Max. Marks: 300   **Date: 21.10.2022**

JB 1 MR BATCH
PHYSICS : PART TEST SET-B
Topic: FLT

1. Two vectors $\vec{a}$ and $\vec{b}$ inclined at an angle θ have a resultant $\vec{c}$ which makes an angle β with $\vec{a}$. If the directions of $\vec{a}$ and $\vec{b}$ are interchanged, then the resultant will have the same

    (a)   magnitude   (b)   direction

    (c)   magnitude as well as direction   (d)   neither magnitude nor direction

2. The sum of two forces acting at a point is 16 N. If the resultant force is 8 N and its direction is perpendicular to minimum force then the forces are

    (a)   6 N and 10 N   (b)   8 N and 8 N   (c)   4 N and 12 N   (d)   2 N and 14 N

3. Rain is falling with speed $12\sqrt{2}$ m/s at an angle of 45° with vertical line. A man in a glider going at a speed of u at angle of 37° with respect to ground. Find the speed of glider so that rain appears to him falling vertically. Consider motion of glider and rain drops in same vertical plane.
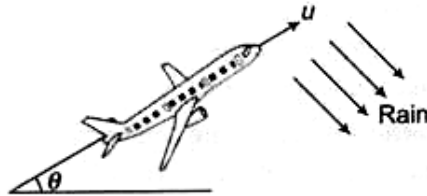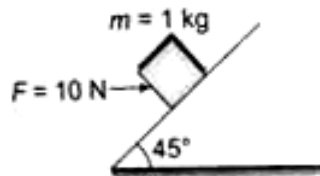

    (a)   15 m/s   (b)   30 m/s   (c)   10 m/s   (d)   25 m/s
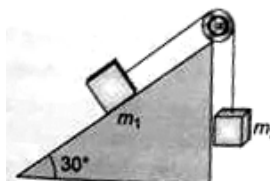

Space for Rough Work

4. A body of mass 1 kg lies on smooth inclined plane. The block of mass m is given force F = 10 N horizontally as shown. The magnitude of net normal reaction on the block is:

   (a) $10\sqrt{2}$ N (b) $\dfrac{10}{\sqrt{2}}$ N (c) 10 N (d) None of these

5. A body of mass 2.0 kg is placed on a smooth horizontal surface. Two forces $F_1 = 20$ N and $F_2 = $ N are acting on the body in directions making angles of 30° and 60° to the surface. The reaction of the surface on the body will be
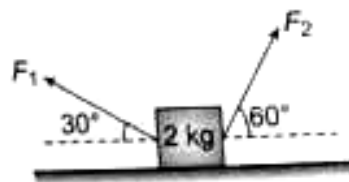
   (a) 20 N (b) 25 N (c) 5 N (d) zero

6. M is a fixed wedge. Masses m_1 and m_2 are connected by a light string. The wedge is smooth and the pulley is smooth and fixed. $m_1 = 10$ kg and $m_2 = 7.5$ kg. When m_2 is just released, the distance it will travel in 2 seconds is
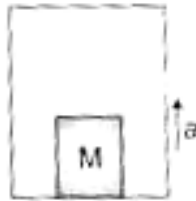

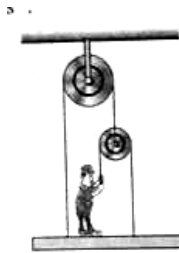   (a) 2.8 m (b) 7.5 m (c) 4.0 m (d) 6.0 m
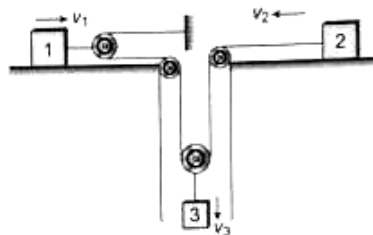
Space for Rough Work

7. With what acceleration a should be box of figure moving up so that the block of mass M exerts a force 7 Mg/4 on the floor of the box?

(a) g/4 (b) g/2 (c) 3g/4 (d) 4g

8. In the given diagram, with what force must the man pull the rope to hold the plank in position? Mass of the man is 80 kg. Neglect the weights of plank, rope and pulley. Take $g = 10$ ms^{-2}.

(a) 200 N (b) 300 N (c) 600 N (d) 150 N

9. Three blocks 1, 2 and 3 are arranged as shown in the figure. The velocities of the blocks v_1, v_2 and v_3 are shown in the figure. What is the relationship between v_1, v_2 and v_3?

(a) $2v_1 + v_2 = v_3$ (b) $v_1 + v_2 = v_3$ (c) $v_1 + 2v_2 = v_3$ (d) None of these
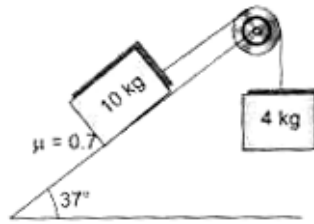
Space for Rough Work

10. A block of mass 2 kg rests on a rough inclined plane making an angle of 30° with the horizontal. The coefficient of static friction between the block and the plane is 0.7. The frictional force on the block is

    (a) 10 N   (b) $7\sqrt{3}$ N   (c) $10 \times \sqrt{3}$ N   (d) 7 N

11. In the arrangement shown in the figure [sin 37° = 3/5]

    (a) direction of force of friction is up the plane   (b) the magnitude of force of friction is zero
    (c) the tension in the string is 20 N   (d) magnitude of force of friction is 56 N

12. The work done by external agent in stretching a spring of force constant k = 100 N/cm from deformation $x_1 = 10$ to deformation $x_2 = 20$ cm.
    (a) – 150 J   (b) 50 J   (c) 150 J   (d) None of these

13. An elastic spring of unstretched length L and force constant K is stretched by amount x. It is further stretched by another length y. The work done in the second stretching is

    (a) $\dfrac{1}{2}Ky^2$ (b) $\dfrac{1}{2}K(x^2 + y^2)$ (c) $\dfrac{1}{2}K(x + y)^2$ (d) $\dfrac{1}{2}Ky(2x + y)$

14. A toy car of mass 5 kg moves up a ramp under the influence of force F plotted against displacement x. The maximum height attained is given by
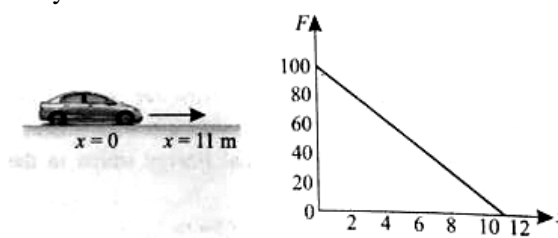
    (a) 20 m   (b) 15 m   (c) 11 m   (d) 5 m

Space for Rough Work

15. A slab S of mass m is released from a height h_0 from the top of a spring of force constant k. The maximum compression x of the spring is given by the equation

(a) $mgh_0 = \dfrac{1}{2}kx^2$ (b) $mg(h_0 - x) = \dfrac{1}{2}kx^2$
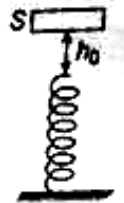
(c) $mgh_0 = \dfrac{1}{2}k(h_0 + x)^2$ (d) $mg(h_0 + x) = \dfrac{1}{2}kx^2$

16. A particle travels 10 m in first 5 sec and 10 m in next 3 sec. Assuming constant acceleration what is the distance travelled in next 2 sec

(a) 8.3 m (b) 9.3 m (c) 10.3 m (d) None of above

17. A car moving at 160 km/h when passes the mark-A, driver applies brake and reduces its speed uniformly to 40 km/h at mark-C. The marks are spaced at equal distances along the road as shown below.

At which part of the track the car has instantaneous speed of 100 km/h? Neglect the size of the car.
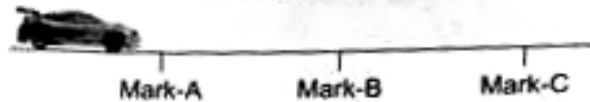
(a) At mark-B (b) Between mark-A and mark-B

(c) between mark-B and mark-C (d) insufficient information to decide

18. A particle is moving along a straight line with constant acceleration. At the end of tenth second its velocity becomes 20 m/s and in tenth second it travels a distance of 10 m. Then the acceleration of the particle will be

(a) 10 m/s^2 (b) 20 m/s^2 (c) $\dfrac{1}{5} \text{ m/s}^2$ (d) 3.8 m/s^2

Space for Rough Work

19. Two cars are moving in the same direction with the same speed 30 km/hr. They are separated by a distance of 5 km, the speed of a car moving in the opposite direction if it meets these two cars at an interval of 4 minutes, will be

   (a)   40 km/hr   (b)   45 km/hr   (c)   30 km/hr   (d)   15 km/hr

20. An elevator, in which a man is standing, is moving upward with a constant acceleration of 2 m/s². At some instant when speed of elevator is 10 m/s, the man drops a coin from a height of 1.5 m. Find the time taken by the coin to reach the floor.

   (a) $\dfrac{1}{\sqrt{3}}$ sec   (b) $\dfrac{1}{2}$ sec   (c) $\dfrac{1}{\sqrt{2}}$ sec   (d)   1 sec

21. The velocity-time graph of a body moving in a straight line is shown in the figure. The displacement and distance travelled by the body in 6 sec are resepectively
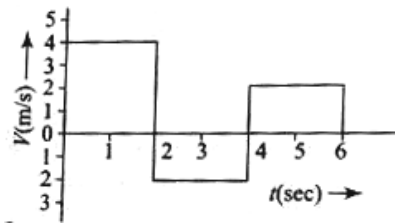
   (a)   8 m, 16 m   (b)   16 m, 8 m   (c)   16 m, 16 m   (d)   8 m, 8 m

22. The path of a projectile in the absence of air drag is shown in the figure by dotted line. If the air resistance is not ignored then which one of the path shown in the figure is appropriate for the projectile
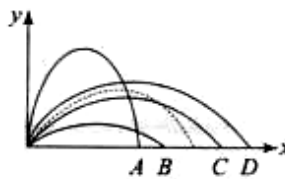
   (a)   B   (b)   A   (c)   D   (d)   C

Space for Rough Work

23. A stone is projected from the ground with velocity 50 m/s at an angle of 30°. It crosses a wall after 3 sec. How far beyond the wall the stone will strike the ground (g = 10 m/sec²)?

    (a)   90.2 m   (b)   89.6 m   (c)   86.6 m   (d)   70.2 m

24. A particle starts moving with velocity 10 m/s in a straight line under an acceleration varying linearly with time. Its velocity time graph is as shown in figure. Its velocity is maximum at t = 3 sec. The time (in sec) when the particle stops is (tan 37° = 3/4)
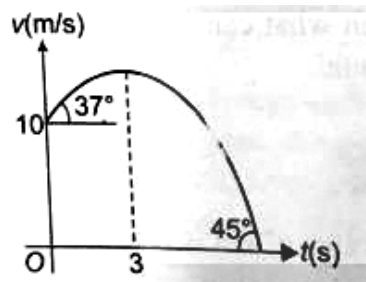
    (a)   6   (b)   8   (c)   7   (d)   5

25. When two vectors of magnitudes P and Q are inclined at an angle θ the magnitude of their resultant 2P. When the inclination is changed to $180 - \theta$ the magnitude of the resultant is halved. Find the ratio of P to Q.

    (a) $\sqrt{2} : \sqrt{3}$ (b) $1 : \sqrt{3}$ (c) $1 : \sqrt{2}$ (d) $\sqrt{3} : \sqrt{2}$

Space for Rough Work

JB 1 MR BATCH
CHEMISTRY : PART TEST SET-B
Topic: FLT

26. The maximum probability of finding an electron in the d_{xy} orbital is
    (a) Along the x-axis
    (b) Along the y-axis
    (c) At an angle of 45° from the x and y-axes
    (d) At an angle of 90° from the x and y-axes

27. The RMS velocity of molecules of a gas of density 4 kg m^{-3} and pressure 1.2×10^5 Nm^{-2} is
    (a) 600 ms^{-1}
    (b) 300 ms^{-1}
    (c) 900 ms^{-1}
    (d) 120 ms^{-1}

28. The maximum number of electrons in an atom with $l = 2$ and n = 3 is
    (a) 2
    (b) 6
    (c) 12
    (d) 10

29. At STP 5.6 L of a gas weigh 60 g. The vapour density of gas is:
    (a) 60
    (b) 120
    (c) 30
    (d) 240

30. 9 g of trivalent metal combines with 8 g of oxygen. The atomic mass of the metal is
    (a) 9
    (b) 18
    (c) 27
    (d) 36

31. Equivalent weight of H_2O_2 is
    (a) 17
    (b) 34
    (c) 68
    (d) 18

32. 2 g of a metal oxide on strong heating gave 112 ml of O_2 gas at STP. Equivalent of the metal is
    (a) 56
    (b) 92
    (c) 112
    (d) 50

33. One mole of chlorine combines with certain weight of metal giving 111 g of its chloride. The same amount of metal can displace 2gm hydrogen from an acid. The equivalent weight of metal is....
    (a) 40
    (b) 20
    (c) 80
    (d) 10

34. For which of the following compound equivalent weight is equal to molecular weight
    (a) H_2SO_4
    (b) H_3PO_2
    (c) H_3PO_4
    (d) H_3PO_3

35. The atomic number of element Unq is :
    (a) 102
    (b) 103
    (c) 104
    (d) 105

Space for Rough Work

36. Mendeleev predicted the physical and chemical properties of the elements. Eka – boron, Eka – silicon and Eka – aluminium. The elements were discovered respectively as

    (a)   Ge, Sc, Ga   (b)   Sc, Ge, Ga   (c)   Al, Ga, Ge   (d)   Ge, Al, Ga

37. Lothar Meyer obtained the curve for the known elements by plotting their atomic volumes against

    (a)   atomic numbers   (b)   atomic masses   (c)   densities   (d)   ionization energies

38. The correct order of the size of C, N, P and S is

    (a) $N < C < P < S$ (b) $C < N < P < S$ (c) $C < N < S < P$ (d) $N < C < S < P$

39. (A), (B) and (C) are elements in the third short period. Oxide of (A) is ionic, that of (B) is amphoteric and that of (C) is a giant molecule. Then (A), (B) and (C) have atomic number in the order

    (a) $(C) < (B) < (A)$ (b) $(A) < (B) < (C)$ (c) $(A) < (C) < (B)$ (d) $(B) < (A) < (C)$

40. How many Cs atoms can be converted to Cs^+ ions by 1 joule energy if IE_1 for Cs is 376 Kj mol^{-1}

    (a) 1.6×10^{18} (b) 1.6×10^{10} (c) 5.8×10^{14} (d) 5.8×10^{25}

41. Based on equation $E = -2.178 \times 10^{-18} J \left(\dfrac{Z^2}{n^2} \right)$ certain conclusions are written. Which of them is not correct?

    (a)   The negative sign in equation simply means that the energy of electron bound to the nucleus is lower than it would be if the electrons were at the infinite distance from the nucleus

    (b)   Larger the value of n, the larger is the orbit radius

    (c)   Equation can be used to calculate the change in energy when the electron changes orbit

    (d)   For n = 1, the electron has a more negative energy than it does for n = 6 which means that the electron is more loosely bound in the smallest allowed orbit

42. When an ideal gas undergoes unrestrained expansion, no cooling occurs because the molecules

    (a)   Are above the inversion temperature   (b)   Exert no attractive force on each other

    (c)   Do work equal to loss in kinetic energy   (d)   Collide without loss of energy

43. Atoms have a mass of the order

    (a) 10^{-26} kg   (b) 10^{-15} kg   (c) 10^{-26} g   (d) 10^{-15} g

44. A golf ball has a mass of 40 g, and a speed of 45 m/s. If the speed can be measured with in accuracy of 2%, calculate the uncertainty in the position.

    (a) 1.46×10^{-33} m   (b) 1.46×10^{-33} cm   (c) 1.59×10^{-33} m   (d) 1.39×10^{33} km

Space for Rough Work

45. For a particular value of azimuthal quantum number (l), the total number of magnetic quantum number (m) in given by:

(a) $l = \dfrac{m+1}{2}$ 　　(b) $l = \dfrac{2m+1}{2}$ 　　(c) $l = \dfrac{m-1}{2}$ 　　(d) $m = \dfrac{2l-1}{2}$

46. A cylinder containing an ideal gas (0.1 mol of 1.0 dm³) is in thermal equilibrium with a large volume of 0.5 molal aqueous solution of ethylene glycol at its freezing point. If the stoppers S_1 and S_2 (as shown in the figure) are suddenly withdrawn, the volume of the gas in litres after equilibrium is achieved will be _____.

(Given K_f (water) = 2.0 K kg mol⁻¹, R = 0.08 dm³ atm K⁻¹ mol⁻¹)
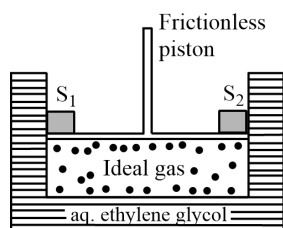
(a) 2.17 　　(b) 3.48 　　(c) 2.69 　　(d) 8.59

47. One would expect proton to have very large

(a) Ionization potential 　　(b) Radius

(c) Charge 　　(d) Hydration energy

48. Atomic number and mass number of an element M are 25 and 52 respectively. The number of electrons, protons and neutrons in M^{+2} ion are respectively.

(a) 25, 25 and 27 　　(b) 25, 27 and 25 　　(c) 27, 25 and 27 　　(d) 23, 25 and 27

49. The ratio of energies of two photons of wavelengths 2000 and 4000 A°.

(a) 1 : 4 　　(b) 4 : 1 　　(c) 1 : 2 　　(d) 2 : 1

40. Which of the given sets of temperature and pressure will cause a gas to exhibit the greatest deviation from ideal gas behaviour

(a) 100ºC and 4 atm 　(b) 100ºC and 2 atm 　(c) –100ºC and 4 atm 　(d) 0ºC and 2 atm

---

Space for Rough Work

JB 1 MR BATCH
MATHEMATICS : PART TEST SET-B
Topic: FLT

51. A question paper is divided into two parts A and B and each part contains 5 questions. The number of ways in which a candidate can answer 6 questions selecting at least two questions from each part is

(a) 200   (b) 100   (c) 80   (d) None of these

52. The value of $e^{(\log_{18} \cot 1° + \log_{10} \cot 2° + ... + \log_{10} \cot 89°)}$ is

(a) 0   (b) $\dfrac{1}{e}$ (c) 1   (d) e

53. $\sin^2 5° + \sin^2 10° + \sin^2 15° + … + \sin^2 85° + \sin^2 90° =$

(a) $9\dfrac{1}{2}$ (b) 9   (c) 8   (d) 7

54. If $\log_{\cos x} \sin x = 0.5$, when $0 < x < 90°$, then the value of $\cos x =$

(a) $\dfrac{\sqrt{5}+1}{4}$ (b) $\dfrac{\sqrt{5}-1}{4}$ (c) $\dfrac{\sqrt{5}-1}{2}$ (d) $\dfrac{\sqrt{5}+1}{2}$

55. If $\dfrac{\cos^4 \alpha}{\cos^2 \beta} + \dfrac{\sin^4 \alpha}{\sin^2 \beta} = 1$ then the value of $\dfrac{\cos^4 \beta}{\cos^2 \beta} + \dfrac{\sin^4 \beta}{\sin^2 \alpha}$ is equal to

(a) 0   (b) 1   (c) 2   (d) 4

56. The total number of selections of at most n things from (2n + 1) different things is 63. Then the value of n is

(a) 4   (b) 3   (c) 2   (d) None of these

57. A total numbers of words which can be formed out of the letters a, b, c, d, e, f taken 3 together such that each word contains at least one vowel is

(a) 48   (b) 96   (c) 72   (d) None of these

Space for Rough Work

58. A father with 8 children takes them 3 at a time to zoological gardens, as often as he can without taking the same 3 children together more than once. The number of times each child will go to the garden is

    (a)   112   (b)   21   (c)   56   (d)   None of these

59. A dictionary is printed consisting of 7 lettered words only than can be made with a letter of the word CRICKET. If the words are printed at the alphabetical order, as in an ordinary dictionary, then the number of word before the word CRICKET is

    (a)   481   (b)   530   (c)   531   (d)   480

60. If a, b, c are three natural numbers in A.P. and $a + b + c = 21$, then the possible number of values of the ordered triplet (a, b, c) is

    (a)   13   (b)   15   (c)   14   (d)   None of these

61. The product of the roots of the equation

    $x^2 - 4mx + 3e^{2\log m} - 4 = 0$ is 8,

    then its roots will be real when m equals

    (a) $\pm\sqrt{2}$ (b) ± 2 (c) $\sqrt{2}$ (d)   1

62. The number of solution of the equation

    $\sin(a^x) + \cos(a^x) = a^x + a^{-x}$ is $a > 0$

    (a)   3   (b)   1   (c)   2   (d)   0

63. If α, β are roots of the equation $ax^2 + 3x + 2 = 0$ $(a < 0)$ then $\dfrac{\alpha^2}{\beta} + \dfrac{\beta^2}{\alpha}$ is greater than

    (a)   2   (b)   1   (c)   0   (d)   None of these

64. The product of real roots of the equation

    $|2x + 3|^2 - 3|2x + 3| + 2 = 0$ is

    (a)   2   (b) $\dfrac{5}{4}$ (c) $\dfrac{5}{2}$ (d)   5

Space for Rough Work

65. Two students while solving a quadratic equation in x with leading coefficient 'I' one copied the constant term incorrectly and got the roots 3 and 2. The other copied the constant term correctly –6. The correct roots are

(a) $-1, 6$ (b) $-6, -1$ (c) $-2, 3$ (d) $-3, 2$

66. If α and β are the roots of equation $8x^2 - 3x + 27 = 0$ then $\left(\dfrac{\alpha^2}{\beta}\right)^{1/3} + \left(\dfrac{\beta^2}{\alpha}\right)^{1/3}$ is equal to

(a) $\dfrac{1}{4}$ (b) $\dfrac{1}{3}$ (c) $\dfrac{7}{2}$ (d) $\dfrac{1}{16}$

67. If α and β are the roots of $x^2 - 2x + 4 = 0$ then $\alpha^5 + \beta^5$ is equal to

(a) 16   (b) 32   (c) 64   (d) None of these

68. In a geometric progression consisting of positive terms each term equals the sum of the next two term. Then the common ratio of this progression equals

(a) $\dfrac{1}{2}(\sqrt{5} - 1)$ (b) $\dfrac{1}{2}\sqrt{5}$ (c) $\sqrt{5}$ (d) $\dfrac{1}{\sqrt{2}}(1 + \sqrt{5})$

69. $1^3 - 2^3 + 3^3 - 4^3 + \ldots + 9^3 =$

(a) -475 (b) 425   (c) 475   (d) -425

70. If $\log_0 (3^{1+x} + 2)$, $\log_3 (4 + 3^x - 1)$ are in A.P., then x equals

(a) $1 - \log_3 4$ (b) $\log_4 3$ (c) $\log_3 4$ (d) $1 - \log_4 3$

71. The sum of the series $\dfrac{1}{2} + \dfrac{3}{4} + \dfrac{7}{8} + \dfrac{15}{16} + \ldots$ upto n terms is

(a) $n - 1 + \dfrac{1}{2^n}$ (b) $n + \dfrac{1}{2^n}$ (c) $2n + \dfrac{1}{2^n}$ (d) $n + 1 + \dfrac{1}{2^n}$

72. If $x^2 + 9y^2 + 25z^2 = xyz\left(\dfrac{15}{x} + \dfrac{5}{y} + \dfrac{3}{z}\right)$, then x, y and z are in

(a) A.P.   (b) G.P.   (c) A.G.P.   (d) H.P.

Space for Rough Work

73. $2^{1/4}, 4^{1/8}, 8^{1/16} \ldots$ up to ∞ is equal to

    (a)   1   (b)   2   (c) $\dfrac{3}{2}$ (d)   None of these

74. The sum of n terms of the series

$$\frac{1}{1+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{7}} + \ldots \text{ is}$$

    (a) $\sqrt{2n+1}$ (b) $\dfrac{1}{2}\sqrt{2n+1}$ (c) $\sqrt{2n+1}-1$ (d) $\dfrac{1}{2}(\sqrt{2n+1}-1)$

75. The value of $^{40}C_{31} + \sum\limits_{j=0}^{10} {}^{40+j}C_{10+j}$ is equal to

    (a) $2 \cdot {}^{45}C_{15}$ (b) $^{51}C_{20}$ (c) $2 \cdot {}^{50}C_{20}$ (d)   None of these

* * * * *

Space for Rough Work

Max. Marks: 300

Date: 21.10.2022

JB 1 MR BATCH
PHYSICS : PART TEST SET-B ANSWER KEY
Topic: FLT

1.	(a)	2.	(a)	3.	(a)	4.	(a)	5.	(d)
6.	(a)	7.	(c)	8.	(a)	9.	(d)	10.	(a)
11.	(a)	12.	(c)	13.	(d)	14.	(c)	15.	(d)
16.	(a)	17.	(c)	18.	(b)	19.	(b)	20.	(b)
21.	(a)	22.	(a)	23.	(c)	24.	(c)	25.	(a)

CHEMISTRY : PART TEST SET-B ANSWER KEY
Topic: FLT

26.	(c)	27.	(b)	28.	(d)	29.	(b)	30.	(c)
31.	(a)	32.	(b)	33.	(b)	34.	(b)	35.	(c)
36.	(b)	37.	(b)	38.	(d)	39.	(b)	40.	(a)
41.	(d)	42.	(b)	43.	(a)	44.	(a)	45.	(c)
46.	(a)	47.	(d)	48.	(d)	49.	(d)	50.	(c)

MATHEMATICS : PART TEST SET-B ANSWER KEY
Topic: FLT

51.	(a)	52.	(c)	53.	(a)	54.	(c)	55.	(b)
56.	(d)	57.	(b)	58.	(b)	59.	(b)	60.	(a)
61.	(b)	62.	(d)	63.	(d)	64.	(c)	65.	(a)
66.	(a)	67.	(b)	68.	(a)	69.	(b)	70.	(a)
71.	(a)	72.	(d)	73.	(b)	74.	(d)	75.	(b)