TEST

JEE Mains PYQs Work, Energy, Power (Physics Master Academy)

QUESTIONS

SECTIONS

1. Section A - 30 Questions

Section 1 : Section A - 30 Questions

SECTION INSTRUCTIONS

This section contains 30 MCQs. 4 marks will be awarde for every corrct answer. - 1 mark will be deducted for every incorrect answer

1 Two persons A and B perform same amount of work in moving a body from a certain distance d with application of forces acting at angle 45° and 60° with the direction of displacement respectively. The ratio of force applied by person A to force applied by person B is $\frac{1}{\sqrt{x}}$. The value of x is ____

- 1
- 2
- 3
- 4

Correct: +4 · Incorrect: -1

2 A force $\vec{F} = (5y + 20)\hat{j}$ N acts on a particle. The work done by this force when the particle is moved from y = 0m to y = 10m is____J.

- 350
- 400
- 425
- 450

3 A porter lifts a heavy suitcase of mass 80 kg and at the destination lowers it down by a distance of 80cm with a constant velocity. Calculate the work done by the porter in lowering the suitcase (take g = 9.8ms^{-2})

- ○ -62720.0J
- ○ -627.2J
- ○ +627.2J
- ○ 784.0J

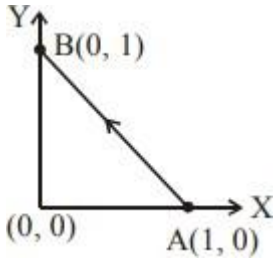
Correct: +4 · Incorrect: -1

4 A person pushes a box on a rough horizontal platform surface. He applies a force of 200N over a distance of 15m. Thereafter he gets progressively tired and his applied force reduces linearly with distance to 100N. The total distance through which the box has been moved is 30m. What is the work done by the person during the total movement of the box?

- ○ 3280J
- ○ 2780J
- ○ 5690J
- ○ 5250J

Correct: +4 · Incorrect: -1

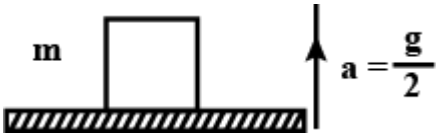
5 Consider a force $\vec{F}$ = -x $\hat{i}$ + y $\hat{j}$. The work done by this force in moving a particle from point A(1, 0) to B (0, 1) along the line segment is (all quantities are in SI units)



- ○ 2J
- ○ ½ J
- ○ 1J
- ○ 3/2 J

Correct: +4 · Incorrect: -1

6 A block of mass m is kept on a platform which starts from rest with constant acceleration g/2 upward, as shown in kg. work done by normal reaction on block in time t is



- $\frac{-mg^2t^2}{8}$
- $\frac{mg^2t^2}{8}$
- 0
- $\frac{3mg^2t^2}{8}$

Correct: +4 · Incorrect: -1

7 When a rubber band is stretched by a distance x it exerts restoring force of magnitude $F = ax + bx^2$ where a and b are constants. The work done in stretching the unstretched rubber band by L is

- aL^2+bL^3
- $\frac{1}{2}(aL^2+bL^3)$
- $\frac{aL^2}{2}+\frac{bL^3}{3}$
- $\frac{1}{2}\left(\frac{aL^2}{2}+\frac{bL^3}{3}\right)$

Correct: +4 · Incorrect: -1

8 A body of mass 'm' dropped for a height h reaches the ground with a speed of $0.8\sqrt{gh}$. The value of work done by the air friction is

- -0.68 mgh
- mgh
- 1.64 mgh
- 0.64 mgh

Correct: +4 · Incorrect: -1

9 If the kinetic energy of a moving body becomes four times its initial Kinetic energy then he percentage change in its momentum will be

- ○ 100%
- ○ 200%
- ○ 300%
- ○ 400%

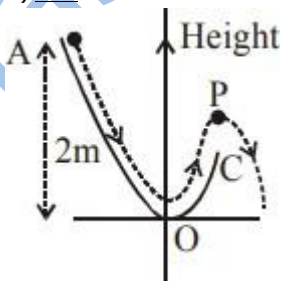
Correct: +4 · Incorrect: -1

10 Two solids A and B of mass 1kg and 2kg respectively are moving with equal linear momentum. The ratio of these kinetic energies $(KE)_A$: $(KE)_B$ will be A/l, so the value of A will be ___

- ○ 1
- ○ 2
- ○ 3
- ○ 4

Correct: +4 · Incorrect: -1

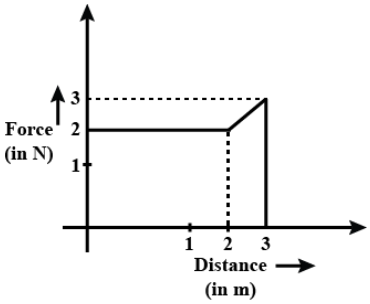
11 A particle (m = 1) slides down a frictionless track (AOC) starting from rest at a point A (height 2m). After reaching C, the particle continues to move freely in air in a projectile. When it reaching its highest point P (height 1m), the kinetic energy of the particle (in J) is (Figure drawn schematic and not to scale, take g = 10 ms^{-2}) ___



- ○ 0
- ○ 5
- ○ 10
- ○ 15

Correct: +4 · Incorrect: -1

12 A particle moves in a one dimension fro rest under the influence of a force that varies with the distance travelled by the particle as shown in kgure. The kinetic energy of the particle after it has travelled 3m is



- 4J
- 2.5J
- 6.5J
- 5J

Correct: +4 · Incorrect: -1

13 A uniform cable of mass 'M' and length 'L' is placed on a horizontal surface such that its $(1/n)^{th}$ part is hanging below the edge of the surface. To lift the hanging part of the cable upto the surface, the work done should be

- $\frac{MgL}{2n^2}$
- $\frac{MgL}{2n^2}$
- $\frac{2MgL}{n^2}$
- $nMgL$

Correct: +4 · Incorrect: -1

14 A particle which is experiencing force given by $\vec{F}$ = 3$\hat{i}$ – 12$\hat{j}$, undergoes a displacement of $\vec{d}$ = 4$\hat{i}$. IF the particle had a kinetic energy of 3J at the beginning of the displacement, what is the kinetic energy at the end of the displacement?

- 9J
- 12J

- 10J
- 15J

Correct: +4 · Incorrect: -1

15 A force acts on a 2kg object so that its position is given bas a function of time as $x = 3t^2 + 5$. What is the work done by this force in krst 5 seconds?

- 850J
- 950J
- 875J
- 900J

Correct: +4 · Incorrect: -1

16 An object is dropped from a height h from the ground. Every time it hits the ground it loses 50% of its kinetic energy. The total distance covered as $t \to \infty$ is

- 3h
- ∞
- 5/3 h
- 8/3 h

Correct: +4 · Incorrect: -1

17 A time dependent force F = 6t acts on a particle of mass 1kg. IF the particle starts from rest, the work done by the force during the krst 1 second will be

- 9J
- 18J
- 4.5J
- 22J

Correct: +4 · Incorrect: -1

18 A 60HP electric motor lifts elevator having a maximum total load capacity of 2000Kg. If the frictional force on the elevator is 4000N, the speed of the elevator at full load is close to (1HP = 746W, g = 10 ms^{-2})

- 1.7 ms^{-1}
- 1.9 ms^{-1}
- 1.5 ms^{-1}
- 2.0 ms^{-1}

Correct: +4 · Incorrect: -1

19 A particle of mass M is moving in a circle of kxed radius R in such a way that its centripetal acceleration at time t is given by n^2Rt^2 where n is constant. The power delivered to the particle by the force acting on it is

- ½ $Mn^2R^2t^2$
- Mn^2R^2t
- MnR^2t^2
- MnR^2t

Correct: +4 · Incorrect: -1

20 A wind powered generator converts wind energy into electrical energy. Assume that the generator converts a kxed fraction of the wind energy intercepted by its blades into electrical energy. For wind speed v, the electrical power output will be most likely proportional to

- v^4
- v^2
- v^3
- v

Correct: +4 · Incorrect: -1

21 A body is accelerates uniformly from rest to v_1 in time t_1. The instantaneous power delivered to the body as a function of time t is

- $\frac{m v_1 t^2}{t_1}$
- $\frac{m v_1^2 t}{t_1^2}$
-

$\frac{m v_1 t}{t_1}$

○ $\frac{m v_1^2 t}{t_1}$

Correct: +4 · Incorrect: -1

22 A block moving horizontally on a smooth surface with a speed of 40m/s splits into two parts with masses win the ratio 1: 2. If the smaller part moves at 60m/s in the same direction, then the fractional change in kinetic energy is

○ 1/3

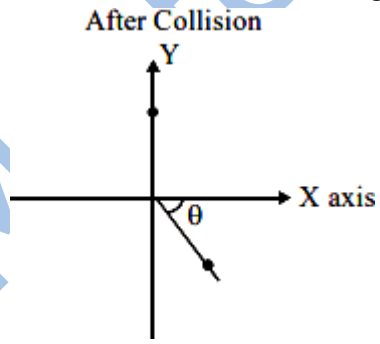
○ 2/3

○ 1/8

○ 1/4

Correct: +4 · Incorrect: -1

23 A ball of mass 10kg moving with a velocity $10\sqrt{3}$ ms^{-1} along X axis, hits another ball of mass 20 kg which is at rest. After collision the krst ball comes to rest while and the second one disintegrates in two equal pieces. One of the piece starts moving along Y axis at a speed of 10m/s. The second piece starts moving at a speed of 20m/s at an angle θ (degree) with respect to X axis.
The conkguration of pieces after collision is the kgure. The value of θ to the nearest integer is ___



○ 20

○ 30

○ 45

○ 60

Correct: +4 · Incorrect: -1

24 Given below are two statements: one is labeled as Assertion A and other is labeled as Reason R.
Assertion A: Body P having mass M moving with speed u has head on collision elastically with another body Q will have a maximum speed equal to 2u after collision.
Reason R: During elastic collision, he momentum and kinetic energy are both conserved

- ○ Both A and R are correct and R is the correct explanation of A
- ○ A is not correct but R is correct
- ○ A is correct but R is not correct
- ○ Both A and R are correct and R is Not the correct explanation of A

Correct: +4 · Incorrect: -1

25 A block of mass 1.9kg is at rest at the edge of a table, of height 1m. A bullet of mass 0.1kg collides with the block and sticks to it. IF the velocity of the bullet is 20 m/s in the horizontal direction just before the collision then the kinetic energy just before the combined system strikes the floor is (take g – 10m/s^2. Assume there is no rotational motion and loss of energy after the collision is negligible)

- ○ 20J
- ○ 21J
- ○ 19J
- ○ 23J

Correct: +4 · Incorrect: -1

26 A man (mass 50kg) and his son (mass 20kg) are standing on a frictionless surface facing each other. The man pushes his son so that he starts moving at a speed of 0.70 ms^{-1} with respect to the man. The speed of the man with respect to the surface is

- ○ 0.28 ms^{-1}
- ○ 0.20 ms^{-1}
- ○ 0.47 ms^{-1}
- ○ 0.14 ms^{-1}

Correct: +4 · Incorrect: -1

27 A body of mass 2kg makes an elastic collision with a second body at rest and continues to move in the original direction but with one fourth of its original speed. What is the mass of the second body?

- ○ 1.0 kg
- ○ 1.5kg
- ○ 1.8kg
- ○ 1.2kg

Correct: +4 · Incorrect: -1

28 A particle of mass m is moving with sped 2v and collides with a mass 2m moving with a speed v in the same direction. After collision, the krst mass is stopped completely while the second one splits into two particles each of mass m which moves at angle 45° with respect to the original direction. The speed of each moving particle is

- $\sqrt{2}v$
- $2\sqrt{2}v$
- $v/(2\sqrt{2})$
- $v/\sqrt{2}$

Correct: +4 · Incorrect: -1

29 A moving particle of mass m makes a head on elastic collision with another particle of mass 2m, which is initially at rest. The percentage loss in energy of the colliding particle on collision, is close to

- 33%
- 67%
- 90%
- 10%

Correct: +4 · Incorrect: -1

30 Consider the following two statements:
A: Linear momentum of a system of particle is zero
B: Kinetic energy of a system of particle is zero.

- A does not imply B and B does not imply A
- A implies B and B does not imply A
- A does not imply B but B implies A
- A implies B and B implies A

Correct: +4 · Incorrect: -1

TEST

JEE Mains PYQs Work, Energy, Power (Physics Master Academy)

ANSWERS

SECTIONS

1. Section A - 30 Questions

Section 1 : Section A - 30 Questions

1 2

2 450

3 -627.2J

4 5250J

5 1J

6 $\frac{3mg^2t^2}{8}$

7 $\frac{aL^2}{2}+\frac{bL^3}{3}$

8 0.64 mgh

9 100%

10 2

11 10

12 6.5J

13 $\frac{MgL}{2n^2}$

14 15J

15 900J

16 3h

17 4.5J

18 1.9 ms^{-1}

19 Mn^2R^2t

20 v

21 $\frac{m v_1^2 t}{t_1^2}$

22 1/8

23 30

24 Both A and R are correct and R is the correct explanation of A

25 21J

26 0.20 ms^{-1}

27 1.5kg

28 $2\sqrt{2}v$

29 90%

30 A does not imply B but B implies A

FOR FULL SOLUTIONS VISIT OUR APP.