Hohete Tibeb Share

Ethio - Parents' Physics Test yourself for Grade11

2019/20

Unit 5 Work and Energy

I. Write True or False

1. Work is done against gravity when you walk up stair.
2. Work is the dot product of force and displacement
3. The SI unit of work and kinetic energy are the same.
4. Work done is the same as the change in kinetic energy.
5. Power is the rate of change in kinetic energy of the body.

II. Match

Column A	**Column B**
1. Work	A. the rate of work done
2. Kinetic energy	B. Gravity
3. Dissipative force	C. The energy due to configuration
4. Conservative force	D. The scalar product of force and displacement
5. Power	E. the energy due to the motion of an object
	F. Drag caused by air

III. Choose the correct answer and write the letter of your choice on the answer sheet.

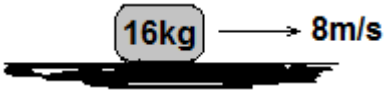
1. Which one of the following statements is **not correct** about work?
   A. Work is a scalar physical quantity
   B. If a box is carried downstairs, the work done on it against gravity is negative
   C. The work done against a non-conservative force becomes zero in one cycle
   D. When the total work done on an object is zero, the object moves at a constant velocity

2. Alex kicks a 250 g football along the ground with a force of 180 N. If his foot moved with the ball a distance of 40 cm, at what speed does the ball move away from his foot?
   A. 24 m/s B. 20 m/s C. 16 m/s D. 11 m/s

3. A man displaces a crate 6m by exerting a force at an angle of 37° to the direction of the displacement. If the work done is 1344 J, what is the applied force?
   A. 280 N B. 310 N C. 320 N D. 400 N

4. A boy moves a box from a position of $\vec{S}_1$ = (2 m, 3 m, 0) to another point $\vec{S}_2$ = (8 m, - 2 m, 0) by exerting a force of $\vec{F}$ = (50 N, - 42 N, 0). Calculate the work done by the boy on the box?
   A. 620 J B. 510 J C. 480 J D. 370 J

5. The box stops sliding within 32 m, see figure, due to friction. Calculate the friction force that retards the motion.



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A. 32 N B. 2 N C. 24 N D. 16 N

6. One of the following is **false** about an object that is projected vertically in air.
   A. The sum of its K.E and P.E is the same at any point in the absence of air resistance
   B. For an ascending body the increase in K.E equals to the decrease in P.E
   C. When the object descends the loss in P.E is the same as the gain in K.E
   D. The K.E of the object at the ground equals to the P.E at the top

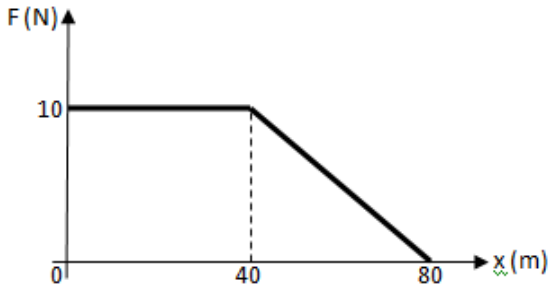
7. A ball of mass 100 g moves at 4 m/s and collides with another 100 g ball that moves at 6 m/s. If they stick together after the collision and move at 1 m/s for a short period of time, how much kinetic energy is lost in the form of heat and sound during the collision?
   A. 2.6 J B. 2.5 J C. 3.6 J D. 1.6 J

8. When an object is moving in a gravitational field then which one of the following is **true** about the work done?
   A. $W = \Delta KE + \Delta U$ B. $W = I_{CM} + Md^2$
   C. $W = \tau \bullet \theta$ D. $W = KE + PE$

9. Which one of the following is non – conservative force?
   A. gravitational force B. Air resistance
   C. Electrical force D. Elastic force

10. A block is initially moving at 5 m/s along a horizontal surface. If the coefficient of friction between the block and the surface is 0.5, how far will the block move on the surface before it comes to rest?
   A. 2.5 m B. 25 m C. 17.5 m D. 5 m

11. A force is acting on a point particle as a function of distance as shown in the graph below. What is the total work done on the point object?



A. 800 J B. 600 J C. 700 J D. 500 J

12. An object under a constant force of $(3\hat{i}+2\hat{j})$ N moves a displacement of $(2\hat{i}-3\hat{j})$ m, what is the work done by the force on the object?
   A. 0 J B. 6 J C. 12 J D. 25 J

13. All of the following statement define power **except**
   A. the rate of using energy B. the capacity for doing work
   C. the product of force and velocity D. the rate of doing work

14. A weightlifter lifts 200 kg through 1.4 m in 2 seconds. What power the weightlifter develops?
   A. 1.4×10^2 W B. 1.2×10^2 W C. 1.4×10^3 W D. 1.2×10^3 W

15. When a spring stretched by 2 mm its potential energy becomes 4 J. If it is stretched by 10 mm, its potential energy is equal to

A. 100 J B. 200 J C. 300 J D. 400 J

16. A body of mass 10 kg at rest is acted upon simultaneously by two forces 4 N and 3 N at right angles to each other. The kinetic energy of the body at the end of 10 sec is

A.100 J B. 300 J C.50 J D. 125 J

17. Consider an 80 kg man and 320 kg horse both running along a road with the same kinetic energy. The man must run

A. with the same speed as the horse. B. 4 times as fast as the horse.

C. twice as fast as the horse. D. 16 times as fast as the horse.

18. A worker pushes a wheelbarrow with a horizontal force of 50 N on level ground over a distance of 5.0 m. If a friction force of 43 N acts on the wheelbarrow in a direction opposite that of the worker, what net work is done on the wheelbarrow by the worker?

A. 35 J B. 215 J C. 250 J D. 10 J

19. A student weighing 700 N climbs at constant speed to the top of an 8 m vertical rope in 10 s. The average power expended by the student to overcome gravity is most nearly

A. 1.1 W B. 87.5 W C. 560 W D. 875 W

20. If the momentum of a body is increased n times, its kinetic energy increases.

A. n times B. 2n times C. n^2 times D. $\sqrt{n}$ times

II. Fill in the blanks with an appropriate words or phrases.

1. If we tripled the stretched length of a spring, its energy will increase by _____.
2. The work done against a conservative force in one cycle; (i.e. coming back to the same initial spot or initial level) equals _____.
3. The energy of a body due to its position or shape is _____
4. Forces which are act in the same plane is _____
5. The System of International unit power is _____

III. Workout the following.

1. A car of mass 800 kg accelerates from rest to a speed of 12 m/s. If the force exerted by its engine is 3200 N, what distance does it cover to attain this speed?
2. What is the kinetic energy of a mass of 200 g body moving with a speed of light?
3. A mass of 20 kg is raised through a vertical height of 40 m in 4 seconds. What is the rate of work done?
4. A body of mass 4 kg has a mechanical energy of 200 J and a potential energy of 150 J. What is the speed of the mass?
5. If the elongation of a spring of constant K is tripled, by what factor the elastic potential energy varies?

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Unit 6 Rotational Dynamics

I. Write True or False.

1. The direction of the angular velocity is parallel to the axis of rotation.
2. Angular acceleration is a vector physical quantity and its unit is rad/s.
3. Torque has the same unit as work done which is Joule..
4. A large torque always produce a large impulse on a body than a smaller torque.
5. The rotational equivalent of a force is torque.

II. Match

Column A	**Column B**
____1. Angular acceleration	A. effect of force
____2. Torque	B. rate of change of angular velocity
____3. Moment of inertia	C. rate of change of angular displacement
____4. Angular momentum	D. $\vec{r} \times \{\vec{p}$
____5. Angular velocity	E. rate of change of angular acceleration
	F. rotational equivalent of mass

I. Choose the correct answer and write the letter of your choice on the answer sheet.

1. A flywheel spins at 200 rev/min. What is its angular speed in ’rad/s?’

   A. 30.4 rad/s B. 20.9 rad/s C. 28.5 rad/s D. 27.2 rad/s

2. A car travels at 24 m/s. If each wheel has a diameter of 60 cm, what is the angular speed of a wheel?

A. 40 rad/s B. 70 rad/s C. 75 rad/s D. 80 rad/s

3. A machinist applies a force of 140 N tangent to the rim of a rotating disk that has a radius of 30 cm. If he does a work of 882 J, how many times does he rotate the disk?

A. 21.0 B. 12.4 C. 6.3 D. 3.3

4. A 7 kg point mass goes around an axis at a radius of 2 m. Its moment of inertia is:

A. 7 kg.m^2 B. 14 kg.m^2 C. 28 kg.m^2 D. 9 kg.m^2

5. A solid sphere of mass 6 kg rolls without slipping along a horizontal surface at a speed of 2 m/s. Its total kinetic energy is: (Use: solid sphere I = $\frac{2}{5}$mR^2)

A. 8.4 J B. 16.8 J C. 7 J D. 14 J

6. A drum turns at an angular velocity of 32 rad/s. If it has a power of 2240 W, what is the torque exerted on it?

A. 35 N.m B. 60 N.m C. 70 N.m D. 86 N.m

7. Which two physical quantities have the same units?

A. Angular impulse and angular momentum B. Angular impulse and torque

C. Angular momentum and torque D. Angular impulse and work

8. A diver jumps from a board and goes into the air by giving herself some angular momentum. If she spins at an angular speed of 2 rad/s and a moment of inertia of 2.4 kg.m^2, how fast does she spin when her legs and hands are pulled in towards her axis of rotation and thereby attains a moment of inertia of 0.8 kg.m^2?

A. 6.0 rad/s B. 5.4 rad/s C. 4.2 rad/s D. 0.7 rad/s

9. The angular velocity of a rotating object changes from 5π rad/s to 15π rad/s in 10 seconds. How many revolutions has the object undergone?

A. 50 B. 100 C. 150 D. 200

10. What is the work done by a force $\vec{F}$=9 {$\hat{i}$+4 {$\hat{j}$¿ N¿ if it displaces an object from $\vec{r}_1$=2 {$\hat{i}$- {$\hat{j}$¿ m¿ to another point $\vec{r}_2$=4 {$\hat{i}$+ 5 {$\hat{j}$¿ m¿?

A. 0 B. 9 J C. 32 J D. 42 J

11. Which of the following physical quantity is the rotational equivalent of mass?

A. torque B. force C. moment of inertia D. center of mass

12. The potential energy of a spring stretched by 2 cm is 40 J. What is the force constant of the spring?

A. 10^4 N/m B. 2 x 10^4 N/m C. 2 x 10^3 N/m D. 2 x 10^5 N/m

13. The moment of inertia of a body **does not** depend on

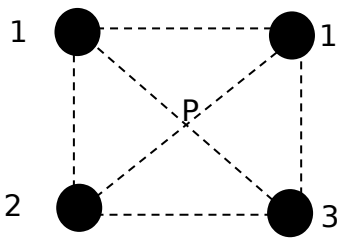
A. its mass B. its shape

C. the distance between its center of mass and axis of rotation D. its speed of rotation

14. A child sits on a turntable at a distance of 3.5 m from the center and rotates through an arc length of 7 m. What is the angular displacement of the child?

A. 2 rad B. 5 rad C. 0.5 rad D. 24.5 rad

15. What is the moment of inertia of the system about point P for the figure shown below, if the distance of each mass from P is $\sqrt{0.5}$ m?



A. 3.5 kg m^2 B. 2 kg m^2 C. 4.75 kg m^2 D. 14 kg m^2

16. A wheel of mass 30 kg and radius of 2 m is at rest. What torque must exerted on it to change its angular velocity from rest to 3.14 rad/s in 2 minutes? (take: I = ½ MR^2)

A. 94.2 Nm B. 15.7 Nm C. 1.57 Nm D. 188.4 Nm

17. Which one of the following is non – conservative force?

A. electric force B. gravitational force C. frictional force D. elastic force

18. A 1 kg mass attached to a spring of force constant 16 N/m oscillates with a maximum displacement of 10 cm. What is the maximum speed of the mass?

A. 0.3 m/s B. 0.2 m/s C. 4 m/s D. 0.4 m/s

19. What is the potential energy of a 4 kg mass projected vertically upward at 50 m/s at the end of 2 seconds?

A. 800 J B. 1600 J C. 2400 D. 3200 J

20. A 2000 kg car is accelerate from rest to a speed of 40 m/s in a time of 6 seconds. What is the power developed to

accelerate this car at this rate?

A. 32 kW B. 266.7 kW C. 3200 kW D. 32000 kW

21. What is the tangential velocity of a body rotating in a circle of radius 50 cm with an angular velocity of 30 rad/s?

A. 15 m/s B. 60 m/s C. 1500 m/s D. 150 m/s

22. If the angular velocity of a rotating body is tripled, by what factor the rotational kinetic energy varies?

A. 3 B. 1/3 C. 9 D. 6

23. A solid sphere (I = 2/5 MR^2) and a hollow sphere (2/3 MR^2), both uniform and having the same mass and radius, are released from rest at the same height on a ramp. If they roll down the ramp without slipping, which one will have the greater forward velocity at the bottom of the ramp?

A. The solid sphere B. The hollow sphere

C. Both will have the same forward velocity D. needs additional information.

24. Which one of the following is dimensionally the SI unit of angular impulse?

A. N . s B. N . m .s C. kg . m^2/s D. rad/s^2

25. A wheel rotating at constant angular acceleration, starting from rest. Which one of the following is the same for all

points on the wheel at a fixed instant of time?

A. tangential speed B. angular speed

C. linear displacement D. tangential acceleration

II. Fill in the blanks with an appropriate word or phrase.

1. During rotation, the angle between angular velocity and angular momentum is _____.

2. Torque is the vector product of _____and _____.

3. Moment of inertia of a particle of mass m about the origin at a distance r from the origin is given by ____

4. The change in angular momentum of a rotating body caused by a torque acting over a certain time is _____

5. The product of moment of inertia and angular velocity is _____

III. Workout the following

1. A disc of radius 15 cm is rotating with a constant angular acceleration of 10 rad/s^2 starting from rest for 5 s. Find the final angular velocity.
2. What is the rotational kinetic energy of a body with moment of inertia 200 kg m^2 and an angular velocity of 2 rad/s?
3. A force of $\vec{F}$ = 20 N î – 15 N ĵ rotates a bar at a position of $\vec{r}$ = 0.6 m î + 0.8 m ĵ. Calculate the torque of this force.
4. A flywheel starts rotating from rest with an angular acceleration of 0.4 rad/s^2. What angle will it have turned through in 4 seconds? Give your answer in 'rad.'
5. A point particle is rotating around a circle for half the circumference of the path. What is the angular

   displacement of the particle?