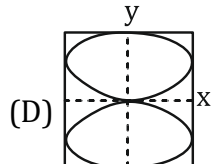
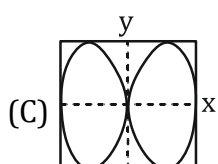
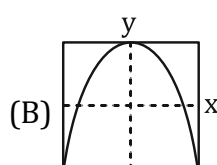
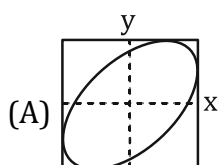


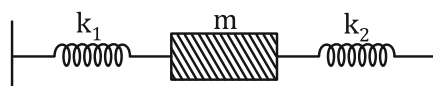
- Q.1** A block of mass  $m$  attached to a massless spring is performing oscillatory motion of amplitude 'A' on a frictionless horizontal plane. If half of the mass of the block breaks off when it is passing through its equilibrium point, the amplitude of oscillation for the remaining system become  $fA$ . The value of  $f$  is
- (A)  $\frac{1}{\sqrt{2}}$  (B) 1 (C)  $\frac{1}{2}$  (D)  $\sqrt{2}$
- Q.2** A particle is executing simple harmonic motion (SHM) of amplitude  $A$ , along the  $x$ -axis, about  $x = 0$ . When its potential energy (PE) equals kinetic energy (KE), the position of the particle will be
- (A)  $A$  (B)  $\frac{A}{\sqrt{2}}$  (C)  $\frac{A}{2\sqrt{2}}$  (D)  $\frac{A}{2}$
- Q.3** A particle executes simple harmonic motion with an amplitude of 5 cm. When the particle is at 4 cm from the mean position, the magnitude of its velocity in SI units is equal to that of its acceleration. Then, its periodic time in second is
- (A)  $\frac{8\pi}{3}$  (B)  $\frac{4\pi}{3}$  (C)  $\frac{3\pi}{8}$  (D)  $\frac{7\pi}{3}$
- Q.4** A cylindrical plastic bottle of negligible mass is filled with 310ml of water and left floating in a pond with still water. If pressed downward slightly and released, it starts performing simple harmonic motion at angular frequency  $\omega$ . If the radius of the bottle is 2.5 cm then  $\omega$  is close to (density of water =  $10^3 \text{ kg/m}^3$ )
- (A)  $7.95 \text{ rads}^{-1}$  (B)  $3.75 \text{ rads}^{-1}$  (C)  $5.00 \text{ rads}^{-1}$  (D)  $1.25 \text{ rads}^{-1}$
- Q.5** A particle undergoing simple harmonic motion has time dependent displacement given by  $x(t) = A \sin \frac{\pi t}{90}$ . The ratio of kinetic to potential energy of this particle at  $t = 210 \text{ s}$  will be
- (A)  $\frac{1}{9}$  (B) 2 (C)  $\frac{1}{3}$  (D) 3
- Q.6**  $x$  and  $y$  displacements of a particle are given as  $x(t) = a \sin \omega t$  and  $y(t) = a \sin 2\omega t$ . Its trajectory will look like



**Q.7** Two particles are executing simple harmonic motion of the same amplitude  $A$  and frequency  $\omega$  along the  $X$ -axis. Their mean position is separated by distance  $X_0$  ( $X_0 > A$ ). If the maximum separation between them is  $(X_0 + A)$ , the phase difference between their motion is

- (A)  $\frac{\pi}{2}$  (B)  $\frac{\pi}{3}$  (C)  $\frac{\pi}{4}$  (D)  $\frac{\pi}{6}$

**Q.8** Two springs, of force constants  $k_1$  and  $k_2$  are connected to a mass  $m$  as shown. The frequency of oscillation of the mass is  $f$ . If both  $k_1$  and  $k_2$  are made four times their original values, the frequency of oscillation becomes



- (A)  $2f$  (B)  $f/2$  (C)  $f/4$  (D)  $4f$

**Q.9** A particle of mass  $m$  executes simple harmonic motion with amplitude  $a$  and frequency  $\nu$ . The average kinetic energy during its motion from the position of equilibrium to the end is

- (A)  $2\pi^2 ma^2 \nu^2$  (B)  $\pi^2 ma^2 \nu^2$  (C)  $\frac{1}{4} ma^2 \nu^2$  (D)  $4\pi^2 ma^2 \nu^2$

**Q.10** If  $x$ ,  $v$  and  $a$  denote the displacement, the velocity and the acceleration of a particle executing simple harmonic motion of time period  $T$ , then, which of the following does not change with time?

- (A)  $a^2 T^2 + 4\pi^2 v^2$  (B)  $aT/x$  (C)  $aT + 2\pi v$  (D)  $aT/v$

(Physics)

**SIMPLE HARMONIC MOTION****ANSWER KEY**

1. (A) 2. (B) 3. (A) 4. (A) 5. (C) 6. (C) 7. (B)  
8. (A) 9. (B) 10. (B)

