

PHY 102 – CA Test

Take the acceleration due to gravity (g) to be 9.8 m/s^2

Universal Gravitation Constant, $G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$

- The displacement of a particle in an x - y plane is given by $x = At^2 + B$ and $y = Dt^3 - E$ where t is time from rest and A, B, D and E are constants. The respective dimensions of A, B and D are:
A. (LT^{-2}, L^2, LT^3) B. (LT^{-2}, LT^3, L^2)
C. (LT^{-2}, L, LT^{-3}) D. (LT^{-3}, L, LT^3)
- If the constants A, B, D and E in question 1 are respectively 2, 2, 1 and 2 in SI units, the magnitude of the velocity of the particle 5 s from rest is:
A. 40.3 m/s B. 77.6 m/s C. 85.0 m/s D. 95.6 m/s
- In a football match, the ball undergoes three consecutive displacements, D_1, D_2 and D_3 (in m) before the goalkeeper stops it. If $D_1 = i + 3j$, $D_2 = 2i + 3j$ and $D_3 = -i + j$, the resultant displacement is:
A. 7.2 m B. 7.6 m C. 9.6 m D. 2.7 m
- On sensing danger, two birds A and B, fly away from the same nest with velocities $V_A = i + 4j + 3k$ and $V_B = 4i + 2j - 4k$ relative to a stationary observer. How far apart are the two birds after 5 s?
A. 9.4 m B. 94.0 m C. 39.4 m D. 18.7 m
- The moon revolves round the earth, making a complete revolution in 27.3 days in an orbit of radius $3.85 \times 10^8 \text{ m}$. What is the centripetal acceleration is:
A. 27.3 m/s^2 , directed towards the centre of the earth
B. $54.6 \times 10^{-3} \text{ m/s}^2$, directed towards centre of the earth
C. $54.6 \times 10^3 \text{ m/s}^2$, directed tangentially to its orbit
D. $2.73 \times 10^{-3} \text{ m/s}^2$, directed towards the centre of the earth
- If the radius of the earth were to grow from 6,400km to 64,000km while its mass doubled, your weight on the earth's surface would:
a) decrease by a factor of 50 b) increase by a factor of 100 c) decrease by a factor of 100
d) increase by a factor of 2
- Three identical point masses are placed at the corners of an equilateral triangle of sides " R ". If the mass of each particle is " M ", then the magnitude of the net force on each particle is:
a) $0.9GM^2/R^2$ b) $1.5GM^2/R^2$ c) $1.7GM^2/R^2$ d) $3.0GM^2/R^2$
- A body of mass 2kg is projected with an initial velocity of 10m/s up along a plane inclined at 30° to the horizontal. It travels a distance of 10m along the plane, stops, and then slides down. Determine the coefficient of (kinetic) friction and the speed of the body when it returns to the bottom of the plane.
a) 0.0 and 10.0 m/s b) 0.6 and 6.6 m/s c) 0.7 and 9.3 m/s d) 0.7 and 10.3 m/s

9) The head of a snake can accelerate 45 m/s^2 in striking a victim. If initial speed of its head is 10 m/s and it is 1 m away from a victim, how much time does a victim have in order to escape from being bitten by the snake?

a) 0.08 s b) 0.12 s c) 0.24 s d) not enough information is provided

10) A constant force $(3,0,4) \text{ N}$ moves a body from point $(-5,3,1) \text{ m}$ to the point $(4,3,3) \text{ m}$. If the initial velocity of the body is $(6,1,1) \text{ m/s}$, determine the work done by the force and the angle between the force and the initial velocity of the body

a) 20 J and 30.5° b) 25 J and 42.5° c) 30 J and 43.5° d) 35 J and 44.5°

11) The area of the parallelogram defined by the vectors $(6,3,1) \text{ m}$ and $(-2,4,5) \text{ m}$ is:

a) 5.0 m^2 b) 45.0 m^2 c) 45.2 m^2 d) 45.5 m^2

12) A canon ball was shot at an angle of 45° to the horizontal and hit a point 500 m from the firing point, at the same horizontal level. Two seconds after firing the canon ball, was it moving upwards or downwards?

a) Moving up b) Moving down c) It had landed d) not enough information is given

13) A stone tied to the end of a string is whirled around in a vertical circle at constant speed. If the string never sags, at what point in the motion is the tension in the string the largest?

a) At its topmost point b) At its lowest point c) Midway between the topmost and lowest point d) There is not enough information given, the length of the string is required

14) A 10 kg block is pulled along an inclined plane by a constant 250 N force. The coefficient of friction between the block and the plane is 0.5 and the plane is inclined at an angle of 45° to the horizontal. If pulled from rest, how far along the plane does the block travel in 4 seconds? a) 200.0 m b) 182.8 m c) 116.8 m d) 96.8 m

15) From the top of a cliff, two balls A and B with masses 1 kg and 20 kg , respectively, are thrown with the same vertical speeds. However the one with mass 1 kg was thrown vertically upward while the other was thrown vertically downward. Neglecting air resistance, which ball will have the larger speed just before landing at the bottom of the cliff?

a) ball A with mass 1 kg b) ball B with mass 20 kg c) it depends on the height of the cliff d) neither