



Second
Semester
2024/2025

Energy and Its
Applications

Unit 2

Class
PREP 1

Subject
science



Question 1

Choose the correct answer from the following options:

1. What factors determine the kinetic energy of any object?
a) Mass and height. b) Mass and velocity. c) Velocity and height. d) Weight and velocity.
2. If an object has a mass of 2 kg and moves at a velocity of 3 m/s, its kinetic energy is:
a) 6 Joules. b) 9 Joules. c) 12 Joules. d) 18 Joules.
3. When the velocity of an object doubles while its mass remains constant, its kinetic energy:
a) Doubles. b) Increases fourfold. c) Remains constant. d) Decreases by half.
4. When an object falls from a height, its potential energy converts into:
a) Thermal energy. b) Kinetic energy. c) Chemical energy. d) Light energy.
5. An object with a mass of 5 kg is placed at a height of 4 m above the ground. Its potential energy is:
a) 20 Joules. b) 50 Joules. c) 100 Joules. d) 200 Joules.
6. When an object reaches the ground after falling, its potential energy is:
a) Equal to its kinetic energy. b) Zero. c) At its maximum value. d) Undefined.
7. When a pendulum is at its highest point, its energy is:
a) Only kinetic energy. b) Only potential energy. c) A combination of kinetic and potential energy. d) Zero.
8. When the pendulum passes through its equilibrium position (lowest point), its energy is:
a) Only kinetic energy. b) Only potential energy. c) A combination of kinetic and potential energy. d) Zero.
9. At the midpoint between the highest point and the equilibrium position of a pendulum:
a) Potential energy = Kinetic energy. b) Potential energy > Kinetic energy. c) Potential energy < Kinetic energy. d) Potential energy = Zero.





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10. The mechanical energy of an object is equal to:

- | | | | |
|---|---|---|-------------------------------|
| a) The sum of its potential and kinetic energy. | b) The difference between its potential and kinetic energy. | c) The product of its potential and kinetic energy. | d) Only its potential energy. |
|---|---|---|-------------------------------|

11. If the mechanical energy of an object is 100 Joules and its potential energy is 60 Joules, its kinetic energy is:

- | | | | |
|----------------|---------------|----------------|---------------|
| a) 160 Joules. | b) 60 Joules. | c) 100 Joules. | d) 40 Joules. |
|----------------|---------------|----------------|---------------|

12. When an object is in free fall, its mechanical energy remains constant because:

- | | | | |
|---|---|--------------------------|----------------------|
| a) Potential energy converts into kinetic energy. | b) Kinetic energy converts into potential energy. | c) There is no friction. | d) All of the above. |
|---|---|--------------------------|----------------------|

13. The kinetic energy of an object depends on its direction of motion.

- | | |
|---------|----------|
| a) True | b) False |
|---------|----------|

14. Kinetic energy and mechanical energy always have the same value.

- | | |
|---------|----------|
| a) True | b) False |
|---------|----------|

15. The unit of velocity in the kinetic energy equation is:

- | | | | |
|-----------------|-------------------------|-----------|----------|
| a) Meter/second | b) Meter/second squared | c) Newton | d) Joule |
|-----------------|-------------------------|-----------|----------|

16. If the kinetic energy of an object is 200 Joules and its mass is 4 kg, its velocity is:

- | | | | |
|----------|-----------|-----------|------------|
| a) 5 m/s | b) 10 m/s | c) 20 m/s | d) 2.5 m/s |
|----------|-----------|-----------|------------|

17. Kinetic energy depends on:

- | | | | |
|-----------------------|---------------------------|----------------------------|----------------------------|
| a) The square of mass | b) The square of velocity | c) The square root of time | d) The square root of mass |
|-----------------------|---------------------------|----------------------------|----------------------------|

18. How do potential energy and kinetic energy change in a moving object?

- | | | | |
|--|--|--|--|
| a) A decrease in kinetic energy is followed by an increase in potential energy | b) A decrease in potential energy is followed by an increase in kinetic energy | c) An increase in potential energy leads to a decrease in kinetic energy | d) No change occurs in potential or kinetic energy |
|--|--|--|--|

19. An object with a kinetic energy of 9 J moves at a velocity of 3 m/s. What is its mass?

- | | | | |
|---------|---------|---------|---------|
| a) 6 kg | b) 5 kg | c) 2 kg | d) 4 kg |
|---------|---------|---------|---------|





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20. When the mass of an object doubles, its kinetic energy also doubles.

- a) True b) False

21. What is the unit of kinetic energy?

- a) Newton b) Joule c) Meter/second d) Watt

22. Kinetic energy is inversely proportional to the velocity of an object.

- a) True b) False

23. When an object is in free fall from a certain height:

- a) Potential energy is entirely converted into kinetic energy b) Kinetic energy is entirely converted into potential energy c) Both potential and kinetic energy increase together d) Mechanical energy remains constant

24. An object has a kinetic energy of 75 J and a mass of 1.5 kg. What is its velocity?

- a) 20 m/s b) 100 m/s c) 5 m/s d) 10 m/s

25. What is the role of the Aswan High Dam in generating electricity?

- a) Converting kinetic energy into potential energy b) Converting the potential energy of water into kinetic energy to generate electricity c) Converting electrical energy into mechanical energy d) Storing potential energy and converting it into thermal energy

26. How does a wrecking ball work?

- a) Converting kinetic energy into potential energy b) Converting stored potential energy into kinetic energy to demolish buildings c) Converting electrical energy into kinetic energy d) It is not used in demolishing buildings

27. Where is potential energy at its maximum?

- a) When the object reaches the ground b) When the object is at its highest point from its original position c) When the object passes through its original position d) At the start of motion

28. Why should lifting heavy objects in a way that harms the spine be avoided?

- a) Because it can increase potential energy b) Because it can increase pressure on leg muscles c) Because the load should be on the back, not the legs d) Because lifting heavy objects reduces kinetic energy





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29. What happens when an object is released from a certain height in free fall?

- | | | | |
|---|---|--|---------------------------|
| a) Potential energy increases, and kinetic energy decreases | b) Kinetic energy increases, and potential energy decreases | c) Both potential and kinetic energy remain constant | d) Neither energy changes |
|---|---|--|---------------------------|

30. What is the mathematical formula for kinetic energy?

- | | | | |
|---|---|----------------------|----------------------------------|
| a) $KE = \frac{1}{2} \times m \times v$ | b) $KE = \frac{1}{2} \times m \times v^2$ | c) $KE = m \times v$ | d) $KE = \frac{1}{2} \times v^2$ |
|---|---|----------------------|----------------------------------|

Question 2

Give three examples of kinetic energy in everyday life

Question 3

Explain the effect of speed on kinetic energy, giving an example

Question 4

What is the relationship between kinetic energy and mechanical energy?

Question 5

How can you reduce the kinetic energy of a moving object?

Question 6

Calculate the kinetic energy of a car with a mass of 1000 kg moving at a speed

Question 7

A body with a mass of 10 kg falls from a height of 10 m. Calculate its speed

Question 8

If an object has 500 J of mechanical energy and 300 J of kinetic energy, what is its height above the ground?





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b) **$KE = \frac{1}{2} \times m \times v^2$**
c) $KE = m \times v$
d) $KE = \frac{1}{2} \times v^2$

Question 2

Give three examples of kinetic energy in everyday life

- o Wind that drives windmills.
- o Flowing rivers that generate electricity.
- o The movement of cars on roads.

Question 3

Explain the effect of speed on kinetic energy, giving an example

Kinetic energy depends on the square of the speed. If the speed doubles, the kinetic energy quadruples.

Example: A car moving at 20 m/s has much more kinetic energy than a car moving at 10 m/s.

Question 4

What is the relationship between kinetic energy and mechanical energy?

Mechanical energy is the sum of kinetic energy and potential energy.

When potential energy is converted into kinetic energy or vice versa, mechanical energy remains constant unless acted upon by external forces.

Question 5

How can you reduce the kinetic energy of a moving object?

- o Reduce the object's speed.
- o Reduce its mass.
- o Use external forces such as friction or braking.





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Question 6 Calculate the kinetic energy of a car with a mass of 1000 kg moving at a speed

Kinetic Energy of a Car

Given:

Mass of the car (m) = 1000 kg

Velocity of the car (v) = 20 m/s

Solution:

The formula for kinetic energy (KE) is:

$$KE = \frac{1}{2} \times m \times v^2$$

Substituting the values:

$$KE = \frac{1}{2} \times 1000 \times (20)^2 = \frac{1}{2} \times 1000 \times 400 = 200,000 \text{ Joules}$$

Final Answer:

The car's kinetic energy = 200,000 Joules.

Question 7 A body with a mass of 10 kg falls from a height of 10 m. Calculate its speed

Velocity of an Object Upon Reaching the Ground

Given:

Mass (m) = 10 kg

Height (h) = 10 m

Gravitational acceleration (g) = 9.8 m/s²

Solution:

Step 1: Calculate the potential energy (PE) at 10 m height:

$$PE = m \times g \times h = 10 \times 9.8 \times 10 = 980 \text{ J}$$

Step 2: When the object reaches the ground, all potential energy converts to kinetic energy (KE):





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$$KE = PE = 980 \text{ J}$$

Step 3: Use the kinetic energy formula:

$$KE = \frac{1}{2} \times m \times v^2$$

$$980 = \frac{1}{2} \times 10 \times v^2$$

$$980 = 5 \times v^2$$

$$v^2 = 980 / 5 = 196$$

$$v = \sqrt{196} = 14 \text{ m/s}$$

Question 8

If an object has 500 J of mechanical energy and 300 J of kinetic energy, what is its height above the ground?

Total mechanical energy (E) = 500 J

Kinetic energy (KE) = 300 J

Acceleration due to gravity (g) = 9.8 m/s²

Step 1: Calculate potential energy (PE):

$$E = KE + PE$$

$$500 = 300 + PE$$

$$PE = 500 - 300 = 200 \text{ J}$$

Step 2: Use the potential energy formula to find height (h):

$$PE = m \times g \times h$$

$$200 = m \times 9.8 \times h$$

To find height, we need the mass (m). If mass is not provided, we express the answer as (m × h):

$$m \times h = 200 / 9.8 \approx 20.41$$

If we assume a mass of 10 kg (example):

$$h = 200 / (10 \times 9.8) \approx 2.04 \text{ meters}$$

If the mass is 10 kg, the height ≈ 2.04 meters.

