INDIAN SCHOOL AL WADI AL KABIR		
CLASS: IX	**DEPARTMENT: SCIENCE (2025-26)** **SUBJECT: PHYSICS**	**DATE: 18/11/2025**
WORKSHEET NO:4 WITH ANSWERS	**TOPIC: WORK AND ENERGY**	**NOTE: A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

I. OBJECTIVE TYPE QUESTIONS

1. If 1 newton of force displaces a body by 1m, the work done is
   (a) 10J (b) 5J (c)1J (d) Depends on time
2. On tripling the speed of motion of a body, the change in K.E. is
   (a)9 times (b) 8 times (c) 4 times (d) 2 times
3. A mass is moving 5m/s with speed along the x-direction on a smooth surface, when a force of 5 N acts on it along the y-axis. The work done by the force is
   (a) 25J (b)10 J (c) Depends on time (d) zero
4. The unit of kinetic energy is
   (a) joule (b) newton (c) watt (d) joule/s
5. When a body falls freely towards the earth, then its total energy
   (a)increases (b) decreases (c) remains constant (d) first increases and then decreases
6. A battery lights a bulb. The sequence of energy transfer in the process is
   (a)electrical energy to heat and light
   (b) chemical energy to electrical energy and then to heat and light
   (c) chemical energy to heat and light
   (d) chemical energy to light
7. If a force of F newtons moves a body with constant speed v, the power delivered by it is
   (a) F/v (b) Fv (c)F^2v (d)v/F
8. A body of mass 20kg is lifted up through a distance of 5 m in 10 sec. Then the power delivered is
   (a) 20Watt (b) 10 watt (c) 30 watt (d)100 watt
9. Which one of the following is not the unit of energy?
   (a) joule (b) newton metre
   (c) kilowatt (d) none of these
10. When a coil spring is compressed, the work is done on the spring. The potential energy
    (a) increases (b) decreases
    (c) disappears (d) remains unchanged
11. A force of 5N is acting perpendicular on a body producing a displacement of 2 m. Then the work done is
    (a) 10J (b) 5 J (c) 3J (d) zero joule

ASSERTION AND REASONING

DIRECTIONS: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both assertion (A) and reason (R) are true, and reason (R) is the correct explanation of assertion (A).

(b) Both assertion (A) and reason (R) are true, but reason (R) is not the correct explanation of assertion (A).

(c) Assertion (A) is true, but reason (R) is false.

(d) Assertion (A) is false, but reason (R) is true.

(e) Both Assertion and Reason are false.

12. **Assertion**: The kinetic energy of a body is quadrupled when its velocity is doubled.

Reason: Kinetic energy is proportional to the square of velocity.

13. **Assertion:** No work is done when a woman carrying a load on her head walks on a level road with a uniform velocity.

Reason: No work is done if the force is perpendicular to the direction of displacement

14. **Assertion:** Work done by friction on a body sliding down an inclined plane is positive.

Reason: Work done is greater than zero if the angle between force and displacement is acute or both are in the same direction.

II.SHORT ANSWER TWO MARKS QUESTIONS

15. Define 1Watt
16. Identify the energy possessed by
    i. Rolling Stone
    ii. Stretched rubber band
17. A coolie is walking on a railway platform with a load of 30kg on his head. How much work is done by coolie?
18. A 2m high person is holding a 25 kg trunk on his head and standing at a roadway bus terminus. How much work is done by the person?
19. A bag of wheat is dropped from a height h. What energy conversion takes place as it reaches the ground?
20. What type of energy is possessed by a compressed spring?
21. Two balls of mass m each are raised to heights h and 2h, respectively. What will be the ratio of their potential energies?
22. At what speed will a body of mass 1kg have a kinetic energy of 1J?
23. A horse of mass 250kg and a dog of mass 30 kg are running at the same speed. Which of the two possesses more kinetic energy? How?

III. SHORT ANSWER THREE MARKS QUESTIONS

24. A man of mass 60kg runs up a flight of 30 steps in 40s. If each step is 20cm high, calculate his power.

25. Give an example of

(a) Force acting in the direction of displacement

(b) Force acting against the direction of displacement

(c) Force acting perpendicular to the direction of displacement

26. What will be the kinetic energy of an object if its mass is doubled and the velocity is reduced to half

IV. LONG ANSWER FIVE MARKS QUESTIONS

27. (a) Define Kinetic energy and derive the expression for Kinetic energy

(b) The masses of the scooter and bike are in the ratio of 2:3, but both are moving with the same speed of 108km/h. Compute the ratio of their kinetic energy

28.(a) Define potential energy. Derive an equation for gravitational potential energy

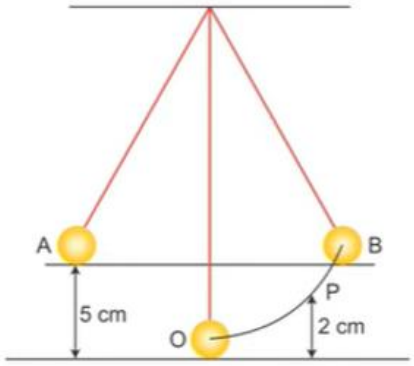
(b) A 5kg ball is thrown upwards with a speed of 10m/s (g=10m/s).

(i) Calculate the maximum height attained by it

(ii) Find the potential energy when it reaches the highest point

V. CASE STUDY BASED QUESTIONS

29. The following table shows that a simple pendulum consisting of a bob of mass 100 g. Initially, the bob of the pendulum is at rest at 'O'. It is then displaced to one side at A. The height of 'A' above 'O' is 5cm. (Take g=10m/s^2)



i. What is the value of the potential energy of Bob at 'A', and where does it come from?

(a) 0.05J (b) 0.5J (c) 0.0005J (d)50J

ii. What is the value of the total energy of the bob at position A?

(a) 1J (b) 0.05J (c) 5J (d) 50J

iii. What is the value of the kinetic energy of the bob at the mean position 'O'?

(a) 10J (b)5 J (c) 0.05J (d) 50J

iv. What is the value of kinetic energy and potential energy of the bob at the position 'P', whose height above 'P' whose height above 'O' is 2cm?

(a) P.E=0.2J and K.E=0.3J (b) P.E=2.0J and K.E =3.0J

(c)P.E = 0.002J and K.E=0.003J (d) P.E =0.02 J and K.E =0.03J

v. What is kinetic energy?

(a) Energy acquired due to motion

(b) Energy acquired due to rest

(c) Sum of potential and mechanical energy

(d) It is the energy stored inside a body

PREVIOUS YEAR QUESTIONS

30. A force acting on a 10 kg mass changes its velocity from 54km/h to 90k/h. Calculate the work done by the force CBSE 2016

31. What is the work to be done to increase the velocity of a car from 30 km/h to 60 km/h. If the mass of the car is 1500 kg.

ANSWERS

1.	(c)1J
2.	(a)9 times (K.E αv^2) v--->3v, K.E--->9K.E
3.	(d) zero (as force and displacement are perpendicular)
4.	(a) joule
5.	(c) remains constant
6.	(b) chemical energy to electrical energy and then to heat and light
7.	(b) Fv
8.	[d]100 watt
9.	[c] kilowatt
10.	[a] increases
11.	[d] zero joule
12.	(a) Both assertion (A) and reason (R) are true, and reason (R) is the correct explanation of assertion (A).
13.	(a) Both assertion (A) and reason (R) are true, and reason (R) is the correct explanation of assertion (A).
14.	(d) Assertion (A) is false but reason (R) is true.
15.	1 Watt is the power when 1 joule of work is done in 1 second
16.	i. kinetic energy ii. potential energy
17.	Zero because the angle between the force and the displacement is 90^0
18.	Zero, because there is no displacement
19.	The energy of the wheat bag changes from potential energy to kinetic energy and sound energy
20.	Potential energy
21.	Both bodies have the same mass. Potential energy of bodies: $\therefore$ (PE)1=mgh and (PE)2=mg(2h) $\Rightarrow$ (PE)1:(PE)2=1:2
22.	We know that K.E = 1/2 m v^2 Replace K.E i.e kinetic energy by 1 J and mass (m) by 1 kg (given in the question) 1 = 1/2× 1 × v^2 2 = v^2 (take 2 to the other side) v = $\sqrt{2}$ m/s v = 1.414 m/s
23.	Kinetic energy is directly proportional to mass. Since mass of a horse (250kg) is greater than that of a dog (30kg), the horse has greater kinetic energy for the same speed.

24.	Given m=60kg,t=40s, h=30×20cm =(30×20/100)m Power= W/t=mgh /t=(60×10×30×0.2)/40 = 90W
25.	(a) Horizontal force applied on a table to displace it (b) Frictional force acting on a box which is being shifted (c) Gravitational pull of Earth on the Moon
26.	M = 2m and v = v/2 K.E = 1/2 m v^2 New Kinetic energy = ½ of the original kinetic energy
27.	(a) The energy possessed by a body by virtue of its motion is called kinetic energy. Equation for kinetic energy Consider an object of mass m moving with a uniform velocity, u. It is displaced through a distance, s, when a constant force F acts on it in the direction of its displacement Then work done, W = F × s ……(1) Velocity changes from u to v. Let a be the acceleration produced. $v^2-u^2 = 2as$ ……..(2) $s = \frac{v^2 - u^2}{2a}$ …….. (3) We know, F = ma ……(4) Substituting equations (4) and (3) in (1) Work done by the force, F, is $W = ma \times \frac{(v^2 - u^2)}{2a}$ $W = \frac{1}{2} m(v^2 - u^2)$ ……(5) Work done = Change in Kinetic Energy If the object is starting from its stationary position, that is, u=0, then $W = \frac{1}{2} m v^2$ ……(6) Thus, the kinetic energy possessed by an object of mass, m and moving with a uniform velocity, v, is **$E_k = \frac{1}{2} m v^2$**) Kinetic energy α Mass of body Let mass of scooter=m_s=2m Mass of bike =m_b=3m Kinetic energy of scooter/Kinetic energy of bike= m_s/m_b= 2m/3m=2:3
28.	The potential energy of an object is the energy possessed by the object due to its position or shape. Equation for Potential Energy Consider an object of mass *m* is raised to a height *h* from the ground, the force required to raise the object is equal to the weight of the object. *Force,F = mg* *Work done = Force × displacement*

	or $W = mg \times h = mgh$ Potential energy gained by the object $E_p = mgh$ Given, mass of the ball, $m = 5\ kg$ Speed of the ball, $v = 10\ m/s$ (a) Initial kinetic energy of the ball, $E_k = \frac{1}{2}mv^2 = \frac{1}{2}(5)(10)^2 = 250\ J$ When the ball reaches the highest point, its kinetic energy becomes zero and the entire kinetic energy is converted into its potential energy. $\therefore E_p = 250\ J$ (b) If h is the maximum height attained by the ball, $E_p = mgh$ or $mgh = 250\ J$ or $h = \frac{250}{mg} = \frac{250}{(5)(10)} = 5\ m$
29.	i. The work done in raising the bob through a height of 5 cm (against the gravitational attraction) gets stored in the bob in the form of its potential energy. PE=mgh =0.1×10×0.05=0.05J ii. At position A, PE = 0.05 J, KE = 0 So, Total energy = 0.05 J iii. At mean position, potential energy is zero, hence KE at O = 0.05 J iv. PE at P = mgh $= 0.1 \times 10 \times 2 \times 10^{-2}$ = 0.02 J K.E = Total energy – PE = 0.05 – 0.02 = 0.03 J v. (a) Energy acquired due to motion
30.	m=10kg, u=54km/h, v=90km/h u=15m/s, v=25m/s Work done on an object =change in kinetic energy Work done=1/2m(v^2-u^2) W=5(25^2–15^2) W=5(625–225) =5×400=2000 Work done W=2kJ
31	Solution: Mass of car, m = 1500 kg. Initial velocity, u = 30 km/h = 8.33 m/s. Final velocity, v = 60 km/h = 16.67 m/s. Work done = change in K.E = 750 x 208.5 =≈ 156375 J

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