QB365	
Important Questions - Work and Energy	

9th Standard CBSE

Science

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eg.No.:

Time : 01:00:00 Hrs

Total Marks : !	50
Section-A	
1) Work done is measure by	1
(a) mass * velocity (b) mass * acceleration (c) force * distance (d) force * time	
2) A body is under the action of the equal and opposite forces, each of 5 N.The body is displaced by 2m.The work	1
done is	
(a) +10 J (b) -10 J (c) zero (d) 25 J	
3) Ns is equivalent to	1
(a) kg m s ⁻² (b) kg m s ⁻¹ (c) kg m s ⁻³ (d) Nm ⁻¹ s	
4) A body is acted upon by a force which is proportional to the distance covered. If distance covered be denoted	1
by S, then work done by the force will be proportional to	
(a) S (b) S ² (c) S ^{3/2} (d) S ^{2/3}	
5) Kg m ² s ⁻² is associated with	1
(a) energy (b) force (c) power (d) momentum	
6) In the oscillations of a simple pendulum, the sum of the P.E. and K.E. is	1
(a) zero (b) infinite (c) constant (d) maximum	
7) A wound watch spring has	1
(a) no energy stored in it (b)mechanical P.E. stored in it. (c)mechanical K.E. stored in it.	
(d) electrical energy stored in it.	
8) A body is dropped from a certain height above the ground.When it is half way down, it possesses	1
(a) only kinetic energy (b)only potential energy (c)both kinetic and potential energy	
(d) no energy at all	
9) The kinetic energy of a body decreases by 36%.What is the percentage decrease in momentum?	1
(a) 12 (b) 20 (c) 28 (d) 36	
10) How is work done by a force measured?A porter lifts a luggage of 20 kg from the ground and puts it on his	1
head 1.7 m above the ground.Find the work done by the porter on the luggage.	
Section-B	
11) (a) Name and define the SI unit of a work.	2
(b) Is work done a scalar or vector quantity?	
12) If the mass of a body is doubled, its kinetic energy of 1 joule relative to the ground when it is at a height of	2
(a) 0.102 m (b) 1 m (c) 9.8 m (d) 32 m	

13) When is the work done by a force said to be (a) positive and (b) negative?Give examples.	
14) What is the work done by a coolie walking on a level road with a load on his head?	2
15) Discuss whether or not work is done in the following cases:	2
(i) When we twist a wire.	
(ii) When we press a football.	
(iii) When we push a table.	
(iv) When a person carries a handbag and walks on a level road.	
(v) When a person holds a book in his hand and keeps it stationary.	
16) Seema tried to push a heavy rock of 100 kg fro 200 s but could not more it.Find the work done by Seema at	2
the end of 200 s.	
17) In a tug of war, one team is slowly giving way to the other.What work is being done and by whom?	2
18) Can the kinetic energy of an object be negative?	2
19) Does a man standing at rest on a moving car possess kinetic energy?	2
20) Write an expression for the work done when a force is acting on an object in the direction of its displacement.	2
Section-C	
21) Is energy a scalar or vector quantity?	5
22) A body of mass 25 kg is raised to the top of a <mark>building 10 m high and</mark> then dropped freely under gravity.	5
(a) Calculate the work done in raising the body to the top of the building.	
(b) What is the value of the gravitational potential energy at the top of the building?	
(c) By what factor will the g <mark>ravita</mark> tional potential energy of the same body increase if it is raised to the top of a	
multistorey building 30 m high?	
(d) When will the kinetic energy of the body be maximum?	
23) A force of 10N acts on a body of 2 kg for 3 seconds.Find the kinetic energy acquired by the body in 3 seconds.	5
24) A force of 20 N displaces an object through 10 cm and does 1 J work in the process.Find the angle between	5
force and displacement.	

Section-A	

1) (C)	force " distance	1
2) (c)	zero	1
3) (b)	kg m s ⁻¹	1
4) (b)	S ²	1
5) (a)	energy	1
6) (c)	constant	1
7) (b)	mechanical P.E. stored in it.	1
8) (c)	both kinetic and potential energy	1
9) (b)	20	1

10)

Work done by a force is measured by the product of force and displacement when they are in same direction or opposite direction.

Given, m = 20 kg

$$\therefore$$
 $s = 1.7m$ [where, m = mass of luggage, g = acceleration due to gravity.]
 \therefore $W = F_s = mgs$
[\therefore F and s are in same direction.]
 $= 20 \times 10 \times 1.7 = 340$ J
Section-B

11)

(a) The SI unit of work is joule(J). One joule of work is said to be done when a force of one Newton displaces a body through a distance of 1 meter in its own direction. Thus,

1 joule= 1 newton*1 metre or 1J=1 Nm.

(b) Work done is a scalar quantity because it has only magnitude and no direction.

12) (a) 0.102 m

13)

(a) Positive Work. Work done by a force is positive if the force acts in the direction of displacement. Then $W = F \times s \times cos$ $0^{\circ} = F$ s

Examples:

(i) When a body falls freely under gravity, the work done by the force of gravity is positive.

(ii) When a horse pulls a cart, the applied force and displacement are in the same direction, the work done by the horse is positive.

(b) Negative Work. Work done by a force is negative if the force acts opposite to the direction of displacement. Then

W=F imes s imes cos $180^\circ=F$ s(-1)=-F s

Examples:

(i) When a body is lifted up, the work done by the gravitational force is negative. This is because the gravitational acts vertically downwards while the displacement is in the vertically upward direction.(ii) When brakes are applied to a moving vehicle, the work done by the braking forces is negative. The braking force acts in the backward direction while the displacement of the vehicle is in the forward direction.

14)

Yes, it is possible that a force is acting on a body but still the work done is zero.For example, consider a coolie carrying a load on his head across a level road.He exerts an upward force equal to the weight of the load.But the displacement of the load is in the horizontal direction.Thus the angle between force F and displacement s is 0°.Hence

W=F s cos $90^\circ=0$

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15)

(i) When we twist a wire and change its shape, work is done against internal forces of cohesion between the molecules of the wire.

(ii) When we press a football, we change its volume and work is done against the pressure of the air inside the bladder of the football.

(iii) When we push a table, we do work against the force of friction between the legs of the table and the floor.

(iv) In this case, no work is done because the force the person is applying against the weight of the bag is acting vertically upwards and his motion is in the horizontal direction. There is thus no motion in the direction of the force and so work done is zero.

(v) In this case, though the force is constantly being applied, there is no displacement and hence work done is zero.

- 16) Zero, because displacement of the rock is zero.
- 17)

The work is done by the winning team and is equal to the product of resultant force applied by the two teams and the displacement suffered by the losing team.

- 18) No, both m and v^2 are always positive.
- 19) Yes, because he is sharing the motion of the car and so he possesses kinetic energy.
- 20) Work done=Force*Displacement

Section-C

21)	Energy is a scalar quantity as it has only magnitude and no direction.	5
22)	Here m=25 kg, h=10m, g=10m/s ²	5
	(a) Work done =mgh=25*10*10J=2500J	
	(b) Gravitational P.E.=Work done=2500J	
	(c) Gravitational P.E. at a height of 30m=25*30*10J=7500J	
	P.E. at 30 m height/P.E. at 10m height=7500J/2500J=3	
	Thus, P.E. increases by 3 times.	
	(d) K.E. of the body will be maximum just before the body strikes the ground.	
23)	Here F=10 N, m=2 kg, t=3s	5
	Acceleration, a=F/m=10/2=5 ms ⁻²	
	Velocity of the body after 3s v=u+at=0+5*3=15 ms ⁻¹	
	K.E. of the body after 3s	
	$K.E=1/2 mv^2=1/2^{*}2^{*}(15)^2=225J$	
24)	Here F=20 N, s=10 cm=0.10 m, W=1J, $ heta=?$	5

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$$\begin{split} W &= F \quad s \quad \cos \quad \theta \\ 1 &= 20^* 0.10^* \cos \quad \theta \text{ or } \cos \quad \theta = \frac{1}{2} \\ \text{Hence, } \theta &= 60^\circ \end{split}$$

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