DOT INSTITUTEOF PHYSICS

TEST-SERIES FOR JEE-MAIN 2019-2020

PART TEST-2

PHYSICS, CHEMISTRY, MATHEMATICS,

PHYSICS : Laws of Motion & Friction .
CHEMISTRY: Atomic Structure.
MATHEMATICS : Quadratic Equations, Inequations and Inequalitie

Duration : 3 Hrs. Max. Marks : 360

Name :_____ Roll No. : _____Date : _____

SEAL

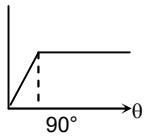
Instructions to Candidates

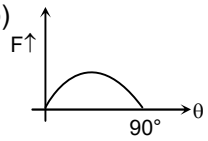
GENERAL:

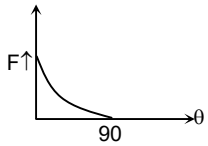
1. This paper contains 90 Qs. in all. All questions are compulsory.
2. There is Negative Marking.
3. Write your Name & Roll No. in the space provided on this cover page of question paper.
4. The question paper contains blank space for your rough work. No additional sheet will be provided
   for rough work.
5. The answer sheet, machine readable Optical Mark Recognition (OMR) is provided separately.
6. **Do not break the seals of the question paper booklet till you have throughly read the perscribed topics**
7. Blank papers, Clipboards, Log tables, Slide Rule, Calculators, Cellular Phones, Pagers and Electronic Gadgets in any form are not allowed to be carried inside the examination hall.
8. Solve the paper within the permitted time.

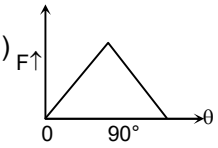
PART A – PHYSICS

1. A block rests on a rough plane whose inclination θ to the horizontal can be varied. Which of the following graphs indicates how the frictional force F b/w the block and plane varies as θ increased ?

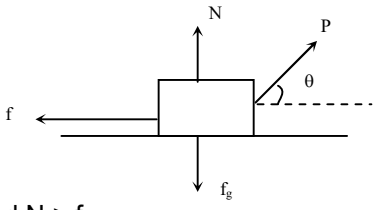
(a) 

(b) 

(c) 

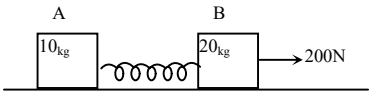
(d) 

2. A boy pulls a wooden box along a rough horizontal floor at constant speed by means of a force $\vec{P}$ as shown. In diagram 'f' is the magnitude of force of friction, 'N' is magnitude of normal force, and 'f_g' is the magnitude of the force of gravity. Which of the following must be true?



(a) P = f and N = f_g
(b) P = f and N > f_g
(c) P > f and N < f_g
(d) P > f and N = f_g

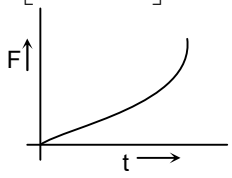
3. Two blocks A and B connected to each other by a light spring are kept on a rough horizontal surface μ = 0.1 as shown in the Figure. If at any instant acceleration of A is 12 ms^{-2} then at this instant acceleration of B would be

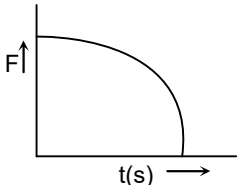


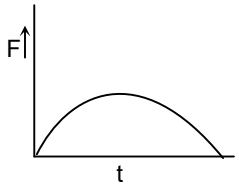
(a) 12 ms^{-2}
(b) 6 ms^{-2}
(c) 24 ms^{-2}
(d) 2.5 ms^{-2}

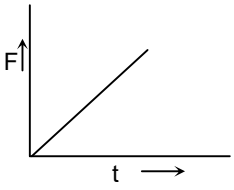
4. A particle of mass m, originally at rest, is subjected to force whose direction is constant but magnitude varies with time according to relation

$F = F_0\left[1-\left(\frac{t-T}{T}\right)^2\right]$ where F_0 & T are constants the graph b/w F versus t for time interval 2T is

(a) 

(b) 

(c) 

(d) 

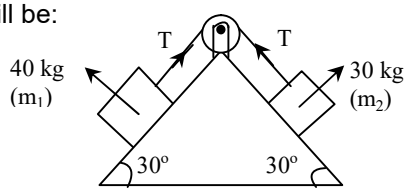
5. Two masses 40 kg and 30 kg are connected by a weightless string passing over a frictionless pulley as shown in the following figure. The tension in the string will be:

(a) 188 N

(b) 368 N

(c) 288 N

(d) 168 N



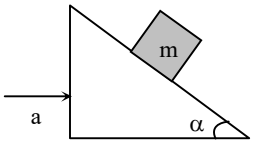
6. A block is kept on a frictionless inclined surface with angle of inclination α. The incline is given an acceleration a to keep the block stationary. Then a is equal to:

(a) g

(b) g tan α

(c) g/tan α

(d) g cosec α



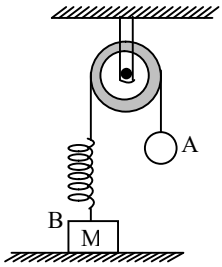
7. In the figure, the ball A is released from rest, when the spring is at its natural (unstretched) length. For the block B of mass M to leave contact with ground at some stage, the minimum mass of A must be:

(a) 2M

(b) M

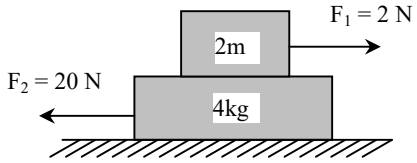
(c) M/2

(d) M/4



8. In the case of pulling a cart, the force that causes the horse to move forward is that force :
(a) the horse exerts on the ground (b) the horse exerts on the cart
(c) the ground exerts on the horse (d) the cart exerts on the horse

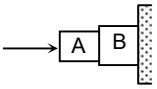
9. In the arrangement shown in figure, coefficient of friction between the two blocks is $\mu = \frac{1}{2}$. The force of friction acting between the two blocks is :



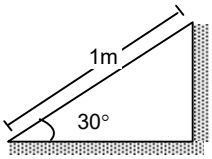
(a) 8N (b) 10 N
(c) 6 N (d) 4 N

10. A cold soft drink is kept on the balance. When the cap is opened, then the weight
(a) increases (b) decreases
(c) first increases, then decreases (d) remains same

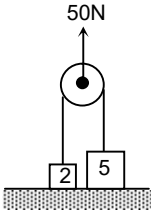
11. Blocks A and B are pushed against the smooth wall with force F. Surfaces of A and B are rough. Pick the true for the blocks to be at rest against the wall:
(a) System is not at rest
(b) F should be more than weight of (A+B)
(c) F should be less than weight of (A+B)
(d) F should be equal to weight of (A+B)



12. A uniform rod of length 1 m having mass 1kg rests against a smooth wall at an angle of 30° with the ground. Calculate the force exerted by the ground on the rod in vertical direction
(a) 10 N (b) 2.31N
(c) 23.1N (d) 12.3 N



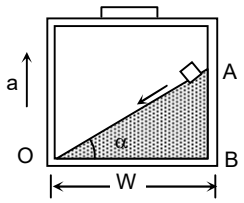
13. Two blocks of masses 2 kg and 5 kg are at rest on ground. The masses are connected by a string passing over a frictionless pulley which is under the influence of a constant upward force F = 50N. The accelerations of 5 kg and 2 kg masses are



(a) 0,2.5 ms^{-2} (b) 0,0

(c) 2.5 ms^{-2} , 2.5 ms^{-2} (d) 1 ms^{-2}, 2.5 ms^{-2}

14. A body of mass m starting from rest slides down a frictionless inclined surface of gradient α fixed on the floor of a lift accelerating upward with an acceleration a. Taking width of inclined p[lane as W, the time taken by body to slide from top to bottom of the plane is

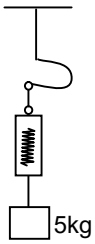


(a) $\left(\frac{2W}{(g+a)\sin\alpha}\right)^{\frac{1}{2}}$ (b) $\left(\frac{4W}{(g-a)\sin\alpha}\right)^{\frac{1}{2}}$

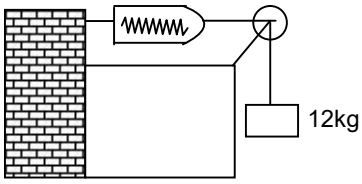
(c) $\left(\frac{4W}{(g+a)\sin 2\alpha}\right)^{\frac{1}{2}}$ (d) $\left(\frac{W}{(g+a)\sin 2\alpha}\right)^{\frac{1}{2}}$

15. Reading on scale in each case will be

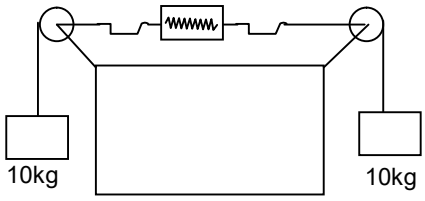
(I)



(II)



(III)



(a) 50N, 120N, 100N (b) 100N, 144N, 200N

(c) 50N, 12N, 20N (d) 5N, 12N, 10N.

16. Force acting on a body of mass 1 kg is related to its position x as $F = x^3 - 3x$ N. It is at rest at x = 1. Its velocity at x = 3 can be:

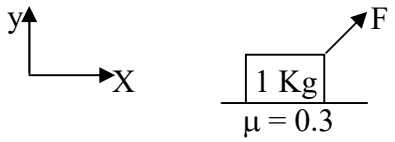
(a) 4 m/s (b) 3 m/s

(c) 2 m/s (d) 5 m/s

17. A force $\vec{F} = \hat{i} + 4\hat{j}$ acts on block shown. The force of friction acting on the block is:

(a) $-\hat{i}$ (b) $-1.8\hat{i}$

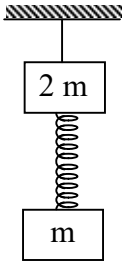
(c) $-2.4\hat{i}$ (d) $-3\hat{i}$



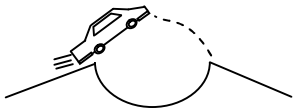
18. Two blocks are connected by a spring. The combination is suspended, at rest, from a string attached to the ceiling, as shown in the figure. The string breaks suddenly. Immediately after the string breaks, what is the initial downward acceleration of the upper block of mass 2m?

(a) 0 (b) 3g/2

(c) g (d) 2g



19. A stunt man jumps his car over a crater as shown (neglect air resistance)



(a) during the whole flight the driver experiences weightlessness

(b) during the whole flight the driver never experiences weightlessness

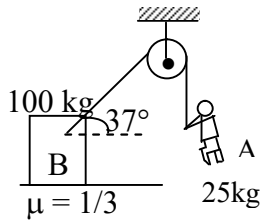
(c) during the whole flight the driver experiences weightlessness only at the highest point

(d) the apparent weight increases during upward journey

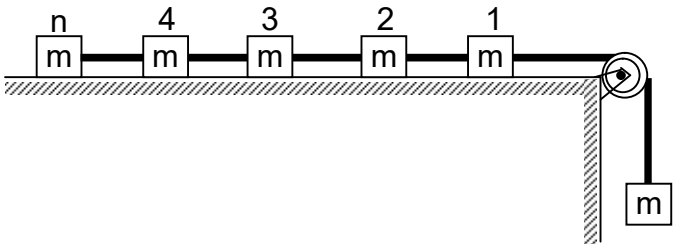
20. Block B of mass 100 kg rests on a rough surface of friction coefficient $\mu = 1/3$. A rope is tied to block B as shown in figure. The maximum acceleration with which boy A of 25 kg can climbs on rope without making block move is:

(a) $\frac{4g}{3}$ (b) $\frac{g}{3}$

(c) $\frac{g}{2}$ (d) $\frac{3g}{4}$



21. In the given arrangement, n number of equal masses are connected by strings of negligible masses. The tension in the string connected to n^{th} mass is



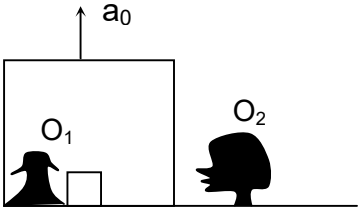
(a) $\frac{mMg}{nm+M}$ (b) $\frac{mMg}{nmM}$

(c) mg (d) mng

22. Three identical blocks each of mass M are along a frictionless table and a force F is acting as shown. Which of the following statements is false ?

(a) the net vertical force on block A is zero
(b) the net force on block A is F/3
(c) the acceleration of block C is F/3M
(d) the force of interaction between A and B is 2F/3.

23. Observer O_1 is in a lift going upwards and O_2 is on the ground. Both apply Newton's law, and measure normal reaction on the body

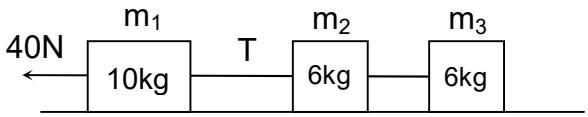


(a) the both measure the same value (b) the both measure zero
(c) the both measure different value (d) no sufficient data

24. A machine gun fires 10 bullets per second, each of mass 10 g, the speed of each bullet is 20 cm/s, then force of recoil is

(a) 200 dyne (d) 2000 dyne
(c) 20 dyne (d) none of these

25. Three blocks of masses m_1, m_2 and m_3 are placed on a horizontal frictionless surface. A force of 40N pulls the system then calculate the value of T, if m_1 = 10kg, m_2 = 6kg, m_3 = 4 kg :



(a) 40 N (b) 20 N
(c) 10 N (d) 5 N

26. If the coefficient of friction between an insect and bowl is μ and the radius of the bowl is r, the maximum height to which the insect can crawl in the bowl is

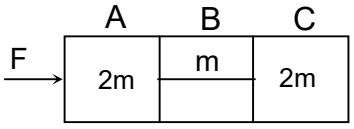
(a) $\frac{r}{\sqrt{1+\mu^2}}$ (b) $r\left[1-\frac{1}{\sqrt{1+\mu^2}}\right]$

(c) $r\sqrt{1+\mu^2}$ (d) $r[\sqrt{1+\mu^2}-1]$

27. A particle moves in the x-y plane under the influence of a force such that its linear momentum is $\vec{p}(t) = A[\hat{i}\cos(kt) - \hat{j}\sin(kt)]$, where A and k are constants. The angle between the force and the momentum is

(a) 0° (b) 30°
(c) 45° (d) 90°

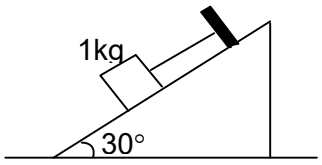
28. The system is pushed by a force F as shown in figure. All surfaces are smooth except between B and C is μ. Minimum value of F to prevent block B from downward slipping is



(a) $\left(\frac{3}{2\mu}\right)$mg (b) $\left(\frac{5}{2\mu}\right)$mg

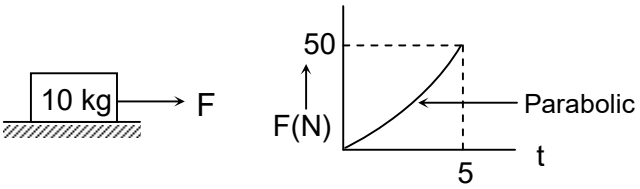
(c) $\left(\frac{5}{2}\right)\mu$mg (d) $\left(\frac{3}{2}\right)\mu$mg

29. The coefficient of friction between two surfaces is $\mu = 0.8$. The tension in the string shown in the figure is



(a) 0 N (b) 6 N
(c) 4 N (d) 8 N

30. A force F is applied to the initially stationary cart. The variation of force with time is shown in the figure. The speed of cart at t = 5 sec is



(a) 10 m/s (b) 8.33 m/s
(c) 2 m/s (d) zero

PART B – CHEMISTRY

31. A dye absorb a photon of wavelength λ and re-emits the same energy into two photons of wavelengths λ_A and λ_B respectively. The wavelength λ with λ_A and λ_B is related as

(a) $\lambda = \frac{\lambda_A + \lambda_B}{\lambda_A . \lambda_B}$ (b) $\lambda = \frac{\lambda_A \lambda_B}{\lambda_A + \lambda_B}$

(c) $\lambda = \frac{\lambda_A^2 \lambda_B^2}{\lambda_A + \lambda_B}$ (d) $\lambda = \frac{\lambda_A \lambda_B}{(\lambda_A + \lambda_B)^2}$

32. Which rule among the following could explain the presence of unpaired electrons in O-atom ?
(a) Hund's rule (b) Aufbau's principle
(c) Heisenberg uncertainity principle (d) Pauli's exclusion principle

33. The orbital angular momentum of an electron in 4d orbital is

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

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

34. A compound of vanadium has magnetic moment of 1.73 B.M Vanadium ion in compound is present as M^{x+}. Then
x = ?
(a) 1 (b) 2
(c) 3 (d) 4

35. The mass of an electron is m, charge is e and it is accelerated from rest through a potential difference of V volts. The velocity acquired by electron will be
(a) $\sqrt{\frac{V}{m}}$ (b) $\sqrt{\frac{eV}{m}}$
(c) $\sqrt{\frac{2eV}{m}}$ (d) Zero

36. The mass of a particle is 10^{-10} g and its diametre is 10^{-4} cm. If its velocity is 10^{-6} cm s^{-1} with 0.0001 % uncertainty in measurement. The uncertainty in its position is
(a) 5.2×10^{-8} m (b) 5.2×10^{-7} m
(c) 5.2×10^{-6} m (d) 5.2×10^{-9} m

37. If λ and λ_0 are the wavelengths of incident light and threshold light respectively, then the velocity of photoelectron ejected from the metal surface is
(a) $\sqrt{\frac{2h}{m}(\lambda_0 - \lambda)}$ (b) $\sqrt{\frac{2hc}{m}(\lambda_0 - \lambda)}$
(c) $\sqrt{\frac{2hc}{m}\left(\frac{\lambda_0 - \lambda}{\lambda\lambda_0}\right)}$ (d) $\sqrt{\frac{2h}{m}\left(\frac{1}{\lambda_0} - \frac{1}{\lambda}\right)}$

38. The probability of finding electron in dxy orbital is
(a) along X and Y-axis (b) along X and Z-axis
(c) along Y and Z-axis (d) at an angle of $\frac{\pi}{4}$ with X-axis

39. A bulb emits light of λ = 4500 A°. The bulb is rated 150 watt and 10% energy is emitted as light. The number of photon emitted per second is
(a) 27.2×10^{18} (b) 29.4×10^{2}
(c) 27.2×10^{6} (d) 33.9×10^{18}

40. Which of the following are isodiaphers ?
(a) $_{82}Pb^{208}$, $_{83}Bi^{210}$ (b) $_{82}Pb^{208}$, $_{83}Bi^{209}$
(c) $_{82}Pb^{208}$, $_{84}P_o^{214}$ (d) $_{82}Pb^{208}$, $_{84}P_o^{218}$

41. The spin multiplicity of carbon atom is
(a) 3 (b) 2
(c) 1 (d) 4

42. In multielectronic species, the energy of an electron in atomic orbital is the function of
(a) principle quantum number n only (b) azimuthal quantum number ℓ only
(c) both n and ℓ (d) some time on ℓ and other times on n

43. If n and ℓ are principle and azimuthual quantum number respectively, then the expression for calculating the total no. of electrons in any energy level is
(a) $\sum_{\ell=1}^{n} 2(2\ell + 1)$ (b) $\sum_{\ell=1}^{n-1} 2(2\ell + 1)$
(c) $\sum_{\ell=0}^{n+1} 2(2\ell + 1)$ (d) $\sum_{\ell=0}^{n-1} 2(2\ell + 1)$

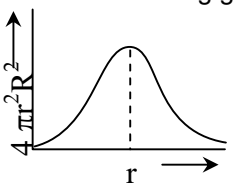
44. Li^{+3} and a proton are accelerated by the same potential, their de Broglie wavelength λ_{Li}^{3+} and λ_p have the ratio (assume $m_{LI} = 9m_p$)
(a) 1 : 2 (b) 1 : 4
(c) 1 : 1 (d) $1 : 3\sqrt{3}$

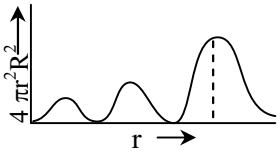
45. Hydrogen atoms are excited to n = 4 state. In the spectrum of emitted radiation, number of lines in the ultraiolet and visible regions are respectively.
(a) 3 ; 1 (b) 1 ; 3
(c) 2 ; 3 (d) 3 ; 2

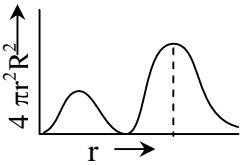
46. If the radius of first orbit of H-atom is a_0, then de Broglie wavelength of electron in 4^{th} orbit is
(a) $2\pi a_0$ (b) $16a_0$
(c) $\frac{a_0}{4}$ (d) $8\ \pi a_0$

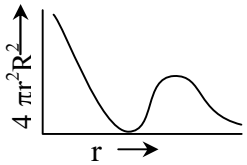
47. The number of d-electrons in Fe^{+2} (z = 26) is not equal to that of
(a) s-electrons in Mg (b) p-electrons in Ne
(c) d-electrons in Fe (d) p-electrons in Cl

48. Which of the following graphs represents the radial charge density of 3d electron ?

(a) 

(b) 

(c) 

(d) 

49. The work function of a metal is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this metal is approximately
(a) 540 nm (b) 400 nm
(c) 310 nm (d) 220 nm

50. The total number of orbitals in the principal shell of He^+ that has energy equal to $-\frac{hcR}{4}$, is (R = Rydberg constant)
(a) 4 (b) 16
(c) 9 (d) none of these

51. An orbital with l = 0 is symmetrical about the
(a) x–axis only (b) y–axis only
(c) z–axis only (d) nucleus

52. Which is the correct relationship :
(a) E_1 of H = $\frac{1}{2}$ E_2 of He^+ = $\frac{1}{3}E_3$ of Li^{2+} = $\frac{1}{4}E_4$ of Be^{3+}
(b) E_1 of H = E_2 of He^+ = E_3 of Li^{2+} = E_4 of Be^{3+}
(c) E_1 of H = 2 E_2 of He^+ = 3 E_3 of Li^{2+} = 4 E_4 of Be^{3+}
(d) E_1 of H = $\frac{2}{3}$ E_2 of He^+ = $\frac{4}{3}E_3$ of Li^{2+} = $\frac{5}{3}E_4$ of Be^{3+}

53. Photoelectric emission is observed from a surface for frequencies ν_1 and ν_2 of incident radiations ($\nu_1 > \nu_2$). If the maximum kinetic energy of photoelectrons in the two cases are in the ratio of 1 : 2, then threshold frequency ν_0 is given by
(a) $\frac{\nu_2 - \nu_1}{2-1}$ (b) $\frac{2\nu_1 - \nu_2}{2-1}$
(c) $\frac{2\nu_2 - \nu_1}{2-1}$ (d) $\frac{\nu_2 - \nu_1}{2}$

54. For radial probability distribution curves, which of the following is/are not correct
(a) The number of maxima in 2s orbital are two
(b) The number of spherical or radial nodes is equal to n – ℓ – 1
(c) The number of angular nodes are 'ℓ'
(d) $3d_z^2$ has two angular nodes.

55. The first emission line in the atomic spectrum of hydrogen in the Balmer series appears at
(a) $\frac{9R}{400}cm^{-1}$ (b) $\frac{7R}{144}cm^{-1}$
(c) $\frac{3R}{4}cm^{-1}$ (d) $\frac{5R}{36}cm^{-1}$.

56. The radius of which of the following orbits is same as that of the first Bohr's orbit of hydrogen atom?
(a) He^{+} (n = 2) (b) Li^{2+} (n = 2)
(c) Li^{2+} (n = 3) (d) Be^{3+} (n = 2)

57. The most probable radius (in pm) for finding the electron in He^{+} is
(a) 0.0 (b) 52.9
(c) 26.5 (d) 105.8

58. Frequency of matter wave is equal to
(a) (K.E.)/2h (b) 2.(K.E.)/h
(c) (K.E.)/h (d) λ

59. In one joule of energy, the number of photons with wave number equal to x is
(a) $(hcx)^{-1}$ (b) $x(hc)^{-1}$
(c) hcx (d) $hc(x)^{-1}$

60. The total number of orbitals in fifth energy level should theoretically be
(a) 10 (b) 25
(c) 15 (d) 18.

PART C – MATHEMATICS

61. The value of a for which the equation $2x^2 + 2\sqrt{6}\,x + a = 0$ has equal roots is equal to
(a) 3 (b) 4
(c) 2 (d) $\sqrt{3}$

62. The condition that $x^3 - px^2 + qx - r = 0$ may have two of its roots equal to each other but opposite in sign is
(a) rp = q (b) $r = 2p^3 + pq$
(c) r = pq (d) $r = p^2q$

63. The solution of the equation $2^{x^2} : 2^{2x} = 8 : 1$ is
(a) {1, – 3} (b) {1, 3}
(c) {–1, – 3} (d) {3, –1}

64. If the product of the roots of the equation $x^2 - 3\lambda x + 2e^{2\log\lambda} - 1 = 0$ is 7, then the roots of the equation are real if λ is equal to
(a) ± 2 (b) 1
(c) 4 (d) none of these

65. The number of real roots of $(x + 3)^4 + (x + 5)^4 = 16$ is
(a) 0 (b) 2
(c) 4 (d) 3

66. If α, β, γ are the roots of the cubic equation $px^3 + qx^2 + rx + s = 0$, of which the two roots are equal in magnitude but opposite in sign, then which of the following is true :
(a) pq = rs (b) ps = qr
(c) pr = qs (d) none of these

67. The solution set of the equation $y^{1/3} + (2y - 3)^{1/3} = [3(y - 1)]^{1/3}$ is
(a) {–1, 0, 3/2} (b) {0, –1, –3/2}
(c) {0, 1, 3/2} (d) none of these

68. The expression $\frac{8x^2 + 16x - 51}{(2x - 3)(x + 4)} > 3$ if
(a) x < – 4 (b) x > 5/2
(c) – 3 < x < 3/2 (d) all of these

69. If $|x - 3| + |x - 1| + |x - 2| \leq 3$, then
(a) x ε [0, 6] (b) x ε [1, 3]
(c) x ε (1, 3) (d) x ε [3, ∞)

70. If α, β are the roots of the equation $ax^2 + 3x + 2 = 0$, (a < 0), then $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$ is less than
(a) 0 (b) 1
(c) 2 (d) none of these

71. The set of all the values of x satisfying $(2x - 1)(x - 2)^2 > 0$ is
(a) $\left(\frac{1}{2}, \infty\right)$ (b) $\left(\frac{1}{2}, 1\right) \cup (1, \infty)$
(c) $\left(-\frac{1}{2}, \frac{1}{2}\right)$ (d) $-\left(\frac{1}{2}, 1\right) \cup (1, 2)$

72. The set of values of x satisfying $\sqrt{2x - 3} > \sqrt{6 - x}$ is
(a) (3, ∞) (b) [3, 6]
(c) (– ∞, 6] (d) (3, 6]

73. If α and β are the roots of $ax^2 + bx + c = 0$, then the equation $ax^2 - bx(x - 2) + c(x - 2)^2 = 0$ has roots
(a) $\frac{2\alpha}{1 - 2\alpha}, \frac{2\beta}{1 - 2\beta}$ (b) $\frac{1 - 2\alpha}{2\alpha}, \frac{1 - 2\beta}{2\beta}$
(c) $\frac{2\alpha}{1 + 2\alpha}, \frac{2\beta}{1 + 2\beta}$ (d) $\frac{1 + 2\alpha}{2\alpha}, \frac{1 + 2\beta}{2\beta}$

74. The number of roots of the equation $5^{2y + 1} - 21.5^{y + 1} = 500$ is / are
(a) 0 (b) 1
(c) 2 (d) none of these

75. If $\sqrt{9x^2+6x-1} < (2-x)$, then x belongs to

(a) $\left(\frac{-3}{2},\frac{1}{4}\right)$ (b) $\left(\frac{-3}{2},\frac{1}{4}\right]$

(c) $\left[\frac{-3}{2},\frac{1}{4}\right)$ (d) $\left(-\infty,\frac{1}{4}\right)$

76. The number of real solutions for $(x-a)^2+(x-b)^2+(x-c)^2=0$ such that a, b, c are consecutive integers is

(a) 3 (b) 2

(c) 0 (d) none of these

77. The set of all possible values of $a \in R$ for which the expressions $x^2 - ax + 1 - 2a^2$ is always positive for all $x \in R$ is

(a) $\left[\frac{-2}{3},\frac{2}{3}\right]$ (b) $\left(-\infty,\frac{-2}{3}\right)\cup\left(\frac{2}{3},\infty\right)$

(c) $\left(\frac{-2}{3},\frac{2}{3}\right)$ (d) $\left(-\infty,\frac{-2}{3}\right)\cup\left[\frac{2}{3},\infty\right)$

78. If p, q are real roots of $x^2 + px + q = 0$ and $x^2 + px + q + k$ is non – negative, then possible value of k is $(q \neq 0)$

(a) $\frac{3}{2}$ (b) $\frac{-3}{2}$

(c) $\frac{9}{4}$ (d) $\frac{-9}{4}$

79. The other solutions of the equation $x^4 + 4x^3 + 6x^2 + 4x + 5 = 0$ if one solution is i is / are

(a) – i, 2 + i (b) $\pm$ i, – (2 + i)

(c) $\pm$ i, – 2 $\pm$ i (d) None of these

80. The condition for which the equation $x^3 - px^2 + qx - r = 0$ may be in A.P. is

(a) $2p^3 + 27r = 9pq$ (b) $2p^3 - 27r = 9pq$

(c) $-2p^3 + 27r = -9pq$ (d) $-2p^3 - 27r = 9pq$

81. P and Q solved a quadratic equation. In solving it, P made a mistake in constant term only and got the roots as 5 and 2 while Q made a mistake in the coefficient of x only and obtained 6 and 2 as roots, then the correct roots are

(a) (– 4, – 3) (b) (4, 3)

(c) (– 6, 2) (d) none of these

82. If a, b, c are three distinct positive real numbers, then the number of real roots of $ax^2 + 2b|x| - c = 0$ is
(a) 4 (b) 2
(c) 0 (d) none of these

83. The equation $x^2 + b^2 = 1 - 2bx$ and $x^2 + a^2 = 1 - 2ax$ have one and only one root common, then
(a) $a + b = 2$ (b) $a + b + 2 = 0$
(c) $|a + b| = 2$ (d) none of these

84. The H.M. of the roots of the equation $(5 + \sqrt{2})x^2 - (4 + \sqrt{5})x + (8 + 2\sqrt{5}) = 0$ is
(a) 2 (b) 4
(c) 7 (d) 8

85. If one root is square of the other root of the equation $x^2 + px + q = 0$, then the relation between p and q is
(a) $p^3 - (3p - 1)q + q^2 = 0$ (b) $p^3 - (3p + 1)q + q^2 = 0$
(c) $p^3 + (3p - 1)q + q^2 = 0$ (d) $p^3 + (3p + 1)q + q^2 = 0$.

86. The number of values of a for which

$(a^2 - 3a + 2)x^2 + (a^2 - 5a + 6)x + a^2 - 4 = 0$ is an identity in x is -

(A) 0 (B) 2

(C) 1 (D) 3

87. If $x = \sqrt{6 + \sqrt{6 + \sqrt{6 + ...}}}$, then -

(A) $-2 < x < 3$ (B) $2 < x < 3$

(C) $x = 3$ (D) $x > 3$

88. Let α, β be the roots of the equation $ax^2 + 2bx + c = 0$ and γ, δ be the roots of the equation $px^2 + 2qx + r = 0$. If $\alpha, \beta, \gamma, \delta$ are in G.P., then-

(A) $q^2 ac = b^2 pr$ (B) $qac = bpr$

(C) $c^2 pq = r^2 ab$ (D) $p^2 ab = a^2 qr$

89. The set of values of p for which

$(p-2)x^2 + 7x + p^2 - 4p = 0$ has roots of opposite signs are-

(A) $0 < p < 2$ (B) $2 < p < 4$

(C) $p < 0$ (D) $0 < p > 4$

90. If α, β, γ are the roots of the equation

$x^3 - x - 1 = 0$, then the value of $\sum\left(\frac{1+\alpha}{1-\alpha}\right)$ is -

(A) –3 (B) –5

(C) –7 (D) None of these