Talent Search Exam. 2023

TEST CODE **1106**

for class XI (Non-Medical)

BOOKLET A

Duration : 1.30 Hours | **Max. Marks : 240**

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

INSTRUCTIONS

A. General :

1. This booklet is your Question Paper. DO NOT break seal of Booklet until the invigilator instructs to do so. Total Questions to be Attempted 60: **Chemistry : 20, Mathematics : 20 Questions, Physics : 20.**
2. The Answer Sheet is provided to you separately which is a machine readable Optical Response Sheet (ORS). You have to mark your answers in the ORS by darkening bubble, as per your answer choice, by using black & blue ball point pen.
3. Things NOT ALLOWED in EXAM HALL : Blank Paper, clipboard, log table, slide rule, calculator, camera, mobile and any electronic or electrical gadget. If you are carrying any of these then keep them at a place specified by invigilator at your own risk.
4. Do not use white-fluid or any other rubbing material on answer sheet. Before handing over the answer sheet to the invigilator, candidate should check that **Roll No, Test code and Book Code** have been filled and marked correctly. Immediately after the prescribed examination time is over, the **Answer sheet is to be returned to the invigilator.**

B. Filling the Answer Sheet :

5. On Side-1 of Answer Sheet write your Name and Roll Number in the respective boxes. Do not write anything on Side-2.
6. **Marking Scheme:**
   a. If darkened bubble is RIGHT answer : 4 Marks.
   b. If no bubble is darkened in any question: No Mark.
   c. If darkened bubble is WRONG answer: –1 Mark (Minus One Mark).
7. Think wisely before darkening bubble as there is negative marking for wrong answer.

PROCEDURE OF FILLING UP THE ANSWERS IN ANSWER SHEET

Avoid Improper Marking	Proper Marking
Partially Filled, Lightly Filled, Tick-Cross Marked	Fully darken

Name of the candidate (In Capital Letters)

Roll Number

I have read all the instruction and shall abide by them.

.....

(Signature of the candidate)

I have verified all the information filled in by the candidate.

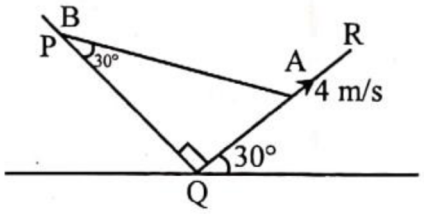
.....

(Signature of the Invigilator)

The Only Person Responsible for Your Success is You.

[PHYSICS]

1. A rod of length L is sliding on a frictionless surfaces as shown in the figures. Velocity of end A is 4 m/s along the wall. Find the velocity of end B, when and B makes 30° with wall PQ



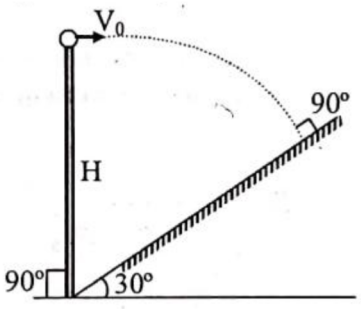
(1) 8 m/s

(2) $2\sqrt{3}$ m/s

(3) $4\sqrt{3}$ m/s

(4) $\frac{4}{\sqrt{3}}$ m/s

2. In the given figure, the angle of inclination of the inclined plane is 30°. Find the horizontal velocity V_0 so that the particle hits the inclined plane perpendicularly.



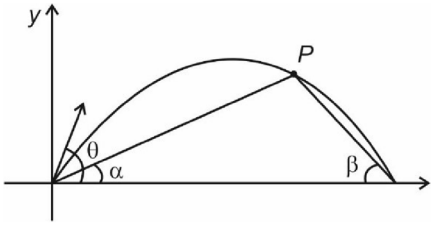
(1) $V_0 = \sqrt{\frac{2gH}{5}}$

(2) $V_0 = \sqrt{\frac{2gH}{7}}$

(3) $V_0 = \sqrt{\frac{gH}{5}}$

(4) $V_0 = \sqrt{\frac{gH}{7}}$

3. A particle is thrown at an angle θ in vertical plane and it passes through the point P as shown. If $\beta = 45°$ and $\alpha = 37°$, then angle of projection is



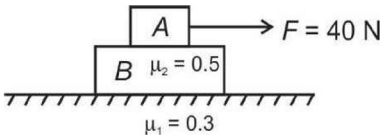
(1) $\tan^{-1}\left(\frac{1}{2}\right)$

(2) $\tan^{-1}\left(\frac{7}{4}\right)$

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

(4) $\tan^{-1}\left(\frac{1}{4}\right)$

4. Two blocks A and B of masses 4 kg and 5 kg respectively are arranged above one another as shown. If F = 40 N, then ($g = 10\ m/s^2$)



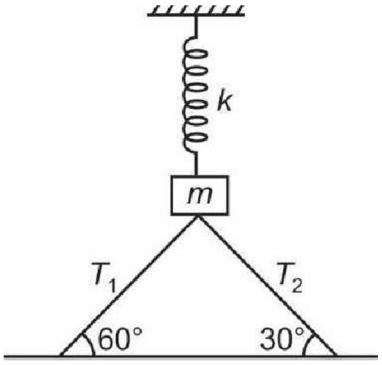
(1) Acceleration of A is 5 m/s^2

(2) Friction force on A is 20 N

(3) Net frictional force on B is zero

(4) All of these

5. A block of mass m = 1 kg is suspended at equilibrium by a light spring of spring constant k = 200 N/m and two light strings. If springs is elongated by 10 cm in the position shown, then



(1) Tension T_1 is $10\sqrt{3}$N

(2) Tension T_1 is $5\sqrt{3}$ N

(3) Tension T_2 is $5\sqrt{3}$ N

(4) All of these

6. Under simultaneous action of two forces, a stationary particles starts moving parallel to a vector $\hat{i}-\hat{j}$. If one of the force is $(3\hat{i}-\hat{j}-\hat{k})$N and the other has smallest possible magnitude, find the other force:

(1) $(-2\hat{i}+\hat{j}+\hat{k})$N

(2) $(\hat{i}+\hat{j}-\hat{k})$N

(3) $(-\hat{i}-\hat{j}-\hat{k})$N

(4) $(2\hat{i}-\hat{j}-\hat{k})$N

7. In the setup shown, blocks of masses 3m and 2m are placed on a frictionless horizontal ground and the free end P of the thread is being pulled by a constant force F. Find acceleration of the free end P:

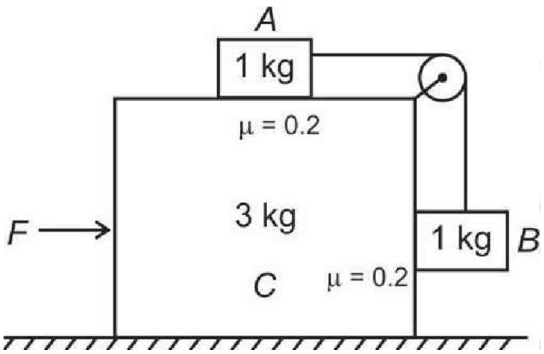
(1) F/(5m)

(2) 2F/m

(3) 3F/m

(4) 5F/m

8. In the arrangement shown, if the blocks A and B do not slide over the bigger block C, then



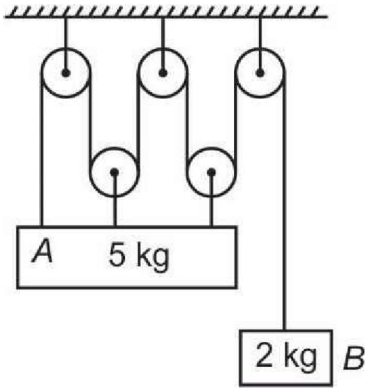
(1) Minimum value of F is 33.3 N

(2) Maximum value of F is 65 N

(3) Minimum acceleration of C is 7.5 m/s^2

(4) None of these

9. In the arrangement shown. Pulleys and string are light and frictionless, then select the correct statement (s) ($g = 10\ m/s^2$)



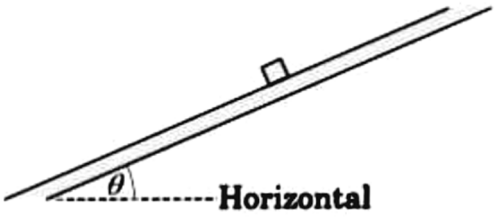
(1) Acceleration of block A is $\frac{10}{11} m/s^2$ upwards

(2) Acceleration of block B is $\frac{50}{11} m/s^2$

(3) Tension in string is $\frac{120}{11} N$

(4) All of these

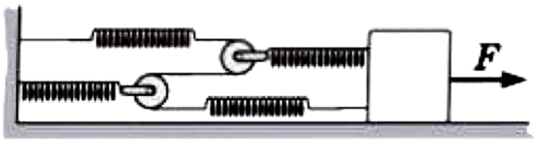
10. A small block is sliding on a frictionless inclined plane that is moving upward with a constant acceleration. If the block remains at a level height, what is the acceleration of the inclined plane? Acceleration due to gravity is g:



(1) $g \tan\theta$ (2) $g \cot\theta$

(3) $g \sin^2\theta$ (4) $g \tan^2\theta$

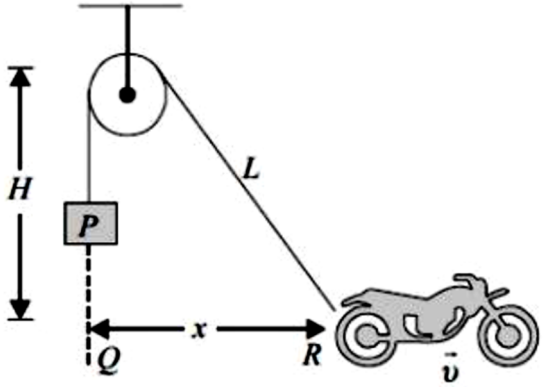
11. In the setup shown, a block is placed on a frictionless floor, the cords and pulleys are ideal and each spring has stiffness k. The block is pulled away from the wall. How far will the block shift, while the pulling force is increased gradually from zero to a value F?



(1) $\frac{2F}{5k}$ (2) $\frac{10F}{3k}$

(3) $\frac{8F}{9k}$ (4) $\frac{10F}{9k}$

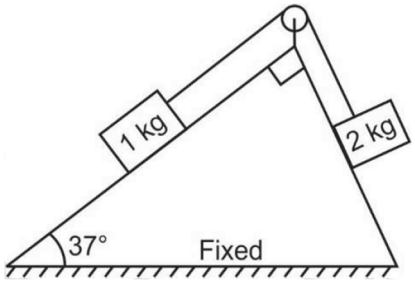
12. If the velocity of the motorcycle υ is constant, then determine the velocity of the mass as a function of x. Given that ends P and R are coincident on Q when x = 0:



(1) $\frac{x\nu}{\sqrt{H^2 + x^2}}$ (2) $\frac{H^2 + x^2}{x\nu}$

(3) $\sqrt{\frac{H^2 + x^2}{\nu x}}$ (4) $\frac{H^2 + x^2}{(\nu x)^2}$

13. In the arrangement shown, pulley and string are ideal friction is absent. The acceleration of centre of mass is ($g = 10\ m/s^2$)



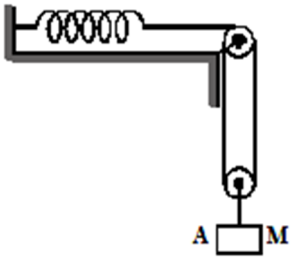
(1) $\frac{5\sqrt{3}}{2} m/s^2$

(2) $\frac{10\sqrt{5}}{3} m/s^2$

(3) $\frac{3\sqrt{5}}{10} m/s^2$

(4) $\frac{10\sqrt{5}}{9} m/s^2$

14. Block A in the figure is released from the rest when the extension in the spring is x_0. The maximum downward displacement of the block:



(1) $\frac{Mg}{2k} - x_0$

(2) $\frac{Mg}{2k} + x_0$

(3) $\frac{2Mg}{k} - x_0$

(4) $\frac{2Mg}{k} + x_0$

15. A vehicle of mass M is accelerated on a horizontal frictionless road under a force changing its velocity from u to v in distance s. A constant power P is given by the engine of the vehicle, then:

(1) $v = \left[\frac{3PS}{2M} + u^2\right]^{1/2}$

(2) $v = \left[\frac{2PS}{3M} + u^2\right]^{1/2}$

(3) $v = \left[\frac{3PS}{M} + u^3\right]^{1/3}$

(4) $v = \left[\frac{3PS}{2M} + u^3\right]^{1/3}$

16. The deceleration experienced by a moving motor boat, after its engine is cut-off is given by $dv/dt = -kv^3$, where k is constant. If v_0 is the magnitude of the velocity at cut-off, the magnitude of the velocity at a time t after the cut-off is:

(1) $v_0/2$

(2) v

(3) $v_0 e^{-kt}$

(4) $\frac{v_0}{\sqrt{2v_0^2 kt + 1}}$

17. Two particles A and B start moving due to their mutual interaction only. If at any time 't', $\vec{a}_A$ and $\vec{a}_B$ are their respective accelerations, $\vec{v}_A$ and $\vec{v}_B$ are their respective velocities and upto that time W_A and W_B are the work done on A and B respectively by the mutual force, m_A and m_B are their masses respectively, then which of the following is always correct:

(1) $\vec{v}_A + \vec{v}_B = 0$

(2) $m_A\vec{v}_A + m_B\vec{v}_B = 0$

(3) $W_A + W_B = 0$

(4) $\vec{a}_A + \vec{a}_B = 0$

18. In an elastic collision:

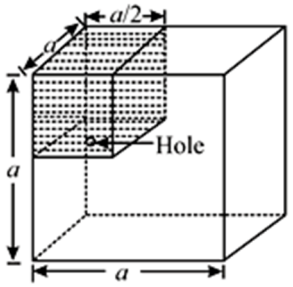
(1) Only KE of system is conserved

(2) Only momentum is conserved

(3) Both KE and momentum are conserved

(4) Neither KE nor momentum is conserved

19. The figure shows a hollow cube of side 'a' of volume V. There is a small chamber of volume V/4 in the cube as shown. This chamber is completely filled by m kg of water. Water leaks through a hole H. Then the work done by gravity in this process assuming that the complete water finally at the bottom of the cube is:



(1) $\frac{1}{2}$ mg a

(2) $\frac{3}{8}$ mg a

(3) $\frac{5}{8}$ mg a

(4) $\frac{1}{8}$ mg a

20. A balloon having mass 'm' is filled with gas and is held in hands of a boy. Then suddenly it get released and gas start coming out of it with a constant rate. The velocities of the ejected gases is also constant 2 m/s with respect to the balloon. Find out the velocity of the balloon when the mass of gas is reduced to half:

(1) ℓ n2

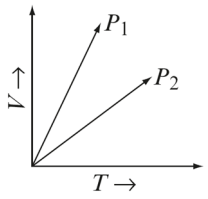
(2) 2 ℓ n 4

(3) 2 ℓ n2

(4) None of these

21. V vs. T curves at different pressures P_1 and P_2 for fixed amount of an ideal gas are shown below.

Which one of the following is correct?



(1) $P_1 > P_2$

(2) $P_1 < P_2$

(3) $P_1 = P_2$

(4) Relation between P_1 and P_2 depends on the gas.

22. When 2 g of gas A is introduced into an evacuated flask kept at 25°C, the pressure was found to be 1 atmosphere. If 3 g of another gas B is then added to the same flask, the pressure becomes 1.5 atm. Assuming ideal behaviour, the ratio of molecular weights ($M_A : M_B$) is

(1) 1:3 (2) 3:1

(3) 2:3 (4) 3:2

23. Find the value of wave number $\bar{\nu}$ in terms of Rydberg's constant, when transition of electron takes place between two levels of He^+ ion whose sum is 4 and difference is 2.

(1) $\frac{8R}{9}$ (2) $\frac{32R}{9}$

(3) $\frac{3R}{4}$ (4) None of these

24. Photoelectric emission is observed from a surface for frequencies v_1 and v_2 of the incident radiation ($v_1 > v_2$). If the maximum kinetic energies of the photoelectrons in the two cases are in the ratio 1 : k then the threshold frequency v_0 is given by:

(1) $\frac{v_2 - v_1}{k-1}$ (2) $\frac{k v_1 - v_2}{k-1}$

(3) $\frac{k v_2 - v_1}{k-1}$ (4) $\frac{v_2 - v_1}{k}$

25. Successive ionisation energies of an element 'X' are given below (in Kcal)

IP_1	IP_2	IP_3	IP_4
165	195	556	595

Electronic configuration of the element 'X' is:-

(1) $1s^2$, $2s^2 2p^6$, $3s^2$ $3p^2$

(2) $1s^2$, $2s^1$

(3) $1s^2$, $2s^2 2p^2$

(4) $1s^2$, $2s^2 2p^6$, $3s^2$

26. A molecule XY_2 contains two σ , two π-bonds and one lone pair of electron in the valence shell of X. The arrangement of lone pair as well as bond pairs is :

(1) square pyramidal

(2) linear

(3) trigonal planar

(4) Unpredictable

27. Which of the following orbital combination can not from π-bond ?

(1) $p_x + p_x$ sideways overlapping

(2) $d_{x^2-y^2} + p_y$ sideways overlapping

(3) $d_{xy} + d_{xy}$ sideways overlapping

(4) $d_{yz} + p_y$ sideways overlapping

28. Aqueous solutions of two compounds $M_1 - O - H$ and $M_2 - O - H$ are prepared in two different beakers. If, the electronegativity of M_1 = 3.4, M_2 = 1.2, O = 3.5 and H = 2.1, then the nature of two solutions will be respectively :

(1) acidic, basic (2) acidic, acidic

(3) basic, acidic (4) basic, basic

29. If the aufbau principle had not been followed, Ca (Z= 20) would have been placed in the :

(1) s-block (2) p-block

(3) d-block (4) f-block

30. A volume of 50 ml of '20 vol' H_2O_2 solution is mixed with 50 ml of '10 vol' H_2O_2 solution. The volume strength of the resulting solution is (assume neither expansion nor contraction in volume of solution, on mixing)

(1) '30 vol'

(2) '10 vol'

(3) '15 vol'

(4) '22.5 vol'

31. If the ratio of mole fractions of solute and solvent is unity, then the mass percent of solute is (Molar masses of solute and solvent are X and Y, respectively)

(1) 50%

(2) $\frac{Y}{X+Y} \times 100\%$

(3) $\frac{X}{Y} \times$ mass percent of solvent

(4) $\frac{Y}{X} \times$ mass percent of solvent

32. The wavelengths of the first Lyman lines of hydrogen, He^+ and Li^{2+} ions are $\lambda_1, \lambda_2, \lambda_3$. The ratio of these wavelengths is

(1) 1 : 4 : 9

(2) 9 : 4 : 1

(3) 36 : 9 : 4

(4) 6 : 3 : 2

33. A human patient suffering from a duodenal ulcer may show a concentration of HCl of 80×10^{-3} molar in gastric juice. If his stomach receives 3 L of gastric juice per day, how much medicine (antacid syrup) containing 2.6 g of $Al(OH)_3$ per 100 ml must he consumes per day to neutralize the acid?

(1) 27 ml

(2) 80 ml

(3) 240 ml

(4) 120 ml

34. The empirical formula of an organic gaseous compound containing carbon and hydrogen is CH_2. The volume occupied by certain mass of this gas is exactly half of the volume occupied by the same mass of nitrogen gas under identical conditions. The molecular formula of the organic gas is

(1) C_2H_4 (2) CH_2

(3) C_6H_{12} (4) C_4H_8

35. A sample of air contains only N_2, O_2 and H_2O. It is saturated with water vapour and pressure is 640 torr. The vapour pressure of water is 40 torr and the molar ratio of N_2:O_2 is 3:1. The partial pressure of N_2 in the sample is

(1) 540 torr (2) 900 torr

(3) 1080 torr (4) 450 torr

36. There are three elements A, B and C. Their atomic number are Z_1, Z_2 and Z_3 respectively. If $Z_1 - Z_2 = 2$ and $\frac{Z_1+Z_2}{2} = Z_3 - 2$ and the electronic configuration of element A is $[Ar]3d^6\ 4s^2$, then incorrect order of magnetic momentum is/are.

(1) $B^+ > A^{2+} > C^{2+}$

(2) $A^{3+} > B^{2+} > C$

(3) $B > A > C^{2+}$

(4) $B = A^{3+} > C^{3+}$

37. The first ionization energy of first atom is greater than that of second atom, whereas reverse order is true for their second ionization energy. Which set of elements is in accordance to above statement?

(1) C , B

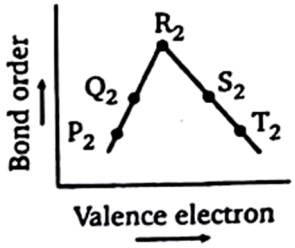
(2) P , S

(3) Be , B

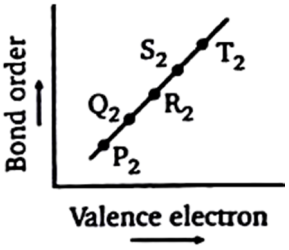
(4) All of these

38. If P to T are second period p-block elements then which of the following graph show correct relation between valence electrons in P_2 to T_2 (corresponding molecules) and their bond order is :

(1)



(2)



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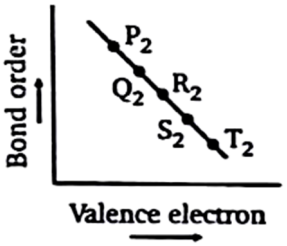
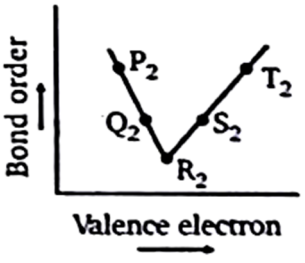


(4)



39. The hybridization of central atoms of compounds A, B, C and D are $sp^3 d$, sp^3, sp^2 and sp respectively. If compounds A and D have same shape like I_3^- and compounds B and C have same shape like water molecule. Then calculate value of "P + Q + R + S", where P, Q, R and S are number of lone pairs on central atoms of compounds A, B, C and D respectively.

(1) 5 (2) 6

(3) 4 (4) 3

40. If $\Delta_{eg}H$ of A^+ (g) = - x kJ/mol, $\Delta_{eg}H$ of A(g) = - y kJ/mol and $\Delta_{ionisation}$ H of A^+ (g) = + z kJ/mol, then ΔH for the process : A^- (g) $\rightarrow$ A^{2+} (g), is

(1) (x + y + z) kJ/mol (2) (z - x + y) kJ/mol

(3) (x + y - z) kJ/mol (4) (x - y + z) kJ/mol

[MATHEMATICS]

41. Number of real solutions of the equation $x^2 + 3|x| + 2 = 0$ is :

(1) 0 (2) 1

(3) 2

(4) 4

42. If roots of the equation $(m - 2) x^2 - (8 - 2m) x - (8 - 3m) = 0$ are opposite in sign, then number of integral value(s) of m is/are :

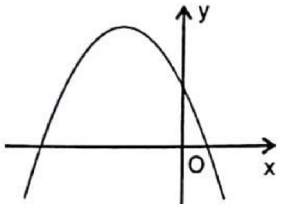
(1) 0

(2) 1

(3) 2

(4) more than 2

43. If graph of the quadratic $y = ax^2 + bx + c$ is given below :



then :

(1) a < 0, b > 0, c > 0 (2) a < 0, b > 0, c < 0

(3) a < 0, b < 0, c > 0 (4) a < 0, b < 0, c < 0

44. A = {ϕ, {ϕ}}, then P(A) is

(1) {ϕ, {ϕ}}

(2) {ϕ, {ϕ}, {{ϕ}}}

(3) {ϕ, {ϕ}, {{ϕ}}, {ϕ, {ϕ}}}

(4) {ϕ}

45. The sum of all the solutions in $[0, 4\pi]$ of the equation $\tan x + \cot x + 1 = \cos\left(x + \frac{\pi}{4}\right)$ is

(1) 3π (2) $\pi/2$

(3) $7\pi/2$ (4) 4π

46. The domain of $f(x) = (x^2 - 1)^{-1/2}$ is

(1) $(-\infty,-1)\cup(1, \infty)$ (2) $(-\infty,-1]\cup(1, \infty)$

(3) $(-\infty,-1]\cup[1, \infty)$ (4) None of these

47. The domain of the function $y = 1/\sqrt{|x| - x}$ is

(1) $(-\infty, 0)$ (2) $(-\infty, 0]$

(3) $(-\infty, -1)$ (4) $(-\infty, \infty)$

48. The total number of solutions of $\log_e |\sin x| = -x^2 + 2x$ in $[0, \pi]$ is equal to

(1) 1 (2) 2

(3) 4 (4) none of these

49. The total number of solutions of $\sin\{x\} = \cos\{x\}$ (where $\{ . \}$ denotes the fractional part) in $[0, 2\pi]$ is equal to :

(1) 5 (2) 6

(3) 8 (4) none of these

50. The number of real roots of $3^x + 4^x + 5^x - 6^x = 0$ is/are

(1) Two (2) More than two

(3) One

(4) Equation does not have any real root

51. The number of solutions of $\log_{\sin x} 2^{\tan x} > 0$ in the interval $\left(0, \frac{\pi}{2}\right)$ is

(1) 0

(2) 1

(3) 2

(4) 3

52. If the complete set of value of x satisfying $|x - 1| + |x - 2| + |x - 3| \geq 6$ is $(-\infty, a] \cup [b, \infty)$, then a + b = :

(1) 2 (2) 3

(3) 6 (4) 4

53. The set of all x in $\left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$ satisfying $|4 \sin x - 1| < \sqrt{5}$ is given by

(1) $\left(-\frac{\pi}{10}, \frac{3\pi}{10}\right)$ (2) $\left(\frac{\pi}{10}, \frac{3\pi}{10}\right)$

(3) $\left(\frac{\pi}{10} - \frac{3\pi}{10}\right)$ (4) None of these

54. The number of integers satisfying the inequality $\frac{x}{x+6} \leq \frac{1}{x}$ is :

(1) 7

(2) 8

(3) 9

(4) 3

55. For $x \in R$, the expression $\frac{x^2 + 2x + c}{x^2 + 4x + 3c}$ can take all real values if $c \in$:

(1) (1, 2)

(2) [0, 1]

(3) (0, 1)

(4) (- 1, 0)

56. The number of ordered pairs which satisfy the equation $x^2 + 2x \sin(xy) + 1 = 0$ are
(where $y \in [0, 2\pi]$)

(1) 1

(2) 2

(3) 3

(4) 0

57. If $\alpha, \beta, \gamma, \delta \in R$ satisfy

$$\frac{(\alpha+1)^2+(\beta+1)^2+(\gamma+1)^2+(\delta+1)^2}{\alpha+\beta+\gamma+\delta} = 4.$$

If biquadratic equation $a_0x^4 + a_1x^3 + a_2x^2 + a_3x + a_4 = 0$ has the roots $\left(\alpha+\frac{1}{\beta}-1\right), \left(\beta+\frac{1}{\gamma}-1\right)$, $\left(\gamma+\frac{1}{\delta}-1\right), \left(\delta+\frac{1}{\alpha}-1\right)$. Then the value of a_2 / a_0 is :

(1) 4

(2) - 4

(3) 6

(4) none of these

58. If X and Y are two subsets of the universal set U and X′ denotes the complement of X, then

$X \cup (X \cap Y)'$ is equal to

(1) X (2) Y′

(3) ϕ (4) U

59. In a class of 60 students, 30 students like Mathematics, 25 like Science and 15 like both. Then, the number of students who like either Mathematics or Science is

(1) 30

(2) 40

(3) 45

(4) 50

60. The value of $(A \cup B \cup C) \cap (A \cap B^C \cap C^C) \cap C^C$ is

(1) $(B \cap C^C)$

(2) $(A \cap B^C \cap C^C)$

(3) $(B \cap C)$

(4) $(A \cap B \cap C)$