

DPP - Daily Practice Problems

Chapter-wise Sheets

Date :

Start Time :

End Time :

PHYSICS

CP03

SYLLABUS : Laws of Motion

Max. Marks : 74

Time : 60 min.

GENERAL INSTRUCTIONS

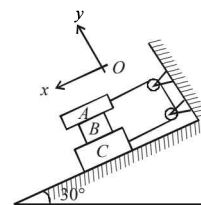
- The Daily Practice Problem Sheet contains 20 Questions divided into 5 sections.
Section I has 5 MCQs with ONLY 1 Correct Option, 3 marks for each correct answer and -1 for each incorrect answer.
Section II has 4 MCQs with ONE or MORE THAN ONE Correct options.
For each question, marks will be awarded in one of the following categories:
Full marks: $+4$ If only the bubble(s) corresponding to all the correct option(s) is (are) darkened.
Partial marks: $+1$ For darkening a bubble corresponding to each correct option provided NO INCORRECT option is darkened.
Zero marks: If none of the bubbles is darkened.
Negative marks: -2 In all other cases.
Section III has 4 Single Digit Integer Answer Type Questions, 3 marks for each Correct Answer and 0 marks in all other cases.
Section IV has Comprehension/Matching Cum-Comprehension Type Questions having 5 MCQs with ONLY ONE correct option, 3 marks for each Correct Answer and 0 marks in all other cases.
Section V has 2 Matching Type Questions, 2 mark for the correct matching of each row and 0 marks in all other cases.
- You have to evaluate your Response Grids yourself with the help of Solutions.

Section I - Straight Objective Type

This section contains 5 multiple choice questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

1. Three blocks A, B, C of weights $40\text{N}, 30\text{N}, 80\text{N}$ respectively are at rest on an inclined plane as shown in figure. Determine the smallest value of coefficient of limiting friction (μ_s) for which equilibrium of system is maintained.

- (a) 0.1757
(b) 0.2757
(c) 0.5757
(d) 0.8757



RESPONSE GRID

1. (a) (b) (c) (d)

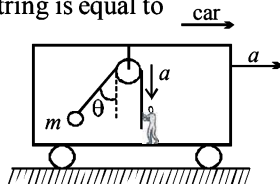
Space for Rough Work

P-10

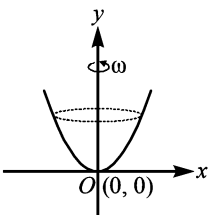
DPP/ CP03

2. A bob is hanging over a pulley inside a car through a string. The second end of the string is in the hand of a person standing in the car. The car is moving with constant acceleration a directed horizontally as shown in figure. Other end of the string is pulled with constant acceleration a vertically. The tension in the string is equal to

- (a) $m\sqrt{g^2 + a^2}$
 (b) $m\sqrt{g^2 + a^2} - ma$
 (c) $m\sqrt{g^2 + a^2} + ma$
 (d) $m(g + a)$



3. In the given figure, a smooth parabolic wire track lies in the xy -plane (vertical). The shape of track is defined by the equation $y = x^2$. A ring of mass m which can slide freely on the wire track, is placed at the position A(1,1). The track is rotated with constant angular speed ω such that there is no relative slipping between the ring and the track. The value of ω is

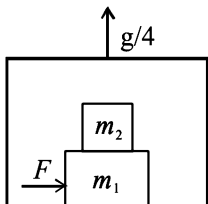


4. A block of mass m is placed on a surface with a vertical cross section given by $y = \frac{x^3}{6}$. If the coefficient of friction is 0.5, the maximum height above the ground at which the block can be placed without slipping is:

- (a) $\frac{1}{6}m$ (b) $\frac{2}{3}m$ (c) $\frac{1}{3}m$ (d) $\frac{1}{2}m$

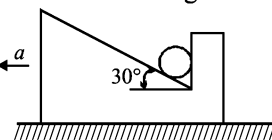
5. A plank of mass $M_1 = 8$ kg with a bar of mass $M_2 = 2$ kg placed on its rough surface, lie on a smooth floor of elevator ascending with an acceleration $g/4$. The coefficient of friction is $\mu = 1/5$ between m_1 and m_2 . A horizontal force $F = 30$ N is applied to the plank. Then the acceleration of bar and the plank in the reference frame of elevator are

- (a) $3.5 \text{ m/s}^2, 5 \text{ m/s}^2$ (b) $5 \text{ m/s}^2, 50/8 \text{ m/s}^2$
 (c) $2.5 \text{ m/s}^2, 25/8 \text{ m/s}^2$ (d) $4.5 \text{ m/s}^2, 4.5 \text{ m/s}^2$



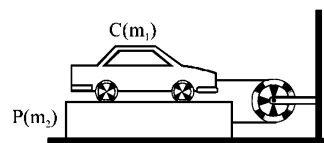
7. The system in figure is given an acceleration. Weight of the ball is W .

- (a) The force on the ball from vertical surface is $1.15 W$
 (b) The force on the ball from inclined surface is



- (c) The force on the ball from vertical surface is $W \left(0.58 + \frac{a}{g} \right)$
 (d) The forces on the ball from inclined surface is $1.15 W$

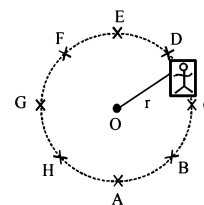
8. A car C of mass m_1 rests on a plank P of mass m_2 . The plank rests on a smooth floor. The string and pulley are ideal.



The car starts and moves towards the pulley with acceleration.

- (a) If $m_1 > m_2$, the string will remain under tension
 (b) If $m_1 < m_2$, the string will become slack
 (c) If $m_1 = m_2$, the string will have no tension, and C and P will have accelerations of equal magnitude
 (d) C and P will have acceleration of equal magnitude if $m_1 \geq m_2$

9. A machine, in an amusement park, consists of a cage at the end of one arm, hinged at O. The cage revolves along a vertical circle of radius r (ABCOEFGH) about its hinge O, at constant linear speed $v = \sqrt{gr}$.



The cage is so attached that the man of weight ' w ' standing on a weighing machine, inside the cage, is always vertical. Then which of the following is correct?

- (a) The reading of his weight on the machine is the same at all positions
 (b) The weight reading at A is greater than the weight reading at E by $2w$.
 (c) The weight reading at G = w
 (d) The ratio of the weight reading at E to that at A = 0

Section II - Multiple Correct Answer Type

This section contains 4 multiple correct answer(s) type questions. Each question has 4 choices (a), (b), (c) and (d), out of which **ONE OR MORE** is/are correct.

6. A horizontal force P is exerted on a 20 kg box in order to slide it up a 30° incline. The friction force retarding the motion is 80N. If the acceleration of the moving box is to be
- (a) zero then P is 223N (b) 0.75 m/s^2 then P is 206 N
 (c) zero then P is 206 N (d) 0.75 m/s^2 then P is 223 N

Section III - Integer Type

This section contains 4 questions. The answer to each of the questions is a single digit integer ranging from 0 to 9.

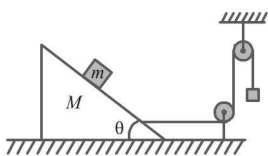
10. A block slides down a smooth inclined plane to the ground when released from the top, in time t seconds. Another block is dropped vertically from the same point, in the absence of the inclined plane and reaches the ground in $t/2$ second. Then find the angle (in degree in multiple of 10) of inclination of the plane with the vertical.

RESPONSE
GRID

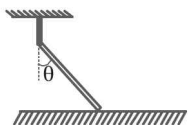
2. (a)(b)(c)(d) 3. (a)(b)(c)(d) 4. (a)(b)(c)(d) 5. (a)(b)(c)(d) 6. (a)(b)(c)(d)
 7. (a)(b)(c)(d) 8. (a)(b)(c)(d) 9. (a)(b)(c)(d) 10. 0 1 2 3 4 5 6 7 8 9

Space for Rough Work

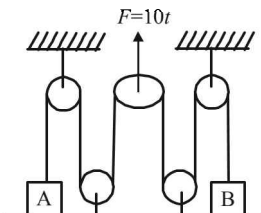
11. Find the mass of the hanging block which will prevent the smaller block from slipping over the triangular block. All the surfaces are frictionless and the strings and the pulleys are light. Given $m = M = 1 \text{ kg}$; $\cot \theta = 2$.



12. A uniform rod of length 2ℓ and mass m is suspended from one end by inextensible string and other end lies on smooth ground. The angle made by rod with vertical is $\theta = \sin^{-1}(1/\sqrt{3})$. If N_1 and N_2 represents the contact force from ground on rod just before and just after cutting string then find the ratio of N_1/N_2 .

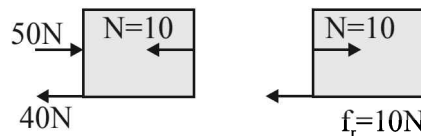


13. In the arrangement shown in figure $m_A = 1 \text{ kg}$ and $m_B = 2 \text{ kg}$, while all the pulleys and strings are massless and frictionless. At $t = 0$, a force $F = 10t$ starts acting over central pulley in vertically upward direction. Find the velocity of A (in deca m/s) when B loses contact with floor.

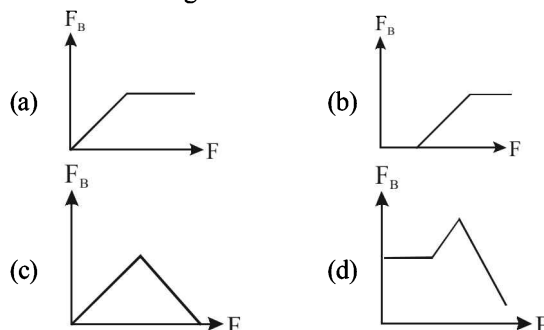


The value of F can be changed. When the welding between block A and ground breaks, block A will start pressing block B and when welding of B also breaks, block B will start pressing the vertical wall.

14. If $F = 50 \text{ N}$, the friction force acting between block B and ground will be –



- (a) 10 N (b) 20 N (c) 30 N (d) 15 N
15. The force of friction acting on B varies with the applied force F according to curve –

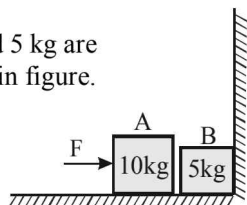


Section IV - Comprehension/Matching Cum-Comprehension Type

Directions (Qs. 14 and 15) : Based upon the given paragraph, 2 multiple choice questions have to be answered. Each question has 4 choices (a), (b), (c) and (d), out of which **ONLY ONE** is correct.

PARAGRAPH

Two bodies A and B of masses 10 kg and 5 kg are placed very slightly separated as shown in figure. The coefficients of friction between the floor and the blocks are as $\mu_s = \mu_k = 0.4$. Block A is pushed by an external force F .



Directions (Qs. 16-18) : This passage contains a table having 3 columns and 4 rows. Based on the table, there are three questions. Each question has four options (a), (b), (c) and (d) **ONLY ONE** of these four options is correct.

The acceleration of a particle as measured from an inertial frame is given by the vector sum of all the forces acting on the particle divided by its mass. Column I shows the motion of blocks (m_1, m_2, m_3) in contact/connected by massless string on a smooth horizontal surface. If f_1 is the contact force between body m_1 and m_2 , f_2 between body m_2 and m_3 , T_1 be the tension in the string between body m_1 and m_2 , T_2 between body m_2 and m_3 . Column II and III shows different values of f_1 , f_2 , T_1 and T_2 in different situations shown in column I.

Column I	Column II	Column III
I.	(i) $T_1 = \frac{(m_2 + m_3)F}{m_1 + m_2 + m_3}$	(P) $f_2 = \frac{(m_1 + m_2)F}{m_1 + m_2 + m_3}$
II.	(ii) $T_1 = \frac{m_1 F}{m_1 + m_2 + m_3}$	(Q) $f_2 = \frac{m_3 F}{m_1 + m_2 + m_3}$
III.	(iii) $f_1 = \frac{m_1 F}{m_1 + m_2 + m_3}$	(R) $T_2 = \frac{(m_1 + m_2)F}{m_1 + m_2 + m_3}$
IV.	(iv) $f_1 = \frac{(m_2 + m_3)F}{m_1 + m_2 + m_3}$	(S) $T_2 = \frac{m_3 F}{m_1 + m_2 + m_3}$

RESPONSE
GRID

11. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ 12. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨
13. ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ 14. (a) (b) (c) (d) 15. (a) (b) (c) (d)

Space for Rough Work

P-12

DPP/ CP03

16. If the acceleration of body m_1 , m_2 and m_3 respectively shown in situation Column I (I) are (2, 2, 2) then the correct matching is [Take $m_1 = 1$ kg, $m_2 = 2$ kg, $m_3 = 3$ kg, $F = 12$ N]
 (a) I(iv) Q (b) IV(iv) P (c) III(ii) P (d) I(iii) Q
17. If the value of T_1 and T_2 shown in the situation column I (IV) are 10N and 6N respectively then find the correct matching. [Take $m_1 = 1$ kg, $m_2 = 2$ kg, $m_3 = 3$ kg, $F = 12$ N].
 (a) II(i) R (b) IV(i) S (c) IV(iii) S (d) III(ii) S
18. Which of the following does not show the correct matching?
 (a) II(iii) P (b) III(ii) R (c) I(iv) Q (d) IV(i) R

Section V - Matrix-Match Type

This section contains 2 questions. It contains statements given in two columns, which have to be matched. Statements in column I are labelled as A, B, C and D whereas statements in column II are labelled as p, q, r and s. The answers to these questions have to be appropriately bubbled as illustrated in the following example. If the correct matches are A-p, A-r, B-p, B-s, C-r, C-s and D-q, then the correctly bubbled matrix will look like the following:

	p	q	r	s
A	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
B	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
D	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

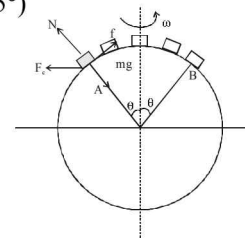
19. The block is placed at different position of earth from A to B as shown. Then the following parameters for different positions from A to B will vary as follows. Consider the effect of rotation of earth about its own axis. Neglect the effect of rotation of earth around the sun and assume earth as a perfect sphere, (F = centrifugal force; f = frictional force; $\theta < 45^\circ$)
 Match the two columns.

Column I

- (A) Gravity force
 (B) Normal force
 (C) Centrifugal force
 (D) Frictional force

Column II

- (p) first increases and then decreases
 (q) first decreases and then increases
 (r) remains constant
 (s) increases only



20. Match the columns ($g = 10$ m/s²)

Column I

- (A) Block of mass 2 kg on a rough horizontal surface pulled by a horizontal force of 20N, $\mu_s = 0.5$
 (B) Block of mass 2 kg pulled with constant speed up an incline of inclination 30° and coefficient of friction $1/\sqrt{3}$
 (C) Block of mass 0.75kg pulled by a constant force of 7.5N upon incline of inclination 30° and coefficient of friction $1/\sqrt{3}$
 (D) Block of mass 2 kg pulled vertically by a force of 20N

Column II

- (p) Tension at the mid point of block is 10N
 (q) Acceleration of block is 5 m/s²
 (r) Force of friction acting is 5N
 (s) Resultant force on the block is zero

RESPONSE
GRID

16. (a) (b) (c) (d) 17. (a) (b) (c) (d) 18. (a) (b) (c) (d)
 19. A - (p) (q) (r) (s); B - (p) (q) (r) (s); C - (p) (q) (r) (s); D - (p) (q) (r) (s)
 20. A - (p) (q) (r) (s); B - (p) (q) (r) (s); C - (p) (q) (r) (s); D - (p) (q) (r) (s)

DAILY PRACTICE PROBLEM DPP CP03 - PHYSICS

Total Questions	20	Total Marks	74
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	24	Qualifying Score	35
$\text{Net Score} = \sum_{i=1}^V [(correct_i \times MM_i) - (In_i - NM_i)]$			

Space for Rough Work