Name : _____ Date : _____ Time : Start [ ] End [ ] Marks : 100

# NEET | Class XI

# PHYSICS

# DPP | P | 025

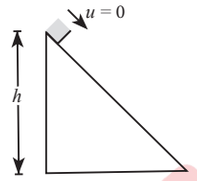
***Instructions*** :

- DPP contains 25 topicwise questions
- Each question has four options out of which only one option is correct.
- Each question carries 4 marks.
- Mark the correct answer in the OMR Sheet given at the end of the DPP.
- For every incorrect answer deduct 1 mark.

## Chapter 6 : Work, Energy and Power

**Topic :** The Conservation of Mechanical Energy

**1.** A block is released from the top of the smooth incline plane of height $h$. Find the speed of the block as it reaches the bottom of the plane.




(a) $\sqrt{2gh}$ (b) $\sqrt{gh}$ (c) $\sqrt{3gh}$ (d) $\sqrt{\frac{gh}{2}}$

**2.** A block of mass $m$ is dropped from the fourth floor of an office building and hits the sidewalk below at speed $v$. From what floor should the block be dropped to double that impact speed?

(a) the eighth floor (b) the tenth floor
(c) the twelfth floor (d) the sixteenth floor

**3.** A spherical ball of mass 20 kg is stationary at the top of a hill of height 100 m. It slides down a smooth surface to the ground, then climbs up another hill of height 30 m and finally slides down to a horizontal base at a height of 20 m above the ground. The velocity attained by the ball is ($g = 10\ m/s^2$)

(a) 10 m/s (b) $10\sqrt{30}$ m/s
(c) 40 m/s (d) 20 m/s

**4.** A spring gun of spring constant 90 N/cm is compressed 12 cm by a ball of mass 16 g. If the trigger is pulled, the velocity of the ball is

(a) 50 m $s^{-1}$ (b) 90 m $s^{-1}$
(c) 40 m $s^{-1}$ (d) 60 m $s^{-1}$

**5.** A ball falls under gravity from a height of 10 m with an initial downward velocity $u$. It strikes the ground and losses 50% of its energy and then rises back to the same height. The initial velocity $u$ is ($g = 9.8\ m/s^2$)

(a) 7 m $s^{-1}$ (b) 25 m $s^{-1}$
(c) 14 m $s^{-1}$ (d) 28 m $s^{-1}$

**6.** Consider a one-dimensional motion of a particle with total energy $E$. There are four regions $A$, $B$, $C$ and $D$ in which the relation between potential energy $V$, kinetic energy $K$ and total energy $E$ is as given below:

Region $A : V > E$ Region $B : V < E$
Region $C : K > E$ Region $D : V > K$

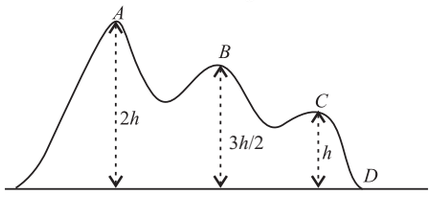
Which of the following regions the particle cannot be found?

(a) Region $A$ (b) Region $B$
(c) Region $C$ (d) Region $D$

**7.** In a shotput event an athlete throws the shotput of mass 10 kg with an initial speed of 1 m $s^{-1}$ at 45° from a height 1.5 m above ground. Assuming air resistance to be negligible and acceleration due to gravity to be 10 m $s^{-2}$, the kinetic energy of the shotput when it just reaches the ground will be

(a) 2.5 J (b) 5.0 J
(c) 52.5 J (d) 155.0 J

**8.** A small roller coaster starts at point $A$ with a speed $u$ on a curved track as shown in the figure.



The friction between the roller coaster and the track is negligible and it always remains in contact with the track. The speed of roller coaster at point $D$ on the track will be

(a) $(u^2 + gh)^{1/2}$ (b) $(u^2 + 2gh)^{1/2}$

(c) $(u^2 + 4gh)^{1/2}$ (d) $u$

**9.** The potential energy of a particle of mass 1 kg free to move along the x-axis is given by $U(x) = \left(\frac{x^2}{2} - x\right)$ joules. If total mechanical energy of the particle is 2 J, then find its maximum speed.

(a) 2 m/s (b) 5 m/s (c) $\sqrt{5}$ m/s (d) $\sqrt{3}$ m/s

**10.** A ball of mass $m$ is dropped from a cliff of height $H$. The ratio of its kinetic energy to the potential energy when it is fallen through a height 3/4 $H$ is

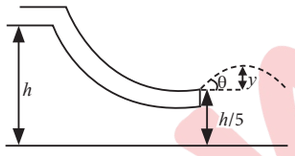
(a) 3 : 4 (b) 4 : 3 (c) 1 : 3 (d) 3 : 1

**11.** A 15 g ball is shot from a spring gun whose spring has a force constant 600 N m$^{-1}$. The spring is compressed by 5 cm. The greatest possible horizontal range of the ball for this compression is (Take $g$ = 10 m s$^{-2}$)

(a) 6 m (b) 8 m

(c) 10 m (d) 12 m

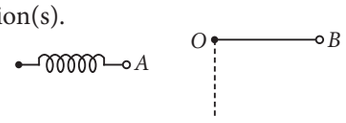
**12.** A girl slides along a curved water slide, without friction, from a height $h$. What is the maximum value of height $y$ in terms of $h$ and θ?




(a) $\frac{4h}{5}\sin^2\theta$ (b) $\frac{3h}{5}\sin^2\theta$

(c) $\frac{2h}{5}\sin^2\theta$ (d) $\frac{8h}{5}\sin^2\theta$

**13.** Two particles $A$ and $B$ having same mass, $A$ is connected to a light spring of natural length $l_A$ and particle $B$ is connected to a light string of length $l_B$ ($l_A < l_B$). When spring becomes vertical, its length becomes $l_B$. Both are released from rest from horizontal position (shown in the figure). Mark the correct option(s).



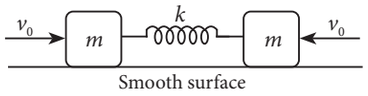

(a) At lowest position, particle $A$ has more speed than that of particle $B$

(b) At lowest position, particle $A$ has lesser speed than $B$

(c) At the lowest position, both have same speed

(d) None of the above

**14.** Two blocks each of mass 1 kg are connected by a light spring of spring constant $k$ = 100 N/m. When spring is in natural length, each block is projected in opposite direction with speed of 10 m/s. The work done by spring on each block upto maximum compression is




(a) 100 J (b) –100 J

(c) 50 J (d) –50 J

**15.** A girl in a swing is 2.5 m above ground at the maximum height and 1.5 m above the ground at the lowest point. Her maximum velocity in the swing is ($g$ = 10 m s$^{-2}$)

(a) $5\sqrt{2}$ m s$^{-1}$ (b) $2\sqrt{5}$ m s$^{-1}$

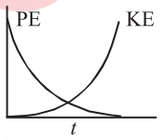
(c) $2\sqrt{3}$ m s$^{-1}$ (d) $3\sqrt{2}$ m s$^{-1}$

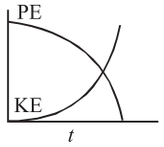
**16.** A particle of mass $m$ moving with velocity $V_0$ strikes a simple pendulum of mass $m$ and sticks to it. The maximum height attained by the pendulum will be

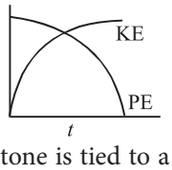
(a) $\frac{V_0^2}{8g}$ (b) $\sqrt{V_0 g}$

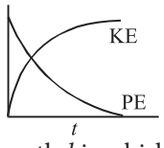
(c) $2\sqrt{\frac{V_0}{g}}$ (d) $\frac{V_0^2}{4g}$

**17.** A particle falls from rest under gravity. Its potential energy with respect to the ground (PE) and its kinetic energy (KE) are plotted against time ($t$). Choose the correct graph

(a) 


(b) 


(c) 


(d) 


**18.** A stone is tied to a string of length $l$ is whirled in a vertical circle with the other end of the string at the centre. At a certain point of time, the stone is at its lowest position and has speed $u$. The magnitude of the change in its velocity at it reaches a position where the string is horizontal is

(a) $\sqrt{(u^2 - 2gl)}$ (b) $\sqrt{2gl}$

(c) $\sqrt{(u^2 - gl)}$ (d) $\sqrt{2(u^2 - gl)}$

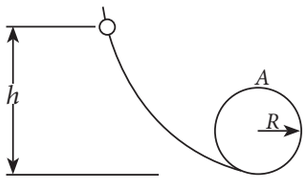
**19.** A heavy particle hanging from a string of length $l$ is projected horizontally with speed $\sqrt{gl}$. The speed of the particle at the point where the tension in the string equals weight of the particle is

(a) $\sqrt{2gl}$ (b) $\sqrt{3gl}$

(c) $\sqrt{gl/2}$ (d) $\sqrt{gl/3}$

**20.** A bead slides without friction around a loop-the-loop shown in figure. The bead is released from rest at a height $h$ = 3.50 $R$,

How large is the normal force on the bead at point ($A$) if its mass is 50 g?

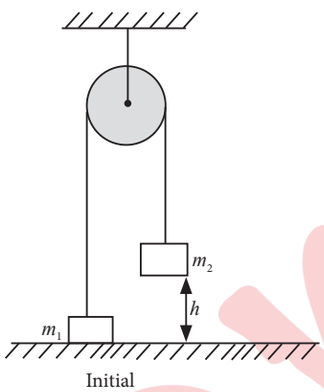



(a) 0.10 N downward (b) 0.10 N upward
(c) 1.0 N downward (d) 1.0 N upward

**21.** A ball whirls around in a vertical circle at the end of a string. The other end of the string is fixed at the center of the circle. Assuming the total energy of the ball-Earth system remains constant. What is the difference of tension in string at bottom and top during circular motion ($T_{bottom} - T_{top}$)?

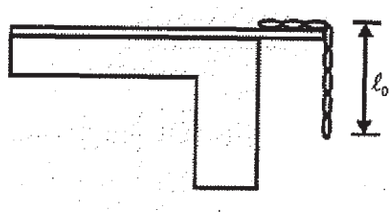
(a) 5 $mg$ (b) 3 $mg$
(c) 6 $mg$ (d) 3.5 $mg$

**22.** Two blocks with masses $m_1 = 3$ kg and $m_2 = 5$ kg are connected by a light string that slides over a frictionless pulley as shown in figure. Initially, $m_2$ is held 5 m off the floor while $m_1$ is on the floor. The system is then realeased. The speed with which $m_2$ hit the floor is




(a) 5 m/s (b) 6 m/s
(c) $\sqrt{10}$ m/s (d) $\sqrt{8}$ m/s

**23.** A chain of length $l = 80$ cm and mass $m = 2$ kg is hanging from the end of plane, so that the length $l_0$ of the vertical segment is 50 cm as shown in the figure. The other end of the chain is fixed by a nail. At a certain instant, the nail is pushed out, what is the velocity of the chain at the moment it completely siled off the plane? Neglect the friction.

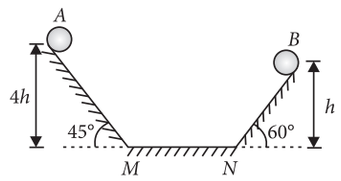



(a) 4.46 m/s (b) 2.23 m/s
(c) $\sqrt{10}$ m/s (d) 1.73 m/s

**24.** A particle of mass $m$ is moving in a horizontal circle of radius $r$, under a centripetal force equal to $-(k/r^2)$ where $k$ is constant. The total energy of the particle is

(a) $-\frac{k}{r}$ (b) $-\frac{k}{2r}$
(c) $\frac{k}{2r}$ (d) $\frac{2k}{r}$

**25.** Two identical balls $A$ and $B$ are released from the positions shown in the figure. They collide elastically on horizontal portion $MN$ and exchange their velocities. The ratio of heights attained by $A$ and $B$ after the impact will be (neglect friction)




(a) 1 : 4 (b) 2 : 1
(c) 4 : 13 (d) 2 : 11

## OMR SHEET

Use HB pencil only and darken each circle completely.
Mark only one choice for each question as indicated.

Correct marking ● ⓑ ⓒ ⓓ
Wrong marking ⊗ ⓑ ◑ ⊙

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

**RESULT P | 025 - PHYSICS**

| Total Questions | 25 | Total Marks | 100 |
|---|---|---|---|
| Attempted | | Correct | |
| Incorrect | | Net Score | |

Net Score = (Correct × 4) – (Incorrect × 1) = .....
Percentage Score = .....

**Check your learning! If your score is**

| | |
|---|---|
| > 90% | EXCELLENT WORK ! |
| 90-75% | GOOD WORK ! |
| 74-60% | SATISFACTORY ! |
| < 60% | NOT SATISFACTORY! |