Molecular Kinetic Theory Model

TOPIC QUESTIONS

Level	A Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 30min

1. A mechanical system is oscillating at resonance with a constant amplitude. Which one of thefollowing statements is **not** correct?

   A The applied force prevents the amplitude from becoming too large.

   B The frequency of the applied force is the same as the natural frequency of oscillation of the system.

   C The total energy of the system is constant.

   D The amplitude of oscillations depends on the amount of damping.

2. For a particle moving in a circle with uniform speed, which one of the following statements is correct?

   A The kinetic energy of the particle is constant.

   B The force on the particle is in the same direction as the direction of motion of the particle.

   C The momentum of the particle is constant.

   D The displacement of the particle is in the direction of the force.

3. A young child of mass 20 kg stands at the centre of a uniform horizontal platform which rotates at a constant angular speed of 3.0 rad s^{-1}. The child begins to walk radially outwards towards the edge of the platform. The maximum frictional force between the child and the platform is 200 N. What is the maximum distance from the centre of the platform to which thechild could walk without the risk of slipping?

A 1.1 m

B 1.3 m

C 1.5 m

D 1.7 m

4. A particle travels at a constant speed around a circle of radius r with centripetal acceleration a. What is the time taken for ten complete rotations?

A $\frac{\pi}{5}\sqrt{\frac{a}{r}}$

B $\frac{\pi}{5}\sqrt{\frac{r}{a}}$

C $20\pi\sqrt{\frac{a}{r}}$

D $20\pi\sqrt{\frac{r}{a}}$

5. The frequency of a body moving with simple harmonic motion is doubled. If the amplituderemains the same, which one of the following is also doubled?

A the time period

B the total energy

C the maximum velocity

D the maximum acceleration

6. A body moves with simple harmonic motion of amplitude A and frequency
What is the magnitude of the acceleration when the body is at maximum displacement?

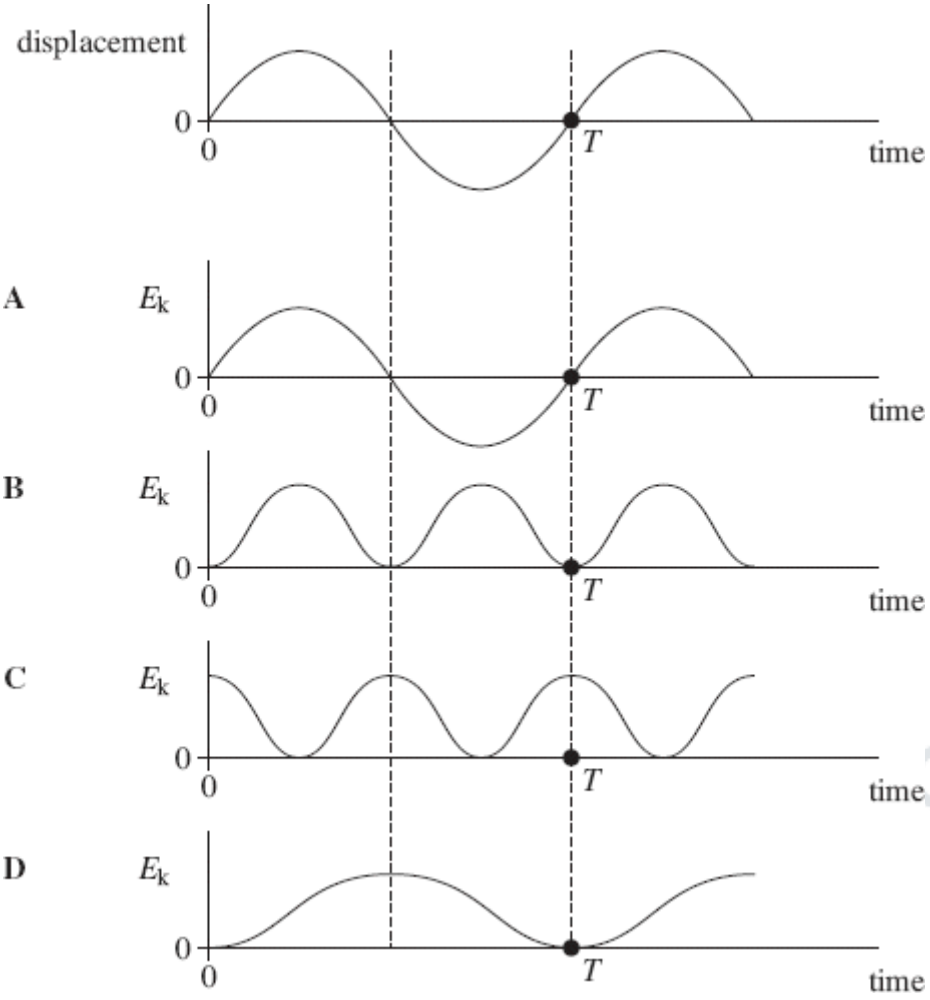
A zero

B $4\pi^2 Ab^2$

C Ab^2

D $\frac{4\pi^2 A}{b^2}$

7. An object oscillating in simple harmonic motion has a time period T. The first graph shows how its displacement varies with time. Which of the subsequent graphs, **A** to **D**, show how thekinetic energy, E_k, of the object varies with time?



8. The period of vertical oscillation of a mass-spring system is T when the spring carries a mass of 1.00 kg. What mass should be added to the 1.00 kg if the period is to be increased to 1.50 T?

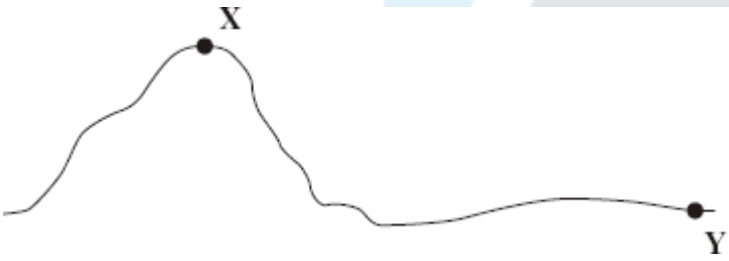
A 0.25 kg

B 1.00 kg

C 1.25 kg

D 2.00 kg

9. The diagram shows two positions, **X** and **Y**, on the Earth's surface.



Which line, **A** to **D**, in the table gives correct comparisons at **X** and **Y** for gravitational potentialand angular velocity?

	gravitational potential at Xcompared with Y	angular velocity at Xcompared with Y
A	greater	greater
B	greater	same
C	greater	smaller
D	same	same

10. What would the period of rotation of the Earth need to be if objects at the equator were to appear weightless?

radius of Earth = 6.4×10^6 m

A 4.5×10^{-2} hours

B 1.4 hours

C 24 hours

D 160 hours

11. A mass of 0.90 kg is suspended from the lower end of a light spring of stiffness 80 N m^{-1}.

When the mass is displaced vertically and released, it undergoes vertical oscillations of small amplitude.

What is the frequency of the oscillations?

A 0.071 Hz

B 0.67 Hz

C 1.50 Hz

D 14 Hz

12. The period of a simple pendulum is doubled when the pendulum length is increased by 1.8 m.What is the original length of the pendulum?

A 0.45 m

B 0.60 m

C 0.90 m

D 3.6 m

13. A particle of

mass m is oscillating with simple harmonic motion. The period of the oscillation is T and the amplitude is A.

What is the maximum kinetic energy of the particle?

A $\frac{mA^2}{2T^2}$

B $\frac{\pi^2 mA^2}{2T^2}$

C $\frac{2mA^2}{T^2}$

D $\frac{2\pi^2 mA^2}{T^2}$

14. A simple pendulum and a mass–spring system each have a time period T on the Earth.They are taken to the surface of a planet where the acceleration due to gravity is $\frac{g}{4}$.

What are the time periods of the pendulum and the mass–spring system on this planet?

	Simple pendulum	Mass–spring system
A	$\frac{T}{2}$	T ⬭
B	$2T$	T ⬭
C	$\frac{T}{2}$	$2T$
D	$2T$	$2T$

15. A particle of mass m undergoes simple harmonic motion with amplitude A and frequency f.What is the total energy of the particle?

A $2\pi mfA^2$

B $2\pi^2 mf^2A^2$

C $4\pi^2 m^2 f^2 A$

D $4\pi^2 mf^2A^2$

16. The time period of a pendulum on Earth is 1.0 s. What would be the period of a pendulum ofthe same length on a planet with half the density but twice the radius of Earth?

A 0.5 s

B 1.0 s

C 1.4 s

D 2.0 s

17. Which one of the following statements always applies to a damping force acting on avibrating system?

A It is in the same direction as the acceleration.

B It is in the same direction as the displacement.

C It is in the opposite direction to the velocity.

D It is proportional to the displacement.

18. A satellite of mass *m* travels in a circular orbit of radius *r* around a planet of mass *M*. Whichone of the following expressions gives the angular speed of the satellite?

A

$\sqrt{GMr}$

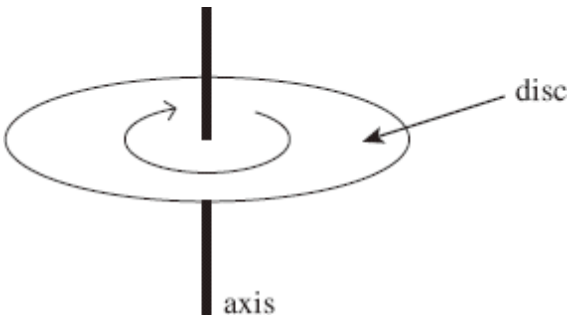
B

$\sqrt{Gmr}$

C $\sqrt{\frac{Gm}{r^3}}$

D $\sqrt{\frac{GM}{r^3}}$

19. The diagram shows a disc of diameter 120 mm that can turn about an axis through its centre.



The disc is turned through an angle of 30° in 20 ms. What is the average speed of a point on theedge of the disc during this time?

A $0.5\pi \text{ m s}^{-1}$

B $\pi \text{ m s}^{-1}$

C $1.5\pi \text{ m s}^{-1}$

D $2\pi \text{ m s}^{-1}$

20. A particle of mass *m* moves in a circle of radius *r* at a uniform speed with frequency *f*. What is the kinetic energy of the particle?

A $\frac{mf^2r^2}{4\pi^2}$

B $\frac{mf^2r}{2}$

C $2\pi^2 mf^2r^2$

D $4\pi^2 mf^2r^2$