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MCQ on Units and dimention

Choose the correct answer:

1) The dimensions of pressure is

a) $ML^{-1}T^{2}$ b) $ML^{-2}T^{2}$ c) $ML^{-1}T$ $ML^{-1}T^{-2}$

Pressure

$P = \frac{F}{a}$ Force / Area

$= \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$

Power ML^2T^{-3}

Work ML^2T^{-2}

2) The dimension of pressure is

a) Energy Energy per unit volume 3) Acceleration d) Force

3)The dimensional formula of acceleration is

b) MLT^{-2} b) $ML^{-1}T^{-2}$ c) $M^{-1}LT^{-2}$ M^0LT^{-2}

$a = \frac{\text{Velocity}}{\text{Time}} = \frac{LT^{-1}}{T} = LT^{-2} = M^0LT^{-2}$

4)If The modulus of elasticity is given by the relation F/A, then, its and dimensiononal formula will be

$\frac{F}{A} = \frac{MLT^{-2}}{L^2} = ML^{-1}T^{-2}$

modulus elasticity $= \frac{F}{A}$

a) $ML^{-1}T^{2}$ b) $ML^{-2}T^{2}$ c) $ML^{-1}T$ $ML^{-1}T^{-2}$

$\frac{MLT^{-2}}{t^2L} = ML^{-1}T^{-2}$

5) The dimensional formula of coefficient of viscosity is

a) $ML^{-1}T^{2}$ b) $ML^{-2}T^{2}$ c) $ML^{-1}T$ $ML^{-1}T^{-1}$

Coefficient of Viscosity $= \frac{F \cdot r}{A \cdot V} = \frac{MLT^{-2} \cdot L}{L^2 \cdot LT^{-1}} = ML^{-1}T^{-2}T^{1} = ML^{-1}T^{-1}$

and its unit is

a) N/m b) N c) N/m^2 Non of the mentioned

6)Dimensional formula of latent heat- الحرارة الكامنة - (Joule/kg)

$M^0L^2T^{-2}$ (B) MLT^{-2} (C) ML^2T^{-2} (D) ML^2T^{-2}

$\frac{J}{Kg} = \frac{N \cdot m}{Kg} = \frac{MLT^{-2}L}{M} = ML^2T^{-2}$

7) The volume of a cube in m^3 is numerically equal to its surface area in m^2. The volume of the cube is

(a) $64m^3$ (b) $1000m^3$ $216m^3$ (d) $512m^3$

$6L^2 = L^3 \Rightarrow L = 6$

حجم المكعب $= L^3 = 6L^2$

$6(6)^2 = 216\ m^3$

8) If the displacement of a particle is given by $x = A^2 \sin^2 kt$ where t denotes the time.

$Hz = \frac{1}{t}$

$t \times \frac{1}{t} = 1$

$Kt = 0$

The unit of k is

(a) radian (b) meter hertz (d) second

8) Which of the following physical quantity is dimensionless?

(a) angle (b) strain (c)frequency (d) all of these

الزاوية الانفعال التردد

9)A physical quantity may be dimensionless but it may have units.

Answer"

Frequency and velocity gradient have the same unit.

10)Nm^{-2} is the unit of-------

Pressure

$N \cdot m^{-2}$

Nm^{-2} N / m^2 F/A

$|A \times B| = AB \sin\theta$

$P = \frac{F}{A}$ Energy per unit volume

modulus of elasticit $= \frac{F}{A}$

Coefficient of viscosity $= \frac{F \cdot r}{A \cdot V}$

- directly proportional
- inversent proportional

Newton's 2nd law :-

$a \propto F$, $a \propto \frac{1}{m}$ $\Rightarrow a \propto \frac{F}{m}$

$\sum F = m\vec{a}$

net Force

$g \cdot cm/s^2 = dyne$

$1N = 10^5 dyne$

$F_{1x} = 10\cos 60 = 5$ $F_{1y} = 10\sin 60 = 8.6$

$F_{2x} = 15\cos(-30) = 13$ $F_{2y} = 15\sin 30 = 7.5$

$F_x = 17.9 = 18$ $F_y = 16.16$

$a_x = \frac{18}{5} = 3.6$ $a_y = \frac{16.16}{5} = 3.232$ or 22

$a = \sqrt{(3.6)^2 + (3.232)^2} = 4.8$

$a \propto \frac{1}{m}$

$a \propto$

Fnet / a | m

98 N

5 kg $a = \frac{F}{m}$

$5(9.8) = 49$

$F_{net} = 98 - 49 = 49$

$a = \frac{49}{5} = 9.8 m/s^2$

Inertial Frames

$F = 0$ قانون نيوتن الأول

$g = 9.8$

Gravitionant Force = weight

$F_g = W = mg$ وزن الجسم

وزن الجسم على القمر $\frac{1}{6}$ وزنه على الأرض

3rd law

A B

$F_{A\ on\ B}$ action $= -F_{B\ on\ A}$ reaction

opposite

$F = 15$

$m = 3$ $a = \frac{15}{3} = 5 m/s^2$

$F_{net} = 0$

$a = 0$ → rest / constant velocity

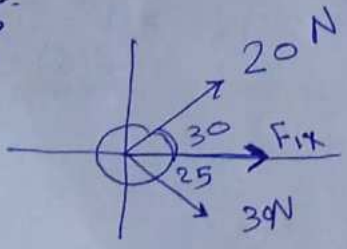
1st law

10 m/s → 10 m/s → 10 m/s

object at rest

Inertia : tendency to keep the state of rest or motion

2^5



$m = 2kg$

$F_{1x} = 20\cos 30$ $F_{1y} = 20\sin 30$

$F_{2x} = 30\cos(-25)$ $F_{2y} = 30\sin(-25)$

$10\sqrt{3} + 27.18$

$F_x = 44.5$

$F_y = -2.6$

$a_x = \frac{F_x}{m} = \frac{44.5}{2} = 22.25 m/s^2$

$a_y = \frac{F_y}{m} = \frac{-2.6}{2} = -1.3 m/s^2$

$a = \sqrt{(22.25)^2 + (-1.3)^2}$ =

1-Which of the following is the SI units of force?

a. Kgm/s^2 . Kgm^{-1} C.Newton-metre d.Newton

2-The forces are said to be balanced, if net force is .Zero...

3- What causes the motion of a body which is initially in the state of rest?

a) Force b) Displacement c) Speed d) Velocity

4-. People sitting in a moving bus experience a jerk when the bus stops This is due to

a) Inertia of motion b) Inertia of rest c) Inertia of turning d) Inertia of acceleration

5-The inertia of an object causes the object to

a. decrease its speed b.Increase its speed c.resist any change in the state of its motion

d. decelerate due to friction

6- Which of the following is true for the third law of motion?

a. Action-Reaction pair always acts on the same body.

b. They act on different bodies in opposite directions

c. Action-Reaction pairs have the same magnitudes and directions

d. Act on either body at normal to each other

Answer: (b) They act on different bodies in opposite directions.

7-Which law is also known as the law of inertia?

a. Newton's first law of motion b.Newton's second law of motion

b. Newton's third law of motion d.Law of conservation of momentum

8-A passenger in a moving train tosses a coin that falls behind him. It means that the motion of the train is

a. Uniform b.accelerated c.retarded d.along circular tracks

Answer: (b) accelerated

9-An object of mass 2 kg is sliding with a constant velocity of 4 ms^{-1} on a frictionless horizontal table. The force required to keep the object moving with the same velocity is

(a) 32 N (b) 0 N (c) 2 N (d) 8 N

Answer: (b) 0 N

10- A water tanker filled up to 2/3 of its height is moving with a uniform speed. On a sudden application of brakes, the water in the tank would

a) move backward b) move forward (c) be unaffected (d) rise upwards

11- A straight moving bus takes a sharp right turn. What will happen to the passengers sitting inside the bus?

a) They will tilt rightwards b) They will tilt leftwards

c) They will stay the way they were d) They will start jumping

Choose the correct answer:

12- Why do we not experience any leaning when a train takes a turn?
a) Because the train is powerful
b) Because of large turning radius
c) Because the train does not torn
d) Because the driver is smart

13-Rocket works on the principle of conservation of
(a) mass (b) energy (c) momentum (d) velocity

14- A water tanker filled up to 2/3 of its height is moving with a uniform speed. On a sudden application of brakes, the water in the tank would
(a) move backward (b) move forward (c) be unaffected (d) rise upwards

15- If the mass of a body is doubled and its velocity becomes half, then the linear momentum of the body will
(a) remain same (b) become double (c) become half (d) become four times.

16-The inertia of an object tends to cause the object
(a) to increase its speed (b) to decrease its speed
(c) to resist any change in its state of motion (d) to decelerate due to friction

17-A ball is thrown vertically upward in a train moving with uniform velocity. The ball will
(a) fall behind the thrower (b) fall ahead of the thrower
(c) return back to the thrower (d) fall on the left of the thrower

18- An athlete does not come to rest immediately after crossing the winning line due to the
(a) inertia of motion (b) inertia of rest (c) inertia of direction (d) none of these

19-The momentum of an object is product of its mass and velocity

20-According to second law of motion "the rate of change of momentum is directly proportional to ..... applied".

Force

ANSWER ON QUESTIONS OF VECTORS

1. Which of the following quantities are scalars in physics?

(a) Momentum (b) Displacement (c) Area (d) Average velocity

2. The position vector of the point (1, 2, 0) is:

A. i + j + k B. i + 2j + k C. i + 2j D. 2j + k

3. The magnitude of the vector 6i + 2j + 3k is equal to:

MAGNITUDE OF THE VECTOR = $\sqrt{36 + 4 + 9} = 7$

A. 5 B. 1 C. 7 D. 12

4. What is the magnitude of vector -3i + 5j?

A. $\sqrt{34}$ B. $\sqrt{32}$ C. $\sqrt{8}$ D. $\sqrt{16}$

5: What is the magnitude of vector, $v = 1/\sqrt{3}\,i + 1/\sqrt{3}\,j + 1/\sqrt{3}\,k$?

A. 0 B. 1 C. 2 D. 3

6: Can two different vectors have the same magnitude?

Yes, they can have the same magnitude

A. Yes B. No C. Cannot be determined D. None of the above

7: What is the value of x and y if $2i + 3j = xi + yj$?

A. 4, 9 B. 3, 2 C. 2, 3 D. 0, 0

8. The scalar product of 5i + j – 3k and 3i – 4j + 7k is:

5x3 + 1x-4 + -3x7= -10

A. 15 B. -15 C. 10 D. -10

9. The scalar product of two perpendicular vectors is

Perpendicular (متعامدين) means that the subtended angle (الزاوية المحصورة) equal 90° and cos 90 = zero

A. 0 B. 1 C. 0.45 D. non of them

10. If the angle between two vectors (both having a non-zero magnitude) is greater than 90° and smaller than 270°, then the scalar product (dot product) of these vectors is

A. Positive B. Negative C. Zero D. Positive when the angle is smaller than 180°, negative when the angle is greater than 180°

Perpendicular $A_x = A\cos 90 = \text{zero}$, $A_y = A\sin 90$ ①

zero = صفر

11. If the scalar product (dot product) of two unit vectors is zero, they are... $A_x A_y = \text{zero}$

a. Parallel b. perpendicular C- Pointing in the same direction d. Non of them

Because angle between two vectors is 90 $\cos 90 =$ zero

12. What are vector quantities in physics?

- Answer
- Quantities that have both a direction and a magnitude = vector quantity

AB · عمودي = zero

13. What is the scalar product (or dot product) $\vec{v} \cdot \vec{w}$ of the two vectors $\vec{v} = (0,5,-2)$ and $\vec{w} = (3,1,-2)$?

Answer: $\vec{v} \cdot \vec{w} = (0*3)+(5*1)+(-2 * -2) = 9$

$\vec{v} = (0, 5, -2)$

$\vec{w} = (3, 1, -2)$

14. The components of a vector are given as $A_x=5.3$ and $A_y=2.9$. What is the magnitude of this vector?

(a) 3 (b) 6 (c) 4 (d) 5

$|\vec{A}| = \sqrt{(A_x)^2 + (A_y)^2}$

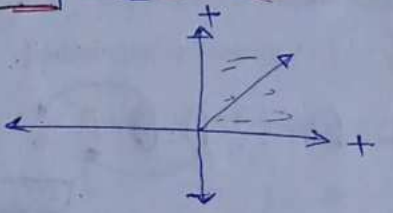
$= \sqrt{(5.3)^2 + (2.9)^2} = 6.04 = 6$

15. Calculat the angle of the vector $23.5\,\hat{x} + 34.3\,\hat{y}$ with x axis

a. 34.4^0 b. 67^0 c. 55.6^0 d. 17.3^0

$$\theta = \tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\frac{34.3}{23.5} = 55.58^0 \approx 56^0$$

Best wishes



$\tan\theta = \frac{y}{x}$

$\tan^{-1}\tan\theta = \tan^{-1}\frac{y}{x}$

$\theta = \tan^{-1}\frac{y}{x} = \frac{34,3}{23.5} = 55,58^\circ \approx 56^\circ$

14. If $|a \times b| = 4$ and $|a.b| = 2$, then $|a|^2\,|b|^2$ is equal to:

A. 4

B. 6

C. 20

D. 2

Answer: 20

$|A.B| = |A||B|\cos\theta = 4$

$|A \times B| = AB\sin\theta = 2$

$|A \times B| = AB\sin\theta = 4$

$|A.B| = |A||B|\cos\theta = 2$

MCQ on Newton's second low

1- What is the force applied on a body with 5 kg of mass and an acceleration of 7 m/s²?

a) 35 N b) 5 N c) 7 N d) 0 N

2- Unit of force is

a) Newton b) Pascal c) Byte d) Gram

3-The unit 'Newton' is equivalent to

a) Kg-m/s² b) Kg-m/s c) Kg/m/s² d) Kg²-m/s²

4-If the force acting on a body is 10 N, and the acceleration is 4 m/s², what can be the mass of the body?

a) 2.5 Kg b) 25 Kg c) 0.25 Kg d) 5 Kg

5- An example of variable mass system is

a) A car moving b) A rocket taking off c) A bicycle moving d) A man walking

Answer (b) In case of a rocket taking off, the mass of the fuel is large and cannot be neglected. As the rocket starts moving, a large amount of fuel is getting burnt out from the nozzle, hence the total mass decreases. Hence it is a variable mass system.

6-How do we calculate force in a variable mass constant velocity system?

a) F = ma b) F = mv c) F = v(dm/dt) d) F = m/t

Answer: c

Explanation: The general expression for force is F = dp/dt. On solving we get F = m(dv/dt) + v(dm/dt). Since the system is constant velocity, hence dv/dt = 0. What remains is F = v(dm/dt).

7-An object weighs 30N on earth. A second object weighs 30N on the moon. Which the greater mass? (Note: due to its size, the moon has less gravity than the earth.)

a) Object on the moon b) Object on earth c) Booth the same d) Non of them

8-A 10N falling object encounters 4N of air resistance. The net force on the object is:

a) 4 N b) 6 N c) 8 N d) 10 N

Answer (b)

When an object is falling, it experiences two forces: gravity pulling it downwards and air resistance pushing against it. In this case, the object has a gravitational force of 10N pulling it downwards, while the air resistance exerts a force of 4N in the opposite direction. The net force is the vector sum of these two forces, which can be calculated by subtracting the smaller force (4N) from the larger force (10N). Therefore, the net force on the object is 10N - 4N = 6N.

9-Which of the following has zero acceleration? An object

a) Moving at constant velocity b) at rest c) at equilibrium d) all of them

Answe (d)

10-A 10kg block with an initial velocity of 10m/s slides 10m across a horizontal surface and comes to rest. It takes the block 2 seconds to stop. The stopping force acting on the block is about:

a) 5 N b) 10 N c)20 N d) 30 N

Answer (b)

11-The stopping force acting on the block can be calculated using the equation F = m * a, where F is the force, m is the mass, and a is the acceleration. In this case, the block comes to rest, so its final

السرعة ①

velocity is 0 m/s. Using the equation $v_f = v_i + at$, where vf is the final velocity, vi is the initial velocity, a is the acceleration, and t is the time taken, we can find the acceleration. Rearranging the equation, we have $a = (v_f - v_i) / t$. Plugging in the values, we get a = (0 - 10) / 2 = -5 m/s^2. Since the force acting on the block is in the opposite direction to its motion, the force is positive. Therefore, the stopping force acting on the block is 10N.

$a = \frac{V_f - V_i}{t_r} = -5$ $\quad m = 10$ $\quad F = ma$

$10 * -5 = -50$

Rate

Remember that Inertia is the property of an object that resists changes in its motion. When an object has more mass, it also has more inertia. This means that it will be more resistant to changes in its velocity or direction of motion. In this scenario, since the first object has twice as much mass as the second object, it will also have twice as much inertia. The other options, such as volume, gravitational acceleration, and velocity, are not directly related to an object's mass and therefore do not necessarily increase in the same proportion.

* القصور الذاتي هو خاصية الجسم الذي يقاوم التغيرات في حركته عندما يكون لجسم ما كتلة أكبر، فإنه يكون أيضًا أكثر قصورًا ذاتيًا وهذا يعني أنه سيكون أكثر مقاومة للتغيرات في سرعته أو اتجاه حركته في هذا السيناريو بما أن كتلة الجسم الأول ضعف كتلة الجسم الثاني، فسيكون له أيضا ضعف القصور الذاتي. الخيارات الأخرى مثل الحجم، وتسارع الجاذبية، والسرعة لا ترتبط مباشرة بكتلة الجسم، وبالتالي لا تزيد بالضرورة بنفس النسبة.

2st 3rd

Mcq on Newton's second and third lows, Energy and work

Note that:

Newton's third low of motion states that to every action there is always an equal and opposite reaction.

If a body A exerts a force Fon another body B, then Bexerts a force –F on A.

Force always comes on pairs.

1-Two bodies in contact experience forces in ----------

a) Same direction **Opposite directions** c) Perpendicular directions d) Five different directions

Answer: b

2-A bats man hits a ball with a force a 5 N. What force does the bat experience?

5 N b) 10 N c) 15 N d) 20 N

3-A truck with a mass of 2500 Kg travelling with an acceleration of 5 m/s^2 hits a scooter. What force does the truck experience?

12500 N b) 500 N c) 10000 N d) 2500 N

4- A man is standing still. The force by the man on the earth is F1→. The force by the earth on the man is F2. Which one of the following is true?

a) F1 =F2 **F1 =−F2** c) F1 =5(F2) d) 2(F1)=F2

If a fly collides with the windshield of a fast moving bus which experiences the greater impact force

a) the flly b) the bus **the same force experienced by both?**

5-which experiences the greater acceleration the fly or the bus or is the same acceleration experienced by both?

6- If a fly collides with the windshield of a fast-moving bus, which experiences an impact force with a larger magnitude? (a) The fly. (b) The bus. (c) The same force is experienced by both. (ii) Which experiences the greater acceleration? (a) The fly. (b) The bus. (c) The same acceleration is experienced by both.

7-A 100 gram ball is kept on the top of a building of 70 m height. Find the potential energy of the ball (assume g=10m/s^2)

70 J b) 80 J c) 90 J d) 100 J

8-The energy possessed by a stationary object at height of 5 m and with a mass of40 kg. (g=10 m/s^2) is

a)1000 J **2000 J** c- 3000 J d- 4000J

9-The potential energy stored in a spring is U when it is stretched for length 10 cm. If the spring is stretched for the next 10 cm, then the chang in its potential energy is equal to the

3U b) 4U c)2U d) None of them

Answer 3

First
$U1 = 1/2\ kx^2$

$= 1/2\ k\ (0.1)^2$

Second

$U2 = 1/2\ k\ (0.2)^2 = 4U$

$U2-U1 = \Delta U = 4U-U = 3U$

$P.E_{elastic} = \frac{1}{2} k x^2$

$= \frac{1}{2} K (0,1)^2$

$P.E_{elastic^2} = \frac{1}{2} k (0.2)^2$

$\frac{1}{2}K(0.1)^2 - \frac{1}{2}K(0.2)^2$

$= \frac{1}{2}K[(0.2)^2 - (0.1)^2]$

K.E

$\frac{1}{2}mv^2$

10-Which expression represents power?

a) Fd Work

b) mgh P.E gravitational

c) $mv^2/2$

v

Power

W/t

11-According to Newton's second law of motion, acceleration is proportional to force. That means a larger force ↳ F=ma

a) produces a smaller acceleration. B) doesn't affect acceleration.
C) produces a smaller mass. produces a larger acceleration.

12-What are the metric units of momentum

a) Kg.m/s b) Newton c) Newton. Non of them

mV

Kgm/s

F = ma

13-In Newton's second law of motion, what is the relationship between acceleration and mass? Acceleration is ---------- to mass.

inverse

15-Find the energy of a stationary object of mass of 10 kg, at height of 10 m

$m.g.h = 10 \times 10 \times 10 = 1000$ J

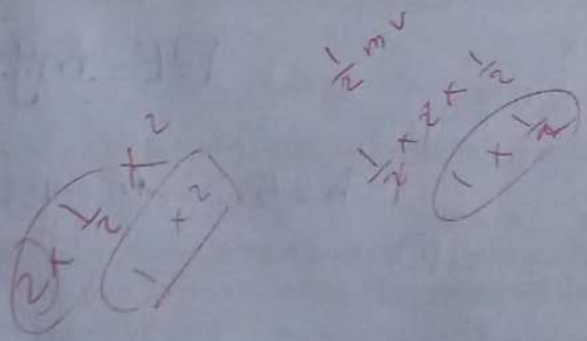
16-A compressed spring possess a
a)Chemical energy b)kinetic energy potential energy d) Non of them

17- An object is falling from a certain height, Then the total energy will
a) Increase b) decrease remain constant d) Non of them

$K.E = \frac{1}{2} m v^2$ → increase

P.E ⇒ decrease

ثابتة



1) **A 12 g bullet is fired horizontally into a fixed block of wood and comes to rest after traveling 15 cm. The bullet's initial velocity is 400 m/s. What is the magnitude of the force of the wood on the bullet? Assume that the stopping force of the wood acting on the bullet is constant.**

Answer

$$v_f^2 = v_i^2 + 2a\nabla y \ , \quad v_f = 0, \quad 400^2 = -2ax0.15$$

$$a = \frac{400x400}{2x0.15} = -533333\frac{m}{s^2}$$

$$F = ma = 0.012\,x - 533333 = 6400N$$

2) **A fire helicopter flying at a constant altitude and a constant speed of 42 m/s carries 620 kg empty water bucket. After dropping water on a fire the cable supporting the bucket makes an angle of 20° to vertical. What is the force of air resistance on the empty bucket?**

Answer

Because the speed is constant, then the acceleration and then the force are equal zero

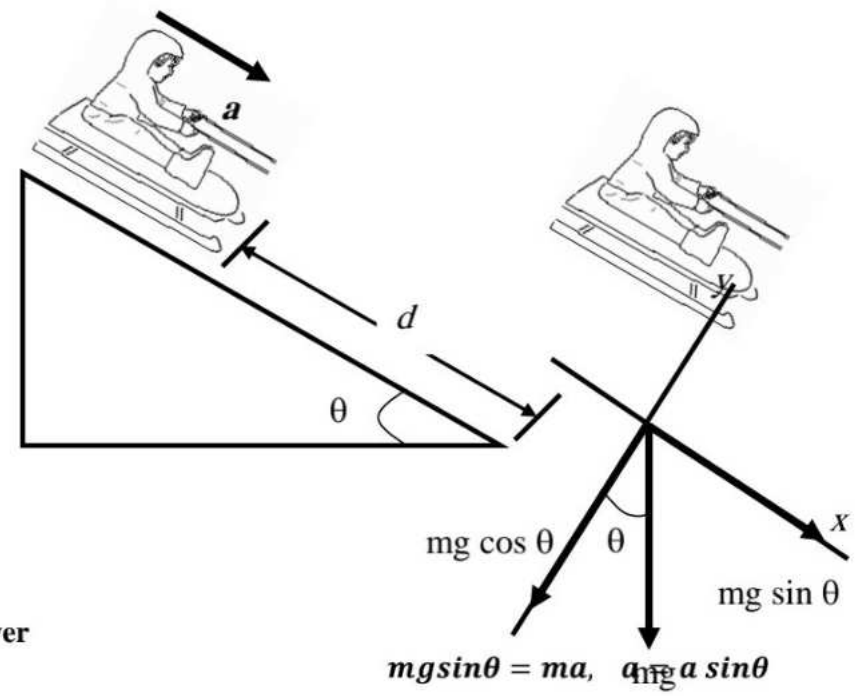
$$\sum F_y = Tcos\,20 - mg = 0 \quad , T = 6466.55\,N$$

$$\sum F_x = Tsin\,20 - R = 0\,, R = 2211.7\,N$$

A child on a sled is released on a frictionless, inclined hill of angle θ

a)Determine the acceleration of the sled after it is released.

b)Suppose the sled is released from rest at the top of the hill, and the distance from the front of the sled to the bottom of the hill is *d*. How long it takes the front of the sled to reach the bottom, and what is its speed just as it arrives at that point?



Answer

$$mgsin\theta = ma, \quad a = g\,sin\theta$$

$$d = v_i t + \frac{1}{2}at^2 = 0 + \frac{1}{2}at^2 = \frac{1}{2}g\,t^2\,sin\theta\,t^2\,,\ t^2 = \frac{2d}{gsin\theta}$$

$$v_f = v_i t + at = -gsin\theta\,t$$

3-A spring 40 mm long is stretched by the application of a force. If 10 N force required to stretch the spring through 1 mm, then work done in stretching the spring through 40 mm is

a) **84 J** b) **68 J** c) **C24 J** d) **8 J**

Solution

The correct option is D 8 J

We know that work done by the spring force is given by

Ws=1/2 kx2

k=F/x=10/0.001=104 N/m

$W=1/2kx^2=1/2\times10^4\times(40/1000)^2$

$1/2\times10^4\times16/10^4=8$ J

4-Work done for certain spring when stretched through 1mm is 10 joule. The amount of work that must be done on the spring to stretch it further by 1mm is

a)30J b)40J c)10J d)20J

Solution

Potential energy stored in spring to stretch it through x length from rest length=$1/2kx^2$

Hence $10J=1/2k(10^{-3})^2$

The potential energy stored in it when it is further stretched by 1mm equal $1/2k(10^{-3}+10^{-3})^2=40J$

Hence energy required to stretch it from 1mm to 2mm=40J−10J=30J

5-What is the SI unit of force?

a)Kg b)Dyn c)N d) Non of them

6-One object exerts a force of magnitude F_1 on another object and experiences a force of magnitude F_2 in return. What is true for F_1 and F_2?

a) $F_1 > F_2$ b) $F_1 < F_2$ c) $F_1 = F_2$ d) Non of them

6- Newton's universal law of gravitation applies to

(a) small bodies only (b) planets only

(c) both small and big bodies (d) only valid for solar system

Answer: It is applicable to both small & big bodies.

7-Which expression represents power?

a) Fd b) mgh c) mv^2 d)W/t

8-Why is this expression for kinetic energy incorrect? $KE=(m)(v)^2$.

a. **The constant g is missing.**
b. **The term v should not be squared.**
c. **The expression should be divided by 2.**
d. **The energy lost to friction has not been subtracted.**

9-What is the kinetic energy of a 10kg object moving at 2 m/s?

a)10J b) 20J c)40J d)100J

10) The formula to find the work done is

a) W = F+d b) W = F.d c) W = F-d d)W = F/d

11) If a force acting on a body causes no displacement, the work done is——

a) -1 b) 1 c) 0 d) Infinity

Answer: (c) 0

12) Objects in motion possess energy and can do work; this energy is called-----

a)Solar energy b)Thermal energy c) Potential energy d) Kinetic Energy

Answer: (d) Kinetic Energy

13)The sum of kinetic energy and potential energy is ————-

a)Mechanical energy b)Thermal energy c) Potential energy d) Kinetic Energy

Answer: (a) Mechanical energy

14) The energy used in one hour at the rate of 1kW is known as ————-

a) 10kWh b)1kWh c)1W d) 1kW/h

Answer: (b) 1kWh

15) What are the various factors affecting kinetic energy?

a)Mass b) Momentum c) Velocity d)All the above options

Answer: (d) All the above options

Explanation: Factors affecting kinetic energy are mass, momentum, and velocity.

16) When two identical bodies are in motion, the body with a higher velocity has ————-

a)Lower Kinetic Energy b)Higher Kinetic Energy c)No Kinetic Energy d) None of the options

Answer: (b) Higher Kinetic Energy

Explanation: When two identical bodies are in motion, the body with a higher velocity has higher kinetic energy.

17) State true or false:

The object must be displaced for the work to be done.

a. True b. False

Answer: (a) True

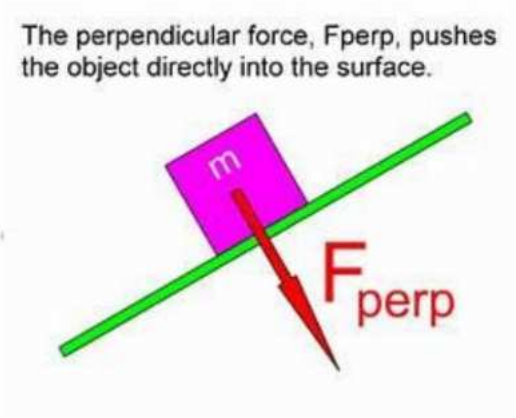
Explanation: Two conditions that need to be satisfied for work to be done are: force should act on the object, and the object must be displaced.

18) If the displacement is perpendicular to the force, then the work done is said to be—--.

a)-1 **b)1** **c) Infinity** **d) Non of them**

Answer: (c) 0

Explanation: If the displacement is perpendicular to the force, then the work done is zero as in the figure below.



	Midterm exam for 1st level students Faculty of Computer and artificial Intelligence	Time: 1 Hour 10 marks

الجزيئات التي تتورن المادة الصلبة تتذبذب حول مواقع التوازن الخاصة بها

Choose the correct answer:

1- The molecules in a solid ..... about their equilibrium positions.
a) translate **b) oscillate** c) rotate d) move

2- In ..... the force acting on an object is proportional to the position of the object relative to some equilibrium position.
a) simple harmonic motion b) normal motion c) any motion d) momentum

3- A block of mass m attached to the end of a ..... oscillates back and forth if disturbed from its equilibrium position.
a) alloy b) rod **c) spring** d) material

موضح الزنبرك

4- When the block is displaced to the right of equilibrium ($x > 0$), the force exerted by the spring acts to the .....
a) north b) middle **c) left** d) right

5- When the block is at its equilibrium position ($x = 0$), the force exerted by the spring is.....
a) twice b) maximum c) one **d) zero**

في موضع اتزانها

6- When the block is displaced to the left of equilibrium ($x < 0$), the force exerted by the spring acts to the right.
a) north b) middle c) left **d) right**

7- The spring exerts on the block a force that is proportional to the position and is given by .....
a) Hooke's law b) Archimedes' principle c) Keller's law d) Ohm's law

8- ..... force is always directed toward the equilibrium position and therefore opposite the displacement from equilibrium.
a) Newton's **b) A restoring** c) Coulomb's d) natural

9- An object moves with simple harmonic motion whenever its ..... is proportional to its position.
a) velocity b) displacement c) speed **d) acceleration**

10- A mathematical solution of a simple harmonic motion $d^2x/dt^2 = -\omega^2 x$ can be written in the form.....
a) $x = A\cos(\omega t + \varphi)$ b) $v = A\cos(\omega t + \varphi)$ c) $x = \cos(\omega t + \varphi)$ d) $x = \cos(\omega t + \varphi)$

11- The parameters A, ω, and ϕ are constants of the simple harmonic motion called ..... , ... and ..... respectively.
a) amplitude, angular velocity and phase angle **b) amplitude, angular frequency and phase angle**
c) amplitude, angle and angular frequency d) angular frequency, amplitude, and phase angle

12- The ..... of simple harmonic motion, is determined uniquely by the position and velocity of the particle at $t = 0$.

a) phase constant (φ) **b) displacement** **c) angular frequency** **d) acceleration**

13- If the ..... of a particle is described by $x = A\cos(\omega t + \varphi)$, the particle is undergoing simple harmonic motion.

a) position **b) velocity** **c) angular frequency** **d) acceleration**

14- The ..... of the motion is the time interval required for the particle to go through one full cycle of its motion.

a) velocity (v) **b) frequency (f)** **c) period (T)** **d) acceleration (a)**

15- The ..... is the inverse of the period and represents the number of oscillations that the particle undergoes per unit time interval.

a) velocity (v) **b) frequency (f)** **c) angular frequency (ω)** **d) acceleration (a)**

16- The period and frequency of a simple harmonic motion depend *only* on the mass of the particle and the ..... of the spring.

a) force **b) work** **c) force constant** **d) kinetic energy**

17- The *maximum* values of the magnitudes of the velocity and acceleration are .....

a) $v_{max} = \sqrt{\frac{m}{k}}A, a_{max} = \frac{k}{m}A$

b) $v_{max} = \sqrt{\frac{k}{m}}A, a_{max} = \frac{m}{k}A$

c) $v_{max} = \frac{m}{k}A, a_{max} = \sqrt{\frac{k}{m}}A$

d) $v_{max} = \sqrt{\frac{k}{m}}A, a_{max} = \frac{k}{m}A$

18- The ..... is 90° out of phase with the position and the ..... is 180° out of phase with the position.

a) velocity, acceleration **b) time, acceleration** **c) velocity, time** **d) acceleration, velocity**

$v_{max} = \sqrt{\frac{k}{m}}A$ $\quad a_{max} = \omega^2 A = \frac{k}{m}$

Best wishes, Prof. Dr. Safwat Ahmed Aly and Prof. Dr. Mohamed Abdel-Rahman

$F = \frac{\omega}{2\pi}$ $\quad \omega = 2\pi f = \frac{2\pi}{T}$

$F = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$