OmniMerit

INTEGRATING NOBLE VALUES

ALL INDIA

Standardized Evaluation Exam (SE_2)

Time: 3 hours ***Maximum marks: 360***

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

IMPORTANT INSTRUCTIONS

1. Immediately fill in the particulars on this page of the test booklet with blue/black ball point pen.
2. This Test Booklet consists of three parts – **Part 1, Part 2** and **Part 3**.
3. **Part 1** Physics has **30** objective type questions consisting of **FOUR (4)** marks for each correct response. Mark your answers for these questions in the appropriate space against the number corresponding to the question in the Answer Sheet placed inside the Test Booklet. Use Blue/Black Ball Point Pen only for writing particulars/marking responses of **Side-1** and **Side-2** of the Answer Sheet. **Part 2** Chemistry has **30** objective type questions consisting of **FOUR (4)** marks for each correct response. **Part 3** Mathematics **has 30** objective type questions consisting of **FOUR (4)** marks for each correct response. Marks allotted to each question are written against each question.
4. There is only one correct response for each question in **Part 1**, **Part 2 and Part 3**. Filling up more than one response in each question will be treated as wrong response will be deducted accordingly as per instruction above.
5. The test is of **3** hours duration. The maximum marks are **360**.
6. On completion of the Test, the candidates must handover the Answer Sheet to the invigilator in Room/Hall. Candidates are allowed to take away with them the Test Booklet of with them.

Name of the Student

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Roll Number

Examination Centre Number

I have read all the instructions and shall abide by them

……

Signature of the Candidate

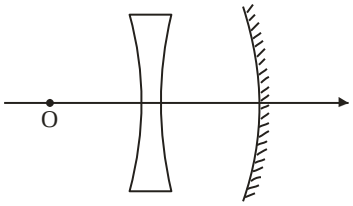
I have verified all the information filled in by the Candidate

……..

Signature of the Invigilator

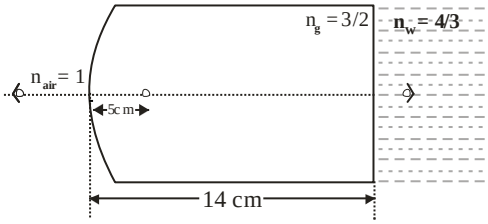
PHYSICS

1. Consider the situation as shown in the figure. A point object O is placed at a distance of 20 cm from a concave lens of focal length 5 cm. Now a concave mirror of radius 9 cm is adjusted on the right side of the lens, so that the final image coincides with the object O. Find the separation between the lens and the mirror.



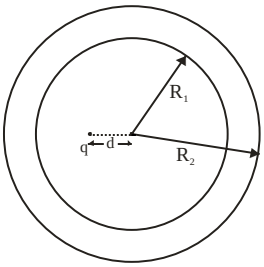
(A) 4 cm (B) 9 cm (C) 5 cm (D) 3 cm

2. There is a small air bubble inside a thick lens of glass as shown in the figure. What is the distance between the images of the air bubble as seen by two observers, one in air and other in water? (Given Radius of the curved surface is 5 cm).



(A) 1 cm (B) 9 cm (C) 1.5 cm (D) 4 cm

3. A hollow, conducting spherical shell of inner radius R_1 and outer radius R_2 encloses a charge q inside, which is located at a distance d ($<R_1$) from the centre of the spheres. The potential at the centre of the shell is



(A) $\frac{kq}{d}$ (B) $kq\left[\frac{1}{R_2}-\frac{1}{R_1}+\frac{1}{d}\right]$

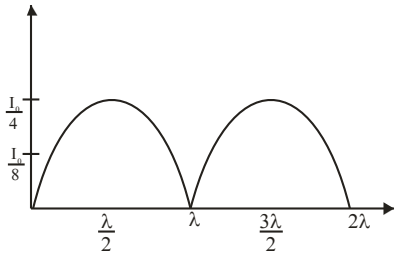
(C) O (D) $kq\left[\frac{1}{R_2}-\frac{1}{R_1}\right]$

4. A trapped air bubble of volume V_0 is released from a depth h measured from the water surface in a large water tank. The volume of the bubble grows to $2V_0$ as it reaches just below the surface. The temperature of the water and the pressure above the surface of water (10^5 N/m^2) remain constant throughout the surface. If the density of water is 1000 kg/m^3 and the acceleration due to gravity is 10 m/s^2, then the depth h is $\begin{pmatrix}\text{neglect}\\ \text{surface}\\ \text{tension}\end{pmatrix}$

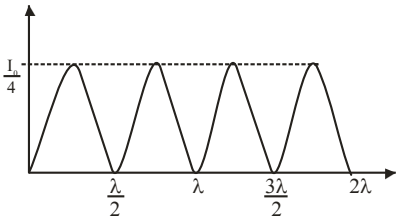
(A) 1 m (B) 50 m (C) 100 m (D) 10 m

5. Three polarizers P, Q and R are placed parallel to each other with their planes perpendicular to the z-axis. Q is placed between P and R. Initially the polarizing directions of P and Q are parallel, but that of R is perpendicular to them. In this arrangement when unpolarized light of intensity I_0 is incident on P, the intensity coming out of R is zero. The polarizer Q is now rotated about the z-axis. As a function of angle of rotations, the intensity of light coming out of R is best represented by

(A)



(B)



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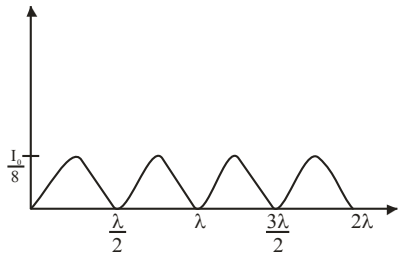

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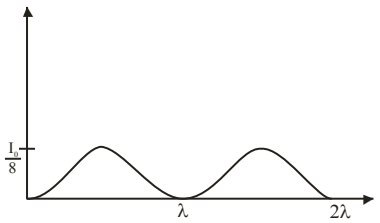
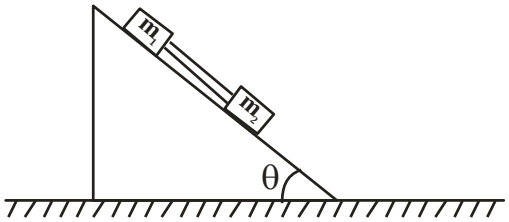


6. Two blocks of masses m_1 & m_2 are joined by light rod and the system is placed on frictionless inclined plane as shown in the figure. If T is the tension in the rod and θ is the angle of inclination of inclined plane, choose the correct alternative



(A) If $m_1 < m_2$, $T > 0$

(B) If $m_1 > m_2$, $T > 0$

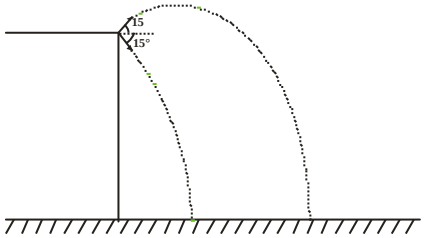
(C) Acceleration of the system is less than $g \sin\theta$

(D) Tension in the rod will not depend on masses m_1 & m_2 and it will remain zero.

7. An object moves in a circular path of radius R. At t = 0 it has speed v_0. From this point, the magnitude of the radial and tangential accelerations are arranged to be equal at all the times such that its speed is increasing. At what time its speed becomes double of the initial speed

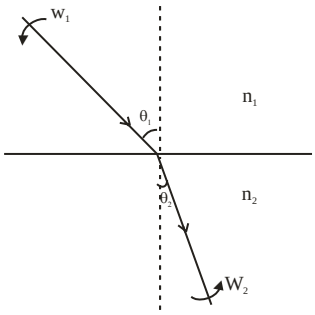
(A) $\frac{2R}{3v_0}$ (B) $\frac{2v_0}{3R}$ (C) $\frac{3R}{2v_0}$ (D) $\frac{R}{2v_0}$

8. Two balls are thrown with the same speed 3 m/s from the top of a cliff. The angles of their initial velocities are 15° above and below the horizontal. How much farther along the ground does the top ball hit than the bottom ball. (Take g = 10 m/s^2)



(A) $\frac{3}{20}$m (B) $\frac{9}{20}$m (C) $\frac{9}{6}$m (D) $\frac{9\sqrt{3}}{10}$m

9. Consider the refraction of light ray as shown in the figure below. Incident ray is rotating with constant angular velocity 2 rad/sec. What is the angular velocity of refracted ray, when the angle of incidence become 30°. (Given $\frac{n_1}{n_2} = \sqrt{3}$)



(A) 2 rad/sec. (B) $\sqrt{3}$rad / sec (C) $\frac{1}{2}$rad / sec (D) 6 rad/sec

10. The sign of work done by a force on a body is important to understand. Choose the correct statement about work done by a force

(A) Work done by an applied force on a body moving on a rough horizontal plane with uniform velocity is zero.

(B) A man is lifting a bucket out of a well by means of a rope tied to the bucket. Work done by gravity on the bucket is negative.

(C) A person is doing push-ups on the ground. Work done by ground on the person is positive for half cycle and negative for remaining half cycle.

(D) A man is running on a road with acceleration 2 m/s^2, work done by friction is positive.

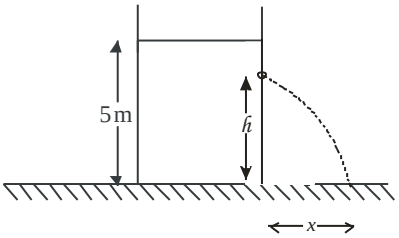
11. An object of mass 5 kg is projected with speed 50 m/s at an angle of 53° with the horizontal. After 2 seconds particle breaks into two equal fragments. One of the part goes vertically upward with the speed 40 m/s just after the break-up of the object. What is the velocity of the other part just after the break–up?

(A) 60 m/s (B) 30 m/s (C) 90 m/s (D) 120 m/s

12. A monochromatic light of intensity 8 mW emits 5 × 10^{15} photons per second. The light ejects photoelectrons from a metal surface. The stopping potential for this set up is 3V. What is the work function of the metal?

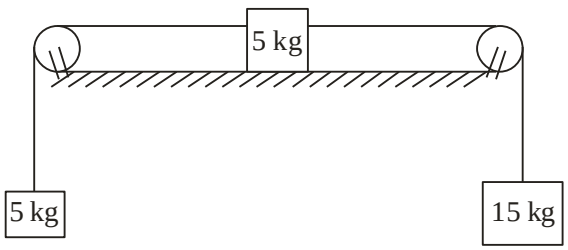
(A) 3e V (B) 7e V (C) 10 eV (D) 5e V

13. An open tank with a large cross section area is filled with water up to a height 5m as shown in the figure. At what height h should a hole be made so that x becomes 3 m.



(A) 2.5 m (B) 3.5 m (C) 4.5 (D) 3 m

14. Consider the situation shown in the figure. Friction coefficient between the table and the block is 0.2. If $\frac{T_1}{T_2}=\frac{6x}{17}$ where T_1 is the tension in the right string and T_2 is the tension in the left string. The value of x is



(A) 4 (B) 6 (C) 1/4 (D) 1/6

15. Nucleus P is converted in S through the following reactions

P → Q + α

$Q \rightarrow R + e^-$

$R \rightarrow S + e^-$

Now a student figures out 4 conclusions from the above reactions

(i) R and S are isotopes

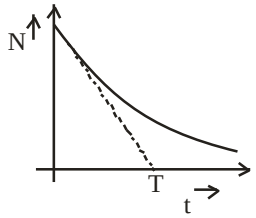
(ii) P and S are isotopes

(iii) Q and S are isotopes

(iv) Q and R are isotopes

(A) Only (ii) is correct (B) (ii) & (iii) are correct (C) (iii) & (iv) are correct (D) (ii), (iii) & (iv) are correct

16. A radioactive sample undergoes decay as per the following graph. Dotted line represents the slope of the curve at t = 0. If this dotted line intersects the time axis at t = T. Choose the correct alternative $\begin{pmatrix} \text{Given } t_{1/2} = \text{half life} \\ t_{avg} = \text{mean life} \end{pmatrix}$



(A) $t_{1/2} > T$ (B) $t_{avg} = T$ (C) $t_{1/2} = T$ (D) $t_{avg} > T$

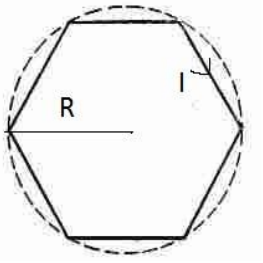
17. The moment of inertia of a disc about one of its diameter is I_o. The mass per unit area of the disc is proportional to the distance from its center. If the radius of the disc is R and its mass is M, the value of I_o is

(A) $\frac{MR^2}{2}$ (B) $\frac{2MR^2}{5}$ (C) $\frac{3MR^2}{10}$ (D) $\frac{3MR^2}{5}$

18. Two particles A and B of mass m and one particle C of mass 2m are kept on the x-axis in the order of ABC. Particle A is given a velocity $v\hat{i}$. consequently there are two collisions, both of which are completely inelastic. If the net energy loss because of these collision is x fraction of the initial energy. The value of x is (ignore frictional losses)

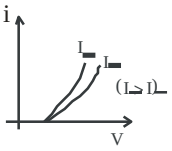
(A) $\frac{1}{2}$ (B) $\frac{3}{4}$ (C) $\frac{4}{10}$ (D) $\frac{1}{3}$

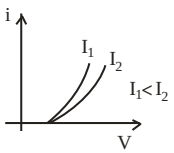
19. A conducting wire is in the shape of regular hexagon, which is inscribed inside an imaginary circle of radius R as shown in fig. A current I flows through the wire. The magnitude of the magnetic field at the centre of the circle is

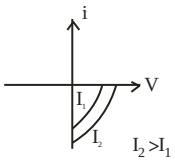


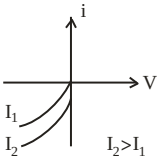
(A) $\frac{\sqrt{3}\mu_o I}{2\pi R}$ (B) $\frac{\mu_o I}{2\sqrt{3}\pi R}$ (C) $\frac{\sqrt{3}\mu_o I}{\pi R}$ (D) $\frac{3\mu_o I}{2\pi R}$

20. I_1 and I_2 are the intensities of light falling on a solar cell. The i – v characteristics of the cell is

(A) 

(B) 

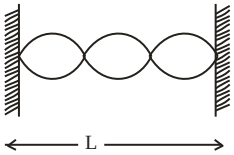
(C) 

(D) 

21. A hot engine operate between a cold reservoir at temperature $T_L = 150\,K$ and a hot reservoir at temperature T_H. It takes 300 J of heat from the hot reservoir and delivers 225 J of heat to the cold reservoir in a cycle. What could be the temperature of the hot reservoir?

(A) 230 K (B) 160 K (C) 175 K (D) 190 K

22. A string fixed at both ends is vibrated by a tuning fork of frequency v Hz and it forms a standing wave pattern shown below. What is the speed of the travelling wave by which this standing wave pattern is formed?

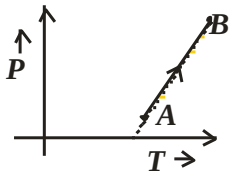


(A) v L (B) v (3L) (C) v(2L/3) (D) v (3L/2)

23. The diameter of the two capillary tubes are 1mm and 1.5 mm respectively. Now if they are put in water having surface tension of $7.36\times10^{-2}N/m$ and zero contact angle. What will be the difference in the level of meniscus between the 2 arms.

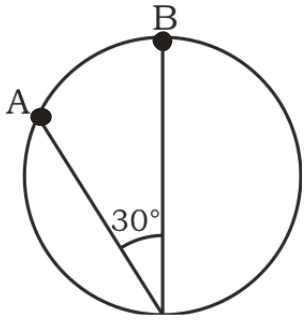
(A) 5 mm (B) 10 mm (C) 15 mm (D) 20 mm

24. State of an ideal gas is changed from State A to State B according to the process shown in the P-T Diagram. Choose the correct alternative



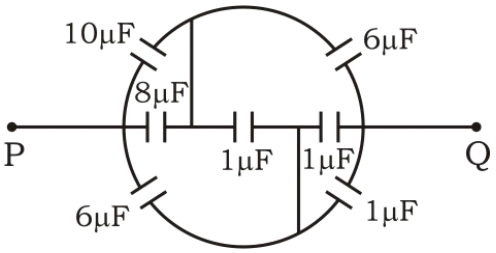
(A) Volume is continuously decreasing during the process
(B) Volume is continuously increasing during the process
(C) It is an isochoric process as slope of P-T graph is constant
(D) We cannot comment on volume as pressure and Temperature both are increasing

25. Two ropes are fixed on a vertical ring such that their lower ends are fixed at the lowest point of the ring as shown in the figure. There are two beads A and B that can slide without friction on the ropes are released from the ends of the ropes. If bead A takes time t_A to reach the other end and bead B takes t_B for the same. Then



(A) $t_A = t_B$ (B) $t_A > t_B$
(C) $t_A < t_B$ (D) cannot be determined

26. Find the equivalent capacitance across PQ



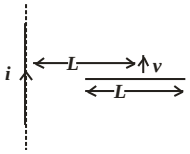
(A) 8μF (B) 9μF (C) 6μF (D) 12μF

27. A cube made of iron expands uniformly in all directions on heating. There is a cavity of radius r at the centre of the cube. If temperature of the cube is raised by ΔT Kelvin. What will be the change in the volume of the cavity? Given coefficient of area expansion of iron is α_A.

(A) $\frac{-3\alpha_A}{2}\left(\frac{4}{3}\pi r^3\right)\Delta T$ (B) $\frac{-1}{2}\alpha_A\left(\frac{4}{3}\pi r^3\right)\Delta T$

(C) $\frac{\alpha_A}{2}\left(\frac{4}{3}\pi r^3\right)\Delta T$ (D) $\frac{3\alpha_A}{2}\left(\frac{4}{3}\pi r^3\right)\Delta T$

28. In the given figure a straight long wire carrying a current i and a rod of length L coplanar with the wire and perpendicular to it moves with a constant velocity v in a direction parallel to the wire. The distance of the wire from the centre of the rod is l. Find the motional emf induced in the rod.



(A) $\frac{\mu_o iv}{2\pi}\ell n 3$ (B) $\frac{\mu_o iv}{2\pi}\ell n\frac{4}{3}$

(C) $\frac{\mu_o iv}{2\pi}\ell n\frac{3}{2}$ (D) $\frac{\mu_o iv}{2\pi}\ell n\frac{9}{4}$

29. An alternating current is; $i = i_1\cos\omega t + i_2\sin\omega t$. The rms current is given by

(A) $\frac{i_1 + i_2}{\sqrt{2}}$ (B) $\frac{|i_1 + i_2|}{\sqrt{2}}$

(C) $\sqrt{\frac{i^2_1 + i^2_2}{2}}$ (D) $\sqrt{\frac{i^2_1 + i^2_2}{\sqrt{2}}}$

30. A teacher gives an equation to his students $P = Ax - Bx^2 + Cx^3 - Dx^4$ and asked them to find the dimensional formula of P and told them that A, B, C and D are dimensionless number. When students as k about the dimensions of x, he refused to tell, Now which of the following statements is correct

(A) P is a dimensionless quantity

(B) Dimensional formula of P is [L]

(C) Dimensional formula of P is $[L]^{-1}$

(D) Dimensional formula of P can't be determined because data in insufficient

CHEMISTRY

31. With Increase of temperature, which of these changes?
(A) Molality (B) Weight fraction of solute
(C) Fraction of solute present in water (D) Mole fraction

32. How many oxygen atoms have -1 oxidation number in Marshall's acid?
(A) Zero (B) 1 (C) 2 (D) 3

33. Correct order of increasing C-O bond length of CO, CO_3^{-2} & CO_2 is
(A) $co < co_3^{-2} < co_2$ (B) $co_2 < co_3^{-2} < co$ (C) $co_3^{-2} < co < co_2$ (D) $co < co_2 < co_3^{-2}$

34. Which of the following conditions will always lead to a non-spontaneous change?
(A) ΔH and ΔS both are +ve (B) ΔH is –ve and ΔS is +ve
(C) ΔH and ΔS both are –ve (D) ΔH is +ve and ΔS is –ve

35. Identify the pair of compounds which cannot exist together in solution
(A) $NaHCO_3$ and $NaOH$ (B) Na_2CO_3 and $NaHCO_3$
(C) Na_2CO_3 and $NaOH$ (D) $NaHCO_3$ and $NaCl$

36. One Mole of $N_2O_4(g)$ at 300 K is kept in a closed container under 1 atm. It is heated to 600 K when 20% by mass of $N_2O_4(g)$ decomposes to $NO_2(g)$. The resultant pressure is
(A) 12 atm (B) 2.4 atm (C) 2 atm (D) 5 atm

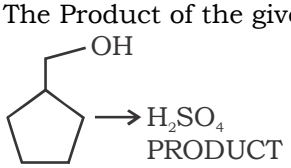
37. A metal Oxide is reduced by heating in a stream of hydrogen. It is found that after complete reduction 3.15 g of the oxide have yielded 1.05 g of the metal. We may deduce that
(A) The atomic weight of the metal is 8 (B) The atomic weight of the metal is 4
(C) The equivalent weight of the metal is 4 (D) The equivalent weight of the metal is 8

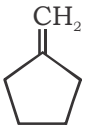
38. Silver is removed electrolytically from 200 ml of 0.1N solution of $AgNO_3$ by a current of 0.1 ampere. How long will it take to remove half of the silver from solution?
(A) 100 Second (B) 16 Second (C) 200 Second (D) 9650 Second

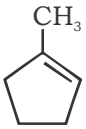
39. Identify the correct statement from the following
(A) Brownian movement is more pronounced for smaller particles than bigger ones.
(B) Solutions of metal sulphide are lyophilic.
(C) Hardy-Schulze law states that larger the size of the coagulation ion greater is the coagulation power.
(D) A lyophilic solution is most stable at isoelectric point

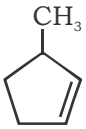
40. Coconut charcoal at -100^oC does not adsorb a mixture of
(A) Ar and Kr (B) Ne and Ar (C) He and Kr (D) He and Ne

41. The Product of the given reaction is



(A) 

(B) 

(C) 
(D) 

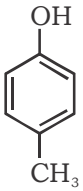
42. The Volume of 0.02M $KMnO_4$ solution required to oxidise exactly 30 ml of 0.1M ferrous sulphate solution in acidic medium is

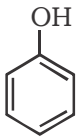
(A) 20 ml (B) 40 ml (C) 30 ml (D) 25 ml

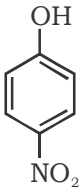
43. For $2C_6H_6(l)+15O_2(g)\rightarrow 12CO_2(g)+6H_2O(g)$ the difference in change in enthalpy and change in internal energy at 25^oC (KJ) is

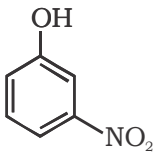
(A) -7.43 (B) +3.72 (C) -3.72 (D) +7.43

44. Consider the following phenol

(I) 

(II) 

(III) 

(IV) 

The decreasing order of acidic nature of the above phenols is

(A) III > IV > I > II (B) III > IV > II > I (C) II > I > IV > III (D) I > IV > II > III

45. When Propyne is treated with aqueous sulphuric acid in presence of $HgSO_4$. The major product is

(A) Propanol (B) Acetone

(C) Propyl Hydrogen Sulphate (D) Acetaldehyde

46. In a homogeneous reaction A → B + C + D the initial pressure was P_0 and after some time t it was P. Expression for rate constant k in terms of P_0, P and t will be

(A) $K=\frac{2.303}{t}\log\frac{2P_o}{3P_o-P}$ (B) $K=\frac{2.303}{t}\log\frac{2P_o}{P_o-P}$

(C) $K=\frac{2.303}{t}\log\frac{3P_o-p}{2P_o}$ (D) $K=\frac{2.303}{t}\log\frac{2P_o}{3P_o-2P}$

47. The compound which reacts fastest with Lucas Reagent at room temperature is

(A) Butan-1-ol (B) Butan-2-ol

(C) 2-Methylpropan-1-ol (D) 2-Methylpropan-2-ol

48. The Compound not isomeric with diethyl ether is:

(A) Butan-1-ol (B) Butanone (C) n-Propyl Methyl Ether (D) 2 Methyl Propan-2-ol

49. The reagent with both acetaldehyde and acetone react easily is:

(A) Tollen's Reagent (B) Fehling's Reagent (C) Schiff's Reagent (D) Grignard's reagent

50. Mole fraction of the solute in a 1.00 Molal aqueous solution is

(A) 1.7700 (B) 0.17770 (C) 0.0177 (D) 0.0344

51. Which of the following has the highest nucleophilicity

(A) F^{-1} (B) OH^{-1} (C) CH_3^- (D) NH_2^-

52. Bordeaux mixture consist of lime and

(A) $FeSO_4$ (B) $CuSo_4$ (C) $Cu(NO_3)_2$ (D) $AgNO_3$

53. Fluorescein, a well-known dye obtained by the reaction of

(A) Phthalic anhydride and Phenol (B) Phthalic anhydride and resorcinol

(C) Succinic acid and resorcinol (D) Phthalic anhydride and catechol

54. Identify the Product "Z" in the following series of reaction

$$C_6H_{12}O_6(glu\cos e) \xrightarrow{HCN} X \xrightarrow{H_2O} Y \xrightarrow{HI} Z$$

(A)Hexanoic Acid (B) Heptanoic Acid (C) α -methyl caproic acid (D) n-Heptane

55. Protein give;

(A) A violet colour with alkaline $CuSO_4$ dilution

(B) A Purple colour on boiling with dilute ninhydrin $CuSO_4$

(C) Yellow colour on boiling with HNO_3

(D) All of the above

56. A polymer of prop-2-ene nitrite is called

(A) Saran (B) Orlon (C) Dacron (D) Tetron

57. Which of the following species is diamagnetic?

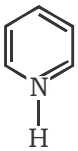
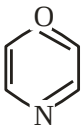
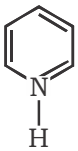
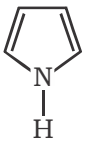
(A) An isolated, gas-phase V^{3+} ion (B) A high spin octahedral Fe^{+2} complex

(C) An isolated, gas phase Cu^{2+} ion (D) A low spin octahedral Co^{3+} complex

58. Three elements A, B and C crystallize into cubic solid lattice. Atom A occupy half of the corners, B atom the cube centre and atom C at the alternate faces. The formula of the compound is

(A) AB_2C_6 (B) ABC_2 (C) AB_2C_2 (D) AB_2C_4

59. In the following compound, the order of basicity is

(I)  (II)  (III)  (IV) 

(A) IV > I > III > II (B) III > I > IV > II (C) II > I > III > IV (D) I > III > II > IV

60. Which order is correct in spectrochemical series of ligands?

(A) $Cl^- < F^- < [C_2O_4]^{2-} < NO_2^- < CN^-$ (B) $CN^- < [C_2O_4]^{2-} < Cl^- < NO_2 < F^-$

(C) $[C_2O_4]^{2-} < F^- < Cl^- < NO_2^- < CN^-$ (D) $F^- < Cl^- < NO_2^- < CN^- < [C_2O_4]^{2-}$

MATHEMATICS

61. The vector $(\vec{a}+3\vec{b})$ is perpendicular to $(7\vec{a}-5\vec{b})$. $(\vec{a}-4\vec{b})$ is perpendicular to $(7\vec{a}-2\vec{b})$. The angle between $\vec{a}$ and $\vec{b}$ is:

(A) 60° (B) 30° (C) 45° (D) 120°

62. If transverse axis of a hyperbola is 4 times the length of its latus rectum, then, the eccentricity of the hyperbola is

(A) $\frac{5}{2}$ (B) $\frac{\sqrt{5}}{2}$ (C) $\frac{\sqrt{3}}{2}$ (D) $\frac{3}{2}$

63. A Rocket of length l meters is fired vertically upwards from the midpoint of two locations P and Q, $6\sqrt{3}$ meters apart. The speed of the rocket after t second is given by $\frac{ds}{dt}=(6t+3)m/s$. What is the difference in the angle subtended by the lowermost point of the rocket at P and Q respectively after one and two seconds?

(A) 30° (B) 15° (C) 45° (D) 22.5°

64. The number of points in the first quadrant having both coordinates as integer that lies in the interior region bounded between $|x|+|Y|>4$ and $|x|+|Y|<21$ is

(A) 204 (B) 194 (C) 120 (D) 184

65. A plane passes through (2, –1, 1) and parallel to $\frac{x-1}{1}=\frac{y}{2}=\frac{z-2}{2}$ and $\frac{x}{1}=\frac{y-1}{1}=\frac{z}{3}$. What is the equation of the plane.

(A) 8x – y + 3z + 14 = 0 (B) 8x + y – 3z + 14 = 0
(C) 8x – y – 3z – 14 = 0 (D) 8x + y – 3z – 14 = 0

66. Let X={(1,3),(4,2),(2,3),(2,4),(3,1)} be a relation on the set A={1,2,3,4}. The Relation X is

(A) a function (B) Reflexive
(C) Not symmetric (D) Transitive

67. The point of intersection of a circle and a parabola $y = ax^2 + bx + c$ lies on the x-axis. If both points are on the right side of origin then what is the length of the tangent from origin to the circle.

(A) $\sqrt{\frac{c}{a}}$ (B) ac^2 (C) $\frac{b}{a}$ (D) $\sqrt{\frac{bc}{a}}$

68. $\lim_{x\to 0}\frac{\{\sin(1-\cos 2x)\}(\sin^3 x+3\cos x.\sin^2 x)}{x^4.\cos^2 x}$

(A) 0 (B) 6 (C) 1 (D) 2

69. $L_1=\frac{x+1}{3}=\frac{y+2}{1}=\frac{z+1}{2}, L_2=\frac{x-2}{1}=\frac{y+2}{2}=\frac{z-3}{3}$. The distance of point (1, 1, 1) from the plane passing through (–1, –2, 1) and whose normal is perpendicular to both line L_1 and L_2 is

(A) $\frac{13}{\sqrt{75}}$ (B) $\frac{7}{\sqrt{75}}$ (C) $\frac{100}{\sqrt{75}}$ (D) $\frac{10}{\sqrt{75}}$

70. The coefficient of $a^{3/2}$ in the expansion of $\left(\frac{1-a^3}{1-\sqrt{a}}\right)^3$ is (where a>0 & a ≠ 1)

(A) 11 (B) 12 (C) 10 (D) 8

71. The sum of $(2^2 – 2 + 1)\,2! + (3^2 – 3 + 1)\,3! +$ ..... up to 19 terms

(A) 19 (20!) (B) 20 (19!) (C) 19 (21!) (D) 20 (21!)

72. The area (in sq. units) of the region bounded by {(x:y); $y^2 \le 12x$ and $y = mx$} is $\frac{3}{8}$, then 'm' equals.

(A) $\frac{1}{4}$ (B) 4 (C) 2 (D) $\frac{1}{2}$

73. If $\begin{bmatrix} 1/25 & 0 \\ a & 1/25 \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -k & 5 \end{bmatrix}^{-2}$ then, a equals

(A) $\frac{k}{25}$ (B) $\frac{2k}{25}$ (C) $\frac{k}{125}$ (D) $\frac{2k}{125}$

74. If $|z_1| = 2k$, $|z_2| = 3k$, $|z_3| = 4k$ and $|4z_2z_3 + 9z_1z_3 + 16z_1z_2| = 216k$ then $\frac{|z_1+z_2+z_3|}{|z_1|+|z_2|+|z_3|}$ equals
(where k is real number)

(A) $\frac{1}{2}$ (B) 2 (C) 1 (D) $\frac{3}{8}$

75. Consider the conic $e^2x^2 + \pi^2e^2 + \pi^2y^2 - 2\pi e^2x - 2\pi^2ey = 0$ Suppose A is any point on the conic and S_1, S_2 are the foci of the conic, then the maximum value of $(AS_1 + AS_2)$ is

(A) 2π (B) $2\sqrt{\pi}$ (C) πe (D) $2\pi e$

76. The number of 5 digit telephone numbers having at least one of their digits repeated is

(A) 90000 (B) 32440 (C) 67960 (D) 69760

77. The Differential equation of the family of hyperbolas with asymptodes as the lines x+y=1 and x-y=1 is

(A) $yy^1+x=o$ (B) $yy^1=(x-1)$ (C) $yy^{11}+y^1=0$ (D) $y^1+xy=0$

78. If $f(x) = (\pi - x^n)^{\frac{1}{n}}$ and $g(x) = f\left(\frac{x^2}{f(f(x))}\right)$ then, $\frac{dg}{dx}$ equals

(A) $-(\pi - x^n)^{\frac{1-n}{n}}.x^{n-1}$ (B) $(\pi - x^n)^{\frac{1-n}{n}}.x^{n-1}$ (C) $(x^n - \pi).n.x^{n-1}$ (D) $(\pi - x^n)^2.x^{2(n-1)}$

79. Three distinct numbers a, b, c are in G.P. and a + b + c = mb where m is positive integer then, minimum value of m is

(A) 4 (B) 2 (C) 3 (D) 6

80. The negative of $\sim sv(\sim r \wedge s)$ is equivalent to:

(A) $s \wedge (r \wedge \sim s)$ (B) $SV(rv \sim S)$ (C) $S \wedge r$ (D) $S \wedge \sim r$

81. If $\int \frac{1}{x}\sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}dx = k\left[\log\{1+f(1-x)\} - \log\{f(x)\} - \cos^{-1}\{f(x)\}\right] + c$ then, f(–k) equals

(A) 3 (B) 2 (C) 7 (D) No real value

82. The tangent to the curve $y=e^x$ drawn at the points (99, e^{99}) intersect the line joining the points (98, e^{98}) and (100, e^{100})

(A) on the left of x=100 (B) on the right of x=100
(C) at no point (D) at all point

83. The number of solutions of equation $2(\sin^{-1}x)^2 - (\sin^{-1}x) - 6 = 0$

(A) 0 (B) 1 (C) 3 (D) 2

84. If $f(x) = p + q|x| + r|x|^2 + s|x|^3$ where p,q,r and s are constant. Then

(A) f(x) is differentiable at x=0 whatever be p,q,r and s
(B) f(x) is not differentiable at x=0 whatever be p,q,r and s
(C) f(x) is differentiable at x=0 only if q=0
(D) f(x) is differentiable at x=0 only if q=0, S=0

85. The mean of 12 different natural numbers is 12. The maximum value for the second largest of these numbers is

(A) 44 (B) 53 (C) 46 (D) 47

86. The value of the integral $\int_{-\pi}^{\pi} \frac{\cos^2 x}{1+a^x}.dx$

(A) $a\pi$ (B) π (C) $\frac{\pi}{2}$ (D) 2π

87. Number of positive integers x which satisfy the condition $\left[\frac{x}{39}\right] = \left[\frac{x}{41}\right]$

(where, $[\ ]$ denotes integer function)

(A) 339 (B) 363 (C) 399 (D) 400

88. If $\lim_{x\to\frac{1}{2}} \left(\sin^2 \pi x\right)^{\left(\frac{\alpha.(1-\cos \pi x)(1+\cos \pi x)}{\beta(1-\sin \pi x)(1+\sin \pi x)}\right)} = e^{2016}$ then, $\alpha + 2016\beta$ equals

(A) 0 (B) 1 (C) 2 (D) 2016

89. If two chords of the circle $x^2 + y^2 - ax - by = 0$, drawn from the point (a, b) is divided by the x-axis in the ratio 3:1 then

(A) $9a^2 > 16b^2$ (B) $a^2 > 16b^2$ (C) $16a^2 > 9b^2$ (D) $a^2 < ab^2$

90. Out of 41 tickets consecutively numbered, three are drawn at random. What is the probability that numbers on them are in A.P?

(A) $\frac{21}{41}$ (B) $\frac{20}{533}$ (C) 1 (D) $\frac{41}{40^2-1}$