St. Lawrence High School

A Jesuit Christian Minority Institution

Term : 1st

Solution of Work Sheet – 23

Class – XI | Subject – Physics | Date – 13.07.20

Chapter – Work, Power & Energy | Topic – Vertical circular motion

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Choose the correct option for the following questions. $1 \times 15 = 15$

1. A block of mass m moving with speed v compresses a spring by x amount before its speed is halved. What is the value of the spring constant of the spring?
   a. $\frac{3mv^2}{4x^2}$
   b. $\frac{mv^2}{4x^2}$
   c. $\frac{mv^2}{2x^2}$
   d. $\frac{2mv^2}{x^2}$
2. A stone of mass 1kg is tied to the end of a string of 1m length. It is whirled in a vertical circle. If the velocity of the stone at the top be 4m/s, what is the tension in the string there?
   a. 6N
   b. 16N
   c. 5N
   d. 10N
3. In a vertical circle, at which point the tension in the string may be zero?
   a. Highest point
   b. Lowest point
   c. At any point
   d. None of these
4. A stone attached to one end of a string is whirled in a vertical circle. The tension in the string is maximum when-
   a. The string is horizontal
   b. The string is vertical with stone at highest point
   c. The string is vertical with stone at lowest point
   d. None of these
5. A weightless thread can withstand tension upto 30 N. a stone of mass 5kg is tied to it and is revolved in a circular path of radius 2m in a vertical plane. If g = 10m/s^2, then the maximum angular velocity of the stone can be –
   a. 5rad/s
   b. $\sqrt{30}\, rad/s$
   c. $\sqrt{60}\, rad/s$
   d. 10rad/s
6. A particle is moving in a vertical circle. The tension of the string at angles 30° and 60° w.r.t lowest position are T_1 *and* T_2 respectively. Then –
   a. $T_1 = T_2$
   b. $T_1 > T_2$
   c. $T_1 < T_2$
   d. Can not be predicted

7. A body crosses the top most point of vertical circular path with critical speed. What will be the its centripetal acceleration when the string is horizontal?
   a. g
   b. 2g
   c. 3g
   d. 6g
8. A 10kg satellite completes one revolution around the earth at a height 100km in 108 min. the work done by the gravitational force of earth will be –
   a. $108 \times 100 \times 10J$
   b. $\frac{108 \times 10}{100} J$
   c. $0J$
   d. $\frac{100 \times 10}{108} J$
9. A spring of force constant 800N/m has an extension of 5cm. The work done in extending it from 5cm to 15cm is
   a. 16J
   b. 8J
   c. 32J
   d. 24J
10. If a spring extends by x on loading then energy stored by spring is –
   a. $\frac{T^2}{2x}$
   b. $\frac{T^2}{2K}$
   c. $\frac{2K}{T^2}$
   d. $\frac{2T^2}{K}$
11. A body of mass 2kg falls from a height of 20m. what is the loss of potential energy
   a. 400J
   b. 300J
   c. 200J
   d. 100J
12. In stretching a spring by 2cm, energy stored is given by U. Then stretching by 10cm, energy stored will be –
   a. U
   b. 5U
   c. U/25
   d. 25U
13. 4J of work is required to stretch a spring through 10cm beyond its unstretched length. The extra work needed to stretch it through additional 10cm will be –
   a. 4J
   b. 8J
   c. 12J
   d. 16J
14. A body of mass 6kg is displaced under a force which causes displacement in it as $s = \frac{t^2}{4}$ metres, where t is in sec. The work done by the force in 2sec is –
   a. 12J
   b. 9J
   c. 6J
   d. 3J

15. A block released at the top comes to rest just reaching the end of an inclined plane of inclination θ. The coefficient of kinetic friction in this case will be –
    a. Cannot be predicted
    b. $\sin\theta$
    c. $g\cos\theta$
    d. $\tan\theta$

Name of the teacher – Soumitra Maity