Free Mechanical Reasoning/ Aptitude/ Comprehension Test Questions (with answers)

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What does this test contain?

10 Mechanical Reasoning Questions and Explanations

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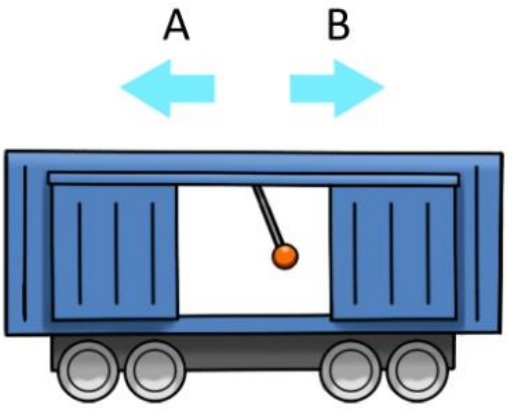
Question 1

Which way is the wagon accelerating? (If either, mark C.)



A | B | C

Explanation

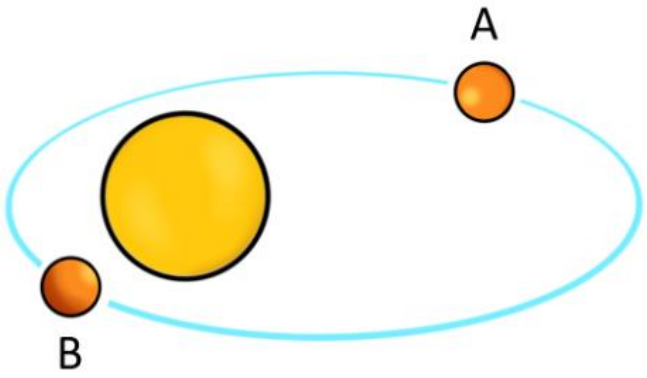
The correct answer is **A.**

The pendulum is moving backwards; therefore, the car is accelerating in the **opposite direction**. That happens when an object is in an accelerating system, in the same way you feel yourself pulled backwards when the car is speeding up or forwards when it is braking.

Remember the physical principle: When an object is within an accelerating system (another object that accelerates or decelerates), the force on the inner object will be in the direction **opposite to the acceleration**.

Question 2

Which planet is moving faster? (If equal, mark C.)



A | B | C

Explanation

The correct answer is **B.**

At the moment depicted in the picture, Planet B is closer to the sun, therefore orbits it at a greater velocity.

The gravitational force between two objects is calculated by:

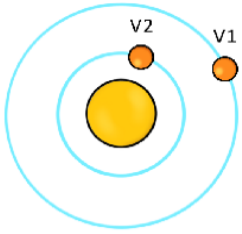
$Fg = (m_1 \times m_2 \times G) / d^2$

Where:

Fg = Gravitational Force, m_1 = Mass of Body 1, m_2 = Mass of Body 2, G = Gravity Constant, d = Distance Between the two Bodies.

You need not remember this formula; however, remember that gravitational force is inversely proportional to the distance squared (The larger the distance, the lower the force).
Remember the physical principle: The closer an orbiting object is to the main object (the object orbited), the faster it travels.

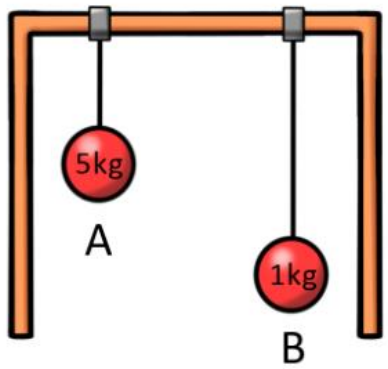
Note: The rule also applies for planets with a circular orbit; in that case, the planet maintains a constant velocity.



In that example – V1 < V2.

Question 3

Which pendulum will swing faster? (If equal, mark C.)



A | B | C

Explanation

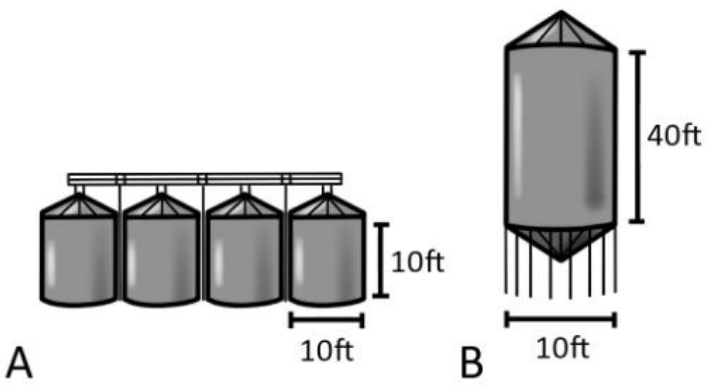
The correct answer is **A.**

Pendulum A has a shorter string; therefore, it will swing faster.
Intuitively, the shorter pendulum has less distance to travel in every cycle and, therefore, will move faster.
The mass of the bob is irrelevant, since the pendulum is affected by gravity, which applies the same acceleration on each body, regardless of its mass. Both bobs accelerate the same; therefore, their mass does not affect the pendulum's movement.

Remember the physical principle: The **only** thing that determines how fast a pendulum will swing is the length of its string.

Question 4

Which granary can hold more wheat? (If equal, mark C.)



A | B | C

Explanation

The correct answer is **C**.

This question can be solved in a straightforward calculation of the volume of the granaries, using the formula of a cylinder's volume:

V = π x R2 x H

Where: π = 3.14, **R** is the cylinder's radius and **H** is the cylinder's height.

Calculating:

Answer A: 4 x π x 52 x 10 = 4 x π x 25 x 10 = 3.14 x 100 x 10 = 3,140
Answer B: π x 52 x 40 = π x 25 x 40 = 3.14 x 1,000 = 3,140

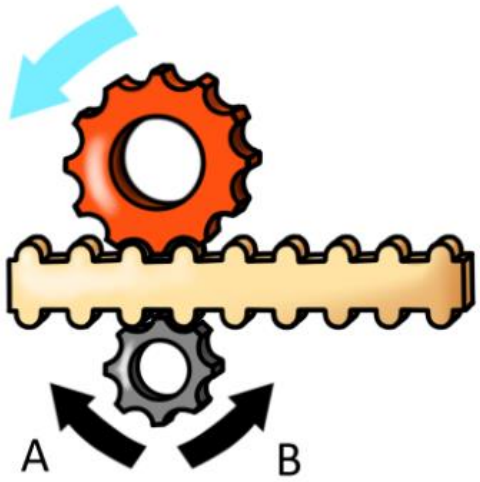
However, there is no need for such lengthy calculations. As we can see, the height of the cylinder affects the volume of a cylinder linearly, meaning 4 cylinders with height H are equal in volume to one cylinder with height 4H:
V (4 short) =4 x {π x R2 x H} = 4 x π x R2 x H
V (1 tall) = π x R2 x 4H = 4 x π x R2 x H

Remember the physical principle: The volume of a cylinder is linearly dependent on its height.

Note: The same does NOT apply for the cylinder's radius, since the R in the formula is squared. In that case, the volume of one cylinder with a radius 2R will be equal to the volume of **four** cylinders with a radius R, and the volume of one cylinder with a radius 4R will be equal to the volume of **sixteen** cylinders with a radius R.

Question 5

In which direction does the grey wheel turn? (If neither, mark C.)



A | B | C

Explanation

The correct answer is **A.**

When contact is made between the rack (toothed belt) and the cogwheels, a conversion from a linear velocity to an angular velocity occurs. The location of the point of contact is critical.

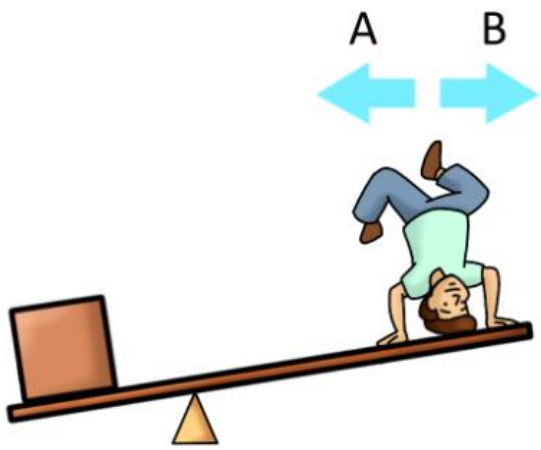
The point of contact between the red cogwheel and the rack is in the lower part of the red cogwheel, a position in which the counterclockwise angular velocity induces a linear velocity to the right.

The point of contact between the grey cogwheel and the rack is in the upper part of the grey cogwheel, a position in which the linear velocity to the right (determined by the rack) induces an angular velocity in a clockwise direction. The process can be exemplified by the blue arrows, which show where each part of the wheel is moving under the rotation conditions:

Remember the physical principle: When converting the linear velocity of a rack to the angular velocity of a cogwheel, "translate" the rotation into arrows and follow the directions.

Question 6

n which direction should the acrobat move his body to balance the seesaw? (If neither, Mark C.)



A | B | C

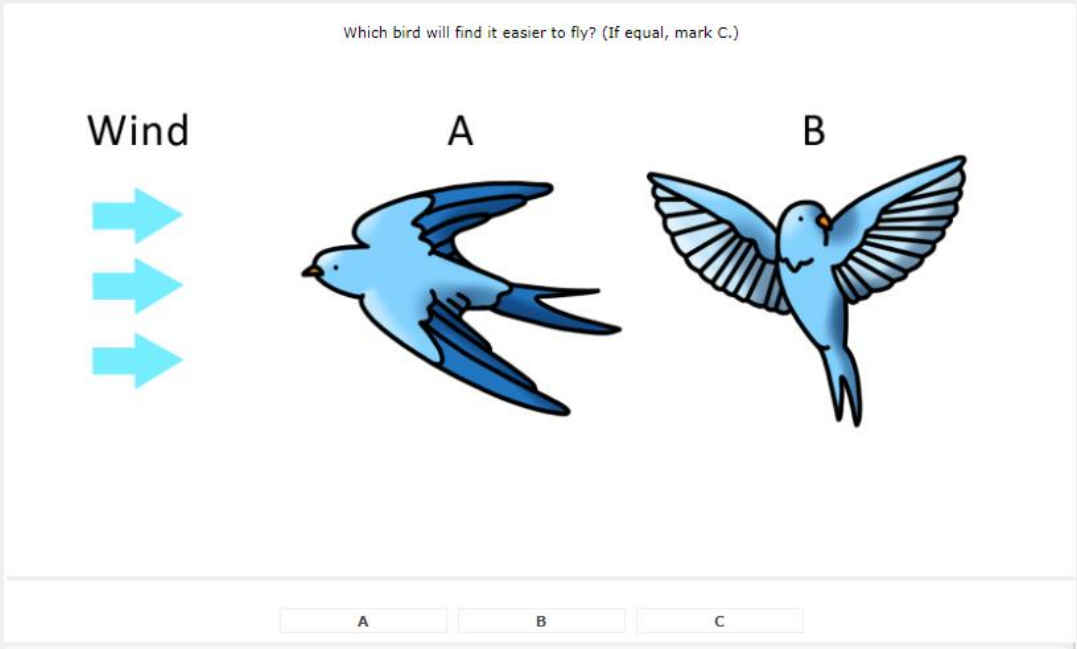
Explanation

The correct answer is **B**.

A seesaw is an example of a first-class lever, where the fulcrum is between the effort and load. For the seesaw to be balanced, the torque applied by the acrobat must increase. Since the weight of the acrobat is constant, the only way to increase the input torque is by increasing the distance from the fulcrum.

Moving in direction B will shift the acrobat's center of gravity farther from the fulcrum, resulting in greater torque, thereby balancing it.

Question 7



Explanation

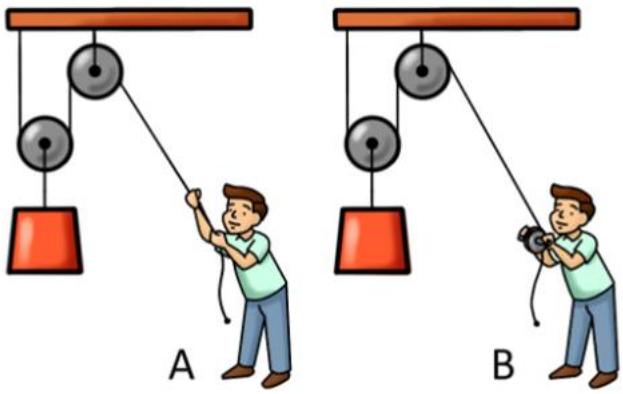
The correct answer is **A.**

The bird in picture A flies with her wings backwards, minimizing the contact surface with the wind and creating less resistance. The bird in picture B flies with her wings in the wind direction, creating much more resistance. The same phenomenon makes a crumpled piece of paper fall faster than an open sheet of paper, which has more surface and therefore more resistance.

Remember the physical principle: The larger the surface of contact with air / wind, the more resistance (force) is created.

Question 8

Who will need to apply more force to lift the weight? (If equal, Mark C.)



A | B | C

Explanation

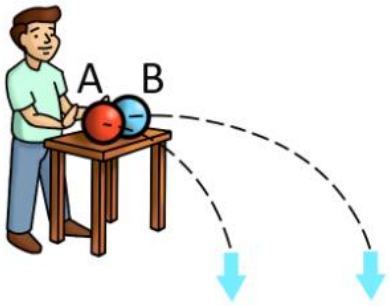
The correct answer is **C.**

The figure in B has a wheel to reel in the rope. However, this wheel does nothing to divide the force and only changes the pulling from a linear motion in A to a circular motion in B.

Remember the physical principle: In a pulley system, the wheels that reduce applied force are **supporting** wheels, not wheels that only change the motion's direction.

Question 9

Which ball will reach the floor first? (If equal, Mark C.)



A | B | C

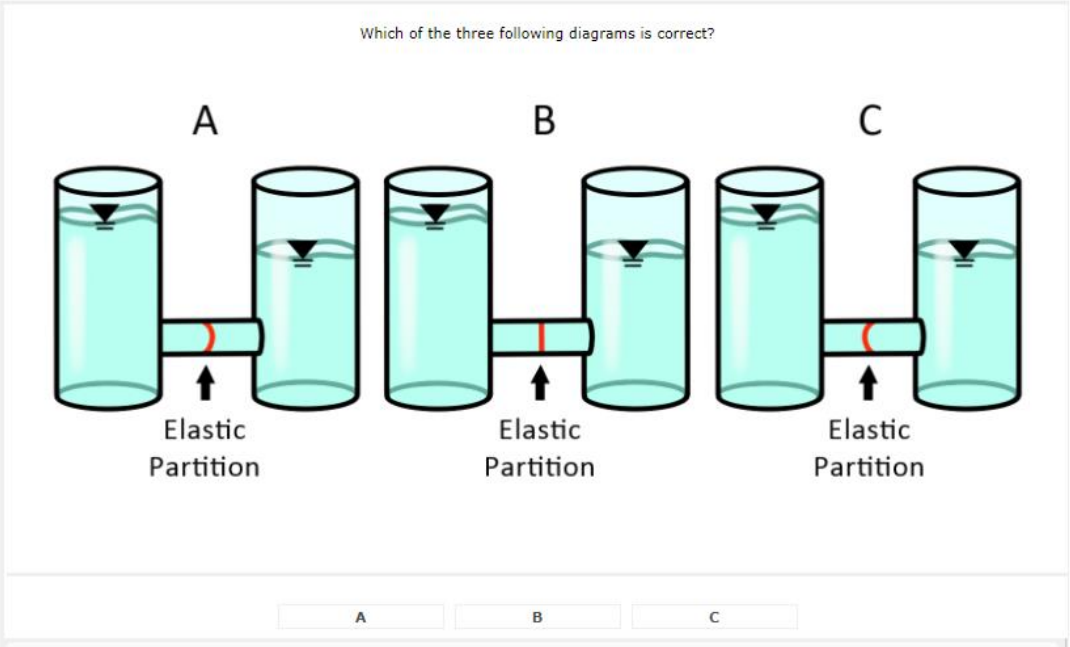
Explanation

The correct answer is **C.**

Gravity is applied onto both balls equally, and the vertical distance they ought to pass is identical. The time needed for both balls to hit the ground is identical, regardless of the horizontal velocity component.
Therefore, it can be deduced that both balls will hit the ground at the same time.

Remember the physical principle: When an object falls under the influence of gravity, its vertical velocity does not depend on the horizontal velocity.

Question 10



Explanation

The correct answer is **A.**

The bending of the partition is caused by pressure difference on both its sides. That pressure difference is determined by the level of water in each container.

The pressure is determined by the height of water on the container – the higher the water – the greater the pressure.

In A, the partition bends to the right, suggesting the pressure is greater on the left side. That is consistent with the higher water level on the left side.

In B, the partition is flat, suggesting there is no pressure difference between its two sides, despite the different water levels. Therefore, this answer is false.
In C, the partition bends to the left, suggesting the pressure is greater on the right side. That contradicts the higher water level on the left side. Therefore, this answer is also false.

Remember the physical principle: Higher water level – higher pressure.

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