CBSE

WORK ENERGY AND POWER WS 2

Class 11 - Physics

Section A

1. A man squatting on the ground gets straight up and stand. The force of reaction of ground on the man during the process is **[1]**

   a) variable but always greater than mg.
   b) constant and equal to mg in magnitude.
   c) at first, greater than mg, and later becomes equal to mg.
   d) constant and greater than mg in magnitude.

2. The launching mechanism of a toy gun consists of a spring of unknown spring constant. When the spring is compressed 0.120 m, the gun, when fired vertically, is able to launch a 35.0-g projectile to a maximum height of 20.0 m above the position of the projectile before firing. Neglecting all resistive forces, determine the spring constant. **[1]**

   a) 873 N/m
   b) 993 N/m
   c) 903 N/m
   d) 953 N/m

3. If F is a force and d is the displacement in the direction of force then the work done by the force is given by **[1]**

   a) 2F.d
   b) - F.d
   c) F.d
   d) -2F.d

4. A 0.800-kg ball is tied to the end of a string 1.60 m long and swung in a vertical circle. (a) During one complete circle, starting anywhere, calculate the total work done on the ball by **[1]**

   i. the tension in the string and
   ii. gravity

   a) 25 J, -25 J
   b) 10 J, 10 J
   c) 30 J, 30 J
   d) 0, 0

5. How much work must be done by a force on 50 kg body in order to accelerate it from rest to 20 $\frac{m}{s}$ in 10 s? **[1]**

   a) 2×10^4 J
   b) 10^3 J
   c) 10^4 J
   d) 2×10^3 J

6. A 60 kg weight is dragged on a horizontal surface by a rope through a distance of 2 m. If the coefficient of friction is μ = 0.5, the angle of rope with the surface is 60° and g = 9.8 m/s^2, then work done is **[1]**

   a) 197 J
   b) 588 J
   c) 15 J
   d) 294 J

7. A 6.0-kg block initially at rest is pulled to the right along a horizontal, surface having a coefficient of kinetic friction of 0.15, by a constant horizontal force of 12 N. Find the speed of the block after it has moved 3.0 m? **[1]**

a) 2.8 m/s

b) 1.8 m/s

c) 3.8 m/s

d) 0.8 m/s

8. A pump is required to lift 800 kg of water (about 210 gallons) per minute from a well 14.0 m deep and eject it with a speed of 18.0 m/s. How much work is done in giving the water the kinetic energy it has when ejected? **[1]**

a) 1.40×10^5J

b) 1.30×10^5J

c) 1.10×10^5J

d) 1.20×10^5J

9. A boy carrying a box on his head is walking on a level load from one place to another on a straight road is doing no work. This statement is **[1]**

a) insufficient data

b) incorrect

c) correct

d) partly correct

10. **Assertion:** A man carrying a load on his head and walking with uniform velocity on a street does not work against gravity. **[1]**

Reason: When a body moves with uniform velocity, work done by all forces on this body is zero.

a) Assertion and reason both are correct statements and reason is correct explanation for assertion.

b) Assertion and reason both are correct statements but reason is not correct explanation for assertion.

c) Assertion is correct statement but reason is wrong statement.

d) Assertion is wrong statement but reason is correct statement.

11. **Assertion (A):** A cyclist comes to a skidding stop, the road does negative work on the cycle but the cycle does no work on the road. **[1]**

Reason (R): The cycle undergoes some displacement but road undergoes no displacement and the angle between the frictional force applied by the road and the displacement of the cycle is 180^o.

a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

12. **Assertion (A):** Power developed in circular motion is always zero. **[1]**

Reason (R): Work done in case of circular motion is zero.

a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

13. **Assertion:** The work done, in bringing a body down from the top to the base along a frictionless inclined plane, is the same as the work done in bringing it down the vertical circle. **[1]**

Reason: The gravitational force on the body along the inclined plane is the same as that along the vertical circle.

a) If both assertion and reason are true and the reason is the correct explanation of assertion.

b) If both assertion and reason are true but the reason is not the correct explanation of assertion.

c) If the assertion is true but the reason is false.

d) If both assertion and reason are false.

14. **Assertion (A):** When a gas is allowed to expand, work done by the gas is positive. **[1]**

Reason (R): Force due to gaseous pressure and displacement (of the piston) are in the same direction.

a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** Work done over a closed path is always zero. **[1]**

Reason (R): No force is required in a closed path.

a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** A person working on in horizontal road with a load on his head does no work. **[1]**

Reason (R): No work is said to be done if directions of force and displacement of load are perpendicular to each other.

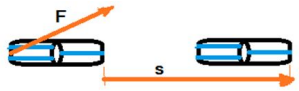
a) Both A and R are true and R is the correct explanation of A.

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

c) A is true but R is false.

d) A is false but R is true.

17. Balram exerts a steady force of magnitude 150 N on the stalled car as shown in the figure below; he pushes it a distance of 20 m. The car also has a flat tyre, so to make the car move straight. He pushes at an angle of 30^{o} to the direction of motion. How much work does he do? **[1]**



a) 2299 J

b) 2323 J

c) 2654 J

d) 2598 J

18. Can the overall energy of a body be negative? **[1]**

19. State the conditions under which a force does no work. **[1]**

20. Calculate the work done in lifting a 300 N weight to a height of 10 m with an acceleration 0.5 ms^{-2}. Take g = 10 ms^{-2}. **[1]**

21. Calculate the number of joules in 1 kWh. **[1]**

22. While catching a cricket ball of mass 200 g moving with a velocity of 20 ms^{-1}, the player draws his hands backward through 20 cm. Find the work done in catching the ball and the average force exerted by the ball on the hand. **[1]**

23. If a force acts perpendicular to the direction of motion of a body, what is the amount of work done? **[1]**

24. 230 joules were spent in lifting a 10 kg weight to a height of 2 m. Calculate the acceleration with which it was raised. Take g = 10 ms^{-2}. **[1]**

25. What is the work done by the force of tension in the string of simple pendulum? **[1]**

26. Give two examples from daily life where according to physics, work done is zero. **[1]**

27. Name and define SI unit of work. **[1]**

28. Does the amount of work done depend upon the fact that how fast is a load raised or moved in the direction of force? **[1]**

29. A gardener pushes a lawn roller through a distance of 20 m If he applies a force of 20 kg wt in a direction inclined at 60^o to the ground, find the work done by him. Take g = 9.8 ms^{-2}. **[1]**

30. Is the unit watt-second associated with energy or power? **[1]**

31. What is the work done by a person in holding a 15 kg suitcase, while waiting for a bus for 15 minutes? **[1]**

32. Can a body have momentum without energy? **[1]**

33. Show that $1J = 10^7$ erg. **[1]**

34. What is the work done by the centripetal force in moving a body through half cycle on the circular path of radius 35 m? **[1]**

35. Fill in the blank: 1 joule = _____ erg. **[1]**

36. A man runs a distance on a level road. The same man ascends up a hill with the same velocity through the same distance. When does he do more work? **[1]**

37. Does the work done depend on how fast or slow a body is moved? **[1]**

38. Give an example in which work done is negative. **[1]**

39. Out of joule, calorie, kilowatt and electron volt, which one is not the unit of energy? **[1]**

40. A coolie with a load on his head is walking on a horizontal platform. What is work done against gravity? **[1]**

41. What physical quantity does the area under the force-displacement curve represent? **[1]**

42. Is it necessary that work done in the motion of a body over a closed loop is zero for every force in nature? Why? **[1]**

43. Calculate the amount of work done by a labourer who carries n bricks, each of mass m, to the roof of a house of height h by climbing up a ladder. **[1]**

44. A porter moving vertically up the stairs with a suitcase on his head does work. Why? **[1]**

45. A body is moving along a circular path. How much work is done by the centripetal force? **[1]**

46. Give one such example in which the work done by the force acting upon a body is zero, although due to the applied force the body is displaced from its initial position. **[1]**

47. In a tug of war one team is slowly giving way to the other. What work is being done and by whom? **[1]**

48. How many joules make-up one erg? **[1]**

49. State gravitational unit of work in SI. **[1]**

50. How much work is done by a coolie walking on a horizontal platform with a load on his head? **[1]**

51. Is work done a scalar or a vector quantity? **[1]**

52. A person continues to push a rock for some time but fails to move it. What is the work done by it? Explain. **[1]**

53. Find the number of joules in the gravitational unit of work in SI. **[1]**

54. A body constrained to move along the z-axis of a coordinate system is subject to a constant force **F** given by $\mathbf{F} = -\hat{\mathbf{i}} + 2\hat{\mathbf{j}} + 3\hat{\mathbf{k}}$N Where $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$ are unit vectors along the x-, y- and z- axis of the system respectively. What is the work done by this force in moving the body a distance of 4 m along the z- axis? **[1]**

Section B

55. Give the expression for work done if the angle between force $\vec{F}$ and displacements $\vec{S}$ is θ. Also find the dimensions and S.I. unit of work. **[2]**

56. A body is being raised to a height *h* from the surface of earth. What is the sign of work done by: **[2]**

    a. applied force

    b. gravitational force?

57. A cyclist comes to a skidding stop in 10 m. During this process, the force on the cycle due to the road is 200 N and is directly opposite to the motion. **[2]**

    i. How much work does the road do on the cycle?

ii. How much work does the cycle do on the road?

58. Define the absolute and gravitational units of work in SI and CGS systems. **[2]**

59. Define the term work. Calculate the work done by a constant force. Is work done a scalar or a vector quantity? **[2]**

60. What is the work done by the centripetal force? Explain. **[2]**

61. The Earth moving around the Sun in a circular orbit is acted upon by a force and hence work must be done on the Earth by the force. Do you agree with this statement? **[2]**

62. What is the work done by a person in carrying a suitcase weighing 10 kg f on his head when he travels a distance of 5 m in the **[2]**

i. vertical direction and

ii. horizontal direction?

Take g = 9.8 ms^{-2}.

Section C

63. **Fill in the blanks:** **[3]**

(a) The work done by a coolie walking on a horizontal platform with a load W on his head is _____. **[1]**

(b) When a spring is stretched, work done by the stretching force is _____. **[1]**

(c) The SI unit of work is _____ and its CGS unit is _____. **[1]**

64. When a 300 g mass is hung from a vertical spring, it stretches from equilibrium by 10 cm. What work is required to stretch it by next 5 cm? **[3]**

Section D

65. Define the term work. Show that work done is equal to the dot product of force and displacement vectors. **[5]**

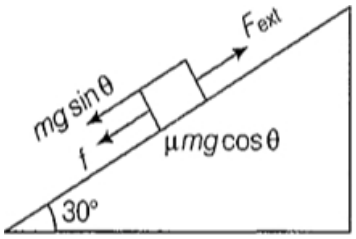
66. A body of mass 0.3 kg is taken up an inclined plane length 10 m and height 5 m and then allowed to slide down the bottom again. The coefficient of friction between the body and the plane is 0.15. What is the **[5]**

i. work done by gravitational force over the round trip?

ii. work done by the applied force over the upward journey?

iii. work done by the frictional force over the round trip?

iv. kinetic energy of the body at the end of trip? (g = 10 ms^{-2})



67. Derive an expression for the work done when a body slides down a rough inclined plane. **[5]**