CBSE

WORK AND ENERGY WS 3

Class 09 - Science

Section A

1. If 60 W bulb and 40 W bulb are connected in parallel to a source of 220 V potential, the bulb glowing brighter is: **[1]**

   a) 60 W
   b) Both glow equally bright
   c) 40 W
   d) Cannot be found

2. An elevator with load, weighting 500 kg is moving up with a velocity of 0.2 ms^{-1}. The power of the motor in horsepower is: (1 H.P. = 746 watt) **[1]**

   a) 1
   b) 1.5
   c) 1.3
   d) 1.2

3. Which of the following quantities have the same units? **[1]**

   a) Power and energy
   b) Work and force
   c) Power and work
   d) Work and energy

4. Weight lifter lifts 240 kg from the ground to a height of 2.5 m in 3 seconds. His average power is: **[1]**

   a) 1960 W
   b) 196 W
   c) 1.96 MW
   d) 19.6 kW

5. If a force of F newton moves a body with constant speed v, the power delivered by it is: **[1]**

   a) $\frac{F}{V}$
   b) F^2V
   c) Fv
   d) $\frac{V}{F}$

6. A horse exerts a force of 200N to pull the cart. If the horse-cart system moves with velocity 36km/h on the level road., then find the power of the horse in terms of horsepower (1hp = 746W). **[1]**

   a) 2.5 h.p.
   b) 3.68 h.p
   c) 2.68 h.p
   d) 1.68 h.p

7. A boy of mass 50 kg runs up a flight of 120 stairs, each measuring a height of 25 cm, in one minute and 40 seconds. If g = 10 m s^{-2}, the power of the boy is **[1]**

   a) 250 W
   b) 750 W
   c) 150 W
   d) 500 W

8. Kilowatt hour is a unit of _____. **[1]**

   a) mass
   b) power
   c) energy
   d) joule

9. S.I. unit of power is _____. **[1]**

a) J/s
b) s/J
c) Js
d) Js^2

10. If an electric iron 1200W is used for 30 minutes every day, then electric energy consumed in the month of April is: **[1]**

a) 8 kWh
b) 10 kWh
c) 18 kWh
d) 20 kWh

11. Water falls from a height of 30 m at the rate of 20 kg/s to operate a turbine. The losses due to frictional forces are 20% of energy. How much power is generated by the turbine? ($g = 10\ m/s^2$) **[1]**

a) 10.2 kW
b) 7.0 kW
c) 12.3 kW
d) 4.8 kW

12. A rickshaw puller pulls the rickshaw by applying a force of 100 N. If the rickshaw moves with a constant velocity of 36 km/h. Find the power of rickshaw puller. **[1]**

a) 10 Watt
b) 100 Watt
c) 2000 Watt
d) 1000w

13. **Assertion (A):** Watt hour has units of energy. **[1]**
Reason (R): Kilowatt hour (kW h) is the unit of electric power.

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.

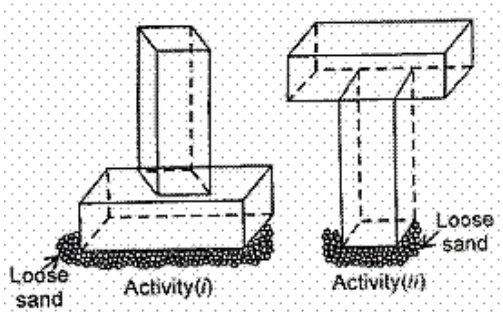
14. **Assertion (A):** A crane P lifts a car up to a certain height in 1 min. Another crane Q lifts the same car up to the same height in 2 min. Then crane P consumes two times more fuel than crane Q. **[1]**
Reason (R): Crane P supplies two times more power than crane Q.

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):** A crane P lifts a car upto a certain height in 1 min. Another crane Q lifts the same car upto the same height in 2 min. Then crane P consumes two times more fuel than crane Q. **[1]**
Reason (R): Crane P supplies two times more power than crane Q.

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. As shown in the following two activities (i) and (ii) have been performed by a student for comparing the pressure exerted by solid iron cuboids having the same weight and dimensions on the loose sand. **[1]**



If p_1 and p_2 be the pressure exerted by the set-up in both the activities respectively, then the observation made by her is

a) $P_1 > P_2$ b) Data is insufficient

c) $P_1 < P_2$ d) $P_1 = P_2$

17. Match the following with correct response. **[1]**

Column A	Column B
(1) W	(A) Nm
(2) 1 KW	(B) $3.6 \times 10^6 J$
(3) 1 KWh	(C) 1000W
(4) 1 HP	(D) 746 W

a) 1-C, 2-B, 3-D, 4-A b) 1-D, 2-A, 3-C, 4-B

c) 1-A, 2-C, 3-B, 4-D d) 1-B, 2-D, 3-A, 4-C

18. Match the following with the correct response. **[1]**

(a) Work	(i) Watt
(b) Power	(ii) Newton
(c) Energy	(iii) Kilowatt-hour
(d) Force	(iv) Joule

a) (a) - (i), (b) - (iii), (c) - (ii), (d) - (iv) b) (a) - (iv), (b) - (i), (c) - (iii), (d) - (ii)

c) (a) - (ii), (b) - (iv), (c) - (i), (d) - (iii) d) (a) - (iii), (b) - (ii), (c) - (iv), (d) - (i)

19. 60 W means that the device will use 60 joules of energy in _____ hour. **[1]**

a) $\frac{1}{360}$ b) 3600

c) $\frac{1}{60}$ d) $\frac{1}{3600}$

20. The combined weight of the sinker and cork is _____ than the weight of the sinker alone. **[1]**

a) less b) zero

c) much d) more

21. Instantaneous power is the product of force and _____. **[1]**

a) volume b) velocity

c) mass d) energy

22. To show that the effect of force depends upon the area of contact, a student holds both the ends of sharpening pencil between the index fingers of both the hands and presses it from both sides. The finger which has a deeper mark of a pencil is: **[1]**

a) on thumb of both the hands
b) towards the flat end of the pencil
c) on forefinger of both the hands
d) towards the pointed end of the pencil

23. What is power? **[1]**

24. Define 1 watt of power. **[1]**

25. An electric bulb of 60 W is used for 6 h per day. Calculate the units of energy consumed in one day by the bulb. **[1]**

26. A lamp consumes 1000 J of electrical energy in 10 s. What is its power? **[1]**

27. A boy of mass 50 kg runs up a staircase of 45 steps in 9 s. If the height of each step is 15 cm, find his power. **[1]**

Take g = 10 ms^{-2}.

Section B

28. Match the following Column A with Column B: **[2]**

Column A	Column B
(a) Power	(i) $\frac{1\ joule}{1\ second}$
(b) P. E.	(ii) $\frac{1}{2}mv^2$
(c) K.E.	(iii) m $\times$ g $\times$ h
(d) 1 watt	(iv) $\frac{W}{t}$

29. Why an egg sinks in fresh water but floats in a strong solution of salt? **[2]**

30. If an electric bulb of 100 watt is lighted for 2 hours. how much electric energy would be consumed? **[2]**

31. Why does a block of plastic released under water come up to the surface of water? **[2]**

32. A man whose mass is 50 kg climbs up 30 steps of a staircase, each measuring 20 cm high, in 30 s. Calculate the power used in climbing the stairs. (Take g = 10 ms^{-2}) **[2]**

33. How is the power related to the speed at which a body can be lifted? How many kilograms will a man working with the power of 100 W, be able to lift at constant speed of 1 ms^{-1} vertically? (g = 10 ms^{-2}) **[2]**

34. What is power? How do you differentiate kilowatt from kilowatt-hour? The Jog Falls in Karnataka state are nearly 20 m high. 2000 tonnes of waterfalls from it in a minute. Calculate the equivalent power if all this energy can be utilized? (g=10 ms^{-2}) **[2]**

35. An electric heater is rated 1500 W. How much energy does it use in 10 hours? **[2]**

36. A horse pulls a cart with a force of 300 N, such that the system of horse and cart moves with uniform speed of 18 kmh^{-1} on a level road. Calculate the power developed by the horse in watt and also find its equivalent horse power. (Take 1 hp = 746 W) **[2]**

37. The Jog falls in Karnataka state are nearly 20 m high 2,000 tonnes of water falls from it in a minute. Calculate the equivalent power, if all this energy can be utilised. (g = 10 ms^{-2}) **[2]**

38. Two boys A and B weighing 60 kg and 40 kg respectively, climb on a staircase each carrying a load of 20 kg on their head. The staircase has 10 steps, each of height 50 cm. If A takes 20 s to climb and B takes 10 s to climb, then **[2]**

i. who possesses greater power?
ii. find the ratio of their powers.

39. i. State and define SI unit of power. **[2]**

ii. A person carrying 10 bricks each of mass 2.5 kg on his head moves to a height 20 m in 50 s. Calculate power spent in carrying bricks of the person. (Given, g = 10 ms^{-2}).

40. Compare the power at which each of the following is moving upwards against the force of gravity? (given g = 10 ms^{-2}) **[2]**

i. a butterfly of mass 1.0 g that flies upward at a rate of 0.5 ms^{-1}.

ii. a 250-g squirrel climbing up on a tree at a rate of 0.5 ms^{-1}.

41. Find the energy in joules consumed in 10 hours by four devices of power 500 W each. **[2]**

42. The power of a motor pump is 2 kW. How much water per minute the pump can raise to a height of 10 m? (Given g = 10 m s^{-2}) **[2]**

43. Five bulbs each having 100 W power are used for 4 h, a heater having 1500 W power is used for 2 h and an electric iron of power 1000 W is used for 5 h. **[2]**

i. Calculate the total energy consumed by them.

ii. Convert this energy into joules.

44. A man of mass 60 kg runs up a flight of 30 steps in 15 seconds. If each step is 20 cm high, calculate the power developed by the man. (Take g = 10 m/s). **[2]**

45. A machine raises a load of 750 N through a height of 16 m in 5 seconds. Calculate the power at which the machine works. **[2]**

46. Calculate the power of an engine required to lift 10^5 kg of coal per hour from a mine 360 m deep. [Take g = 10 ms^{-2}] **[2]**

47. A woman pulls a bucket of water of total mass 5 kg from a well which is 10 m deep of 10 m in 10 s, Calculate the power used by her. (Take, g = 10 ms^{-2}) **[2]**

48. A certain household has consumed 250 units of energy during a month. How much energy is this in joules? **[2]**

49. If an electric iron of 1200 W is used for 30 minutes every day, find the electric energy consumed in the month of April. **[2]**

50. Two girls, each of weight 400 N climb up a rope through a height of 8 m. We name one of the girls A and the other B. Girl A takes 20 s while B takes 50 s to accomplish this task. What is the power expended by each girl? **[2]**

51. Why will a sheet of paper fall slower than one that is crumpled into a ball? **[2]**

52. A 150 kg car engine develops 500 W for each kg. What force does it exert in moving the car at a speed of 20 ms^{-1}? **[2]**

53. Explain briefly why a balloon filled with helium gas rises in air? Why does the balloon not rise indefinitely? **[2]**

54. An engine can pump 30,000 litres of water a vertical height of 45 metres in 10 minutes. Calculate the work done by the machine and its power. [g = 9.8 m/s^2; Density of water = $10^3 kg/m^3$, 1000 litre = 1 m^3]. **[2]**

55. Define average power. **[2]**

56. If the power of a motor is 40 kW, at what speed can it raise a load of 20,000 N? **[2]**

57. Avinash can run at a speed of 8 ms^{-1} against the frictional force of 10 N, and Kapil can move at a speed of 3 ms^{-1} against the frictional force of 25 N. Who is more powerful and why? **[2]**

Section C

58. **State True or False:** **[3]**

(a) The SI unit of work is watt. **[1]**

(b) The energy used in households, industries, and commercial establishments is usually expressed in watt. **[1]**

(c) The power of an electrical appliance tells us the rate at which electrical energy is consumed by it. **[1]**

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

(a) The commercial unit of energy is _____. **[1]**

(b) The electrical energy used during a month is expressed in terms of _____. **[1]**

(c) One _____ is the power of an appliance which does work at the rate of 1 joule per second. **[1]**

60. Amit buys few grams of gold at the poles as per the instruction of one of his friends. He hands over the same when he meets him at the equator. Will the friend agree with the weight of gold bought? If not, why? **[3]**

61. An automobile engine propels a 1,000 kg car A along a levelled road at a speed of 36 km h^{-1}. Find the power if the opposing frictional force is 100 N. Now, suppose after travelling a distance of 200 m, this car collides with another stationary car B of same mass and comes to rest. Let its engine also stop at the same time. Now, car B starts moving on the same level road without getting its engine started. Find the speed of the car B just after the collision. **[3]**

62. i. The potential energy of a freely falling object decreases progressively. What happens to its **[3]**

a. Kinetic energy,

b. total mechanical energy?

State the law on which your answer is based.

ii. A household consumes 1 kWh of energy per day. How much energy is this in joules?

Section D

Question No. 63 to 66 are based on the given text. Read the text carefully and answer the questions: **[4]**

An old man takes 10 minutes to do a particular work whereas a young man takes 5 minutes to do the same work. The rate of doing work of a young man is more than that of an old man. This rate of doing work is called power. Hence, power of young man is more than that of an old man. Thus, Power is defined as the rate of doing work.

Power = $\frac{\text{Work done}}{\text{Time taken}}$

P = $\frac{W}{t}$

When work is done an equal amount of energy is consumed. Power is a scalar quantity. The SI unit of power is watt which is denoted by symbol W.

1 watt is the power of an appliance which does work at the rate of 1 joule per second.

1 watt = 1 joule/1 second

1 watt = 1 joule per second.

The power of an electrical appliance tells us the rate at which electrical energy is consumed by it. Watt is a small unit of power. Sometimes, bigger units of power called kilowatt (kW) and megawatt (MW) are also used.

1 kilowatt = 1000 watts

1 kW = 1000 W

1 megawatt = 1000,000 watts

1MW = 10^6 W

63. What is power?

64. Define the SI unit of power.

65. What does the power of an electrical appliance tell?

66. How many watts are there in 1 kilowatt and 1 megawatt?

Section E

67. Calculate the electricity bill amount for a month of April, if 4 bulbs of 40 W for 5 h, 4 tubelights of 60 W for 5 h, a TV of 100 W for 6 h, a washing machine of 400 W for 3 h are used per day. The cost per unit is Rs. 1.80. **[5]**

68. A man standing on the top of a tower 60 m high throws a ball in the vertically upward direction with a velocity of 20 ms^{-1}. How long will it take the ball to pass by the man while moving in the downward direction? How long will it take the ball to hit the ground? (Take g = 10 ms^{-2}) **[5]**

69. i. What happens when you shake a wet piece of cloth? Explain your observation. **[5]**
    ii. An electric bulb of 200 W is used for 6 hrs a day. Calculate the energy consumed by it in a day in Joules and kilowatt-hour unit.

70. Define watt. Express kilowatt in terms of joule per second. A 150-kg car engine develops 500 W for each kg. What force does it exert in moving the car at a speed of 20 ms^{-1}? **[5]**