1. A constant force of 10 N moves a body in the direction of the force by 2 m. What is the work done?

A) 5 J
B) 10 J
C) 20 J
D) 0 J

✅Answer: C) 20 J
📘 Explanation:
Work done, $W = F \times d \times \cos\theta$
Here, $\theta = 0°$, so $\cos\theta = 1$
$\Rightarrow W = 10 \times 2 \times 1 = 20$ J

2. A porter lifts a 15 kg luggage on his head to a height of 2 m. (Take $g = 10\ m/s^2$). What is the work done?

A) 300 J
B) 150 J
C) 30 J
D) 75 J

✅Answer: A) 300 J
📘 Explanation:
Work done = $m \times g \times h$
$= 15 \times 10 \times 2 = 300$ J

3. When is the work done by a force equal to zero?

A) When displacement is zero
B) When force is zero
C) When force is perpendicular to displacement
D) All of the above

✅Answer: D) All of the above
📘 Explanation:

If displacement = 0, then W = 0

If force = 0, then W = 0

If θ = 90°, then cosθ = 0 ⇒ W = 0
So, all the given conditions lead to zero work.

4. A man pushes a wall but the wall does not move. What is the work done by the man?

A) Positive
B) Negative
C) Zero
D) Infinite

✅Answer: C) Zero
📘 Explanation:
Since displacement = 0,
Work done = Force × Displacement = 0
⇒ No work is done

5. What is the SI unit of power?

A) Joule
B) Watt
C) Newton
D) Kilowatt-hour

✅Answer: B) Watt
📘 Explanation:
Power = Work / Time
Unit = Joule / second = Watt (W)

6. One kilowatt-hour is equal to:

A) 1000 J
B) 3600 J
C) 360000 J
D) 3.6×10^6 J

✅Answer: D) 3.6×10^6 J
📘 Explanation:
1 kWh = 1000 W × 3600 s = 3.6×10^6 J

7. Which of the following is a scalar quantity?

A) Force
B) Acceleration
C) Work
D) Velocity

✅Answer: C) Work
 Explanation:
Work has only magnitude and no direction, so it's a scalar quantity.

8. What is the work done by centripetal force during uniform circular motion?

A) Positive
B) Negative
C) Zero
D) Depends on speed

✅Answer: C) Zero
 Explanation:
Centripetal force is perpendicular to the direction of motion.
So, $W = F \times d \times \cos 90° = 0$
⇒ No work is done

9. A car of mass 1000 kg moves with speed 36 km/h. What is its kinetic energy?

A) 5×10^4 J
B) 1.8×10^5 J
C) 3.6×10^5 J
D) 7.2×10^5 J

✅Answer: A) 5×10^4 J
 Explanation:
Speed = 36 km/h = 10 m/s
K.E. = $\frac{1}{2} \times m \times v^2 = \frac{1}{2} \times 1000 \times 10^2 = 5 \times 10^4$ J

10. Potential energy of a body depends on:

A) Speed
B) Volume
C) Surface Area
D) Position

✅Answer: D) Position
 Explanation:
P.E. = mgh ⇒ depends on height or position above the ground.

11. Which graph correctly represents the work done by a constant force as a function of displacement?

A) A curve increasing with displacement
B) A straight line passing through the origin
C) A parabola
D) A horizontal straight line

✅Answer: B) A straight line passing through the origin
 Explanation:
For constant force: W = F × d
As d increases, W increases linearly ⇒ Straight line through origin.

12. A spring is compressed by 5 cm. If the spring constant is 200 N/m, what is the potential energy stored in it?

A) 0.125 J
B) 0.25 J
C) 1 J
D) 2.5 J

✅Answer: A) 0.125 J
 Explanation:
$U = \frac{1}{2} k x^2 = \frac{1}{2} \times 200 \times (0.05)^2 = 0.125$ J

13. A 2 kg body is dropped from a height of 10 m. What is its kinetic energy just before hitting the ground? (g = 10 m/s²)

A) 100 J

B) 150 J
C) 200 J
D) 300 J

✅Answer: C) 200 J
📘 Explanation:
K.E. just before hitting = Initial P.E. = mgh = 2 × 10 × 10 = 200 J

14. A force acts on a body at an angle of 60° to the horizontal and produces a displacement of 3 m. If the component of force in the direction of displacement is 10 N, what is the work done?

A) 20 J
B) 30 J
C) 40 J
D) 50 J

✅Answer: B) 30 J
📘 Explanation:
W = F × d = 10 × 3 = 30 J (Only the component in direction of displacement matters)

15. A body of mass 4 kg is moving with a speed of 3 m/s. What is its kinetic energy?

A) 6 J
B) 9 J
C) 18 J
D) 36 J

✅Answer: C) 18 J
📘 Explanation:
K.E. = ½ × 4 × 3^2 = 2 × 9 = 18 J

16. Which of the following is not conserved in an inelastic collision?

A) Linear momentum
B) Kinetic energy
C) Total energy
D) Mass

✅Answer: B) Kinetic energy
📘 Explanation:
In inelastic collisions, only momentum and total energy are conserved.
Kinetic energy is not.

17. Power is defined as:

A) Rate of doing work
B) Work done per unit area
C) Force per unit distance
D) Force × displacement

✅Answer: A) Rate of doing work
📘 Explanation:
Power = Work / Time ⇒ It is the rate at which work is done.

18. A machine delivers 1000 J of work in 2 seconds. What is its power output?

A) 1000 W
B) 500 W
C) 2000 W
D) 750 W

✅Answer: B) 500 W
📘 Explanation:
Power = Work / Time = 1000 / 2 = 500 W

19. What is the efficiency of a machine that does 500 J of useful work with 1000 J of energy supplied?

A) 25%
B) 50%
C) 75%
D) 100%

✅Answer: B) 50%
📘 Explanation:
Efficiency = (Useful work / Total input) × 100
= (500 / 1000) × 100 = 50%

20. An object is lifted vertically upward. Which of the following statements is true?

A) Work done by gravity is positive
B) Work done by applied force is negative
C) Work done by gravity is negative
D) Net work done is zero

✅Answer: C) Work done by gravity is negative
🔍 Explanation:
Gravity acts downward, displacement is upward ⇒
Angle = 180°, cosθ = -1 ⇒
W = -mgh ⇒ Negative work by gravity

21. A body of mass 2 kg is moving on a frictionless horizontal surface with a velocity of 5 m/s. A constant force of 2 N acts on it in the direction of motion for 5 seconds. What is the work done by the force?

A) 25 J
B) 50 J
C) 75 J
D) 100 J

✅Answer: C) 75 J
🔍 Explanation:
First, find acceleration:

Initial velocity , time
Displacement:

Work = F × s = 2 × 37.5 = 75 J

22. A block of mass 10 kg is lifted to a height of 2 m in 5 seconds. What is the average power required? (Take g = 10 m/s²)

A) 20 W
B) 40 W
C) 100 W

D) 200 W

✅Answer: B) 40 W
📘 Explanation:
Work = mgh = 10 × 10 × 2 = 200 J
Power = Work / Time = 200 / 5 = 40 W

23. If the velocity of a particle is doubled, what happens to its kinetic energy?

A) Remains the same
B) Doubles
C) Triples
D) Becomes four times

✅Answer: D) Becomes four times
📘 Explanation:
K.E. $\propto v^2$
So if velocity doubles ($v \rightarrow 2v$):
K.E. $\propto (2v)^2 = 4v^2 \Rightarrow$ K.E. becomes 4 times

24. Two objects of equal mass move with speeds v and 2v respectively. What is the ratio of their kinetic energies?

A) 1:2
B) 1:4
C) 2:1
D) 4:1

✅Answer: B) 1:4
📘 Explanation:
K.E. = $\frac{1}{2} mv^2$
Ratio = $(\frac{1}{2} m v^2) : (\frac{1}{2} m (2v)^2) = v^2 : 4v^2 = 1:4$

25. A body of mass 1 kg is thrown vertically upward with a velocity of 20 m/s. What is its potential energy at the highest point? (Take g = 10 m/s^2)

A) 100 J
B) 200 J

C) 400 J
D) 20 J

✅Answer: B) 200 J
 Explanation:
At highest point, K.E. is fully converted to P.E.
Initial K.E. = ½ mv^2 = ½ × 1 × 400 = 200 J
⇒ P.E. at highest point = 200 J

26. A bullet of mass 10 g is moving at 500 m/s. It comes to rest in 0.01 s after hitting a wall. What is the average power delivered to the wall?

A) 2500 W
B) 125000 W
C) 6250 W
D) 25000 W

✅Answer: B) 125000 W
 Explanation:
Mass = 10 g = 0.01 kg
Initial K.E. = ½ × 0.01 × $(500)^2$ = 1250 J
Time = 0.01 s
Power = Work / Time = 1250 / 0.01 = 125000 W

27. A block slides down a smooth inclined plane from height h. The work done by gravity is:

A) Zero
B) mgh
C) –mgh
D) ½ mgh

✅Answer: B) mgh
 Explanation:
Gravity acts along the direction of motion on a smooth incline, so:
Work done by gravity = mgh (positive)

28. A force F = 3x (in newtons) acts on a particle along the x-axis. What is the work done when the particle moves from x = 1 m to x = 2 m?

A) 3 J
B) 4.5 J
C) 6 J
D) 9 J

✅ Answer: B) 4.5 J
📘 Explanation:
Work done = ∫ from x=1 to x=2 of F dx = $\int_1^2 3x\,dx$
= $[3x^2/2]$ from 1 to 2 = (3/2)(4 − 1) = (3/2)(3) = 4.5 J

29. A machine raises a 750 N load to a height of 20 m in 25 seconds. What is the power of the machine?

A) 600 W
B) 500 W
C) 750 W
D) 900 W

✅ Answer: A) 600 W
📘 Explanation:
Work done = Force × Height = 750 × 20 = 15000 J
Time = 25 s
Power = 15000 / 25 = 600 W

30. An engine consumes 100 kJ of heat to do 20 kJ of work. What is its efficiency?

A) 10%
B) 20%
C) 50%
D) 80%

✅ Answer: B) 20%
📘 Explanation:
Efficiency = (Output / Input) × 100 = (20 / 100) × 100 = 20%

31. A body moves along a circular path with constant speed. What is the total work done by the centripetal force over one complete revolution?

A) Positive
B) Zero
C) Negative
D) Depends on radius

✅ Answer: B) Zero
🧠 Explanation:
Centripetal force is always perpendicular to displacement.
Work = F × d × cos(90°) = 0 ⇒ Total work = Zero

32. The area under a force-displacement graph represents:

A) Acceleration
B) Momentum
C) Work done
D) Power

✅ Answer: C) Work done
🧠 Explanation:
Area under F–d graph = ∫ F dx = Work done

33. A 2 kg object falls freely from a height of 20 m. What is its speed just before hitting the ground? (Take g = 10 m/s²)

A) 10 m/s
B) 20 m/s
C) 40 m/s
D) 25 m/s

✅ Answer: B) 20 m/s
🧠 Explanation:
From energy conservation:
mgh = ½ mv² →
20 × 10 = ½ × v² → v² = 400 → v = 20 m/s

34. The potential energy curve of a particle is shown to be minimum at x = 0. What can be said about the force acting on the particle at x = 0?

A) Force is zero
B) Force is maximum
C) Force is minimum
D) Force is negative

✅Answer: A) Force is zero
 Explanation:
Force F = –dU/dx
At minimum potential energy, slope = 0 ⇒ Force is zero

35. Which of the following quantities is not conserved in an inelastic collision?

A) Linear momentum
B) Energy
C) Mass
D) Kinetic energy

✅Answer: D) Kinetic energy
 Explanation:
In inelastic collisions, kinetic energy is lost (converted to heat/sound etc.)
But momentum and mass are conserved.

36. A conservative force field is acting on a particle. Which of the following must be true?

A) Work done depends on path
B) Work done over a closed path is zero
C) Energy is not conserved
D) Force is always constant

✅Answer: B) Work done over a closed path is zero
 Explanation:
For conservative forces, work done in a closed loop is zero, and energy is conserved.

37. A particle is subjected to a conservative force. What happens to its mechanical energy?

A) Always increases
B) Always decreases
C) Remains constant

D) Becomes zero

✅Answer: C) Remains constant
 Explanation:
In a conservative force field (e.g., gravity),
Mechanical Energy = K.E. + P.E. = constant

38. If power delivered to a body is constant, what is the relation between force and velocity?

A) Force is inversely proportional to velocity
B) Force is directly proportional to velocity
C) Force is constant
D) Force varies as square of velocity

✅Answer: A) Force is inversely proportional to velocity
 Explanation:
Power = $F \times v \Rightarrow$
If power is constant: $F \propto 1/v$

39. A block of mass m is moving on a smooth horizontal surface with speed v. It hits a spring with spring constant k and compresses it by a distance x before coming to rest. What is the maximum compression x of the spring?

A) $x = mv / k$
B) $x = mv^2 / 2k$
C) $x = mv^2 / k$
D) $x = \sqrt{(mv^2 / k)}$

✅Correct Answer:

D) $x = \sqrt{(mv^2 / k)}$

Explanation:

Initial kinetic energy of the block = $(1/2)mv^2$

At maximum compression, all this energy is stored in the spring:
Spring potential energy = $(1/2)kx^2$

By conservation of energy: $(1/2)mv^2 = (1/2)kx^2$

Cancel (1/2) from both sides: $mv^2 = kx^2$
So, $x^2 = mv^2 / k$
Therefore, $x = \sqrt{(mv^2 / k)}$

40. A ball dropped from height H reaches ground with speed v. If it is projected upward with the same speed v, what maximum height will it reach?

A) H
B) 2H
C) H/2
D) √H

✅Answer: A) H
🔍 Explanation:
From energy conservation:
If $v = \sqrt{(2gH)}$, then going up with same v, it will reach height H again.
So, maximum height = H

41. A man lifts a box of 20 kg from the ground to his head, 2 meters high, in 2 seconds. His power output is: ($g = 10\ m/s^2$)

A) 100 W
B) 150 W
C) 200 W
D) 250 W

✅Answer: C) 200 W
🔍 Explanation:
Work = mgh = 20 × 10 × 2 = 400 J
Power = Work / Time = 400 / 2 = 200 W

42. A vehicle accelerates from rest to a velocity v in time t by applying constant power. How does its velocity vary with time?

A) $v \propto t$
B) $v \propto \sqrt{t}$

C) $v \propto t^2$
D) $v \propto 1/t$

✅ Answer: B) $v \propto \sqrt{t}$
📘 Explanation:
Power = $F \times v = ma \times v = m(dv/dt) \times v = m/2 \times d(v^2)/dt$
If P is constant, $v^2 \propto t \Rightarrow v \propto \sqrt{t}$

43. A body is acted upon by a variable force $F = 6x^2$. What is the work done in moving it from x = 0 to x = 2 m?

A) 8 J
B) 16 J
C) 24 J
D) 32 J

✅ Answer: B) 16 J
📘 Explanation:
$W = \int_0^2 6x^2\,dx = 6 \times \int_0^2 x^2\,dx = 6 \times [x^3/3]_0^2 = 6 \times (8/3) = 16$ J

44. A boy throws a ball vertically upward. Which of the following is correct about energy at maximum height?

A) K.E. = P.E.
B) K.E. > P.E.
C) K.E. = 0, P.E. maximum
D) P.E. = 0, K.E. maximum

✅ Answer: C) K.E. = 0, P.E. maximum
📘 Explanation:
At maximum height, the body is momentarily at rest ⇒ K.E. = 0
All energy is stored as potential energy

45. In which of the following cases is maximum power delivered by a force?

A) Force is perpendicular to velocity
B) Force is zero
C) Force is opposite to velocity
D) Force is in the direction of velocity

✅Answer: D) Force is in the direction of velocity

🔍 Explanation:

Power = $F \times v \times \cos\theta$

Maximum when $\theta = 0°$, i.e., force and velocity are in same direction