BJNP

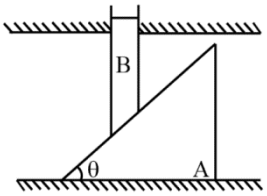
विद्या ददाति विनयम्
Knowledge is Discipline

Learning with the Speed of Mumbai and the Tradition of Kota

Max. Marks: 300 **Date: 03.10.2022**

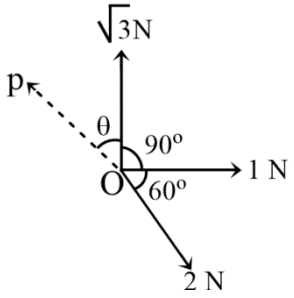
JB 2 KVL BATCH
PHYSICS : PART TEST
Topic: Newton Laws of Motion

1. Find the relation among acceleration of wedge A and the rod B supported on wedge A. Rod B is restricted to move vertically by two fixed wall corners shown in the figure



(a) $a_2 = a_1 \tan\theta$ (b) $2a_2 = 3a_1 \tan\theta$ (c) $6a_2 = a_1 \tan\theta$ (d) $a_1 = 2a_2 \tan\theta$

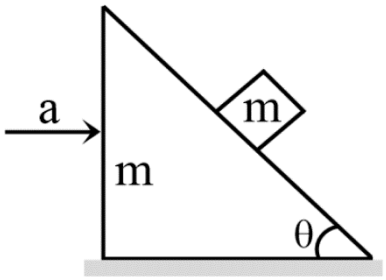
2. Four co-planar concurrent forces are acting on a body as shown in the figure to keep it in equilibrium. Then the value of P and θ are



(a) $P = 4N,\ \theta = 30°$ (b) $P = 2N,\ \theta = 90°$ (c) $P = 1\ N,\ \theta = 90°$ (d) $P = 4\ N,\ \theta = 90°$

Space for Rough Work

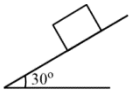
3. The minimum value of acceleration of wedge for which the block starts sliding on the wedge, is:



(a) $g\left(\frac{\cos\theta + \mu\sin\theta}{\sin\theta - \mu\cos\theta}\right)$ (b) $g\left(\frac{\sin\theta + \mu\cos\theta}{\cos\theta - \mu\sin\theta}\right)$

(c) $g\left(\frac{\sin\theta - \mu\cos\theta}{\sin\theta + \mu\cos\theta}\right)$ (d) $g\left(\frac{\cos\theta - \mu\sin\theta}{\sin\theta + \mu\cos\theta}\right)$

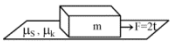
4. Figure shows a block kept on a rough inclined plane. The maximum external force down the incline for which the block remains at rest is 1 N while the maximum external force up the incline for which the block is at rest is 7 N. The coefficient of static friction 'μ' is:

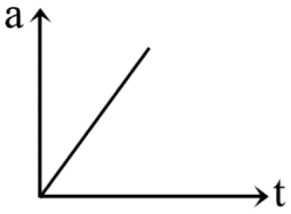


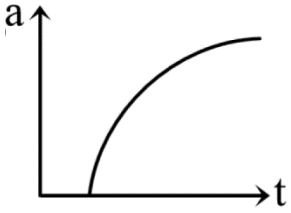
(a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{\sqrt{6}}$ (c) $\sqrt{3}$ (d) $\frac{4}{3\sqrt{3}}$

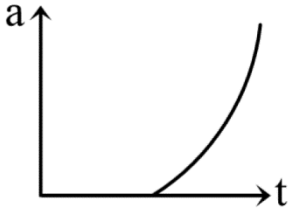
Space for Rough Work

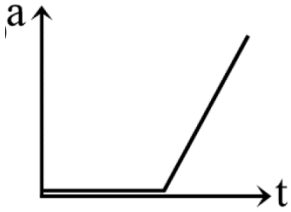
5. A force F = 2t (where 't' is time in seconds) is applied at t = 0 sec to the block of mass 'm' placed on a rough horizontal surface. The coefficient of static and kinetic friction between the block and surface are and respectively. Which of the following graphs best represents the acceleration vs time of the block ($\mu_s > \mu_k$)?



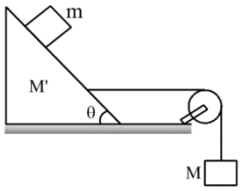
(a) 

(b) 

(c) 

(d) 

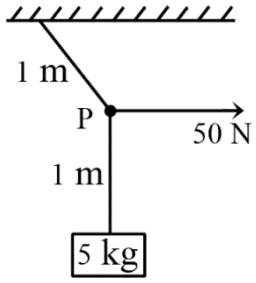
6. Find mass M of the hanging block in figure which will prevent the smaller block from slipping over the triangular block. All the surfaces are frictionless and the strings and the pulleys are light.



(a) $\frac{M' + m}{\tan\theta - 1}$ (b) $\frac{M' + m}{\cot\theta - 1}$ (c) $(M' + m)\tan\theta$ (d) $(M' + m)\cot\theta$

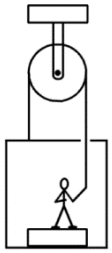
Space for Rough Work

7. A block of mass 5 kg is suspended by a massless rope of length 2 m from the ceiling. A force of 50 N is applied in the horizontal direction at the midpoint P of the rope, as shown in the figure. The angle made by the rope with the vertical in equilibrium is ($g = 10\ m/s^2$)



(a) 30° (b) 40° (c) 60° (d) 45°

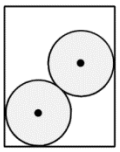
8. Figure shows a man of mass 50 kg standing on a light weighing machine kept in a box of mass 30 kg. The box is hanging from a pulley fixed to the ceiling through a light rope, the other end of which is held by the man himself. If the man manages to keep the box at rest, the weight shown by the machine is.



(a) 10 N (b) 100 N (c) 800 N (d) 200 N

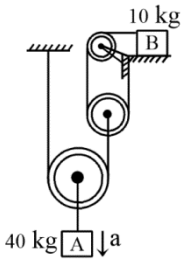
Space for Rough Work

9. Two smooth spheres each of radius 5 cm and weight W rest one on the other inside a fixed smooth cylinder of radius 8 cm. The reactions between the spheres and the vertical side of the cylinder are:



(a) W/4 and 3 W/4 (b) W/4 and W/4 (c) $\frac{3W}{4}, \frac{3W}{4}$ (d) W and W

10. Figure shown two blocks A and B connected to an ideal pulley string system. In this system when bodies are released then: (neglect friction and take g = 10 m/s^2)

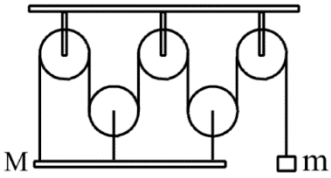


(a) Acceleration of block A is 1 m/s^2 (b) Acceleration of block A is 2 m/s^2

(c) Tension in string connected to block B is 40 N (d) Tension in string connected to block B is 160 N

Space for Rough Work

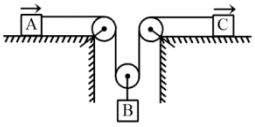
11. Find the acceleration of M shown in the figure. Pulleys are light and frictionless and strings are light and inextensible. (M < m)



(a) $\left(\frac{5m - M}{25m + M}\right)g$ upwards (b) $\left(\frac{5m - M}{25m + M}\right)g$ downwards

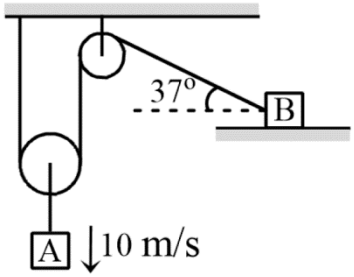
(c) $\left(\frac{5m - M}{5m + M}\right)g$ downwards (d) $\left(\frac{5m - M}{25m + M}\right)g$ downwards

12. Block A and C start from rest and move to the right with acceleration (a) = 12t m/s^2 and a_C = 3 m/s^2. Here t is in seconds. The time when block B comes to rest after t = 0 is:



(a) 2 s (b) 1 s (c) 3/2 s (d) 1/2 s

13. Find velocity of block 'B' at the instant shown in the figure.



(a) 25 m/s (b) 20 m/s (c) 22 m/s (d) 30 m/s

Space for Rough Work

14. A body of mass 'm' slides down a smooth inclined plane having an inclination of 45° with the horizontal. It takes 2 s to reach bottom. If the body is placed on a similar plane having coefficient friction 0.5, what is the time taken for it to reach the bottom ?

(a) 3.725 s (b) 2.650 s (c) 2.828 s (d) 4.135 s

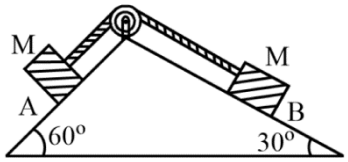
15. A mass of M kg is suspended by a weightless string. The horizontal force that is required to displace it until the string makes an angle of 45° with the initial vertical direction is:

(a) $Mg(\sqrt{2}+1)$ (b) $Mg\sqrt{2}$ (c) $\frac{Mg}{\sqrt{2}}$ (d) $Mg(\sqrt{2}-1)$

16. A bullet of mass 40 g moving with a speed of 90 ms^{-1} enters a heavy wooden block and is stopped after a distance of 60 cm. The average resistive force exerted by the block on the bullet is

(a) 180 N (b) 220 N (c) 270 N (d) 320 N

17. Two block each of mass M are resting on a frictionless inclined plane as shown in the figure. Then:

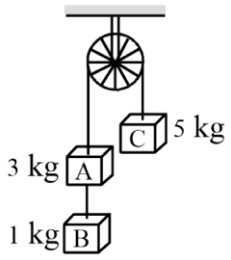


(a) The block A moves down the plane (b) The block B moves down the plane

(c) Both blocks remain at rest (d) Both the blocks move down the plane

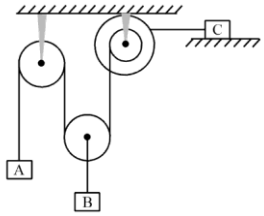
Space for Rough Work

18. Three weight A, B and C are connected by string as shown in the figure. The system moves over a frictionless pulley. The tension in the string connecting A and B is (where g is acceleration due to gravity)



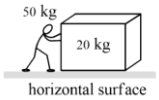
(a) g (b) $\frac{g}{9}$ (c) $\frac{8g}{9}$ (d) $\frac{10g}{9}$

19. Find the constrained relation among the acceleration of blocks A, B and C for the situation shown in the figure. Ratio of radii of step pulley is given as 1 : 2 ($a_A \uparrow$; $a_C \leftarrow$; $a_B \downarrow$)



(a) $2a_A + a_C = 4a_B$ (b) $a_A + a_C = a_B$ (c) $2a_A + 4a_C = 6a_B$ (d) $2a_A * 7a_C = 14a_B$

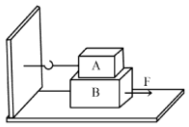
20. A boy of mass 50 kg produces an acceleration of 2 m/s^2 in a block of mass 20 kg by pushing it in horizontal direction. The boy moves with the block such that boy and the block have same acceleration. There is no friction between the boy and fixed horizontal surface but there is friction between foot of the body and horizontal surfaces. Find friction force (in Newton) exerted by the horizontal surface on the boy



(a) 120 (b) 140 (c) 160 (d) 200

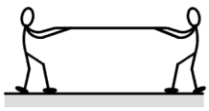
Space for Rough Work

21. A block A with mass 100 kg is resting on another block B of mass 200 kg. As shown in the figure a horizontal rope tied to a wall holds it. The coefficient of friction between A and B is 0.2 while coefficient of friction between B and the ground is 0.3. The minimum required force F to start moving B will be



(a) 900 N (b) 100 N (c) 1100 N (d) 1200 N

22. Two persons pull each other through a massless rope in 'tug of war' game. Who will win?



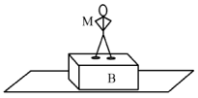
(a) one whose weight is more

(b) one who pulls the rope with a greater force

(c) one who applies more friction force (shear force) on ground

(d) one who applies more normal force (compressive force) on ground

23. A man of mass 60 kg is standing on a block of mass 40 kg kept on the ground. The coefficient of friction between the feet of the man and the block is 0.3 and that between the block and the ground is 0.1. If the man accelerates with an acceleration 2 m/s in the forward direction, then



(a) it is not possible

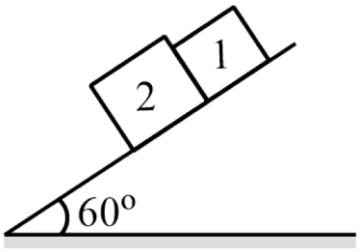
(b) B will move backwards with an acceleration 0.5 m/s^2

(c) B will not move

(d) B will move forward with acceleration 0.5 m/s^2

Space for Rough Work

24. In the figure shown if friction co-efficient of block 1 and 2 with inclined plane is $\mu_1 = 0.5$ and $\mu_2 = 0.4$ respectively, then find the correct statement.



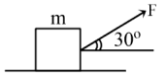
(a) both block will move together

(b) both block will move separately

(c) there is a non-zero contact force between two blocks

(d) None of these

25. Mass m rests on a horizontal surface. The coefficient of friction between the mass and the surface is μ. If the mass is pulled by a force F as shown in the figure, the limiting friction between the mass and the surface will be:



(a) μ mg (b) $\mu[mg - (\sqrt{3}/2)F]$ (c) $\mu\,[mg - (F/2)]$ (d) $\mu\,[mg + (F/2)]$

Space for Rough Work

Date: 03.10.2022

JB 2 KVL BATCH
MATHEMATICS : PART TEST
Topic: Permutation

26. If $4({}^{n}P_3) = 5({}^{n-1}P_3)$, then : n =

(a) 12 (b) 13 (c) 14 (d) 15

27. If ${}^{n}P_3 = {}^{n-1}P_3 + 3\,({}^{7}P_2)$, then : n =

(a) 6 (b) 7 (c) 8 (d) None of these

28. If ${}^{2n}P_3 = 100\,({}^{n}P_2)$, then : n =

(a) 10 (b) 12 (c) 13 (d) None of these

29. If ${}^{7}P_r = 60\,({}^{7}P_{r-3})$, then : r =

(a) 3 (b) 4 (c) 5 (d) None of these

30. If ${}^{11}P_6 + 6\,({}^{11}P_{r-1}) = {}^{12}P_6$, then : r =

(a) 6 (b) 7 (c) 8 (d) None of these

31. If ${}^{56}P_{r+6} : {}^{56}P_{r+3} = 1320 : 1$, then : r =

(a) 49 (b) 48 (c) 41 (d) None of these

32. $(n-1)\,.\,{}^{n}P_r$ =

(a) ${}^{n+1}P_r$ (b) ${}^{n}P_{r+1}$ (c) ${}^{n-r+1}P_{r+1}$ (d) None of these

33. ${}^{n-1}P_r + r({}^{n-1}P_{r-1})$ =

(a) ${}^{n}P_r$ (b) ${}^{n}P_{r-1}$ (c) ${}^{n-1}P_r$ (d) ${}^{n+1}P_r$

34. X and Y are amongst five persons who are to be seated on chairs in a row. If X and Y always sit together, then number of arrangements is

(a) 48 (b) 84 (c) 72 (d) None of these

Space for Rough Work

35. A, B, C are amongst seven persons who are to be seated in a row. Number of arrangements in which A, B, C sit together in any order is

(a) 120 (b) 240 (c) 720 (d) None of these

36. There are 6 men and 4 women. Number of ways in which they can be seated in a row so that no two women are together is

(a) $(4!)\ {}^{10}P_6$ (b) $(6!)\ {}^{10}P_4$ (c) $(6!)\ {}^{7}P_4$ (d) None of these

37. There are 7 English, 5 Marathi and 4 Hindi Books. Number of ways in which they can be arranged on a shelf so that books of the same language are together is

(a) $(7 + 5 + 4)!$ (b) $\frac{(7 + 5 + 4)!}{7!5!4!}$ (c) $3! \times 4! \times 5! \times 7!$ (d) None of these

38. How many different numbers can be formed using all of the digits 3, 3, 4, 5, 5, 8?

(a) 720 (b) 240 (c) 420 (d) None of these

39. When the product $(a + b)(c + d + e)(f + g + h)(i + j)$ is simplified, the number of terms will be

(a) 10 (b) 36 (c) 46 (d) None of these

40. Number of numbers formed from the digits 1, 2, 3, 4, 3, 2, 1 by placing the odd digits in odd places is

(a) 7! (b) $\frac{7!}{2!2!}$ (c) 18 (d) None of these

41. A family consisting of an old man, 6 adults and 4 children is to be seated in a row for dinner. The children wish to occupy the two seats at each end and the old man refuses to have a child on wither side to him. Number of such arrangements is

(a) 84600 (b) 86400 (c) 80460 (d) None of these

42. Number of distinct arrangements of letters of the word RANGOON in which the two N's are together but not the two O's is

(a) 240 (b) 660 (c) 900 (d) None of these

Space for Rough Work

43. Number of distinct arrangements of letters of the word RANGOON in which neither the N's nor the O's are together is

(a) 900 (b) 240 (c) 660 (d) None of these

44. Number of distinct arrangements of letters of the word RANGOON in which the two N's are never together is

(a) 240 (b) 900 (c) 960 (d) None of these

45. In how many ways can 4 boys and 3 girls be arranged in a row so that boys and girls are placed alternatively?

(a) $3! \times 2!$ (b) $6!$ (c) $7!$ (d) $3! \times 4!$

46. In how many was can 7 persons seat along a round table so that two particular persons are never together?

(a) 100 (b) 120 (c) 140 (d) None of these

47. Number of arrangements of the letters a, b, c, d in which b does not follow a, c does not follow b and d does not follow c, is

(a) 12 (b) 14 (c) 13 (d) 11

48. If ${}^{n-1}P_3 : {}^{n+1}P_3 = 5 : 12$, then : n =

(a) 4 (b) 8 (c) 1 (d) None of these

49. Number of arrangements of letters of the word MOBILE in which consonants occupy odd places is

(a) 16 (b) 36 (c) 26 (d) None of these

50. Number of arrangements of 3 boys and 5 girls in a row so that all the boys are together is

(a) 7208 (b) 4320 (c) 86400 (d) None of these

Space for Rough Work

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Max. Marks: 200 **Date: 03.10.2022**

JB 2 KVL BATCH
PHYSICS : PART TEST ANSWER KEY
Topic: Newton Laws of Motion

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

Date: 03.10.2022

JB 2 KV: BATCH
MATHEMATICS : PART TEST ANSWER KEY
Topic: Permutation

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