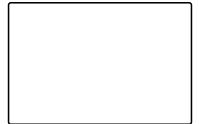


Name: \_\_\_\_\_

Date: \_\_\_\_\_



**Question: 1 of 14**

QID: 387

Marks: 1

The circular motion of a particle whose speed is constant is \_\_\_\_\_

Please mark (✓) for the correct answer.

- A. Periodic but not simple harmonic
- B. Simple harmonic but not periodic
- C. Periodic and simple harmonic
- D. Neither periodic not simple harmonic

**Question: 2 of 14**

QID: 388

Marks: 1

Which of the following is a simple harmonic motion?

Please mark (✓) for the correct answer.

- A. Particle moving in a circle with uniform speed
- B. Wave moving through a string fixed at both ends
- C. Earth spinning about its axis
- D. Ball bouncing between two vertical walls

**Question: 3 of 14**

QID: 389

Marks: 1

A particle executes simple harmonic motion along the x-axis. The force acting on it is given by?

Please mark (✓) for the correct answer.

- A.  $A\cos(kx)$
- B.  $Ae^{-kx}$
- C.  $Akx$
- D.  $-Akx$

**Question: 4 of 14**

QID: 390

Marks: 1

Which one of the following represents simple harmonic motion?

Please mark (✓) for the correct answer.

- A. Acceleration =  $kx$
- B. Acceleration =  $k_0 x + k_1 x^2$
- C. Acceleration =  $-k(x+a)$
- D. Acceleration =  $k(x+a)$



Which one of the following statements is true for the speed  $v$  and the acceleration of a particle executing simple harmonic motion?

Please mark (✓) for the correct answer.

- A. When  $c$  is maximum,  $a$  is maximum
- B. Value of  $a$  is zero, whatever may be the value of  $v$
- C. When  $v$  is zero,  $a$  is zero
- D. When  $v$  is maximum,  $a$  is zero

Geoff, a rock climber, is following his friend Marie up an overhanging cliff. Marie is attached to the rock and ensures that the rope between herself and Geoff is taut at all times. Unfortunately, Geoff falls off and subsequently swings. Unless otherwise stated, ignore air resistance.

Geoff passes through the equilibrium position, for the second time, after 4.5 s. At this point, he is travelling at a speed of  $5 \text{ ms}^{-1}$ . Calculate the following:

- a) The frequency of his oscillations **(2 marks)**
- b) The amplitude of his oscillations **(2 marks)**
- c) His velocity 2.25 s after he falls. **(2 marks)**

Please write your answer below.

For a simple pendulum undergoing simple harmonic motion,  $\omega^2 = g / l$ , where  $l$  is the length of the pendulum and  $g$  is the acceleration due to gravity. For the small angles involved in simple harmonic motion,  $\cos \theta \approx 1 - (\theta^2 / 2)$  and  $\sin \theta \approx \theta$ .

(d) By expressing the angle  $\theta$  in terms of Geoff's displacement,  $x$ , and the rope's length,  $l$ , derive an expression for  $\cos \omega t$  in terms of  $l$ ,  $A$  and  $\theta$ . **(2 marks)**

(e) Using this result, show that his kinetic energy is given by  $0.5m\omega^2(A^2 - l^2\theta^2)$ . **(2 marks)**

Please write your answer below.

e) By considering his vertical displacement, derive an expression for his potential energy in terms of  $l$ ,  $g$ ,  $\theta$  and his mass,  $m$ . **(3 marks)**

Please write your answer below.

f) Hence show that energy is conserved (from previous solution) **(3 marks)**

.....  
Please write your answer below.

--- END OF QUESTION PAPER ---

## Answer Key

No	Question Type	QID	Correct Answer
Question - 1	Multiple Choice (Radiobutton)	387	A
Question - 2	Multiple Choice (Radiobutton)	388	B
Question - 3	Multiple Choice (Radiobutton)	389	D
Question - 4	Multiple Choice (Radiobutton)	390	C
Question - 5	Multiple Choice (Radiobutton)	391	D
Question - 6	Multiple Choice (Radiobutton)	392	B
Question - 7	Multiple Choice (Radiobutton)	393	A
Question - 8	Multiple Choice (Radiobutton)	394	A
Question - 9	Multiple Choice (Radiobutton)	395	C
Question - 10	Multiple Choice (Radiobutton)	396	D
Question - 11	Essay (Evaluted by Admin)	383	Essay Type Question
Question - 12	Essay (Evaluted by Admin)	384	Essay Type Question
Question - 13	Essay (Evaluted by Admin)	385	Essay Type Question
Question - 14	Essay (Evaluted by Admin)	386	Essay Type Question

--- END OF ANSWER KEY ---