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# CHAPTER 4

# WORK AND ENERGY

## TYPE A:- MULTIPLE CHOICE QUESTIONS

*Each question has FOUR possible answers. Select the correct answer and encircle it.*

**Q.1. Work is done on body when it is moved or stopped through a certain distance by the action of an applied**

(a) Power
(b) Energy
(c) Force
(d) Momentum

| a | b | c | d |
|---|---|---|---|

**Q.2. When a body is moved or stopped through a certain displacement `$\vec{d}$' by a force $\vec{F}$, then the work done is** *(Sargodha 1992 s)*

(a) $\vec{F} \cdot \vec{d}$
(b) $\vec{F} + \vec{d}$
(c) $f \times d$
(d) $\vec{F} \times d/2$

| a | b | c | D |
|---|---|---|---|

**Q.3. When a force $\vec{F}$ acts on a body and displaces it through a distance `$\vec{d}$' in the direction of force, then the magnitude of work done is given by** *(Bahawalpur 2002)*

(a) F/d
(b) Fd
(c) F + d
(d) d/F

| a | b | c | D |
|---|---|---|---|

**Q.4. The work done will be zero when the angle between force $\vec{F}$ and the displacement d is** *(Gujranwala 2001 s)*

(a) 45°
(b) 60°
(c) 90°
(d) 150°

| a | b | c | d |
|---|---|---|---|

**Q.5. If a force $\vec{F}$ makes an angle `θ' with the displacement $\vec{d}$ along the direction of motion, then work done is given by**



(a) Fd sinθ
(b) Fd tanθ
(c) Fd
(d) Fd cosθ

| a | b | c | d |
|---|---|---|---|

**Q.6. The work done will be maximum if the angle between the force $\vec{F}$ and displacement $\vec{d}$ is** *(Rawalpindi 1992, 2001)*

(a) 45°
(b) 90°
(c) 180°
(d) 0°

| a | b | c | D |
|---|---|---|---|

**Q.7. The work done will be negative if the angle between force $\vec{F}$ and displacement $\vec{d}$ is** *(Faisalabad 1993, 1996, Multan 1992)*

(a) 30°
(b) 60°
(c) 90°
(d) 180°

| a | b | c | d |
|---|---|---|---|

**Q.8. Work is a**

(a) Vector quantity
(b) Scalar quantity
(c) Fundamental quantity
(d) Conservative quantity

| a | b | c | d |
|---|---|---|---|

**Q.9. The SI unit of work is** *(Faisalabad 1993 supp, Lahore 1992)*

(a) Joule
(b) Newton
(c) Erg
(d) Dyne

| a | b | c | d |
|---|---|---|---|

**Q.10. The dimensions of work are**
*(Gujranwala 2001, D. G. Khan 1992, Multan 2004, 2002 D. G. Khan 2002, Bahawalpur 1992, Sargodha 2001s, Lahore 2000)*

(a) $MLT^{-1}$
(b) $MLT^{-2}$
(c) $ML^2T^{-2}$
(d) MLT

| a | b | c | d |
|---|---|---|---|

**Hint:-**

1 joule = 1 Newton × 1 metre
= ma×L = $MLT^{-2}$ L = $ML^2T^{-2}$

**Q.11. If force and displacement are in the opposite direction, the work done is taken as** *(Bahawalpur 1991, A. K. 2003)*

(a) Positive work

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(b) Negative work
(c) Finite work
(d) Infinite work

| a | b | c | d |
|---|---|---|---|

**Q.12. If a force of one Newton acts on a body and displaces it through a distance of one meter in the direction of force, then the work done will be** *(Sargodha 1992, D. G. Khan 1999)*

(a) Dyne
(b) Erg
(c) Watt
(d) Joule

| a | b | c | d |
|---|---|---|---|

**Q.13. The space or region (حلقہ) around the earth with in which a body can experience (محسوس کرنا) a force of attraction due to earth is called**

(a) Electromagnetic field
(b) Electric field
(c) Magnetic field
(d) Gravitational field

| a | b | c | d |
|---|---|---|---|

**Q.14. The total work done in moving a body along a closed path in a gravitational field is always equal to** *(Multan 2004)*

(a) Maximum
(b) Zero
(c) Unity
(d) One joule

| a | b | C | d |
|---|---|---|---|

**Q.15. A field in which the work done in a moving a body along closed path is zero is called** *(Multan 1993 supp, Rawalpindi 2000 s)*

(a) Electric field
(b) Nuclear field
(c) Electromagnetic field
(d) Conservative field

| a | b | C | d |
|---|---|---|---|

**Q.16. The work done in moving a body from one place to another in a gravitational field is independent ( ازلو ) of** *(Sargodha 2003)*

(a) Force of gravity
(b) The applied force
(c) The path followed by the body
(d) The power consumed

| a | b | C | d |
|---|---|---|---|

**Q.17. When the force is parallel to the direction of motion of the body, then work done on the body is** *(Lahore 1992 supp.)*

(a) Zero
(b) Minimum
(c) Infinity
(d) Maximum

| a | b | c | d |
|---|---|---|---|



**Q.18. If the direction of motion of force is perpendicular to the direction of the motion of the body, then work done will be** *(D.G. Khan 1992)*

(a) Minimum
(b) Maximum
(c) Zero
(d) Infinity

| a | b | c | d |
|---|---|---|---|

**Q.19. Which of the following types of force can do no work on the particle on which it acts?** *(Lahore 1991, D. G. Khan 1992)*

(a) Frictional forces
(b) Gravitational force
(c) Elastic force
(d) Centripetal force

| a | b | c | d |
|---|---|---|---|

**Hint:** As the centripetal force is perpendicular to the direction of motion of the particle at each point that is $F.d=Fd\cos\theta$

**Q.20. If a body of weight `W' is lifted through a height `h' then the work done will be** *(Bahawalpur 1991)*

(a) -wg
(b) Wh
(c) Wh $\sin\theta$
(d) Zero

| a | b | c | d |
|---|---|---|---|

**Q.21. When a body is lifted through a height `h', the work done on the body appears in the form of**

(a) Kinetic energy
(b) Potential energy
(c) Force
(d) Work

| a | b | c | d |
|---|---|---|---|

**Q.22. If body of mass of 2 kg is raised vertically through 2m, then the work done will be** *(Sargodha 1993)*

(a) 38.2 J
(b) 392.1 J
(c) 39.2J
(d) 40J

| a | b | c | d |
|---|---|---|---|

**Q.23. An elevator weighing $3.5\times10^6$ N is raised to a height of 1000m in the absence of friction the work done is** *(Bahawalpur 2005)*

(a) $3.5\times10^3$J
(b) $3.5\times10^4$J
(c) $3.5\times10^6$J
(d) $3.5\times10^9$J

| a | b | c | d |
|---|---|---|---|

**Q.24. The rate of doing work is known as** *(Sargodha 2002)*

(a) Impulse
(b) Energy

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(c) Momentum
(d) Power

| a | b | c | d |
|---|---|---|---|

**Q.25. Power is also defined as the dot product of**
*(Punjab boards 1994, Gujranwala 2002, Multan 2003, 2004)*
(a) Force and mass
(b) Force and displacement
(c) Force and velocity
(d) Force and time

| a | b | c | d |
|---|---|---|---|

**Q.26. Power is a** *(D. G. Khan 1999)*
(a) Scalar quantity
(b) Vector quantity
(c) Neither vector nor scalar quantity
(d) Fundamental quantity

| a | b | c | d |
|---|---|---|---|

**Q.27. The SI unit of power is**
*(Lahore 1992, 1993, 2005, 1993 s, Rawalpindi 1999, 2002)*
(a) Joule
(b) Watt
(c) Newton
(d) Dyne

| a | b | c | d |
|---|---|---|---|

**Q.28. The dimensions of power are**
*(Gujranwala 1991, Rawalpindi 1993, Lhr 1993 s, Faisalabad 2002, Multan 2003)*
(a) $ML^{-1}T^{-2}$
(b) $ML^{-2}T^{-2}$
(c) $ML^{2}T^{-3}$
(d) $ML^{-2}T^{-1}$

| a | b | c | d |
|---|---|---|---|

**Hint:-**
Power = work/time = $W/t = Fd/t = MLT^{-2} \times L/T = ML^{2}T^{3}$

**Q.29. The ratio of work done to the smallest interval of time is called**
*(D. G. Khan 2005)*
(a) Instantaneous force
(b) Instantaneous velocity
(c) Instantaneous acceleration
(d) Instantaneous power

| a | b | c | d |
|---|---|---|---|

**Q.30. The average power and instantaneous power become equal if work is done at** *(Rawalpindi 1992)*
(a) Any rate
(b) At variable rate
(c) At uniform rate
(d) At high rate

| a | b | c | d |
|---|---|---|---|

**Q.31. The power is one kilo-watt if work is done at the rate of**
*(Sargodha 2000s, Lahore 2003, Sargodha 2005)*
(a) $1000Js^{-1}$



(b) $100Js^{-1}$
(c) $1000J\ min^{-1}$
(d) $1000\ erg\ s^{-1}$

| a | b | c | d |
|---|---|---|---|

**Q.32. If an agent consumes a power of 1 kilo-watt in one hour, the work done is**
(a) one watt-hour
(b) one watt
(c) one kilo-watt hour
(d) one mega watt hour

| a | b | c | d |
|---|---|---|---|

**Q.33. In British Engineering system, the unit of power is**
*(Bahawalpur 2001)*
(a) Joule
(b) Watt
(c) Kilo watt
(d) Horse power

| a | b | c | d |
|---|---|---|---|

**Q.34. The relation between horse power and watt is**
*(Gujranwala 1992, D. G. Khan 2000, Lahore 1996, Multan 2003)*
(a) 1 hp = 546 watts
(b) 1 hp = 746 watts
(c) 1 hp = 1000 watts
(d) 1 hp = 946 watts

| a | b | c | d |
|---|---|---|---|

**Q.35. The ability ( ) or capacity to do work is called**
*(Lahore 2000, Faisalabad 2004)*
(a) Force
(b) Power
(c) Kinetic energy
(d) Energy

| a | b | c | d |
|---|---|---|---|

**Q.36. The energy possessed by a body due to its motion is called**
(a) Potential energy
(b) Energy
(c) Kinetic energy
(d) Nuclear energy

| a | b | c | d |
|---|---|---|---|

**Q.37. Kinetic energy of a body depends upon**
(a) Weight of the body
(b) Density of the body
(c) Velocity of the body
(d) Acceleration of the body

| a | b | c | d |
|---|---|---|---|

**Q.38. Kinetic energy of a body of mass m moving with a velocity is given by** *(Sargodha 2002)*
(a) $\frac{1}{2}mv$

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(b) $\frac{1}{2} mv^2$

(c) mv

(d) $\frac{1}{2} m^2v$

| a | b | c | d |
|---|---|---|---|

**Q.39. The SI unit of energy is** *(Faisalabad 1993s, 1995, 97)*

(a) erg

(b) watt

(c) J/s

(d) Joule

| a | b | c | d |
|---|---|---|---|

**Q.40. Kinetic energy is a** *(Lahore 2005s)*

(a) Scalar quantity

(b) Vector quantity

(c) Neither scalar nor vector

(d) Fundamental quantity

| a | b | c | d |
|---|---|---|---|

**Q.41. The units of energy (including K. E. and P.E.) are the same as that of** *(A. Kashmir 2002, 2004)*

(a) Force

(b) Power

(c) Velocity

(d) Work

| a | b | c | d |
|---|---|---|---|

**Q.42. The energy possessed by a body due to change its position is called** *(Bahawalpur 1993, 2005)*

(a) Kinetic energy

(b) Elastic potential energy

(c) Kinetic energy

(d) Potential energy

| a | b | c | d |
|---|---|---|---|

**Q.43. Energy stored in the spring of watch is called** *(Gujranwala 2002, Lahore 2006)*

(a) Potential energy

(b) Kinetic energy

(c) Elastic potential energy

(d) Electric energy

| a | b | c | d |
|---|---|---|---|

**Q.44. The dimensions of kinetic energy are** *(Faisalabad 1993)*

(a) $ML^2 T^{-2}$

(b) $ML^{-2} T^2$

(c) $ML^{-1} T^{-2}$

(d) $ML^{-1} T^{-1}$

**Hint:-**

K. E. $= mv^2/2 = M(L/T)^2 = ML^2 T^{-2}$

| a | b | c | d |
|---|---|---|---|



**Q.45. The dimensions of potential energy are**

(a) $ML^{-1} T^{-1}$

(b) $ML^{-2} T^{-2}$

(c) $ML^2 T^{-2}$

(d) $ML^2 T^{-1}$

**Hint:-**

P.E $= w \times h = F \times h = MLT^{-2} \times L = ML^2 T^{-2}$

| a | b | c | d |
|---|---|---|---|

**Q.46. One erg is equal to**

(a) $10^5$ Joules

(b) $10^7$ Joules

(c) $10^{-5}$ Joules

(d) $10^{-7}$ Joules

**Hint:-** $1 J = 10^7$ erg

| a | b | c | d |
|---|---|---|---|

**Q.47. What is the kinetic energy of a 50 gm bullet moving at a speed of 500 $ms^{-1}$?** *(Gujranwala 2001 s, Sargodha 2001)*

(a) 2500 J

(b) 1500 J

(c) 1250 J

(d) none of the above

| a | b | c | d |
|---|---|---|---|

**Q.48. The potential energy of a body of mass `m' raised to a height `h' is**

(a) mh/2

(b) mh

(c) mgh

(d) mg

| a | b | c | d |
|---|---|---|---|

**Q.49. When an elastic spring is compressed, work is done against the elastic forces such a potential energy is called**

(a) Gravitational potential energy

(b) Absolute potential energy

(c) Electric absolute potential energy

(d) Elastic potential energy

| a | b | c | d |
|---|---|---|---|

**Q.50. The work needed to lift a body of mass `m' from the surface of earth to an infinite distance is**

(a) Kinetic energy of the body

(b) Absolute potential energy of the body

(c) Potential energy of body

(d) Elastic potential energy

| a | b | c | d |
|---|---|---|---|

**Q.51. Kilowatt hour is the unit of** *(Punjab boards 1994, A. Kashmir 2002, Rawalpindi 1997, Multan 2001)*

(a) Power

(b) Work

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(c) Force
(d) Momentum

| A | b | c | d |
|---|---|---|---|

**Q.52. If velocity is doubled then** *(Faisalabad 1993 s, Multan 2000s)*

(a) Momentum increases 4 times an K. E. increase 2 time
(b) Momentum and K. E. remain same
(c) Momentum increases 2 times and K. E. remains constant
(d) Momentum increases 2 times and K. E. increase 4 times

| a | b | c | d |
|---|---|---|---|

**Q.53. Absolute potential energy of the body at the earth's surface is equal to** *(Faisalabad 1993 supp.)*

(a) $-GM/R$
(b) $-GMm/R$
(c) $-GmM/R^2$
(d) $-Gmm/2R^2$

| a | b | c | d |
|---|---|---|---|

**Q.54. Absolute potential energy of a body of mass `m' at a distance `r' from the centre of earth**

(a) $-GM/r^2$
(b) $-GmM/r$
(c) $-Gm/r^2$
(d) $-Gm/r$

| a | b | c | d |
|---|---|---|---|

**Q.55. When the speed of a moving body is doubled**
*(Faisalabad 1993, Rwp. 2000, Gjw. 2001, Multan 2005, Gjw. 2001, Multan 2005)*

(a) Its K. E. is doubled
(b) Its acceleration is doubled
(c) Its P. E. is doubled
(d) Its momentum is doubled

| a | b | c | d |
|---|---|---|---|

**Q.56. A body of mass 2kg moving with a velocity of $4ms^{-1}$ has K. E. equal to** *(A. Kashmir 2004)*

(a) 4 J
(b) 12J
(c) 16J
(d) 8J

| a | b | c | d |
|---|---|---|---|

**Q.57. A force of 8N acting on a body of mass 5kg displaces it through 2m along its direction. The work done is** *(Gujranwala 1993)*

(a) Zero
(b) 8J
(c) 16J
(d) 24J

| a | b | c | d |
|---|---|---|---|

**Q.58. One mega watt-hour is equal to**

(a) $36\times10^6$J
(b) $36\times10^{12}$J
(c) $36\times10^9$J
(d) $36\times10^8$J



| a | b | c | d |
|---|---|---|---|

**Hint:-**

Mega watt-hour = $10^6\times J/S\times3600s = 10^6\times36\times10^2J$
$= 36\times 10^8J$

**Q.59. A body of mass 3kg lies on the surface of the table 2m high. It is moved on the surface by 4m. The change in P. E. will be** *(Gujranwala 1993)*

(a) zero
(b) 9.8J
(c) 19.6J
(d) 329J

| a | b | c | d |
|---|---|---|---|

**Hint:-**

h is zero so change in P.E. is zero ($\therefore$P.E=mgh=0)

**Q.60. Work has the dimensions as that of** *(Gujranwala 1991)*

(a) Torque
(b) Angular momentum
(c) Linear momentum
(d) Power

| a | b | c | d |
|---|---|---|---|

Hint:-

Torque = $F\times r = MLT^{-2}\times L = ML^2T^{-2}$

**Q.61. If an athlete uses 500 Joules of energy to lift a load in 2 seconds, his muscular power *is*** *(Gujranwala 1991)*

(a) 125 watt
(b) 250 watt
(c) 500 watt
(d) 1000 watt

| a | b | c | d |
|---|---|---|---|

**Q.62. The consumption of energy by a 60 watt bulb in 2 sec is** *(Rawalpindi 1993)*

(a) 120J
(b) 60J
(c) 30J
(d) .02J

| a | b | c | d |
|---|---|---|---|

**Hint:-**

Power = Energy/time or energy = $P\times t = 60\times2 = 120J$

**Q.63. A force of 20N is acting on a body at angle of 60° to horizontal axis. Work done in displacing body through 2m horizontally would be** *(Rawalpindi 1991, Sargodha 1995)*

(a) 40J
(b) 34.64J

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(c) 20J
(d) 10J

| a | b | c | d |
|---|---|---|---|

**Hint:-**

$W = Fd\cos 60° = 20 \times 2 \times ½ = 20J$

**Q.64. Which of the following is correct**
*(Multan 1992, D. G. Khan 1992)*

(a) watt and watt-hour represent the same quantity
(b) watt represents energy and watt-hour represents force
(c) watt represents force and watt-hour represents energy
(d) watt represents power and watt-hour represents energy

| a | b | c | d |
|---|---|---|---|

**Q.65. Scalar product of force and displacement is called**
*(Bahawalpur 1992, BWP. 2003)*

(a) Power
(b) Watt
(c) Work
(d) Momentum

| a | b | c | d |
|---|---|---|---|

**Q.66. The work done by the machine is called**
*(Bahawalpur 1993)*

(a) Input
(b) Output
(c) Force
(d) Efficiency

| a | b | c | d |
|---|---|---|---|

**Q.67. Kinetic and potential energies are** *(Multan 2000s)*

(a) Not inter-convertible
(b) Inter-convertible
(c) Two forms of toque
(d) Not related with each other

| a | b | c | d |
|---|---|---|---|

**Q.68. The P.E. of an object on the surface of earth is equal to**
*(Sargodha 1998)*

(a) mgh
(b) 2 mgh
(c) 1/2mgh
(d) zero

| a | b | c | d |
|---|---|---|---|

**Q.69. A stone is thrown up from the surface of earth when it reaches at maximum height its K. E. is equal to**

(a) mgh
(b) $\frac{mv^2}{2}$
(c) Zero
(d) 2 mgh

| a | b | c | d |
|---|---|---|---|



**Q.70. The velocity which is given to a body to enable it to escape out of the earth's gravitational field is called** *(Faisalabad 2002)*

(a) Terminal velocity
(b) Angular velocity
(c) Escape velocity
(d) Orbital velocity

| a | b | c | d |
|---|---|---|---|

**Q.71. The escape velocity on the surfaces of earth is given by the formula**
*(Rawalpindi 1991, 2004, DG Khan 2000s, Bahawalpur 2004, Lahore 2005)*

(a) $\sqrt{gR}$
(b) $\sqrt{2gR}$
(c) $2\sqrt{gR}$
(d) $2gR$

| a | b | c | d |
|---|---|---|---|

**Hint:**

$V_{esc} = \sqrt{\frac{2MG}{R}}$ but

$mg = \frac{GMm}{R^2}$ or $gR = \frac{GM}{R}$

therefore $V_{esc} = \sqrt{2gR}$

**Q.72. The escape velocity can be given by the formula** *(Multan 1997, 2000)*

(a) $\sqrt{\frac{2MG}{R}}$
(b) $\sqrt{\frac{2MG}{R^2}}$
(c) $\sqrt{\frac{2mMG}{R^2}}$
(d) $\sqrt{\frac{mMG}{R}}$

| a | b | c | d |
|---|---|---|---|

**Q.73. The escape velocity of a body depends upon**
*(Faisalabad 1992, D. G. Khan 1991, Gujranwala 1996, Sargodha 2003)*

(a) The mass of the body
(b) The mass of the planet (earth etc.)
(c) Density of the planet
(d) Volume of the planet

| a | b | c | d |
|---|---|---|---|

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**Hint:**

$V_{esc} = \sqrt{2GM/R}$

**Q.74. The ratio between orbital and escape velocities is**
*(Faisalabad 1992, Multan 2001, D. G. Khan 2006)*

(a) $1\sqrt{2}$
(b) $\sqrt{2}$
(c) 2
(d) 1

| a | b | c | d |
|---|---|---|---|

**Q.75. The relation between the escape velocity $V_{esc}$ and the orbital speed '$V_o$' is given by**

(a) $V_{esc} = 1\sqrt{2V_o}$
(b) $V_{esc} = \sqrt{2}\,V_o$
(c) $V_{esc} = V_o$
(d) $V_{esc} = 2V_o$

| a | b | c | d |
|---|---|---|---|

**Hint:-**

Since $V_{esc} = \sqrt{\frac{2GM_e}{R_e}}$ and $V_o = \sqrt{\frac{GM_e}{R_e}}$

$\therefore \quad V_{ecs} = \sqrt{2}\ v_o$

**Q.76. The value of escape velocity is** *(Bahawalpur 2000)*

(a) $11.6 \times 10^3\ ms^{-1}$
(b) $11\times 10^3\ ms^{-1}$
(c) $11.5 \times 10^3\ ms^{-1}$
(d) $12\times 10^3\ ms^{-1}$

| a | b | c | d |
|---|---|---|---|

**Hint:-**

$V_{esc} = \sqrt{2gR} = \sqrt{2\times 9.8\times 6.4\times 10^6} = 11\times 10^3\ ms^{-1}$

**Q.77. The escape velocity from the earth's surface in km $s^{-1}$ is**
*(Multan 2000)*

(a) 4.2 km $s^{-1}$
(b) 7.5 km $s^{-1}$
(c) 9.5 km $s^{-1}$
(d) 11kms$^{-1}$

| a | b | c | d |
|---|---|---|---|

**Q.78. A box of 10kg is moved 2m along the ground by a force of 20N making an angle of 60 with the horizontal. The net work done is**
*(Faisalabad 1992 supp.)*

(a) 100 Joules
(b) 200 Joules
(c) 300 Joules
(d) 20 Joules



| a | b | c | d |
|---|---|---|---|

**Q.79. 25000 watts power is equal to**
*(Faisalabad 1992s, Multan 1997, Gujranwala 1999)*

(a) 2.5 Kilowatt
(b) 25J.P
(c) 50 hp
(d) 33.5 hp

| a | b | c | d |
|---|---|---|---|

**Hint:-** 746 watts = 1hp. $\therefore$ 25000/746 = 33.5 hp

**Q.80. If moon's radius is 1600 km and 'g' on its surface is 1.6 $ms^{-2}$, then the escape velocity on the moon is**
*(Rawalpindi 1991)*

(a) 1600 $ms^{-1}$
(b) 50.6 $ms^{-1}$
(c) 71.6 $ms^{-1}$
(d) 2263 $ms^{-1}$

| a | b | c | d |
|---|---|---|---|

**Hint:-**

$V_{esc} = \sqrt{2gR_m} = \sqrt{2\times 1.6\times 16\times 10^5} = 2263 ms^{-1}$

**Q.81. When two protons are brought together**

(a) Kinetic energy increases
(b) P. E. between them increases
(c) P.E. between them decreases
(d) P.E. between them does not change

| a | b | c | d |
|---|---|---|---|

**Q.82. The dimensions of impulse are the same as that of**
*(Gujranwala 1997, Rawalpindi 2001)*

(a) Energy
(b) Work
(c) Power
(d) Momentum

| a | b | c | d |
|---|---|---|---|

**Q.83. When a meteorite enters into earth's atmosphere, the energy converts into**

(a) Heat energy
(b) Kinetic energy
(c) Nuclear energy
(d) Mechanic energy

| a | b | c | d |
|---|---|---|---|

**Q.84. Present world wide consumption of energy amounts to about**

(a) 2×1013 kilowatt hour annually
(b) 3×1013 kilowatt hour annually
(c) 4×1013 kilowatt hour annually
(d) 6×1013 kilowatt hour annually

| a | b | c | d |
|---|---|---|---|

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**Q.85. The tidal energy (سمندری توانائی) is due to the gravitational pull of** *(Lahore 1993 supp.)*

(a) Sun
(b) Moon
(c) Mars
(d) Planet

| a | b | c | d |
|---|---|---|---|

**Q.86. The important source of energy other than sun is**

(a) Tidal energy
(b) Electrical energy
(c) Heat energy
(d) Nuclear energy

| a | b | c | d |
|---|---|---|---|

**Q.87. Mangla Dam on river produces electricity** *(Sargodha 1996)*

(a) 1750 mega watt
(b) 1500 megawatt
(c) 1750 megawatt
(d) 900 megawatt

| a | b | c | d |
|---|---|---|---|

**Q.88. Terbela Dam on the Indus river produces electricity** *(Sargodha 1999)*

(a) 1900 megawatt
(b) 1750 megawatt
(c) 1850 megawatt
(d) 1600 megawatt

| a | b | c | d |
|---|---|---|---|

**Q.89. The energy stored in a dam is** *(Multan 1997, Lahore 2003)*

(a) Heat energy
(b) P.E.
(c) K.E.
(d) Nuclear energy

| a | b | c | d |
|---|---|---|---|

**Q.90. At present, the hydroelectric generating capacity in Pakistan amounts to about**

(a) 3000 megawatt
(b) 3500 megawatt
(c) 4000 megawatt
(d) 4500 megawatt

| a | b | c | d |
|---|---|---|---|

**Q.91. Pakistan has only one nuclear reactor at Karachi which produces electricity of power**

(a) 200 megawatt
(b) 300 megawatt
(c) 137 megawatt
(d) 500 megawatt

| a | b | c | d |
|---|---|---|---|

**Q.92. The fossils are**

(a) Cotton



(b) Wood
(c) Plastic and seed oils
(d) Coal, petroleum and natural gas

| a | b | c | d |
|---|---|---|---|

**Q.93. The energy obtained by tapping the energy of the hot molten areas inside the earth crust is called**

(a) Nuclear energy
(b) Electrical energy
(c) Magnetic energy
(d) Geothermal energy

| a | b | c | d |
|---|---|---|---|

**Q.94. The energy released in the processes of fission and fusion is called**

(a) Electrical energy
(b) Mechanical energy
(c) Chemical energy
(d) Nuclear energy

| a | b | c | d |
|---|---|---|---|

**Q.95. The source of geothermal energy is**

(a) The fusion in sun
(b) The radioactive decay in the earth's interior
(c) The rotation of earth around sun
(d) The rotation of earth around its own axis

| a | b | c | d |
|---|---|---|---|

**Q.96. Oil in its natural or crude form is**

(a) Very costly
(b) Very cheap
(c) Very useful
(d) Unusable

| a | b | c | d |
|---|---|---|---|

**Q.97. Wind flows from areas of**

(a) High altitudes to areas of low altitudes
(b) Low pressure to areas of high pressure
(c) Low temperature to areas high temperature
(d) High pressure to areas of low pressure

| a | b | c | d |
|---|---|---|---|

**Q.98. The water rises along coasts due to the gravitational pull of the**

(a) Sun on water
(b) Moon on water
(c) Mars on water
(d) Earth on water

| a | b | c | d |
|---|---|---|---|

**Q.99. Every year the amount of solar energy absorbed by earth is nearly**

(a) $3\times10^{17}$ kwh
(b) $4\times10^{17}$ kwh
(c) $5\times10^{17}$ kwh
(d) $6\times10^{17}$ kwh

| a | b | c | d |
|---|---|---|---|

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**Q.100. On a cloudless day, the rate at which the solar energy reaches the earth is about** *(Multan 1997)*

(a) 0.2 kwh $^{-2}$ during 8 hours
(b) 0.4 kwh $^{-2}$ during 8 hours
(c) 08. Kwm $^{-2}$ during 8 hours
(d) 0.9 kwm $^{-2}$ during 8 hours

| a | b | c | d |
|---|---|---|---|

**Q.101. The reaction which takes place in Nuclear Reactor is at** *(Faisalabad 1992)*

(a) Chemical reaction
(b) Fusion reaction
(c) Fission reaction
(d) Mechanical reaction

| a | b | c | d |
|---|---|---|---|

**Q.102. Solar cells are thin sandwitches of**

(a) Good conductors
(b) Bad conductors
(c) Semi – conductors
(d) Insulators

| a | b | c | d |
|---|---|---|---|

**Q.103. A solar cell, a device which converts solar energy into** *(Lahore 1996, Faisalabad 2005)*

(a) Heat energy
(b) Chemical energy
(c) Nuclear energy
(d) Electrical energy

| a | b | c | d |
|---|---|---|---|

**Q.104. Solar cells are made up from the material called** *(Faisalabad 1992)*

(a) Iron
(b) Hydrocarbons
(c) Carbon
(d) Silicon

| a | b | c | d |
|---|---|---|---|

**Q.105. A body at rest may have** *(Rawalpindi 1998, Lahore 1997)*

(a) Speed
(b) Velocity
(c) Momentum
(d) Energy

| a | b | c | d |
|---|---|---|---|

**Q.106. When the mass and speed of a body are doubled, the K.E. becomes** *(Multan 2000)*

(a) 4 times
(b) 8 times
(c) 16 times
(d) 2 times

| a | b | c | d |
|---|---|---|---|

**Q.107. A gas filled balloon possesses**

(a) Kinetic energy



(b) Energy
(c) Potential energy
(d) Both K. E. and P.E.

| a | b | c | d |
|---|---|---|---|

**Q.108. When an arrow is released from its bow, its energy is transferred from**

(a) Heat energy to K. E.
(b) Elastic P.E. to K.E.
(c) Chemical energy to elastic P.E.
(d) K. E. to elastic P. E.

| a | b | c | d |
|---|---|---|---|

**Q.109. A body moves a distance of 10m along a straight line under the action of force 5N and work done is 25J. The angle made by the force along the direction of motion will be**

(a) 30°
(b) 60°
(c) 90°
(d) 45°

| a | b | c | d |
|---|---|---|---|

**Hint:-**

Since work = Fd cosθ

$25 = 5 \times 10 \cos\theta$ or $\cos\theta = ½$

or $\theta = \cos^{-1}(½) = 60°$

**Q.110. The work done by a force 10N applied parallel to direction of motion upto 20 m is**

(a) 10J
(b) 20J
(c) 200J
(d) none

| a | b | c | d |
|---|---|---|---|

**Hint:-**

$W = Fd = 10 \times 20 = 200J$

**Q.111. The work done is said to be negative when force and displacement are:-**

(a) parallel
(b) anti – parallel
(c) perpendicular
(d) none

| a | b | c | d |
|---|---|---|---|

**Q.112. One kilowatt hour of work is always equal to**

(a) 36 MJ
(b) 3.6 MJ
(c) 36.5 MJ
(d) 360 MJ

| a | b | c | d |
|---|---|---|---|

**Q.113. Work – Energy equation can be expressed as**

(a) $Ft = K.F_f^2 - K.E_i^2$

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(b) $F.V = K.E_f^2 - K.E_i^2$
(c) $ma = K.E_f^2 - K.E_i^2$
(d) $Fd = (K.E)_f - (K.E)_i$

| a | b | c | d |
|---|---|---|---|

**Q.114. An example of non-conservative force is**
(a) Electric force
(b) Gravitational force
(c) Frictional force
(d) Magnetic force

| a | b | c | d |
|---|---|---|---|

**Q.115. Geyer derives its energy from the**
(a) Sun
(b) Moon
(c) Earth
(d) None

| a | b | c | d |
|---|---|---|---|

**Q.116. If the speed of a moving body is doubled, its K. E. is**
*(Rawalpindi 2000s)*
(a) doubled
(b) halved
(c) unchanged
(d) 4 times

| a | b | c | d |
|---|---|---|---|

**Q.117. One kilowatt hour of energy is known as**
(a) BOTU
(b) Horse power
(c) Joule
(d) Hertz

| a | b | c | d |
|---|---|---|---|

**Q.118. Original source of biomass**
(a) Moon
(b) Sun
(c) Star
(d) Fossil fuels

| a | b | c | d |
|---|---|---|---|

**Q.119. Tidal energy and wind energy are used to generate**
(a) Charge
(b) Electricity
(c) Current
(d) None of these

| a | b | c | d |
|---|---|---|---|

**Q.120. A device invented by Professor Salter is known as**
*(Faisalabad 2006)*
(a) Salter's car
(b) Salter's ship
(c) Salter's duck
(d) Salter's engine

| a | b | c | d |
|---|---|---|---|

**Q.121. On a clear day at noon, the intensity of the solar energy reaching the Earth's surface is about** *(D. G. Khan 2005)*



(a) $1\ kwm^{-2}$
(b) $2\ kwm^{-2}$
(c) $3\ kwm^{-2}$
(d) $1.5\ kwm^{-2}$

| a | b | c | d |
|---|---|---|---|

**Q.122. For cloudy days or nights, electrical energy can be stored during the sunlight in**
(a) Boron – silicon batteries
(b) Nickel – cadmium batteries
(c) Cadmium – Boron batteries
(d) Boron – Cadmium batteries

| a | b | c | d |
|---|---|---|---|

**Q.123. While passing through the atmosphere, the total energy is reduced due to**
(a) Scattering
(b) Absorption
(c) Reflection
(d) All of the above

| a | b | c | d |
|---|---|---|---|

**Q.124. Biomass is a potential source of**
(a) renewable energy
(b) non – renewable energy
(c) both of the above
(d) none of these

| a | b | c | d |
|---|---|---|---|

**Q.125. Rotting of biomass in a closed tank produces biogas. This closed tank is called**
(a) Ingester
(b) Egester
(c) Digester
(d) None of the above

| a | b | c | d |
|---|---|---|---|

**Q.126. Direct combustion method is usually applied to get energy from waste products commonly known as**
(a) Solid waste
(b) Gaseous waste
(c) Liquid waste
(d) All of the above

| a | b | c | d |
|---|---|---|---|

**Q.127. The methods used to convert biomass into fuels are**
(a) direct combustion
(b) fermentation
(c) both (a) and (b)
(d) none of them

| a | b | c | d |
|---|---|---|---|

**Q.128. Bio-fuel such as ethanol is a replacement of**
(a) gas oil
(b) sui gas
(c) gasoline

| a | b | c | d |
|---|---|---|---|

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(d) kerosene

**Q.129. Hot igneous rocks have a temperature of about**

(a) 100°c
(b) 200°c
(c) 300°c
(d) 250°c

| a | b | c | d |
|---|---|---|---|

**Q.130. Geysers usually occur in**

(a) Hot regions
(b) Cold regions
(c) Volcanic regions
(d) All of the above

| a | b | c | d |
|---|---|---|---|

**Q.131. Heat energy extracted from inside the Earth in the form of heat water or steam is called**

(a) solar energy
(b) geothermal energy
(c) tidal energy
(d) chemical energy

| a | b | c | d |
|---|---|---|---|

**Q.132. A hot spring ( چشمہ ) that discharges (خارج کرنا) steam and hot water intermittently (وقفوں میں ) releasing an explosive (دھماکہ خیز) column into the air is called**

(a) burner
(b) stove
(c) geyser
(d) all of the above

| a | b | c | d |
|---|---|---|---|

**Q.133. Hot igneous rocks, usually in molten or partly molten state are found in the depth of**

(a) 5km
(b) 10 km
(c) 15 km
(d) 20 km

| a | b | c | d |
|---|---|---|---|

**Q.134. Solar energy at normal incidence outside the Earth's atmosphere is about** *(Gujranwala 2004, Gujranwala 2006)*

(a) 10 $Kwm^{-2}$
(b) 1.8 $kwm^{-2}$
(c) 1.4 $kwm^{-2}$
(d) 1.6 $kwm^{-2}$

| a | b | c | d |
|---|---|---|---|

**Q.135. Salter's duck consists of**

(a) duck float
(b) balance float
(c) both (a) and (b)
(d) none of the above

| a | b | c | d |
|---|---|---|---|



**Q.136. Earth receives large amount of energy directly from**

(a) water
(b) wind
(c) sun
(d) moon

| a | b | c | d |
|---|---|---|---|

**Q.137. Kilowatt is the unit of** *(Lahore 2003)*

(a) Power
(b) Work
(c) Force
(d) Current

| a | b | c | d |
|---|---|---|---|

**Q.138. Photocell converts light energy into** *(Gujranwala 2005)*

(a) Chemical energy
(b) Electrical energy
(c) Nuclear energy
(d) Heat energy

| a | b | c | d |
|---|---|---|---|

**Q.139. 1 kwh is equal to** *(Faisalabad 2005)*

(a) $3.6\times10^{6}$ J
(b) $36\times10^{5}$ J
(c) 3.6 MJ
(d) All of these

| a | b | c | d |
|---|---|---|---|

**Q.140. 1 kwh is equal to** *(Sargodha 2005)*

(a) $3.6\times10^{6}$ J
(b) $36\times10^{6}$ J
(c) $36\times10^{4}$ J
(d) $3.6\times10^{7}$ J

| a | b | c | d |
|---|---|---|---|

**Q.141. An electric motor can lift a weight of 2000 N through a height of 10 m in 20 sec. What is the power of the motor.** *(Rawalpindi 2005)*

(a) 10 w
(b) 1000 w
(c) 400,000w
(d) 2000 w

| a | b | c | d |
|---|---|---|---|

Hint:- $P = \frac{w}{t} = \frac{w\times h}{t}$

$$P = \frac{2000\times10}{20} = 1000 \text{ w}$$

**Q.142. Which of the following pairs does not have identical dimensions.** *(D. G. Khan 2005 s)*

(a) Momentum and impulse
(b) Energy and work
(c) Mass and moment of inertia
(d) Torque and energy

| a | b | c | d |
|---|---|---|---|

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**Q.143. SI unit of kinetic energy (K.E) is** *(D. G. Khan 2005 s)*

(a) Watt
(b) Joule
(c) Newton
(d) Kilowatt

| a | b | c | d |
|---|---|---|---|

**Q.144. If a power of 1 kw is maintained for 1 second, then work done is equal to** *(Sargodha 2005)*

(a) $10^3$ J
(b) $10^5$ J
(c) $10^6$ J
(d) $3.6\times10^6$ J

| a | b | c | d |
|---|---|---|---|

**Q.145. Which one is the biggest unit of energy?** *(Sargodha 2001 s)*

(a) Erg
(b) Joule
(c) Watt – hour
(d) Kilo – watt hour

| a | b | c | d |
|---|---|---|---|

**Q.146. Which of the following is not a unit of power?** *(Rawalpindi 2001)*

(a) Joule –sec
(b) Watt
(c) Newton metre per sec
(d) Horse power

| a | b | c | d |
|---|---|---|---|

**Q.147. An example of non – conservative force is** *(Federal board 2004)*

(a) Elastic force
(b) Gravitational force
(c) Frictional force
(d) Magnetic force

| a | b | c | d |
|---|---|---|---|

**Q.148. Value of solar constant is** *(Gujranwala 2006)*

(a) 1.4 kwm$^{-2}$
(b) 1.0 kwm$^{-2}$
(c) 4.1 kwm$^{-2}$
(d) 0.1 kwm$^{-2}$

| a | b | c | d |
|---|---|---|---|

**Q.149. An electric motor can lift a weight of 2000 N through a height of 10 m in 20 sec. what is power of the motor?** *(Rawalpindi 2006)*

(a) 10 w
(b) 1000 w
(c) 3000 w
(d) 4000 w

**Hint:-**

$$P=\frac{w\times h}{t}=\frac{2000\times10}{20}=1000w$$

| a | b | c | d |
|---|---|---|---|

**Q.150. Which of the following quantity is calculated by mulfiplying force with velocity** *(A. Kashmir 2006)*

(a) Acceleration
(b) Power
(c) Torque
(d) Work

| a | b | c | d |
|---|---|---|---|



# ANSWERS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Q.1. | c | Q.2. | a | Q.3. | b | Q.4. | c |
| Q.5. | d | Q.6. | d | Q.7. | d | Q.8. | b |
| Q.9. | a | Q.10. | c | Q11. | b | Q.12. | d |
| Q.13. | d | Q.14. | b | Q.15. | d | Q.16. | c |
| Q.17. | d | Q.18. | c | Q.19. | d | Q.20. | b |
| Q.21. | b | Q.22. | c | Q.23. | d | Q.24. | d |
| Q.25. | c | Q.26. | a | Q.27. | b | Q.28. | c |
| Q.29. | d | Q.30. | c | Q.31. | a | Q.32. | c |
| Q.33. | d | Q.34. | b | Q.35. | d | Q.36. | c |
| Q.37. | c | Q.38. | b | Q.39. | d | Q.40. | a |
| Q.41. | d | Q.42. | d | Q.43. | c | Q.44. | a |
| Q.45. | c | Q.46. | d | Q.47. | d | Q.48. | c |
| Q.49. | d | Q.50. | b | Q.51. | b | Q.52. | d |
| Q.53. | b | Q.54. | b | Q.55. | d | Q.56. | c |
| Q.57. | c | Q.58. | d | Q.59. | a | Q.60. | a |
| Q.61. | b | Q.62. | a | Q.63. | c | Q.64. | d |
| Q.65. | c | Q.66. | b | Q.67. | b | Q.68. | d |
| Q.69. | c | Q.70. | c | Q.71. | b | Q.72. | a |
| Q.73. | b | Q.74. | a | Q.75. | b | Q.76. | b |
| Q.77. | d | Q.78. | d | Q.79. | d | Q.80. | d |
| Q.81. | b | Q.82. | d | Q.83. | a | Q.84. | d |
| Q.85. | b | Q.86. | d | Q.87. | d | Q.88. | b |
| Q.89. | b | Q.90. | a | Q.91. | c | Q.92. | d |
| Q.93. | d | Q.94. | d | Q.95. | b | Q.96. | d |
| Q.97. | d | Q.98. | b | Q.99. | b | Q.100. | c |
| Q.101. | c | Q.102. | c | Q.103. | d | Q.104. | d |
| Q.105. | d | Q.106. | b | Q.107. | c | Q.108. | b |
| Q.109. | b | Q.110. | c | Q.111. | b | Q.112. | b |
| Q.113. | d | Q.114. | c | Q.115. | c | Q.116. | d |
| Q.117. | a | Q.118. | d | Q.119. | c | Q.120. | c |
| Q.121. | a | Q.122. | b | Q.123. | d | Q.124. | a |
| Q.125. | c | Q.126. | a | Q.127. | c | Q.128. | c |
| Q.129. | b | Q.130. | c | Q.131. | b | Q.132. | c |
| Q.133. | b | Q.134. | c | Q.135. | c | Q.136. | c |
| Q.137. | a | Q.138. | b | Q.139. | d | Q.140. | a |
| Q.141. | b | Q.142. | c | Q.143. | b | Q.144. | a |
| Q.145. | b | Q.146. | a | Q.147. | c | Q.148. | a |
| Q.149. | b | Q.150. | b | | | | |

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momentum. The whole rocket consists of several stages of fuel, which behave like individual rocket. When fuel of one stage is finished, it is separated from the rocket. In this way, total mass of rocket decreases and thus acceleration increases. The rocket gains escape velocity in order to escape from the earth's gravitational field.

**Q.56. What is horizontal range?**

**Ans:-** Maximum distance covered by the projectile from the point of projection to the point where it returns to its level of projection, is called horizontal range. It is denoted by 'R'. Its unit is meter.

Mathematically it can be written as

$$R = \frac{v_i^2 \sin 2\theta}{g}$$

**Q.57. What do you understand by the time of flight?**

**Ans:-** It is the total time for which the projectile remains in air. It is denoted by 't'. Its unit is second.

Mathematically, it can be written as

$$t = \frac{2v_i \sin\theta}{g}$$

**Q.58. What is the maximum height of projectile?**

**Ans:-** The maximum height attained by a projectile during its motion is called the height of projectile.

Mathematically it can be written as

$$h = \frac{v_i^2 \sin^2\theta}{2g}$$

**Q.59. Discuss the importance of the velocity – time graph:**

***(Federal board 2005)***

**Ans:-** (i) The distance covered by the object can be determined by calculating the area under the velocity -time graph.

(ii) The average acceleration of an object can be found with the help of slope of velocity -time graph.

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# WORK AND ENERGY



## CHAPTER NO 4

### SHORT ANSWER TYPE QUESTIONS WITH ANS.

**Q.1. A person holds a bag of groceries ( گروسری ) while standing still talking to a friend. A car is stationary ( ساکن )with its engine running. From the standpoint of work how are these two situations similar ?**

**Ans:-** In both of these two cases, the value of the displacements is zero. According to definition of work,

$$W = Fd$$

Here $d = 0$ ,therefore,

$$W = F \times 0 = 0$$

Thus, in both the situations the work done is zero. Therefore, from the standpoint of work, these two situations( صورتیں) are similar.

**Q.2. Calculate the work done in kilo joules in lifting a mass of 10 kg (at a steady velocity) through a vertical height of 10m.**

***(Multan 2006, D. G. Khan 2006, Faisalabad2006, Lahore 2006)***

**Ans:-**

**Data:-**

Mass = m = 10 kg

Vertical height = h = 10m

Value of g = 9.8 $ms^{-2}$

Work done= ?

**CALCULATIONS:-**

Here work done is in the form of potential energy. Thus, using the formula,

$$W = P.E. = mgh$$

Putting the values, we get

$$W = 10 \times 9.8 \times 10$$

Or $W = 980$ J

In kilojoules, work can be written as

$$W = \frac{980}{1000} = 0.980 \text{ KJ}$$ **Ans.**

**Q.3. In which case is more work done? When 50 kg bag of books is lifted through 50 cm, or when 50 kg crate is pushed through 2 m across the floor with a force of 50N?**

**Ans:- First case:-**

Mass of bag = m = 50 kg

$$\text{Height} = h = 50\ \text{cm} = \frac{50}{100} = 0.5\ \text{m}$$

Work done = $W_1$ = ?

Work done in the form of P.E. is given as

$$W = P.E. = mgh$$

Putting the value, we get

$$W_1 = 50 \times 9.8 \times 0.5$$

or $\boxed{W_1 = 245\ J}$ ..... (1)

**Second case:-**

Mass of crate = m = 50 kg

Distance = d = 2m

Force = F = 50 N

Work = $W_2$ = ?

Using the formula of work

$W_2 = Fd$

$= 50 \times 2 = 100J$

$\boxed{W_2 = 100\ J}$ ..... (2)

**Q.4. An object has 1J of potential energy. Explain what does it mean?**

***(Gujranwala 2005, Lahore 2004, Sargodha 2005, A.K. 2006, Multan 2005, Fed. 2005)***

**Ans:-** An object having 1J of potential energy means that the work done stored in the object in the form of potential energy has the capacity to do work of 1 J.

For example, if an object is lifted up by a force of one Newton through a height of one meter, the work done is stored in the object as potential energy of one Joule. If the object is allowed to fall vertically downward,it has the capacity to do 1Joule work.

**Q.5. A ball of mass m is held at a height $h_1$ above a table. The table top is at a height $h_2$ above the floor. One student says that the ball has potential energy $mgh_1$, but another says that it is $mg(h_1+h_2)$. Who is correct?**

**Ans:-** If the table top is considered as reference point, the potential energy of a ball of mass 'm' at a height '$h_1$' from above the table top is $mgh_1$. If the floor is taken as reference point, the potential energy of the same ball with respect to the floor is $mg(h_1 + h_2)$ because now the ball is at a height of $(h_1 + h_2)$ from the floor. Thus, both the students are correct because one student has chosen the table top as a point of reference and the other is telling with respect to the floor as reference point.



**Q.6. When a rocket re-enters the atmosphere, the nose cone becomes very hot, where does this heat energy come from?**

***(Lahore 2005, 2006, Multan 2004, D. G. Khan 2005, Bahawalpur 2004, Gujrawala 2003)***

**Ans:-** There is a large number of dust particles and water vapours present in the air. When a rocket re -enters the atmosphere, it has to face the resistance due to particles. Some K. E. of the rocket is converted into heat energy. Therefore, the cone nose of the rocket becomes very hot due to the heat energy produced by the fluid friction of atmosphere.

**Q.7. What sort of energy is in the following?**

**(a) Compressed spring**

**(b) Water in a high dam**

**(c) A moving car** ***(Sargodha 2003, Multan 2004, Rawalpindi 2005)***

**Ans:-** **(a) Compressed spring:-**

It has elastic potential energy.

(b) **Water in a high dam:-**

Water stored in a high dam possesses (has) the gravitational potential energy.

(c) **A moving car:-**

It has kinetic energy due to its motion.

**Q.8. A girl drops a cup from a certain height, which breaks into pieces. What energy changes are involved?**

***(Bahawalpur 2006, Gujranwala 2005)***

**Ans:-** When a cup is dropped from a certain height, its potential energy is converted into kinetic energy. When the cup collides with (ٹکراتا ) the floor (ground), it breaks into pieces and makes a noise. The kinetic energy of cup becomes zero on the floor. Some of K. E. is used to break the cup into pieces and transferred as K. E. of pieces, the remaining K. E. is converted into sound energy which produces the noise and heat energy.

**Q.9. A boy uses a catapult ( گوپیا ) to throw a stone which accidentally ( اچانک ) smashes ( ٹکراتا ) a green house window. List the possible energy changes.** ***(Lahore 2006)***

**Ans:-** When a boy throws a stone by a catapult, the stone possesses kinetic energy. A part of this energy is used in breaking a greenhouse window and also transferred as K. E. to the broken pieces of window. The remaing part of the K. E. is converted into sound energy which causes the noise and also heat energy.

**Q.10. Write the expression of work done by a force that acts at an angle 60° to a moving body.**

**Ans:-** The work done by a force is expressed as

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$$W = \vec{F}.\vec{d} = Fd\cos\theta$$

Where $\theta$ is the angle between force $\vec{F}$ and displacement $\vec{d}$.
Hence, $\theta = 60°$ so the expression becomes

$$W = Fd\cos 60° \quad \text{Ans.}$$

**Q.11. A body of 1 kg is lifted to a height of 10 m above the ground, what is the work done on the body ?**

**Ans:- Solution:-**

Mass of body = m = 1 kg
Height = h = 10m
Acceleration due to gravity = g = - 9.8 $ms^{-2}$
Work done = P. E. = mgh
Putting the values, we get

$$W = 1 \times 9.8 \times 10 = 98J$$

Hence $\boxed{W = 98\ J}$ Ans.

**Q.12. What are the essential conditions for conservative field?**
***(A. Kashmir 2004)***

**Ans:-** (i) Gravitational field is essential for conservative field
(ii) There must be a closed path in a gravitational field.
(iii) Work done along a closed path in the gravitational field must be zero.
(iv) Work done by a body in the field should be independent of the path followed.

**Q.13. What is the dimension of power?**

**Ans:-** As $\text{Power} = \vec{F}.\vec{V}$

Power = (mass×acceleration).(velocity)
$= [M \times L/T^2][L/T]$
$= [ML^2/T^3] = [ML^2T^{-3}]$

Thus, the dimensions of power are $[ML^2T^{-3}]$

**Q.14. Prove that $P = \vec{F}.\vec{v}$.** ***(Faisalabad 2005, Sargodha 2005, Federal 2004, 2003)***

**Ans:-** The power supplied by the body is given by

$$P = \text{Lim}_{\Delta t \to 0} \frac{\Delta w}{\Delta t} \quad \ldots\ldots\ldots\ldots (1)$$

According to definition

$$\Delta w = \vec{F}.\Delta\vec{d}$$

Putting the value of $\Delta w$ in equ (1) we get



$$P = \text{Lim}_{\Delta t \to 0} \frac{\vec{F}.\Delta\vec{d}}{\Delta t}$$

Or $$P = \text{Lim}_{\Delta t \to 0} \frac{\vec{F}.\Delta\vec{d}}{\Delta t}$$

Since $\frac{\Delta\vec{d}}{\Delta t} = \vec{v}$

Therefore, $\boxed{P = \vec{F}.\vec{v}}$

**Q.15. A mason (راج مستری) of 100N weight is climbing on a 10 m high ladder. Find his P. E. at the middle of ladder.**

**Ans:-** weight of the mason = W = 100 N
Height of the ladder = $h' = 10$ m
Height upto middle of ladder = $h = h'/2 = 5$ m
**Using the formula of P. E.**

P. E. = W×h, putting the values, we get
P.E = 100 ×5 = 500 J

$\boxed{\text{P.E.} = 500\text{j}}$ Ans

**Q.16. What is meant by 'Dissipation of energy"?**

**Ans:-** When the body comes to rest after hitting the ground, the K.E. possessed by the body is coverted into sound and heat energy after striking agains the ground. This is called `Dissipation of energy'

**Q.17. Differentiate between renewable and non – renewable resources of energy.**

**Ans:- Renewable resources:-**

The sources of energy which can be renewed are called renewable resources. For example, hydroelectric, wind, tides, geothermal, biomass, sunlight and ethanol.

**Nonrenewable resources:-**

The sources of energy which can not be renewed are called nonrenewable resources of energy. For example, coal, natural gas, oil, uranium, oil shale and tar sands.

**Q.18. A ball of weight 98 N is moving on a frictionless surface with a velocity of 1 $ms^{-1}$. Compute its K. E.**

**Ans:- Solution:-**

Velocity of ball = v = 1 $ms^{-1}$

Mass of ball = $m = \frac{W}{g} = \frac{98}{9.8} = 10$ kg

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The formula for K. E. is given by K. E. = ½ mv², putting the values, we get

$$K.E. = \tfrac{1}{2} \times 10\,(1)^2 = 5\ J$$

Hence, **K. E. = 5J** Ans

**Q.19. A diver of 50 g mass dives (غوطہ لگاتا) from a 10m high diving board in a swimming pool. Calculate its P. E. before jump.**

**Ans:- Solution:-**

$$\text{Mass of a diver} = m = 50\ g = \frac{50}{1000} = \frac{1}{20}\ kg$$

Height = 10 m

Acceleration due to gravity = g = 9.8 $ms^{-2}$

As we know, P. E. = mgh

Or $$P.E. = \frac{1}{20} \times 9.8 \times 10 = 4.9\ J$$

Hence, **P. E. = 4.9J** Ans.

**Q.20. Find the average power in lifting 100 kg of mass in 1 s upto height of 10 m.**

**Ans:- Solution:-**

Mass = m = 100 kg

Time = t = 1 s

Height = h = 10 m

As P. E. = mgh

P. E. = 100×9.8×10 = 9800 J

Work done is stored as P. E.

∴ W = 9800 J

$$\text{Power} = \frac{W}{t} = \frac{9800}{1s} = 9800\ \text{watt}$$

Hence **P = 9800 watt** Ans

**Q.21. What type of energy is stored in water dam?**

**Ans:-** Water stored in a high dam possesses (has) the gravitational potential energy.

**Q.22. When an arrow is shot from its bow, it has kinetic energy. From where does it get the K.E.?**

*(Rawalpindi 1992, 93, Lahore 1998, Multan 1996)*

**Ans:-** Some work is done in pulling the string back through a certain



distance. This work is stored as the elastic potential energy in the string. When the arrow is shot from its bow, this P.E. is converted into K.E. of the arrow.

**Q.23. What type of energy is stored in the spring of watch?**

*(D. G. Khan 1992, Multan 1999, Faisalabad 2001, Lahore 2004)*

**Ans:-** The work done in winding the watch is used up in compressing the spring and is stored in the form of elastic potential energy in the spring of watch.

**Q.24. A bucket is taken to the bottom of a well, does the bucket possess any potential energy?** *(Rawalpindi 1999)*

**Ans:-** Yes, when the bucket is taken to the bottom of the well, some work is to be done against the upward thrust of water. This work done is stored as P.E. in the bucket. As soon as the applied force is removed, the bucket comes up to the surface of water since the P. E. is converted into K.E.

**Q.25. The force between a pair of protons is that of repulsion. Does the P. E. increase as the protons are brought closer?**

*(Lahore 1997, Multan 1996)*

**Ans:-** Yes, the potential energy increases when the two protons are brought closer to eachother because the work has to be done against the force of repulsion. This work will appear as the increase in their potential energy.

**Q.26. A meteor (شہاب ثاقب) when enters into Earth's atmosphere burns. What happens to its energy and momentum?** *(Multan 1997)*

**Ans:-** When a meteor enters Earth's atmosphere, it will burn due to the friction between the particles of the atmosphere and meteorite. Hence, the energy possessed by a meteor is converted into heat energy and its momentum is transferred to the particles of atmosphere.

**Q.27. A man rowing boat upstream is at rest with respect to shore, is he doing work?** *(Lahore board 1987, 89)*

**Ans:-** when the man rowing the boat upstream is at rest with respect to shore, he is not doing any work because the displacement of boat is zero and the work is the product of force and displacement (W = Fd = F×0 = 0). Here, the work done by the man on the boat upstream is counter balanced by work done on the boat by current of water downstream. So net work done by the man is zero. (because two works are in opposite direction)

**Q.28. Due to smaller value of `g' a man can jump higher on the surface of the moon. Can he run faster on this account? Explain.**

*(Bahawalpur 2000)*

**Ans:-** No, he cannot run faster on moon than on earth due to smaller value of `g'. in running, man pushes the earth backward with his foot and

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the reaction of the earth pushes the man in the forward direction. As the value of 'g' is less on the surface of the moon as compared to that on the earth, so the reaction force of the moon will push the man forward with smaller force (due to the smaller weight). Hence, a man cannot run faster on moon on this account.

**Q.29. Why does the bob of a swinging pendulum come to rest after some time? What becomes of its energy?** *(Federal board 1998)*

**Ans:-** The to and fro ( ادھر ادھر ) motion of the bob is oppsed by two forces, air resistance and friction on the string at the point of suspension. Due to these opposing forces, the motion of the bob is retarded and after some time it comes to rest.

The energy of the bob is used against the opposing force and it is converted into heat.

**Q.30. What happens to the kinetic energy of a bullet when it penetrates ( داخل ہوتا ) into a target?** *(Sargohda 1987)*

**Ans:-** When a bullet strikes a target, it penetrates into it and comes to rest after covering a small distance. A major part of its kinetic enrgy is used in doing work against the resistance of the target and rest of energy is converted into heat.

∴ Loss of K. E. of the bullet = work done against the resistance of target + heat produced due to friction.

**Q.31. Is kinetic energy a vector quantity?** *(Gujranwala 1987)*

**Ans:-** Kinetic energy is simply the capacity of a body to do work by virtue of its motion. Since work is scalar quantity, therefore kinetic energy is also a scalar quantity and not a vector quantity.

**Q.32. A car is moving with constant speed along a level road with no net force acting on it. Is any work being done on the car?** *(Faisalabad 1990, Sargodha 1999)*

**Ans:-** When a car is moving with constant speed along a level road with no net force acting on it, the work done on it is zero. But the engine of the car exerts a force and does work continuously against friction to keep the motion steady.

**Q.33. At what point the energy of a swinging pendulum is wholly potential. Where is its K.E. maximum?** *(Multan 1986)*

**Ans:- P. E. of swinging Pendulum:-**

At the extreme positions, the whole energy of a simple pendulum lies in the form of potential energy.

**K. E. of swinging pendulum:-**

At the mean point (equilibrium position) the kinetic energy of the swining pendulum is maximum.

**Q.34. Name two conservative forces.**

*(Rawalpindi 2006, A. Kashmir 2004 ,Sargodha 2003)*



**Ans:- Conservative Forces:-**

There are three conservative forces.

(1) Gravitational force (2) Electric force (3) Elastic spring force.

**Q.35. Define escape velocity.** *(Lahore 2006, 2004, D. G. Khan 2004)*

**Ans:- Definition:-**

The initial velocity of an object with which it goes out of the Earth's gravitational field, is known as escape velocity.

Mathematically, it can be calculated by the two formulas

(i) $V_{esc} = \sqrt{\frac{2GM}{R}}$

(ii) $V_{esc} = \sqrt{2gR}$

**Q.36. Explain work** *(A. Kashmir 2006, D. G. Khan 2005)*

**Ans:- Definition:-**

The work done on a body by constant force is defined by the product of the magnitude of the displacement and the component of force in the direction of the displacement.

**Explanation:-**

If a constant force $\vec{F}$ acts on a body and the body moves through a displacement $\vec{d}$ along the direction of force, then the work can be defined as

$$W = Fd \quad \ldots\ldots\ldots\ldots (1)$$

Where F is the magnitude of the force and d is the magnitude of the displacement.

If however, the force makes an angle '$\theta$' with the direction of the displacement, then we take the component of the force in the direction of the displacement.

So it can be written as

$$W = Fd\cos\theta$$

Or $$W = \vec{F}.\vec{d} \quad \ldots\ldots\ldots\ldots (2)$$

Thus, work can be expressed in scalar product.

**Q.37. What is meant by kwh i.e (kilowatt hour). Show that kwh=3.6 MJ** *(Gujranwala 2006)*

**Ans:- Def:-** It is the amout of work done when a power of one kilowatt is maintained for one hour.

It is commercial unit of electric energy.

**To show that 1 KWH = 3.6 MJ**

1 KWH = 1000 watt×3600 s

$= 36\times10^5$ watt –s

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$= 3.6 \times 10^6 J$

Hence 1KWH = 3.6 Mj (watt –s = J)

**Q.38. Distinguish between average power and instantaneous power.**

*(Faisalabad 2006, Rawalpindi 2005)*

**Ans:- Average Power:-**

**Def:-** The rate of doing work is called power.

Mathematically it can be written as

$$P_{av} = \frac{\Delta W}{\Delta t} \qquad \text{(work/time)}$$

**Instantanous Power:-**

It is defined as the work done in an extremely small interval of time (tending to zero)

Mathematically, it can be written as

$$P_{ins} = \text{Limit}_{\Delta t \to 0} \frac{\Delta w}{\Delta t}$$

The average power and instantaneous power become equal if the work is done at a uniform rate.

**Q.39. Show that work done against frictional force is negative**

*(Gujranwala 2006)*

**Ans:-** The work done is expressed as

$$W = \vec{F} \cdot \vec{d} = Fd\cos\theta \quad \ldots\ldots\ldots\ldots\ldots (1)$$

Since frictional force is always opposite to the direction of motion of a body, Thereforce the angle between force and displacement will be 180°.

Now equation (1) can be written

$W = Fd\cos 180°$

$= Fd(-1)$ $\qquad (\cos 180 = -1)$

or $W = -Fd$

Hence, the work done against frictional force is negative.

**Q.40. What is absolute potential energy.**

*(D. G. Khan 2006, 2005, Sargodha 2005, Faisalabad 2005)*

**Ans:- Def:-** Absolute gravitational potential energy is defined as "the work done in moving an object from Earth's surface to infinity where the force of gravity becomes zero" (i.e. g = 0)

The zero reference point is so far away from the Earth that the body is not affected by the Earth gravitational field.

Mathematically, it can be calculated as

$$U_g = -\frac{GMm}{R}$$

The negative sign indicates that the Earth's gravitational field



for mass `m' is attractive.

**Q.41. What is meant by conservative field?**

*(D. G. Khan 2005, Faisalabad 2005, A. Kashmir 2004)*

**Ans:- Def:-** A field in which work done along a closed path is zero, is called conservative field.

**Examples:-**

(1) Gravitational field
(2) Electric field
(3) Magnetic field.

**Q.42. State law of conservation of energy**

**Ans:-** It states that energy can neither be created nor destroyed but it can change from one form to another, but the total amount of energy remains constant.

Mathematically it can be written as

Total Energy = P. E. + K. E. = constant.

**Q.43. What are conservative and non – conservative forces? Give the examples of non – conservative force**

**(b) Define non – conservative field.**

**Asn:- (i) Conservative Force:-**

The force due to conservative field is called conservative force.

**(ii) Non – conservative force:-**

The frictional force is an example of non-conservative force, because if a body is moved over a rough surface between two points along different paths, the work done against the frictional force certainly depends on the path followed.

**Its other Examples:-**

(1) Air resistance
(2) Normal force
(3) Propulsion force of a rocket
(4) Propulsion force of a motor

**(b) Non – conservative field:-**

The field in which the work done in moving a body between two points depends upon the path followed, is called non – conventional field.

**Q.44. Find the value of escape velocity with $R = 6.4\times10^6$ m**

*(Rawalpindi 2004)*

**Ans:-** The escape velocity is given by the relation

$$V_{es} = \sqrt{2gR}$$

Putting the known values in the above relation

$$V_{es} = \sqrt{2\times9.8\times6.4\times10^6} = 11.2\times10^2 \text{ ms}^{-1} \text{ Ans.}$$

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**Q.45. Describe negative work with the examples** *(Lahore 2004)*

**Ans:-** Work done is negative when force and displacement are opposite to each other i.e. $\theta = 180°$

Work done is expressed as

$W = F.d = Fd\cos\theta$

When $\theta = 180°$

So, $W = Fd\cos 180° = Fd(-1)$

Hence $W = -Fd$

**Examples:-**

(i) If a body is lifted against gravity very slowly, the angle between force of gravity and displacement is 180°.

$W = Fd\cos 180 = Fd(-1)$

$W = -Fd$

Hence work done is negative.

(ii) Work done by frictional force and application of brakes is negative, because the frictional force is always opposite to the direction of motion of body.

**Q.46. What do you understand by work and energy. Give their units.** *(Lahore 2005 supp.)*

**Ans:- Work:-** When a constant force $\vec{F}$ applied on a body produces a displacement $\vec{d}$ in the direction of force, then work is said to be done.

Mathematically, it is written as $\because (\theta = 0°)$

$W = \vec{F}.\vec{d} = Fd\cos 0 = Fd$

Let θ be the angle between F and d, then the work done is

$W = \vec{F}.\vec{d} = Fd\cos\theta$

**Energy:-**

The ability ( صلاحیت ) of a body to do work is called energy.

**UNITS:-**

The SI unit of work is Joule.

**Def. of Joule:-**

It is the amount of work done when a force of one Newton acting on a body displaces it through a distance of one meter along the direction of force.

**Unit of Energy:-**

Its unit is the same as that of work.

**Q.47. Define power and give its unit** *(Lahore 2004)*

**DEFINITION:-**

The rate of doing work is called power. Mathematically, it can be written as



$$P = \frac{\Delta W}{\Delta t}$$ (i.e Work /Time )

**Unit of power:-**

Its SI unit is watt.

**Definition of watt:-**

It is defined as the rate of doing one joule of work in one second. That is,

$Watt = 1\ J/1s = Js^{-1}$

**Q.48. A body of mass 10 kg is moving with velocity 10 m/s. compute K.E.** *(Rawalpindi 2004)*

**Ans:-** Mass of the body = m = 10 kg

Velocity of body = v = 10 m/s

K. E. = ?

Using formula and putting the values, we get

$K.E. = \frac{1}{2}mv^2$

$= \frac{1}{2} \times 10 \times (10)^2 = \frac{1}{2} \times 1000$

Hence, K. E. = 500 J

**Q.49. What are basic forms of mechanical energy. Define them** *(Bahawalpur 2004)*

**Ans:-** There are two kinds of mechanical energy.

(1) kinetic energy (k.E)

(2) Potential energy (P. E.)

**Kinetic Energy:- (K. E)**

The energy possessed by a body due to its motion is called kinetic energy. Mathematically, it is expressed as

$k.E. = \frac{1}{2}mv^2$

**Potential Energy (P.E)**

The energy possessed by a body due to its position in a force fiel e.g. gravitational field or elastic spring field.

Mathematically it can be written as

$P.E. = W \times h = mgh$

$P.E. = mgh$

**Units:-** The units of energy, kinetic energy and potential energy are the same as those of work. That is joule in SI unit.

**Q.50. If a body of mass 10 kg is allowed to fall through a distance of 10m. what will be the work done?** *(D. G. Khan 2004)*

**Ans:-** Mass of the body = m = 10 kg

Height = h = 10 m

Work done = W = P.E = mgh

Putting the values in the formula

$W = 10 \times 10 \times 9.8$

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Or W = 980 J

**Q.51. What are the dimensions of work?**

**Ans:-** Work = Force × distance

= Mass×acceleration×distance

$[W] = [M][V/T][L]$

$= [M][L/T \cdot 1/T][L]$

$= [M][L/T^2][L]$

$\therefore \quad [W] = [ML^2T^{-2}]$

Hence, dimensions of work are

$[ML^2T^{-2}]$

**Q.52. What do you mean by non-conventional energy sources? Describe some of the them.**

**Ans:-** The energy sources which are not very common these days and may be available to the world energy demand of future are called non - conventional sources. Some of non – conventional energy sources are

(1) Geo- thermal energy (2) Solar energy

(3) Energy from waves (4) Energy from tides

(5) Energy from biomass.

**Q.53. How can we gain the energy from waves?**

**Ans:-** The tides and winds produce strong water waves. The waves energy makes duck float move relative to balance float and electrical energy is generated.

The energy of these waves can be used to generate electricity. One such device was invented by Prof. Salter known as Salter 's duck.

**Q.54. how can we gain energy from tides?**

**Ans:-** Gravitational interaction between the earth and the moon serves as the source of tide energy. Due to gravitational pull of moon, the water rises twice a day along the coasts. The dam is filled at high tides and water is released in a controlled way at low tide to drive the turbines and produces electricity.

**Q.55. Describe some uses of solar cells.**

**Ans:-** (1) They have low running cost (2) Solar calculators are being used now – a days

(3) Although, the solar cells are costly but remain in use for a long time.

(4) They are used in remote ground based weather stations and rain forcast communication system.

(5) Solar cells are used to power satellites having a large solar panels which are kept facing the sun



**Q.56. What is solar energy? What is the function of solar cells?** *(Federal 2005)*

**Ans:-** The sun is a great source of energy. Its energy is called solar energy. The earth receives huge amount of energy directly from the sun. the sun supplies 1.4 kwm $^{-2}$ energy at outer atmosphere. It is called solar constant.

There is a direct method in which sunlight is directly converted into electricity by using semi – conductor devices called solar cells. Solar cells are thin plates made from silicon.

A large number of solar cells are connected in series forming a solar cell panel, so that high voltage may be obtained for practical use.

**Q.57. Describe the methods to obtain solar energy.**

**Ans:-** Following are the methods for obtaing the solar energy.

(i) By solar cells

(ii) By heating the water directly

(iii) By collecting sun rays with help of mirrors or lenses.

**Q.58. How can the waste products be converted into useful energy?**

**Ans:-** Waste product like wood waste, crop residue and solid waste are used to get energy by direct conversion. They are burnt in a confined container. In this way heat produced is used in boiler to produce steam that can run turbine generator.

**Q.59. What are common methods to convert biomass into energy?**

**Ans:-** Threre are two common methods to convert biomass into energy.

(i) Direct combustion

(ii) Fermentation.

**Q.60. Discuss work – energy principle.** *(Federal board 2005)*

**Ans:-** It states that work done on the body is equal to the change in its kinetic energy.

It should be noted that whenever work is done on a body, it increases its kinetic energy.

That is,

Work done = Final (K.E.) – Initial (K. E.)

= change in kinetic energy of the body

**Example:-** When a body is lifted up from the Earth's surface, the work done changes the gravitational potential energy.

**Q.61. Under what conditions work done will be positive and negative** *(Lahore 2006s)*

**Ans:-** (i) If the angle `θ' between force and displacement is less than 90° (i.e. $\theta<90°$), work done will be positive.

(ii) If the angle `θ' between force and displacement is greater than 90° (i.e. $\theta>90°$) work done will be negative.

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