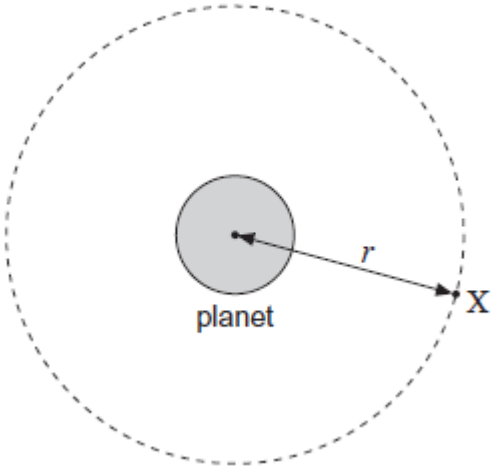
Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic: Further Mechanics

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A satellite X is in a circular orbit of radius r about the centre of a spherical planet of mass M.



Which line, **A** to **D**, in the table gives correct expressions for the centripetal acceleration a and the speed v of the satellite?

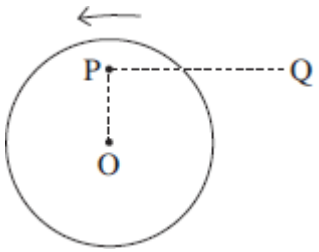
	Centripetal acceleration a	**Speed v**
A	$\frac{GM}{2r}$	$\sqrt{\frac{GM}{2r}}$
B	$\frac{GM}{2r}$	$\sqrt{\frac{GM}{r}}$
C	$\frac{GM}{r^2}$	$\sqrt{\frac{GM}{2r}}$
D	$\frac{GM}{r^2}$	$\sqrt{\frac{GM}{r}}$

(Total 1 mark)

Q2.

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A small mass is placed at P on a horizontal disc which has its centre at O. The disc rotates anti-clockwise about a vertical axis through O with constant angular speed.



Which one of the following describes the force which keeps the mass at rest relative to the disc when in the position shown?

A the weight of the mass

B a frictional force from P to Q

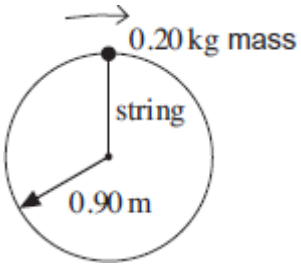
C a frictional force directed away from O

D a frictional force directed towards O

(Total 1 mark)

Q3.

A 0.20 kg mass is whirled round in a vertical circle on the end of a light string of length 0.90 m.



At the top point of the circle the speed of the mass is 8.2 m s^{-1}. What is the tension in the string at this point?

A 10 N

B 13 N

C 17 N

D 20 N

(Total 1 mark)

Q4.

The tip of each prong of a tuning fork emitting a note of 320 Hz vibrates in simple harmonic motion with an amplitude of 0.50 mm.
What is the speed of each tip when its displacement is zero?

A zero

B 0.32π mm s^{-1}

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C 160π mm s^{-1}

D 320π mm s^{-1}

(Total 1 mark)

Q5.

Which line, **A** to **D**, in the table gives the amplitude and frequency of a body performing simple harmonic motion whose displacement x at time t is given by the equation $x = P \cos Qt$?

	Amplitude	Frequency
A	$\frac{P}{2}$	$\frac{Q}{2\pi}$
B	P	$2\pi Q$
C	P	$\frac{Q}{2\pi}$
D	$2P$	$\frac{Q}{2\pi}$

(Total 1 mark)

Q6.

The wheel of the London Eye has a diameter of 130 m and rotates at a steady speed, completing one rotation every 30 minutes. What is the centripetal acceleration of a person in a capsule at the rim of the wheel?

A 1.2×10^{-4} ms^{-2}

B 2.5×10^{-4} ms^{-2}

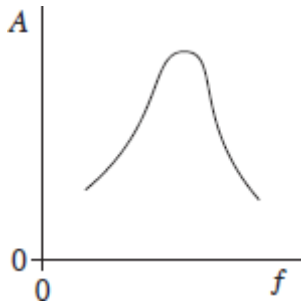
C 3.9×10^{-4} ms^{-2}

D 7.9×10^{-4} ms^{-2}

(Total 1 mark)

Q7.

A periodic force is applied to a lightly-damped object causing the object to oscillate.
The graph shows how the amplitude A of the oscillations varies with the frequency f of the periodic force.



Which one of the following statements best describes how the shape of the curve would differ if the damping had been greater?

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A the curve would be lower at all frequencies

B the curve would be higher at all frequencies

C the curve would be unchanged except at frequencies above the resonant frequency where it would be lower

D the curve would be unchanged except at frequencies above the resonant frequency where it would be higher

(Total 1 mark)

Q8.

A small body of mass m rests on a horizontal turntable at a distance *r* from the centre. If the maximum frictional force between the body and the turntable is $\frac{mg}{2}$, what is the angular speed at which the body starts to slip?

A $\sqrt{\frac{gr}{2}}$

B $\frac{g}{r}$

C $\sqrt{\frac{g}{2r}}$

D $\frac{1}{2}\sqrt{\frac{g}{r}}$

(Total 1 mark)

Q9.

A body of mass 0.50 kg, fixed to one end of a string, is rotated in a vertical circle of radius 1.5 m at an angular speed of 5.0 rad s^{-1}. What is the maximum tension in the string?

A 5.0 N

B 9.0 N

C 14 N

D 24 N

(Total 1 mark)

Q10.

When a mass suspended on a spring is displaced, the system oscillates with simple harmonic motion. Which one of the following statements regarding the energy of the system is **incorrect?**

A The potential energy has a minimum value when the spring is fully compressed or fully extended.

B The kinetic energy has a maximum value at the equilibrium position.

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C The sum of the kinetic and potential energies at any time is constant.

D The potential energy has a maximum value when the mass is at rest.

(Total 1 mark)

Q11.

A particle of mass *m* oscillates in a straight line with simple harmonic motion of constant amplitude. The total energy of the particle is *E*. What is the total energy of another particle of mass 2*m*, oscillating with simple harmonic motion of the same amplitude but double the frequency?

A *E*

B 2*E*

C 4*E*

D 8*E*

(Total 1 mark)

Q12.

For a particle moving in a circle with uniform speed, which one of the following statements is **incorrect?**

A There is no displacement of the particle in the direction of the force.

B The force on the particle is always perpendicular to the velocity of the particle.

C The velocity of the particle is constant.

D The kinetic energy of the particle is constant.

(Total 1 mark)

Q13.

A particle of mass 0.20 kg moves with simple harmonic motion of amplitude 2.0×10^{-2} m. If the total energy of the particle is 4.0×10^{-5}J, what is the time period of the motion?

A $\frac{\pi}{4}$ seconds

B $\frac{\pi}{2}$ seconds

C π seconds

D 2π seconds

(Total 1 mark)

Q14.

A simple pendulum and a mass-spring system are taken to the Moon, where the gravitational field strength is less than on Earth. Which line, **A** to **D**, in the table correctly describes the change, if any, in the period when compared with its value on Earth?

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	period of pendulum	period of mass-spring system
A	increase	no change
B	increase	increase
C	no change	decrease
D	decrease	decrease

(Total 1 mark)

Q15.

Two pendulums, P and Q, are set up alongside each other. The period of P is 1.90 s and the period of Q is 1.95 s.

How many oscillations are made by pendulum Q between two consecutive instants when P and Q move in phase with each other?

A 19

B 38

C 39

D 78

(Total 1 mark)

Q16.

Which line, **A** to **D**, in the table correctly describes the trajectory of charged particles which enter separately, at right angles, a uniform electric field, and a uniform magnetic field?

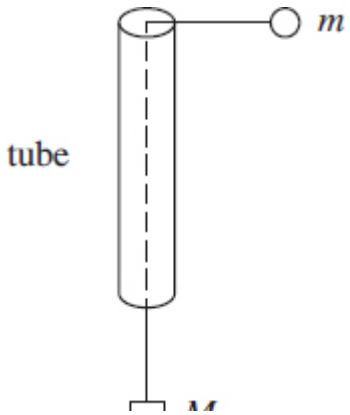
	uniform electric field	uniform magnetic field
A	parabolic	circular
B	circular	parabolic
C	circular	circular
D	parabolic	parabolic

(Total 1 mark)

Q17.

The diagram shows a smooth thin tube through which passes a string with masses *m* and *M* attached to its ends. The tube is moved so that the mass *m* travels in a horizontal circle of constant radius *r* at constant speed *v*.

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Which one of the following expressions is equal to *M*?

A $\frac{mv^2}{2r}$

B mv^2rg

C $\frac{mv^2}{rg}$

D $\frac{mv^2g}{r}$

(Total 1 mark)

Q18.

A particle moves in a circular path at constant speed. Which one of the following statements is correct?

A The velocity of the particle is directed towards the centre of the circle.

B There is no force acting on the particle.

C There is no change in the kinetic energy of the particle.

D The particle has an acceleration directed along a tangent to the circle.

(Total 1 mark)

Q19.

A mass on the end of a spring undergoes vertical simple harmonic motion. At which point(s) is the magnitude of the resultant force on the mass a minimum?

A at the centre of the oscillation

B only at the top of the oscillation

C only at the bottom of the oscillation

D at both the top and bottom of the oscillation

(Total 1 mark)

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Q20.

A baby bouncer consisting of a harness and elastic ropes is suspended from a doorway. When a baby of mass 10 kg is placed in the harness, the ropes stretch by 0.25 m. When the baby bounces, she starts to move with vertical simple harmonic motion. What is the time period of her motion?

A 1.0 s

B 2.1 s

C 2.3 s

D 3.1 s

(Total 1 mark)

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