**VARDHAMAN COLLEGE OF ENGINEERING**

**(AUTONOMOUS)**

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**DEPARTMENT OF MECHANICAL ENGINEERING**

**Engineering Mechanics**

**Multiple choice Question & Answers**

**1. What is the effect of changing the direction of one of the forces in a couple of moments?**

1. It cancels out the moment completely
2. It changes the magnitude of the moment
3. It doubles the moment
4. It does not affect the moment

**Answer:** D) It does not affect the moment

**Explanation:**

Changing the direction of one of the forces in a few minutes does not affect its magnitude. The moment is defined by the magnitude of the forces and the distance between them, not by their specific orientations.

**2. In the context of a couple of moments, what happens when the distance between the two forces increases?**

1. The magnitude of the moment decreases
2. The magnitude of the moment increases
3. The moment becomes unstable
4. The direction of the moment changes

**Answer:** B) The magnitude of the moment increases

**Explanation:**

The moment produced by a couple is directly proportional to the distance between the two forces. Therefore, if the distance increases, the magnitude of the moment increases as well.

**3. What is it does Varignon's theorem state?**

1. The sum of the moments about each point equals the moment of the resultant force about that place
2. The total of forces operating on a body equals zero
3. The total of forces about a given point equals the moment of the resulting force about that point
4. The total of moments about any point equals zero

**Answer:** A) The sum of the moments about each point equals the moment of the resultant force about that place

**Explanation:**

Varignon's theorem states that the sum of the moments about each point equals the moment of the resultant force about that place.

**4. What is the SI unit of moment of force?**

1. Newton-meter (Nm)
2. Joule (J)
3. Pascal (Pa)
4. Watt (W)

**Answer:** A) Newton-meter (Nm)

**Explanation:**

The moment of force is measured in Newton-meter(Nm).

**5. When is a moment of force considered positive?**

1. Clockwise rotation
2. Counterclockwise rotation
3. Linear motion
4. No rotation involved

**Answer:** B) Counterclockwise rotation

**Explanation:**

In engineering mechanics, a moment of force is considered positive when it causes counterclockwise rotation.

**6. Which aspect of engineering mechanics does Bow's notation primarily address?**

1. Statics
2. Dynamics
3. Thermodynamics
4. Kinematics

**Answer:** A) Statics

**Explanation:**

Bow's notation is most commonly used in statics, which studies the equilibrium and stability of stationary objects under the influence of forces and moments.

**7. What does a vector diagram represent in Engineering Mechanics?**

1. Both the magnitude and direction of forces
2. Only the magnitude of forces
3. Only the direction of forces
4. None of the above

**Answer:** A) Both the magnitude and direction of forces

**Explanation:**

A vector diagram shows the magnitude and direction of forces that operate on a body or structure.

**8. Which condition must be satisfied for the application of the Polygon Law of Forces?**

1. Forces must be parallel
2. Forces must have different magnitudes
3. Forces must be concurrent
4. Forces must be acting at different angles

**Answer:** C) Forces must be concurrent

**Explanation:**

The Polygon Law of Forces applies when the forces are concurrent, meaning they have a common point of intersection

**9. When does equilibrium occur in a system of concurrent forces according to the polygon law of forces?**

1. When the forces are non-concurrent
2. When the forces are equal in magnitude
3. When the forces are parallel
4. When the closing side of the polygon becomes zero

**Answer:** D) When the closing side of the polygon becomes zero

**Explanation:**

When the closing side of the polygon becomes zero

**10. What is the condition for equilibrium using the Triangle Law of Forces?**

1. The total force equals the total velocity
2. The sum of all forces equals the total of all seconds
3. The whole force equals the total acceleration
4. The total of all forces equals zero.

**Answer:** C) The whole force equals the total acceleration

**Explanation:**

According to the Triangle Law of Forces, a system is in equilibrium when the vector sum of all forces acting on it is equal to zero.

**11. According to the parallelogram law of forces, the diagonal created by the two forces represents**

1. The resultant force
2. The maximum force
3. The average force
4. The difference in forces

**Answer:** A) The resultant force

**Explanation:**

The diagonal of the parallelogram indicates the resulting force under the parallelogram law of forces.

Equilibrium MCQs

**12. In Engineering Mechanics, neutral equilibrium occurs when**

1. A body remains at rest despite being in an inclined position
2. A body's equilibrium position is lower than its original position
3. The center of gravity is located at the body's geometric center
4. The body's equilibrium position remains unchanged after a small disturbance

**Answer:** D) The body's equilibrium position remains unchanged after a small disturbance

**Explanation:**

Neutral equilibrium exists when a body, upon disturbance, remains in its new position without experiencing any tendency to move.

**13. In a free-body diagram, what does a vector arrow pointing upwards represent?**

1. Shear force
2. Tension force
3. Compression force
4. Frictional force

**Answer:** B) Tension force

**Explanation:**

A vector arrow pointing upwards in a free-body diagram commonly denotes a tension force, which causes the body to stretch or elongate along its axis.

**14. What does the absence of a force vector in a free-body diagram indicate?**

1. The force is zero
2. The force is negligible
3. The force is internal
4. The force is infinite

**Answer:** A) The force is zero

**Explanation:**

A vector arrow pointing upwards in a free-body diagram commonly denotes a tension force, which causes the body to stretch or expand along its axis.

**15. What is Lami's theorem primarily used for in engineering mechanics?**

1. Analysing forces in a three-force equilibrium
2. Analysing stress distribution in deformable materials
3. Studying fluid dynamics within closed systems
4. Determining the moments of a rigid body

**Answer:** A) Analysing forces in a three-force equilibrium

**Explanation:**

Lami's theorem is specifically designed to analyze the equilibrium of forces acting at a point when the body is in static equilibrium. It is particularly useful when dealing with three concurrent forces.

**16. Which principle states that if a system is in equilibrium, any subset of that system is also in equilibrium?**

1. Pascal's Principle
2. Newton's First Law
3. Archimedes' Principle
4. The Principle of Transmissibility

**Answer:** D) The Principle of Transmissibility

**Explanation:**

This principle is crucial in analyzing systems under equilibrium, stating that the conditions of equilibrium can be transmitted through a system of forces.

**17. When a body is in equilibrium, what can be stated about its acceleration?**

1. The acceleration is always zero
2. The acceleration is always variable
3. The acceleration is always constant
4. The acceleration is unpredictable

**Answer:** A) The acceleration is always zero

**Explanation:**

In equilibrium, all translational and rotational accelerations are zero, indicating that the item is either stationary or traveling at a constant pace.

**18. In a two-dimensional equilibrium challenge, how many equations are needed to solve for the unknowns?**

1. One equation
2. Two equations
3. Three equations
4. Four equations

**Answer:** C) Three equations

**Explanation:**

To solve for the unknowns and identify the equilibrium conditions in a two-dimensional equilibrium problem, we must use three independent equations.

**19. Which analytical method in Engineering Mechanics is primarily used to analyze the equilibrium of forces acting on a rigid body?**

1. Finite Element Analysis
2. Method of Joints
3. Method of Sections
4. Method of Virtual Work

**Answer:** D) Method of Virtual Work

**Explanation:**

This method is utilized to determine the displacements and reactions of a structure by analyzing the virtual work done by external forces.

**20. When can the Converse of the Law of the Triangle of Forces be applied?**

1. Only when the forces are not in equilibrium
2. Only when the forces are in equilibrium
3. Only when the forces are parallel to each other
4. Only when the forces are collinear

**Answer:** B) Only when the forces are in equilibrium

**Explanation:**

The Converse of the Law of the Triangle of Forces applies when the forces operating on a point are in equilibrium, indicating a state of balance.

**21. What type of equilibrium is exhibited by a perfectly balanced seesaw when it remains at rest?**

1. Stable equilibrium
2. Neutral equilibrium
3. Unstable equilibrium
4. Dynamic equilibrium

**Answer:** A) Stable equilibrium

**Explanation:**

When a system is in stable equilibrium, it returns to its beginning position after being pushed slightly. When one end of a perfectly balanced seesaw is slightly raised the system usually returns to its original equilibrium.

Friction MCQs

**22. Which physical quantity does the coefficient of friction represent?**

1. Energy
2. Area
3. Ratio
4. Force

**Answer:** C) Ratio

**Explanation:**

The coefficient of friction is the ratio of the frictional and normal forces that press the surfaces together. It is dimensionless and represents the interaction between the surfaces.

**23. Which of the following elements does not influence frictional force between two surfaces?**

1. Temperature
2. Normal force
3. Surface roughness
4. Relative velocity

**Answer:** D) Relative velocity

**Explanation:**

Surface roughness, normal force, and temperature have each an important effect on the frictional force. However, the relative velocity between the surfaces does not directly affect the magnitude of frictional force.

**24. Which physical phenomenon is primarily responsible for dynamic friction?**

1. Adhesion between surfaces
2. Cohesion within the material
3. Electrostatic forces between surfaces
4. Gravity acting on the surfaces

**Answer:** A) Adhesion between surfaces

**Explanation:**

Dynamic friction occurs mainly by adhesive forces between the contacting surfaces. When two surfaces come into contact, molecules at the interface prefer to attach, producing frictional resistance.

**25. What is the connection between limiting friction and the weight of an item on a horizontal surface?**

1. Exponential relationship
2. Inversely proportional
3. Directly proportional
4. No relationship

**Answer:** C) Directly proportional

**Explanation:**

Friction is directly proportional to an object's weight on a horizontal surface. The limiting friction increases in proportion to the weight.

**26. What happens to the normal reaction force when an object gets suspended in the air?**

1. It is zero
2. It decreases
3. It increases
4. It equals the weight of the object

**Answer:** A) It is zero

**Explanation:**

When an object is suspended in mid-air, it makes no touch with any surface, so no normal reaction force applies to it.

**27. In a horizontal surface, what is the direction of the normal reaction?**

1. Downward
2. Upward
3. Horizontal
4. Vertical

**Answer:** B) Upward

**Explanation:**

The normal reaction on a horizontal surface act in the upward direction, opposing the gravitational force pulling an object downward.

**28. Which scenario would likely result in a higher angle of friction?**

1. Surfaces with low mass in contact
2. Rough surfaces in contact
3. Surfaces with oil applied
4. Smooth surfaces in contact

**Answer:** B) Rough surfaces in contact

**Explanation:**

Rough surfaces provide more interlocking points and therefore tend to have a higher angle of friction compared to smoother surfaces.

**29. How does lubrication affect the angle of friction?**

1. No effect on the angle of friction
2. Decreases the angle of friction
3. Changes the direction of the angle of friction
4. Increases the angle of friction

**Answer:** B) Decreases the angle of friction

**Explanation:**

Lubrication reduced the resistance between the surfaces in contact, permitting them to slide past each other.

**30. What causes the magnitude of kinetic friction as the mass of an object in motion increases?**

1. Kinetic friction decreases proportionally
2. Kinetic friction remains constant
3. Kinetic friction is inversely proportional to the mass
4. Kinetic friction increases proportionally

**Answer:** B) Kinetic friction remains constant

**Explanation:**

Kinetic friction is constant independent of the object's mass

**31. Which of the following are the advantages of friction in engineering mechanics?**

1. It allows for smooth motion without resistance
2. It increases the efficiency of machines
3. It reduces wear and tear on moving parts
4. It decreases the force required to move objects

**Answer:** C) It reduces wear and tear on moving parts

**Explanation:**

Friction reduces wear and tear on moving parts by providing a gripping force that keeps slippage or sliding.

**32. What is the disadvantage of friction in engineering mechanics?**

1. It enhances the stability of objects on inclined planes
2. It generates heat, leading to energy loss
3. It facilitates the gripping of tires on roads
4. It aids in the tightening of screws and bolts

**Answer:** B) It generates heat, leading to energy loss

**Explanation:**

Friction generates heat as a result of the resistance between two surfaces, leading to energy loss which can be undesirable in certain mechanical systems.

Centroid and Moment of Inertia MCQs

**33. Which shape typically has its center of gravity located outside its physical boundaries?**

1. Cube
2. Cylinder
3. Cone
4. Sphere

**Answer:** C) Cone

**Explanation:**

In a cone shape, the center of gravity typically lies outside its physical boundaries due to the distribution of mass towards the wider base.

**34. In a uniform-density object, where does the center of gravity coincide?**

1. Geometric center
2. Top surface
3. Bottom surface
4. Side edge

**Answer:** A) Geometric center

**Explanation:**

The center of gravity of a uniform-density object corresponds with its geometric center, regardless of shape.

**35. Which factor does NOT influence the center of gravity of an irregularly shaped object?**

1. Shape
2. Density
3. Shape
4. Color

**Answer:** D) Color

**Explanation:**

The color of an object does not influence its center of gravity; it is determined by factors such as shape, density, and mass.

**36. What is the Centre of Gravity?**

1. The point where an object is perfectly balanced
2. The point where gravity is strongest
3. An object's center of mass
4. The geometric center of an object

**Answer:** C) An object's center of mass

**Explanation:**

It is the position where all of an object's weight acts. It is the center of mass, and for a uniform-density object, it refers to the geometric center.

**37. How does an object's form affect its center of gravity?**

1. The shape has no effect on the Centre of Gravity
2. Irregular shapes have a lower Centre of Gravity
3. The shape determines the location of the Centre of Gravity
4. All objects have the same Centre of Gravity regardless of shape

**Answer:** C) The shape determines the location of the Centre of Gravity

**Explanation:**

The shape of an object significantly affects the location of its Centre of Gravity. Irregular shapes may have a non-obvious or asymmetrical COG compared to regular shapes.

**38. What does the centroid represent in engineering mechanics?**

1. The point where the sum of moments about any axis is minimum
2. The point of intersection of all internal forces in a body
3. The point of equilibrium of a non-uniformly distributed load
4. The point at which the weight of a body is expected to act

**Answer:** D) The point at which the weight of a body is expected to act

**Explanation:**

The centroid is the geometric center of a body or shape on whose all of the body's weight is expected to act. It is an important topic for studying structural equilibrium and stability.

**39. When comparing two objects with the same mass, which factor influences the moment of inertia more significantly?**

1. Density
2. Shape
3. Volume
4. Mass

**Answer:** B) Shape

**Explanation:**

The moment of inertia is created by the object's shape rather than its mass, density, and volume.

**40. How does raising the height affect the moment of inertia of a hollow rectangular section?**

1. Increases
2. Decreases
3. Depends on other factors
4. Remains constant

**Answer:** A) Increases

**Explanation:**

The moment of inertia corresponds to the height (h) of the hollow rectangular section. As a result, when height increases, so does the moment of inertia.

**41. Which method is most usually used to calculate a composite section's moment of inertia?**

1. Guesswork method
2. Approximation method
3. Integration method
4. Trial and error method

**Answer:** C) Integration method

**Explanation:**

This method is frequently applied to determine the moment of inertia of a composite section. This involves combining the area moments of different pieces along the axis of rotation.

**42. Which property of a composite section determines its resistance to bending and torsion?**

1. Poisson's ratio
2. Moment of inertia
3. Young's modulus
4. Shear modulus

**Answer:** B) Moment of inertia

**Explanation:**

A composite section's moment of inertia determines its resistance to bending and torsion.

**43. What is a triangular section's moment of inertia around its base when the base is the axis of rotation?**

1. (1/12) \* base \* height^3
2. (1/36) \* base \* height^3
3. (1/48) \* base \* height^3
4. (1/24) \* base \* height^3

**Answer:** B) (1/36) \* base \* height^3

**Explanation:**

This formula computes the moment of inertia of a triangular section toward its base when the base is the axis of rotation.

Simple Machines MCQs

**44. What simple machine is used for changing the direction of an applied force?**

1. Inclined plane
2. Wheel and axle
3. Pulley
4. Lever

**Answer:** B) Wheel and axle

**Explanation:**

Pulleys reverse the direction of a force, allowing a person to pull below to raise an object or vice versa.

**45. Which of the following represents a screw as a simple machine?**

1. Crowbar
2. Nut and bolt
3. Scissors
4. Hammer

**Answer:** B) Nut and bolt

**Explanation:**

A nut and bolt pair is a typical screw mechanism.

**46. Which of the following better defines a compound machine?**

1. A machine that is overly complex and inefficient
2. A machine that operates using only one simple machine
3. A machine that operates without the use of any simple machines
4. A machine that combines two or more simple machines to conduct tasks

**Answer:** D) A machine that combines two or more simple machines to conduct tasks

**Explanation:**

A compound machine that combines two or more simple machines to conduct tasks, such as pulleys, inclined planes, levers, and more that performs work more easily.

**47. What is the benefit of using a compound machine rather than a single simple machine?**

1. Compound machines are easier to construct
2. Compound machines require less effort to operate
3. Compound machines can achieve a greater mechanical advantage
4. Compound machines have fewer components, reducing the risk of failure

**Answer:** C) Compound machines can achieve a greater mechanical advantage

**Explanation:**

Compound machines may obtain mechanical benefits by combining the strengths of multiple simple machines, making it simpler to do work that would be tougher with a single simple machine.

**48. What is the primary advantage of using a compound machine?**

1. Decreased mechanical advantage
2. Increased efficiency in performing tasks
3. Reduced complexity in design
4. Lower cost of production

**Answer:** B) Increased efficiency in performing tasks

**Explanation:**

Compound machines offer increased efficiency by combining the advantages of different simple machines working together.

**49. In a compound machine, what role do the various simple machines typically play?**

1. They increase the size of the machine
2. They decrease the efficiency of the machine
3. They work together to amplify force or transmit motion
4. They create unnecessary complexity in the machine's operation

**Answer:** C) They work together to amplify force or transmit motion

**Explanation:**

Simple machines within a compound machine collaborate to amplify force or transmit motion effectively.

**50. What is the primary purpose of a simple gear drive system in engineering mechanics?**

1. To increase torque
2. To store energy
3. To transfer motion
4. To decrease torque

**Answer:** D) To decrease torque

**Explanation:**

Simple gear drives are created for transferring motion from one rotating shaft to a different one frequently modifying the speed, direction, or torque of the driven shaft.

**51. What is the velocity ratio in a simple machine?**

1. The ratio of output velocity to input velocity
2. The ratio of input velocity to output velocity
3. The ratio of force to distance
4. The ratio of distance to time

**Answer:** B) The ratio of input velocity to output velocity

**Explanation:**

In a simple machine, its velocity ratio denotes the ratio of the input to output velocity. It represents how much the output velocity is amplified or reduced about the input velocity.

**52. Which factor does NOT affect the velocity ratio of a simple machine?**

1. Friction in the machine
2. Mechanical advantage
3. Efficiency of the machine
4. Load and effort distances

**Answer:** C) Efficiency of the machine

**Explanation:**

The velocity ratio of a simple machine is determined by its mechanical design and the load and effort distances. Factors like friction can affect the efficiency but not directly the velocity ratio.

**53. In a simple lifting machine, what is the term for the force applied to overcome resistance?**

1. Load
2. Effort
3. Force
4. Resistance

**Answer:** B) Effort

**Explanation:**

In the context of lifting machines, effort is described as the force applied by the human operator or machine to increase or move the load.

**54. Which term refers to the weight to be lifted or the resistive force to be overcome with the help of a machine?**

1. Effort
2. Velocity Ratio (V.R.)
3. Load
4. Mechanical Advantage

**Answer:** C) Load

**Explanation:**

The weight to be lifted or the resistive force to be overcome by a machine.

**55. In a simple machine, a mechanical advantage is calculated as**

1. load/ effort
2. effort/load
3. Input distance / Output distance
4. Output distance / Input distance

**Answer:** A) load/ effort

**Explanation:**

In a simple machine, mechanical advantage can be defined as the ratio of load to be raised to effort applied.

**56. According to the Law of Machines, what is the primary role of mechanical advantage?**

1. To increase the input force required
2. To reduce the efficiency of the machine
3. To amplify the output force compared to the input force
4. To diminish the stability of the machine

**Answer:** C) To amplify the output force compared to the input force

**Explanation:**

Mechanical advantage can be defined as the ratio of load to effort applied. It allows machines to multiply force or distance, enhancing their overall effectiveness.

**57. What is the defining characteristic of a reversible machine?**

1. It produces work without consuming any energy
2. It operates at a constant velocity
3. It can run in either direction without dissipating energy
4. It operates without any mechanical components

**Answer:** C) It can run in either direction without dissipating energy

**Explanation:**

Reversible machines can run in either direction without any energy losses, allowing them to be truly reversible in their operation

**58. Which of the following statements regarding self-locking machines is true?**

1. Self-locking machines require external mechanisms to prevent motion
2. Self-locking machines have threads with high friction coefficients
3. Self-locking machines violate the principle of conservation of energy
4. Self-locking machines are not used in engineering applications

**Answer:** B) Self-locking machines have threads with high friction coefficients

**Explanation:**

Self-locking machines possess threads with high friction coefficients, enabling them to resist external forces and prevent unintended motion.

**59. In a simple wheel and axle system, which component acts as the load arm?**

1. The axle
2. The wheel
3. Both the wheel and the axle
4. None of the above

**Answer:** A) The axle

**Explanation:**

In a simple wheel and axle system, the axle is the load arm where the load or resistance is applied.

**60. In a worm and worm wheel system, which component typically experiences self-locking behavior?**

1. Worm wheel
2. Worm
3. Input shaft
4. Output shaft

**Answer:** B) Worm

**Explanation:**

The worm component typically experiences self-locking behavior due to its helical shape and high friction with the worm wheel, preventing the system from back driving.

Dynamics MCQs

**61. Which of the following describes a kinematics vector quantity?**

1. Time
2. Distance
3. Displacement
4. Speed

**Answer:** C) Displacement

**Explanation:**

In kinematics, displacement is a vector quantity considering it represents both the direction and the amount of an object's movement.

**62. How is the analysis of dynamic systems made simpler by D'Alembert's Principle?**

1. By ignoring inertial effects in motion analysis
2. By converting dynamic problems into static equilibrium problems
3. By introducing additional variables to equations of motion
4. By eliminating the need for Newton's laws of motion

**Answer:** B) By converting dynamic problems into static equilibrium problems

**Explanation:**

By using D'Alembert's Principle, engineers can simplify the analyses by converting dynamic challenges into equivalent static equilibrium problems. To balance out the dynamics and facilitate the use of statics concepts, it introduces inertial forces.

**63. Which term describes the inertial force introduced by D'Alembert's Principle?**

1. Reaction force
2. Centrifugal force
3. Centripetal force
4. Fictitious force

**Answer:** D) Fictitious force

**Explanation:**

The inertial force used in D'Alembert's Principle to balance out dynamic systems is also referred to as a fictional force. It's a mathematical construct that helps convert dynamic problems into equivalent static ones for analysis.

**64. How is accuracy affected by a gun's recoil?**

1. Accuracy is solely determined by bullet caliber
2. Lower recoil enhances accuracy
3. Recoil has no impact on accuracy
4. Higher recoil enhances accuracy

**Answer:** B) Lower recoil enhances accuracy

**Explanation:**

Reduced recoil helps the shooter to keep more control over the tool, which boosts accuracy. Increased recoil can impair accuracy by making the shooter anticipate the shot.

**65. Which of the following is a scalar quantity related to work?**

1. Displacement
2. Power
3. Force
4. Acceleration

**Answer:** B) Power

**Explanation:**

Power is the rate at which work becomes done; work is a scalar quantity.

**66. When a roller coaster reaches the highest point of its track, it has maximum**

1. Kinetic energy
2. Potential energy
3. Frictional energy
4. Thermal energy

**Answer:** B) Potential energy

**Explanation:**

Because it is at the highest position on the ground and can perform the most work as it falls, a roller coaster at the peak of its track has maximized potential energy.

**67. Which of the following best describes impulse in engineering mechanics?**

1. A force acting over a period of time
2. A change in momentum over a period of time
3. A change in velocity over a period of time
4. A displacement over a period of time

**Answer:** B) A change in momentum over a period of time

**Explanation:**

The concept of an impulse is a modification in the momentum of an object over time.

**68. Which of the following claims regarding collisions with elastic materials is accurate?**

1. Total momentum is not conserved
2. Kinetic energy is always converted into potential energy
3. Total kinetic energy is conserved
4. Colliding bodies must be perfectly rigid

**Answer:** C) Total kinetic energy is conserved

**Explanation:**

Momentum and kinetic energy are both ensured in an elastic collision.

**69. What happens to the relative velocity of two elastic bodies after a perfectly elastic collision?**

1. It decreases
2. It increases
3. It remains constant
4. It becomes zero

**Answer:** D) It becomes zero

**Explanation:**

After a perfectly elastic collision, the relative velocity of the two bodies becomes zero. This implies that the bodies move together after the collision.

**70. What is kinetic energy?**

1. Energy stored in a body at rest
2. Energy is associated with the motion of an object
3. Potential energy due to gravitational force
4. Energy stored in a compressed spring

**Answer:** B) Energy is associated with the motion of an object

**Explanation:**

A moving object's kinetic energy is the energy it possesses. Both the object's mass and velocity are factors.