

ФЛАГ

Official telegram channel !

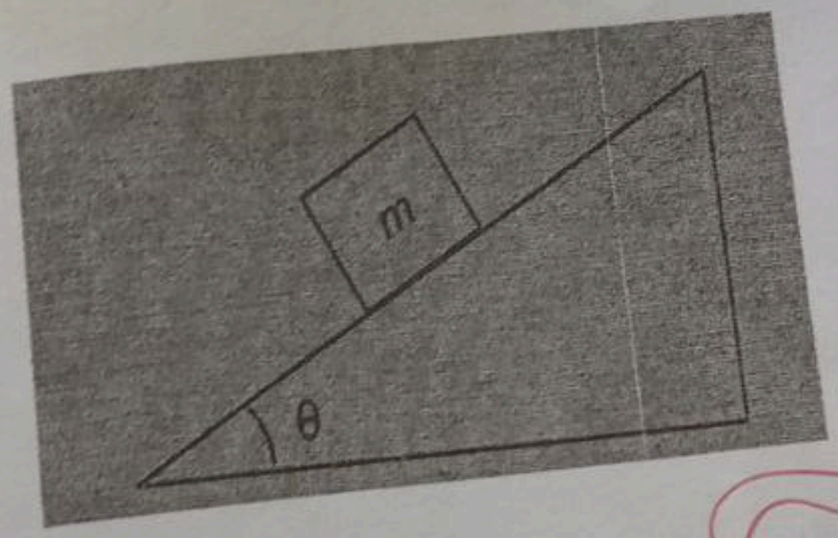
••Join us,| @Keleme_2013

@Keleme_2013

5. *A block of mass m slides down an inclined plane as shown in the figure below. Find the expression for the acceleration of the block.*

A. *If the inclined plane is frictionless*

B. *If the inclined plane has coefficient of kinetic friction* μ_k.



A: $\frac{mg\sin\theta}{m} = \frac{ma}{m}$

$a = g\sin\theta$

B: $\frac{mg\sin\theta - \mu_K(mg\cos\theta)}{m} = \frac{ma}{m}$

$g\sin\theta - \mu_K g\cos\theta = a$

2. *A skater of mass 80 kg initially at rest speeds up to a final speed of 10.0 m/s along a straight line and towards the East direction. Find the*

A. *Momentum of the skater while at rest.*

B. *Momentum of the skater while traveling with its final speed.*

C. *Change in momentum of the skater.*

Soln

Given
m = 80kg
V_f = 10.0m/s
V_i = 0

Req
P_i = ?
P_f = ?
ΔP = ?

A $P_i = mv_i$
$P_i = 80kg \times 0 m/s$
$P_i = 0$

B $P_f = mv_f$
$= 80kg \times 10 m/s$
$= 800 kg/m/s$ due to East

C $= \Delta P = P_f - P_i$
$\Delta P = 800 kg/m/s - 0$
$\Delta P = 800 kg/m/s$

3

4. A truck on a straight road starts from rest, accelerating at 2.00 m/s^2 until it reaches a speed of 20.0 m/s. Then the truck travels for 20.0 s at constant speed until the brakes are applied, stopping the truck in a uniform manner in an additional 5.00 s.

A. How long is the truck in motion?
B. What is the total distance covered by the truck for the entire motion described?

Given
$v = 0$
$a = 2 m/s^2$
$v = 20.0 m/s$
$t_1 = 20.0 s$
$t_2 = 5 s$ 0.5

Required
$t = ?$
$S_{tot} =$

Solution

$T_{to} = t_1 + t_2 + t_3$

$t_1 = v = v + at$

$\frac{v}{a} = \frac{at}{a}$ $t = \frac{v}{a} = \frac{20}{2}$

$t_1 = 10 s$

$T_{tot} = 10 s + 20 s + 5 s =$

$T_{tot} = 35 sec$

B. $S_{tot} = S_1 + S_2 + S_3$

$S_1 = v^2 = v^2 + 2as$

$\frac{v^2}{2a} = 0 + \frac{2as}{2a}$

$S = \frac{(20)^2}{2(2)} = \frac{400}{4} = 100 m$

$S_2 = vt + \frac{1}{2}at^2$ $a = 0$

$S_2 = (20)(20) = 400 m$

$S_3 = \left(\frac{v_1 + v}{2}\right)t$

$\left(\frac{20}{2}\right)5$

$S_3 = (10)5 = 50$

$S_3 = 50 m$

$S_{tot} = 100 m + 400 m + 50 m$

$S_{to} = 550 m$

(3)

Part III: WORK OUT (3 pts. each)

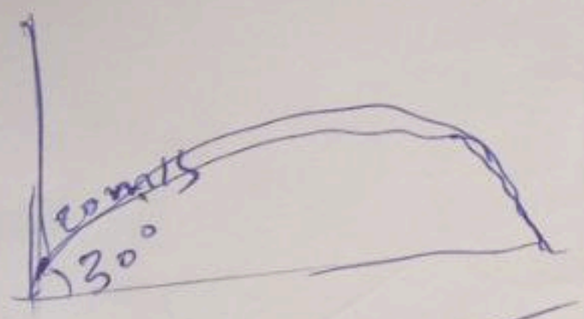
Use $\sin 30 = 0.5 = \cos 60$, $\cos 30 = 0.87 = \sin 60$ and $g = 10 \frac{m}{s^2}$ *if necessary*

1. *An object is launched at a velocity of 20m/s in a direction making an angle of 30 degree upward with the horizontal. What is the*
   - *A. Maximum height reached by the object*
   - *B. Total flight time*
   - *C. Horizontal range of the object*

0.5
0.5
0.05
0.05

Given
$V = 20 m/s$
$\theta = 30°$

Required
$H_{max} = ?$
$T_{60} = ?$
$R = ?$



A $H_{max} = \frac{v^2 \sin^2\theta}{2g}$

$= \frac{(20)^2 \sin^2 30°}{2(10 m/s^2}$

$= \frac{400 (0.5)^2}{20}$

$= \frac{400 (0.05)}{20 m/s^2}$

$H_{max} = \frac{20 m^2/s^2}{20 m/s^2}$

$H_{max} = 1 m$

$T_{to} = \frac{2v \sin\theta}{g}$

$T_{tot} = \frac{2(20) \sin(30°)}{10 m/s^2}$

$T_{tot} = \frac{2(10 m/s)(0.5)}{10 m/s^2}$

$T_{tot} = \frac{20 m/s}{10 m/s^2}$

$T_{tot} = 2 sec$

$R = \frac{v^2 \sin 2\theta}{g}$

$R = \frac{(20)^2 \sin 2(30°)}{10 m/s}$

$R = \frac{400 m^2/s^2 \sin 60°}{10}$

$R = \frac{400 m^2/s^2 (0.87)}{10 m/s^2}$

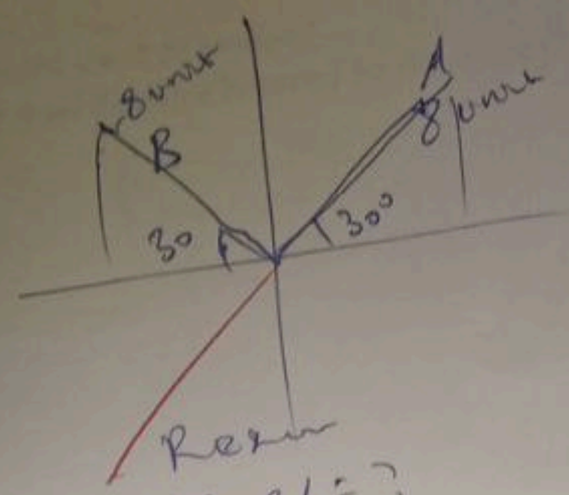
$R = \frac{1 \times 87 m^2/s^2}{10 m/s}$

$R = \frac{348 m^2/s^2}{10 m/s}$

$R = 34.8 m$

2.5

3. Vector $\vec{A}$ has magnitude of 8units and makes an angle of 30^0 with the positive x-axis. Vector $\vec{B}$ also has magnitude of 8units also makes an angle of 30^0 and directed along the negative x-axis. Find the magnitude and direction of $\vec{A} + \vec{B}$.



Given
$|A| = 8$ units
$|B| = 8$ units

Required
$|A+B| = ?$
$\theta = A+B$

Tan$\theta = \frac{\sin\theta}{\cos\theta} = \frac{1}{0}$

(3)

Solution
$A+B = A_x + B_x + A_y + B_y$
$A_x = A\cos 30^\circ = 8\cos 30$
$A_x = 8 \times 0.87$
$A_x = 6.96$ units
$A_y = A\sin 30^\circ = 8\sin 30^\circ$
$A_y = 8 \times 0.5 = 4$
$A_y = 4$ m
$B_x = -B\cos\theta = -B\cos 53^\circ$
$B_x = -8 \times 0.87$
$B_x = -6.96$
$B_y = B\sin 30^\circ = 8\sin 30$
$B_y = 8 \times 0.5 =$
$B_y =$ 4m
$A_x + B = 6.96 + (-6.96) + 4 + 4$
$A_x + B_x = 8$
$|A_x + B_x| = \sqrt{(8)^2} = 8$
$\tan\theta = \frac{y}{x} = \frac{8}{0} =$ undefined
$\theta = 90^\circ$

Part II: Fill the Blank spaces (1pts each)

1. Kipiers 2nd Law states that a planet moves fastest when it is closest to the sun and slowest when it is furthest from the sun.
2. momentem is defined as the quality of a moving object to exert a force on anything that tries to stop it.
3. Prosectort is the path described by the projectile from the point of projection to the point where the projectile reaches the horizontal plane.
4. If $A = -6i - 8j$, $B = -8i + 3j$ and $C = 26i + 19j$. The values of **a** and **b** Such that $aA + bB + C = 0$, $a = \frac{115}{41}$, $b = \frac{183}{164}$
5. Write at least two criteria's for work to be done on an object Force and displacement

ANSWER SHEET

Part I: Choose the best answer for the following questions (1pt each)

1. A	2. D	3. C	4. A	5. A
6. B	7. B	8. A	9. C	10. C

Part II: Fill the Blank spaces (1pt each)

1. Kipiers 2nd Law
2. Momentum
3. ~~f~~rasectory
4. a= 115/41 b= 183/164 = 47/41
5. Force and displacement

$-3a - 4b = -13$

$-8.4 - 4.6 = -13$

$-8a + 3b = -19$

$-22.4 +$

$-3(\frac{115}{41}) - 4b = 43$

$\frac{-345}{41} - 4b = -13$

$-4b = -13 + \frac{345}{41}$

$-4b =$

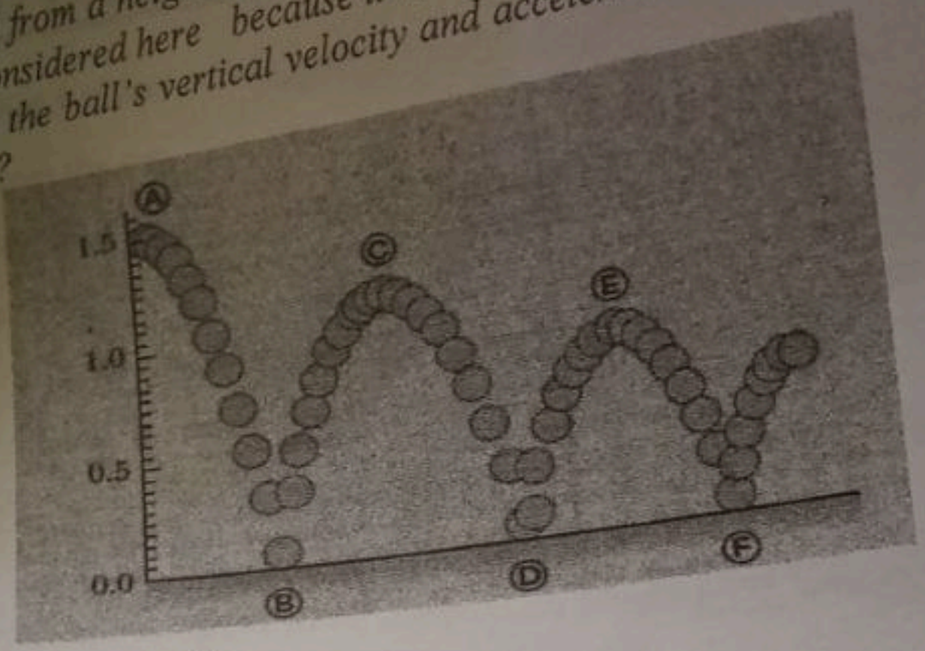
$\frac{-4b}{4} \quad \frac{-188}{41}$

$b = \frac{188}{4(41)} = \frac{188}{164}$ $b = \frac{188^{47}}{4(41)}$

$-6a - 8b = -26$

$-6(11) - 8(\frac{47}{41}) =$

7. *A ball is dropped from a height of 1.5 m and bounces from the floor. (The horizontal motion is not considered here because it does not affect the vertical motion.) Which values represent the ball's vertical velocity and acceleration at points A, C and E in the figure below?*



A. $v_y = 0,\ a_y = -9.8\frac{m}{s^2}$

B. $v_y = 0,\ a_y = 9.8\frac{m}{s^2}$

C. $v_y = 0,\ a_y = 0$

D. $v_y = -9.8\frac{m}{s^2}, a_y = -0$

8. *Which one of the following is non-contact force?*

A. Gravitational force **B**. *Muscular force* **C**. *Air resisting force* **D**. *Applied force*

9. *Which one of the following is true about the path (trajectory) of projectile motion?*

A. The initial velocity is zero

B. The horizontal velocity is zero at maximum height

C. The vertical acceleration is non-zero at topmost point

D. The horizontal acceleration at the highest point is non-zero

10. *Which of the following is correctly arranged from weakest to strongest among the four fundamental forces of nature?*

A. *Electromagnetic force→ Gravitational force→Strong Nuclear force→Weak Nuclear force*

B. *Weak Nuclear force→ Electromagnetic force→Gravitational force→ Strong Nuclear force*

C. *Gravitational force→ Weak Nuclear force →Electromagnetic force→ Strong Nuclear force*

D. *Weak Nuclear force→ Gravitational force→ Electromagnetic force→ Strong Nuclear force*

Part I: Multiple Choice questions: For the following ... appropriate answer. (1pts each)

1. *Two pieces of clay collide and stick together. During the collision, which of these statements are true?*

   A. *only the momentum of the clay is conserved*

   B. *only the mechanical energy of the clay is conserved*

   C. *both the momentum and the mechanical energy of the clay are conserved*

   D. *The kinetic energy of the clay is conserved.*

2. *The magnitudes of two vectors A and B are A = 2 units and B = 4 units. Which one is the largest and smallest values for the magnitude of the resultant vector R = A + B respectively?*

   A. 6 & -2 **C.** 2 & 6

   B. -2 & 6 **D.** 6 & 2

3. *Which one is a unit vector along vector* $\boldsymbol{A = 3i - 4j}$*?*

   A. $0.8\,i - 0.6\,j$ C. $0.6\,i - 0.8\,j$

   B. $0.8\,i + 0.6\,j$ D. $0.6i + 0.8j$

4. *According to Newton's 3rd law of motion*

   A. *Action and Reaction forces are always exist in pair*

   B. *A single isolated force can exist*

   C. *Action and Reaction forces acts on the same objects*

   D. *A and C are correct*

5. *What is the number of significant figures in* **101.01, 67.000, 12.0311, and 0.0000342** *respectively?*

   A. 5,5,6, and 3 **C.** 5,2,6, and 8

   B. 5,2,6, and 3 **D.** 5, 5,6, and 8

6. *Vectors* **A** *and* **B** *have equal magnitudes of 5.00. If the sum of* **A** *and* **B** *is the vector* $6.00\,\hat{j}$*, what is the angle between* **A** *and* **B***?*

   A. 106^0 **B.** 206^0 **C.** 306^0 **D.** None