► C. 28 Hz

► D. 57 Hz

Question No: 2 (Marks: 1) - Please choose one

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1. To raise the pitch of a certain piano string, the piano tuner:

► A. loosens the string

► B. tightens the string

► C. shortens the string

► D. lengthens the string

Question No: 3 (Marks: 1) - Please choose one

A force of 5000N is applied outwardly to each end of a 5.0-m long rod with a radius of 34.0 cm and a Young's modulus of 125×10^8 N/m^2. The elongation of the rod is:

► 0.0020mm

► 0.0040mm

► 0.14mm

► 0.55mm

Question No: 4 (Marks: 1) - Please choose one

A particle oscillating in simple harmonic motion is:

► Never in equilibrium because it is in motion

► Never in equilibrium because there is always a force

► In equilibrium at the ends of its path because its velocity is zero there

► In equilibrium at the center of its path because the acceleration is zero there

Question No: 5 (Marks: 1) - Please choose one

In simple harmonic motion, the restoring force must be proportional to the:

► Amplitude

► Frequency

► Velocity

► **Displacement**

Question No: 6 (Marks: 1) - Please choose one

A 160-N child sits on a light swing and is pulled back and held with a horizontal force of 100 N. The magnitude of the tension force of each of the two supporting ropes is:

► 60N

► **94N**

► 120N

► 190N

Question No: 7 (Marks: 1) - Please choose one

An object attached to one end of a spring makes 20 vibrations in 10 s. Its angular frequency is:

► **12.6 rad/s**

► 1.57 rad/s

► 2.0 rad/s

► 6.3 rad/s

Question No: 8 (Marks: 1) - Please choose one

For an object in equilibrium the net torque acting on it vanishes only if each torque is calculated about:

► The center of mass

► The center of gravity

► The geometrical center

► The same point

Question No: 9 (Marks: 1) - Please choose one

Ten seconds after an electric fan is turned on, the fan rotates at 300 rev/min. Its average angular acceleration is:

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► **3.14 rad/s2**

► 30 rad/s2

► 30 rev/s2

► 50 rev/min2

► 1800 rev/s2

Question No: 10 (Marks: 1) - Please choose one

A 4.0-N puck is traveling at 3.0m/s. It strikes a 8.0-N puck, which is stationary. The two pucks stick together. Their common final speed is:

► **1.0m/s**

► 1.5m/s

► 2.0m/s

► 2.3m/s

Question No: 11 (Marks: 1) - Please choose one

An object moving in a circle at constant speed:

► must have only one force acting on it

► is not accelerating

► is held to its path by centrifugal force

► **has an acceleration of constant magnitude**

Question No: 12 (Marks: 1) - Please choose one

A plane traveling north at 200m/s turns and then travels south at 200m/s. The change in its velocity is:

- ► 400m/s north
- ► **400m/s south**
- ► Zero
- ► 200m/s south

Question No: 13 (Marks: 1) - Please choose one

At time t = 0 a car has a velocity of 16 m/s. It slows down with an acceleration given by –0.50t, in m/s2 for t in seconds. It stops at t =

- ► 64 s
- ► 32 s
- ► 16 s
- ► **8.0 s**

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Question No: 14 (Marks: 1) - Please choose one

1 mi is equivalent to 1609 m so 55 mph is:

- ► 15 m/s
- **► 25 m/s**
- ► 66 m/s
- ► 88 m/s

Question No: 15 (Marks: 1)

If you walk along the top of a fence, why does holding your arms out help you to keep your balance?

Ans:

Holding your arms out increases your moment of inertia.

Question No: 16 (Marks: 2)

Charge is also said to be conserved. What does it mean? Explain.

Answer:

The principal that net electric charge is neither created nor destroyed but is transferable from one material to another.

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So the Charge is also said to be conserved.

Charge conservation is a physical law that states that the change in the amount of electric charge in any volume of space is exactly equal to the amount of charge flowing into the volume minus the amount of charge flowing out of the volume. In essence, charge conservation is an accounting relationship between the amount of charge in a region and the flow of charge into and out of that region.

Mathematically, we can state the law as a continuity equation:

$$Q(t_2) \;=\; Q(t_1) + Q_{IN} - Q_{OUT}.$$

Question No: 17 (Marks: 2)

When a car drives off a cliff, why does it rotate forward as it falls?

Answer:

When the front wheels leave the cliff, the car begins to rotate forward because the front end is already beginning to fall, turn the car around the back axle. Thus by the time it is fully airborne, it is already rotating.

Remember that acceleration due to gravity is around 9. 8 meters/ second PER SECOND, so the front of the car is already falling faster than the rear!

Another idea

Well, for a while, the rear wheels are still up on the cliff, but the font wheels are in the air and nothing is holding them up. So as the centre of gravity of the car starts to fall, the front wheels go down while the rear ones are still being supported. Consequently, some rotation is put on the car. Conservation of momentum causes the car to continue to tumble forward even after the real wheels have left the top of the cliff.

Question No: 18 (Marks: 2)

Why does a book sitting on a table never accelerate "spontaneously" in response to the trillions of inter-atomic forces acting within it?

Answer:

Every one of these interatomic forces is part of an action-reaction pair within the book. These forces add up to zero, no matter how many of them there are. This is what makes Newton's *first* law apply to the book. The book has zero acceleration unless an *external* force acts on it.

Question No: 19 (Marks: 3)

'Captain Planet' is somewhere between galaxies. When a gong sounds in a neighboring spaceship, Captain reacts to the sound. What is wrong with this scenario?

Question No: 20 (Marks: 3)

If you know the position vectors of a particle at two points along its path and also know the time it took to move from one point to the other, can you determine the particle's instantaneous velocity? Its average velocity? Explain

Question No: 21 (Marks: 5)

Steel will rapture if subjected to a shear stress of more that about $4.2 * 10^8$ N/m2. What sideward force is necessary to shear a steel bolt 1 cm in diameter?

Question No: 22 (Marks: 5)

A table-tennis ball is thrown at a stationary bowling ball. The table-tennis ball makes a one-dimensional elastic collision and bounces back along the same line. After the collision, compared to the bowling ball, the table-tennis ball has (a) a larger magnitude of momentum and more kinetic energy (b) a smaller magnitude of momentum and more kinetic energy (c) a larger magnitude of momentum