

Student's Name (Arabic):..... Registration #:..... Sec #.....

Useful Information: Some Results Are Rounded.. CONSIDER (ACCELERATION DUE TO GRAVITY) $g = 9.8 \text{ m/s}^2$.

1. A car traveling at 10 ms^{-1} collides with a tree. An unrestrained (لم يرتبط بحزام الامان) passenger strikes the windshield (الزجاج الامامي) head first and comes to rest in 0.002 s . If the mass of the passenger head is 4 kg , the average force (in N) exerted on his head is:

(a) 31250 (b) 25000 (c) 20000 (d) 50000 (e) 88500

2. A 6.0-kg object moving 5.0 m/s collides with and sticks to a moving 2.0-kg object. After the collision the composite object is moving at 3.0 m/s in a direction opposite to the initial direction of motion of the 6.0-kg object. Determine the speed of the 2.0-kg object before the collision in (m/s).

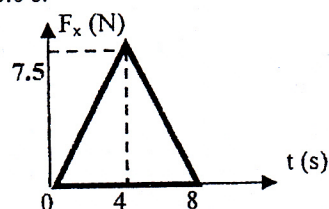
(a) 27.0 (b) 19.7 (c) 3.0 (d) 28.3 (e) 1.5

3. A 2.5-kg object falls vertically downward in a viscous medium at a constant speed of 2.5 m/s . How much work is done (in J) by the force the viscous medium exerts on the object as it falls 80 cm ?

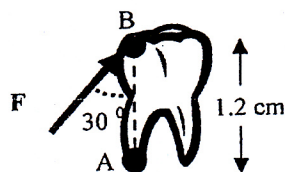
(a) +19.60 (b) -19.60 (c) +1.96 (d) -1.96 (e) +39.2

4. The force acting on a particle ($m = 2 \text{ kg}$) in the X direction varies with time in (s) as in the Figure. If the particle starts from rest at $t = 0 \text{ s}$, find the speed in (m/s) at $t = 8.0 \text{ s}$.

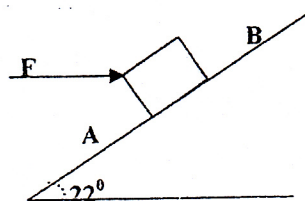
(a) 15 (b) 7.5 (c) 30 (d) 22.5 (e) 0.0



5. A steel band exerts a force of 80.0 N on a tooth at point B as in the figure. What is the torque in (N.m) on the tooth about the point A?

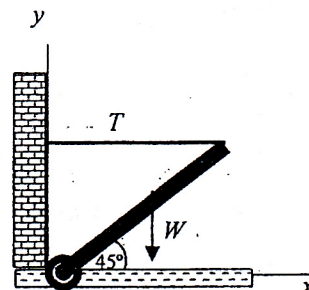
(a) 0.012 (b) 0.480 (c) 0.642
(d) 0.0 (e) 0.831

6. A 1.4 kg block is pushed up a frictionless 22° incline from point A to point B which are 1.2 m apart by a horizontal force $F = 6 \text{ N}$. If the kinetic energy at point A is 3 J and at point B it is 4 J , how much work is done (in J) on the block by the force F?

(a) 7.2 (b) 3.0
(c) 5.0 (d) 1.0
(e) 0

7. In the figure, the weight of the rod $W = 1000 \text{ N}$, and its length $l = 10 \text{ m}$. The rod is at equilibrium making an angle 45° with the x -axis. The tension T in the rope connecting the end of the rod to the wall is:

(a) 100 N
(b) 500 N
(c) 707 N
(d) 1000 N
(e) 1414 N



8. In the above question, what is the horizontal component of the reaction force that acts on the rod by the hinge?

(a) 100 N (b) 500 N (c) 707 N (d) 1000 N (e) 250 N

9. When a ball rises vertically to a height h and returns to its original point of projection, the work done on it by the gravitational force is

(a) $+mgh$. (b) $-mgh$ (c) 0. (d) $-2mgh$. (e) $+2mgh$.

10. An object is in static equilibrium if:

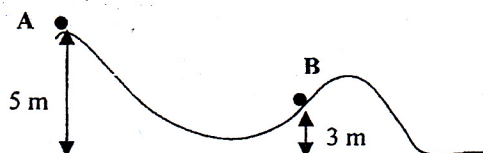
(a) It moves with a constant speed.
(b) The net external force acting on it is zero.
(c) The net torques acting on it about any axis is zero.
(d) The net external force is zero, and the net external torque on it about any axis is zero.
(e) The net internal and external forces acting on it is zero

11. An object of mass m_1 moving in the positive x - direction undergoes a head-on elastic collision with a mass m_2 which is at rest. Which of the following statements is WRONG?

a) After the collision the two objects may move in opposite directions.
b) After the collision the two objects may move in the same direction.
c) Kinetic energy is conserved in this collision
d) After the collision both objects can be at rest
e) During the collision they act on each other with equal and opposite forces.

12. A small object of mass m slides along the frictionless track in the figure, starting from rest at point A. What is its speed (in m/s) at point B?

(a) 6.3 (b) 7.7 (c) 0.0
(d) 9.9 (e) 4.4



List your final answers in this table. Only the answer in this table will be graded..

| Question | Q1: | Q2: | Q3: | Q4: | Q5: | Q6: | Q7: | Q8: | Q9: | Q10: | Q11: | Q12: |
|--------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| Final Answer | | | | | | | | | | | | |

d

$$12) \quad v_i = 0$$

$$\Delta K + \Delta U = 0$$

$$\frac{1}{2} m v_f^2 - 0 - m g 2 = 0$$

$$v_f = 6.26 \approx 6.3$$

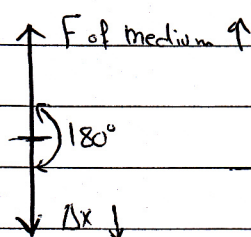
Model Answers

Physics 2nd Exam

| | | | | | | | | |
|---|---|---|---|---|---|---|----|----|
| 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 12 |
| B | | B | A | B | B | C | D | A |

③ $m = 2.5 \text{ kg}$ $U = 2.5$ $\Delta x = 80 \text{ cm} = 0.8 \text{ m}$.
 "constant"

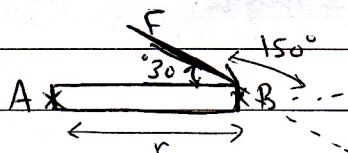
$\rightarrow W = F \Delta x = (mg) \Delta x = 2.5 \times 9.8 \times 0.8 = 19.6 \text{ J}$
 "This is the work done by the object on the medium"



$\rightarrow W = -19.6 \text{ J}$

"This is the work done by the medium on the object"

⑤ $F = 80 \text{ N}$ $\tau = ?$ Pivot $\equiv A$ $r = 1.2 \times 10^{-2} \text{ m}$



$\Sigma \tau = F \times r \times \sin 150 = 80 \times 1.2 \times 10^{-2} \times \frac{1}{2}$

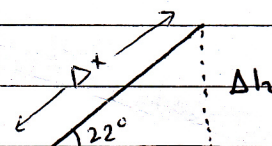
$\Sigma \tau = 0.480 \text{ N.m}$

⑥ $m = 1.4 \text{ Kg}$ $\theta = 22^\circ$ $\Delta x_{AB} = 1.2 \text{ m}$ $\Delta K_{AB} = 4 - 3 = 1 \text{ J}$

$\Delta E = W^a$

$\Delta U + \Delta K = W^a$

$mg(\Delta h) + 1 = W^a$

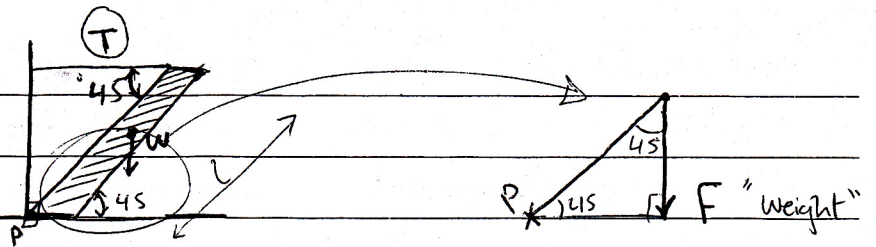


$\rightarrow \Delta h = \Delta x \sin 22$

$\rightarrow 1.4 \times 9.8 \times (\Delta x \sin 22) + 1 = W^a$

$W^a = 1 + 6.2 \rightarrow W^a = 7.2 \text{ J}$

⑦



In Equilibrium $\rightarrow \Sigma \tau = 0$

$$\rightarrow T \times L \times \sin 45 - W \times \frac{L}{2} \times \sin 45 = 0$$

$$\rightarrow T \times \sin 45 = W \times \frac{1}{2} \times \sin 45$$

$$T = \frac{W}{2} = 500 \text{ N}$$

⑧ Since it's in Equilibrium: $\Sigma F = 0 \left\{ \begin{array}{l} \Sigma F_x = 0 \\ \Sigma F_y = 0 \end{array} \right.$

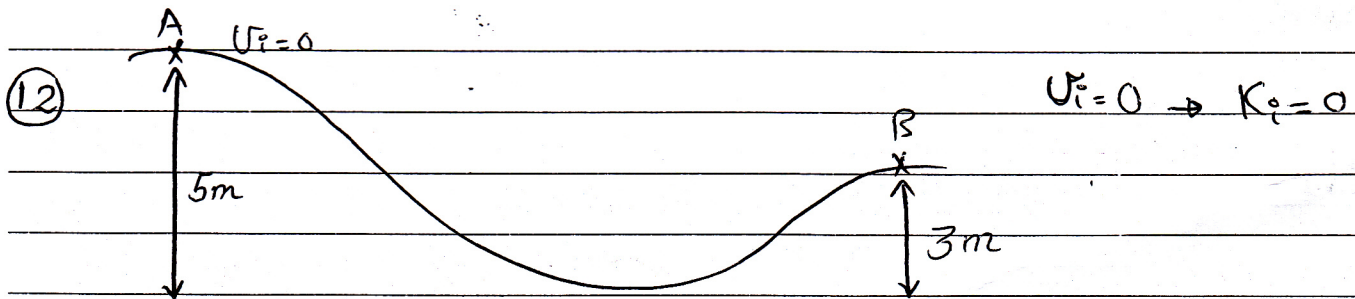
$$\rightarrow \Sigma F_x = 0 \rightarrow H_x - T = 0$$

$$H_x = T$$

$$\text{So: } H_x = 500 \text{ N}$$

⑨ going up: $W = mgh$
going down: $W = -mgh$

$$\Sigma W = 0 \quad !$$



\rightarrow Since no force but the object's weight exerts on it:

$$\Delta E = 0 \rightarrow \Delta U + \Delta K = 0$$

$$U_i + K_i = U_f + K_f$$

$$mgh_i = mgh_f + \frac{1}{2} m U_f^2$$

$$9.8 \times 5 = 9.8 \times 3 + \frac{1}{2} U_f^2$$

$$U_f^2 = 2 \times 9.8 (5-3) = 39.2 \rightarrow U_f = 6.3 \text{ ms}^{-1}$$