k, & \text{for } x=0\end{cases}$ is continuous at $x=0$, then k is equal to
(a) 1 (b) 5 (c) 6 (d) 0

115. If $f(x)=(\cos x)(\cos 2x)\ldots(\cos nx)$, then $f'(x)+\sum_{r=1}^{n}(r\tan rx)f(x)$ is equal to
(a) $f(x)$ (b) 0
(c) $-f(x)$ (d) $2f(x)$

116. If $y=\cos^{-1}\left(\frac{a^2-x^2}{a^2+x^2}\right)+\sin^{-1}\left(\frac{2ax}{a^2+x^2}\right)$, then $\frac{dy}{dx}$ is equal to
(a) $\frac{a}{x^2+a^2}$ (b) $\frac{2a}{x^2+a^2}$
(c) $\frac{4a}{x^2+a^2}$ (d) $\frac{a^2}{x^2+a^2}$

117. If $f(x)=\sin x+\cos x$, then $f\left(\frac{\pi}{4}\right)f^{(iv)}\left(\frac{\pi}{4}\right)$ is equal to
(a) 1 (b) 2 (c) 3 (d) 4

118. If $y=\sin(m\sin^{-1}x)$, then $(1-x^2)y_2-xy_1$ is equal to (Here, y_n denotes $\frac{d^ny}{dx^n}$)
(a) m^2y (b) $-m^2y$
(c) $2m^2y$ (d) $-2m^2y$

119. The height of the cone of maximum volume inscribed in a sphere of radius R is
(a) $\frac{R}{3}$ (b) $\frac{2R}{3}$ (c) $\frac{4R}{3}$ (d) $\frac{4R}{\sqrt{3}}$

120. The longest distance of the point $(a,0)$ from the curve $2x^2+y^2=2x$ is
(a) $1+a$ (b) $|1-a|$
(c) $\sqrt{1-2a+2a^2}$ (d) $\sqrt{1-2a+3a^2}$

121. If m_1 and m_2 are the roots of the equation
$x^2+(\sqrt{3}+2)x+(\sqrt{3}-1)=0$
then the area of the triangle formed by the lines $y=m_1x, y=m_2x$ and $y=c$
(a) $\left(\frac{\sqrt{33}-\sqrt{11}}{4}\right)\cdot c^2$ (b) $\left(\frac{\sqrt{33}+\sqrt{11}}{4}\right)\cdot c^2$
(c) $\left(\frac{\sqrt{11}-\sqrt{33}}{2}\right)\cdot c^2$ (d) $\frac{\sqrt{33}}{2}\cdot c^2$

122. If $u=\sin^{-1}\left(\frac{x^4+y^4}{x+y}\right)$, then $x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}$ is equal to

(a) $3u$ (b) $4u$

(c) $3\sin u$ (d) $3\tan u$

123. If $\int \frac{7x^8+8x^7}{(1+x+x^8)^2}dx=f(x)+c$, then $f(x)$ is equal to

(a) $\frac{x^8}{1+x+x^8}$ (b) $28\log(1+x+x^8)$

(c) $\frac{1}{1+x+x^8}$ (d) $\frac{-1}{1+x+x^8}$

124. If $f_n(x)=\log\log\log\ldots\log x$ (log is repeated n-times), then $\int (xf_1(x)f_2(x)\ldots f_n(x))^{-1}dx$ is equal to

(a) $f_{n+1}(x)+c$ (b) $\frac{f_{n+1}(x)}{n+1}+c$

(c) $nf_n(x)+c$ (d) $\frac{f_n(x)}{n}+c$

125. If $\int(1-\cos x)\mathrm{cosec}^2x dx=f(x)+c$, then $f(x)$ is equal to

(a) $\tan\frac{x}{2}$ (b) $\cot\frac{x}{2}$

(c) $2\tan\frac{x}{2}$ (d) $\frac{1}{2}\tan\frac{x}{2}$

126. If $I_n=\int_0^{\pi/4}\tan^n x dx$, then

$I_2+I_4, I_3+I_5, I_4+I_6, \ldots$, are in

(a) arithmetic progression

(b) geometric progression

(c) harmonic progression

(d) arithmetico-geometric progression

127. The area (in square units) of the region enclosed by the two circles $x^2+y^2=1$ and $(x-1)^2+y^2=1$ is

(a) $\frac{2\pi}{3}+\frac{\sqrt{3}}{2}$ (b) $\frac{\pi}{3}+\frac{\sqrt{3}}{2}$

(c) $\frac{\pi}{3}-\frac{\sqrt{3}}{2}$ (d) $\frac{2\pi}{3}-\frac{\sqrt{3}}{2}$

128. The values of a function $f(x)$ at different values of x are as follows

x	:	0	1	2	3	4	5
f(x)	:	2	3	6	11	18	27

Then, the approximate area (in square units) bounded by the curve $y=f(x)$ and x-axis between $x=0$ and 5, using the Trapezoidal rule, is

(a) 50 (b) 75

(c) 52.5 (d) 62.5

129. The solution of $\tan y\frac{dy}{dx}=\sin(x+y)+\sin(x-y)$ is

(a) $\sec y=2\cos x+c$

(b) $\sec y=-2\cos x+c$

(c) $\tan y=-2\cos x+c$

(d) $\sec^2 y=-2\cos x+c$

130. A family of curves has the differential equation $xy\frac{dy}{dx}=2y^2-x^2$. Then, the family of curves is

(a) $y^2=cx^2+x^3$ (b) $y^2=cx^4+x^3$

(c) $y^2=x+cx^4$ (d) $y^2=x^2+cx^4$

131. If $f(0)=0, f(1)=1, f(2)=2$ and $f(x)=f(x-2)+f(x-3)$ for $x=3,4,5,\ldots$, then $f(9)$ is equal to

(a) 12 (b) 13 (c) 14 (d) 10

132. Let R denote the set of all real numbers and R^+ denote the set of all positive real numbers. For the subsets A and B of R define $f: A\to B$ by $f(x)=x^2$ for $x\in A$. Observe the two lists given below

Column I		Column II	
(A)	f is one-one and onto, if	(1)	$A = R^+, B = R$
(B)	f is one-one but not onto, if	(2)	$A = B = R$
(C)	f is onto but not one-one, if	(3)	$A = R, B = R^+$
(D)	f is neither one-one nor onto, if	(4)	$A = B = R^+$

	A	B	C	D
(a)	1	2	3	4
(b)	4	2	1	3
(c)	4	1	3	2
(d)	4	2	3	1

133. **The numbers $a_n = 6^n - 5n$ for $n = 1, 2, 3, \ldots$ when divided by 25 leave the remainder**

(a) 9 (b) 7 (c) 3 (d) 1

134. **Let $n = 1! + 4! + 7! + \cdots + 400!$. Then ten's digit of n is**

(a) 1 (b) 6 (c) 2 (d) 7

135. **Let $a_n = \frac{10^n}{n!}$ for $n = 1, 2, 3, \ldots$ then the greatest value of n for which a_n is the greatest is**

(a) 11 (b) 20 (c) 10 (d) 8

136. **A polygon has 54 diagonals. Then, the number of its sides is**

(a) 7 (b) 9 (c) 10 (d) 12

137. **If $\left(1 + 2x + 3x^2\right)^{10} = a_0 + a_1x + a_2x^2 + \cdots + a_{20}x^{20}$ then $\frac{a_2}{a_1}$ is equal to**

(a) 10.5 (b) 21

(c) 10 (d) 5.5

138. **For $|x| < \frac{1}{5}$, the coefficient of x^3 in the expansion of $\frac{1}{(1-5x)(1-4x)}$ is**

(a) 369 (b) 370

(c) 371 (d) 372

139. **If $\frac{3x^2+x+1}{(x-1)^4} = \frac{a}{(x-1)} + \frac{b}{(x-1)^2} + \frac{c}{(x-1)^3} + \frac{d}{(x-1)^4}$ then $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ is equal to**

(a) $\begin{bmatrix} 3 & 7 \\ 5 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 3 \\ 7 & 5 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & 7 \\ 3 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 5 \\ 7 & 0 \end{bmatrix}$

140. **$\log_4 2 - \log_8 2 + \log_{16} 2 - \cdots$ is equal to**

(a) e^2 (b) $\log_e 2$

(c) $1 + \log_e 3$ (d) $1 - \log_e 2$

141. **For $x \in R$, the least value of $\frac{x^2-6x+5}{x^2+2x+1}$ is**

(a) -1 (b) $-\frac{1}{2}$ (c) $-\frac{1}{4}$ (d) $-\frac{1}{3}$

142. **$\left\{x \in R: \frac{14x}{x+1} - \frac{9x-30}{x-4} < 0\right\}$ is equal to**

(a) $(-1,4)$ (b) $(1,4) \cup (5,7)$

(c) $(1,7)$ (d) $(-1,1) \cup (4,6)$

143. The condition that the roots of $x^3 - bx^2 + cx - d = 0$ are in geometric progression is

(a) $c^3 = b^3 d$ (b) $c^2 = b^2 d$

(c) $c = bd^3$ (d) $c = bd^2$

144. Let $\alpha \neq 1$ be a real root of the equation $x^3 - ax^2 + ax - 1 = 0$, where $a \neq -1$ is a real number. Then, a root of this equation, among the following, is

(a) α^2 (b) $-\frac{1}{\alpha}$

(c) $\frac{1}{\alpha}$ (d) $-\frac{1}{\alpha^2}$

145. If $f(x) = \begin{vmatrix} 2\cos x & 1 & 0 \\ x - \frac{\pi}{2} & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$,

then $f'(\pi)$ is equal to

(a) 0 (b) 2 (c) $\frac{\pi}{2}$ (d) $\pi - 6$

146. If $\begin{vmatrix} x & x^2 & 1 + x^3 \\ y & y^2 & 1 + y^3 \\ z & z^2 & 1 + z^3 \end{vmatrix} = 0, x \neq y \neq z$,

then $1 + xyz$ is equal to

(a) 0 (b) -1 (c) 1 (d) 2

147. If the system of equations

$(k+1)^3 x + (k+2)^3 y = (k+3)^3$

$(k+1)x + (k+2)y = k+3$

$x + y = 1$

is consistent, then the value of k is

(a) 2 (b) -2 (c) -1 (d) 1

148. If A is a non-zero square matrix of order n with $\det(I + A) \neq 0$ and $A^3 = O$, where I, O are unit and null matrices of order $n \times n$ respectively, then $(I + A)^{-1}$ is equal to

(a) $I - A + A^2$ (b) $I + A + A^2$

(c) $I + A^{-1}$ (d) $I + A$

149. If $z = 1 + i\sqrt{3}$, then $|\operatorname{Arg} z| + |\operatorname{Arg} \bar{z}|$ is equal to

(a) 0 (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{2\pi}{3}$

150. If ω is a complex cube root of unity, then $(x+1)(x+\omega)(x-\omega-1)$ is equal to

(a) $x^3 - 1$ (b) $x^3 + 1$

(c) $x^3 + 2$ (d) $x^3 - 2$

151. $(\sqrt{3} + i)^7 + (\sqrt{3} - i)^7$ is equal to

(a) $128\sqrt{3}$ (b) $256\sqrt{3}$

(c) $-128\sqrt{3}$ (d) $-256\sqrt{3}$

152. The period of

$$\left(\tan\theta - \frac{1}{3}\tan^3\theta\right)\left(\frac{1}{3} - \tan^2\theta\right)^{-1}$$

where $\tan^2\theta \neq \frac{1}{3}$ is

(a) $\frac{\pi}{3}$ (b) $\frac{2\pi}{3}$ (c) π (d) 2π

153. If $a\sin^2\theta + b\cos^2\theta = c$, then $\tan^2\theta$ is equal to

(a) $\frac{b-c}{a-c}$ (b) $\frac{c-b}{a-c}$

(c) $\frac{a-c}{b-c}$ (d) $\frac{a-c}{c-b}$

154. If $\cos(x-y), \cos x, \cos(x+y)$ are three distinct numbers which are in harmonic progression and $\cos x \neq \cos y$, then $1 + \cos y$ is equal to

(a) $\cos^2 x$ (b) $-\cos^2 x$
(c) $\cos^2 x - 1$ (d) $\cos^2 x - 2$

155. The set of solutions of the equation $(\sqrt{3}-1)\sin\theta + (\sqrt{3}+1)\cos\theta = 2$ is

(a) $\left\{2n\pi \pm \frac{\pi}{4} + \frac{\pi}{12} : n \in Z\right\}$
(b) $\left\{2n\pi \pm \frac{\pi}{4} - \frac{\pi}{12} : n \in Z\right\}$
(c) $\left\{n\pi + (-1)^n \frac{\pi}{4} + \frac{\pi}{12} : n \in Z\right\}$
(d) $\left\{n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{12} : n \in Z\right\}$

156. If $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$ then $1 - xy - yz - zx$ is equal to

(a) 1 (b) 0 (c) -1 (d) 2

157. If $\tanh^{-1} x = a\log\left(\frac{1+x}{1-x}\right), |x| < 1$ then a is equal to

(a) 1 (b) 2 (c) $\frac{1}{2}$ (d) $\frac{1}{4}$

158. If $\Delta = a^2 - (b-c)^2$, is the area of the $\triangle ABC$ then $\tan A$ is equal to

(a) $\frac{1}{16}$ (b) $\frac{8}{15}$ (c) $\frac{3}{4}$ (d) $\frac{4}{3}$

159. In a $\triangle ABC, C = 90^\circ$. Then, $\frac{a^2-b^2}{a^2+b^2}$ is equal to

(a) $\sin(A+B)$ (b) $\sin(A-B)$
(c) $\cos(A+B)$ (d) $\cos(A-B)$

160. The sum of angles of elevation of the top of a tower from two points distant a and b from the base and in the same straight line with it is 90°. Then, the height of the tower is

(a) a^2b (b) ab^2
(c) $\sqrt{ab}$ (d) ab