THE UNIVERSITY OF JORDAN | Physics (342105) | PHYSICS DEPARTMENT

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

Lecturer's Name:..... Section # .....

Take $g = 9.8$ m/s^2. **FORM NUMBER 27416** Date: Nov/28/2021

Q1) An object moving along the x-axis has an initial velocity $v = 1$ m/s at t = 0. Its velocity two seconds later is -3 m/s. What is the average acceleration (in m/s^2) of the particle between $t = 0$ and $t = 2$s?

$\vec{a} = \frac{-3-1}{2}$

A) 2 B) 4 C) 0 D) - 2 E) - 4

Q2) A stone is projected vertically upwards from the surface of the ground with an initial speed of 15 m/s. Its average speed (in m/s) over the time interval from its projection to the moment just before hitting the ground is:

A) 7.5 B) 9.8 C) 0 D) 12.5 E) 5.9

$V = \left(\frac{y}{t}\right)_{trip} = \frac{v_i}{2}$

$t_{trip} = \frac{2v_i}{g}$

$y_{trip} = v_i^2/g$

Q3) A car is moving along the positive x-axis at a constant speed of 15 m/s. The driver notices a red traffic light 30 m ahead of him. Thus the driver immediately applies the breaks, and the car decelerates uniformly at 3 m/s^2. Which of the following statements is correct?

A) The car will stop at a position 7.5 m before reaching the traffic light.
B) The car will stop at a position 7.5 m after the traffic light.
C) The car will stop at a position 2.5 m before reaching the traffic light.
D) The car will stop at a position 2.5 m after the traffic light.
E) The car will stop exactly at the position of the traffic light

$v_f^2 = v_i^2 + 2(-a)(\Delta\vec{x})$

$\Delta\vec{x} = \frac{v_i^2}{2a} = +37.5\,m$

Q4) A helicopter is ascending vertically upwards at a constant speed of 12 m/s. When it is at a height of 60 m above the ground it releases a box. The speed (in m/s) of the box just before it hits the ground is:

$v_f^2 = v_i^2 + 2(-a)(-y)$

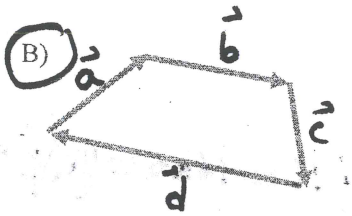
$v_i^2 = (12)^2$

A) 12 B) 34.3 C) 16.7 D) 9.8 E) 36.3

Q5) In each figure, the set of forces act on an object. Which set does NOT change the state of motion of the object?

A)

B)



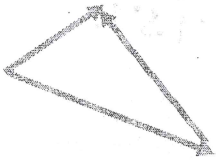
C)

$\vec{a} + \vec{b} + \vec{c} = [-\vec{d}]$

$\Rightarrow$ Net force = zero.

D)

E)



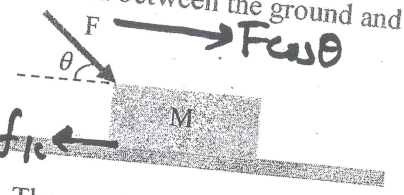
Q6) Which of the following statements is **WRONG**?

A) While mass is a scalar quantity, weight is a vector quantity.
B) The action force and the reaction force can never act on the same object.
C) An object can move at constant velocity if only one force acts on it.
D) If an object is moving at constant velocity, then the resultant force acting on it is zero.
E) The acceleration is always along the direction of the resultant force.

Q7) In the figure the force F = 40 N, M = 4 kg, $\theta = 30^0$ and the coefficient of kinetic friction between the ground and block is $\mu_k = 0.2$. The Acceleration (in m/s^2) of the block is:

A) 0.4
B) 3.5
C) 8.2
D) 9.8
E) 5.7

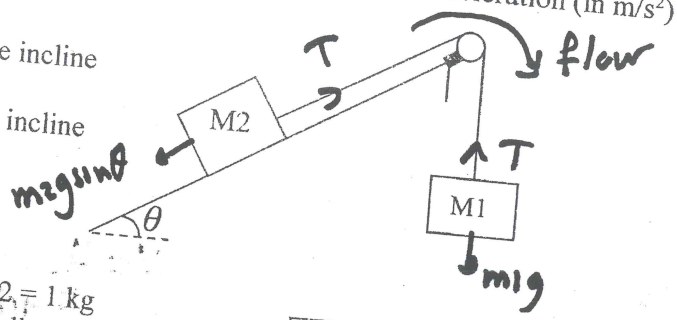
$a = [F\cos\theta - \mu_k(mg + F\sin\theta)]/m$



Q8) In the figure M1 = 3 kg, M2 = 5 kg and $\theta = 30^0$. All the surfaces are frictionless. The acceleration (in m/s^2) of mass M2 is:

A) 0.6 up the incline
B) 0.6 down the incline
C) 2.5 up the incline
D) 2.5 down the incline
E) 0

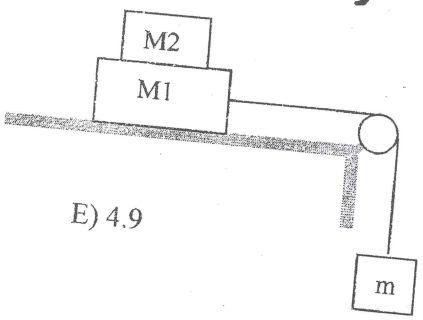
$m_1g - T = +m_1a$
$T - m_2g\sin\theta = +m_2a$



Q9) In the figure, all surfaces are rough. M1=3 kg and M2 = 1 kg and the coefficients of friction $\mu_s = 0.5$ and $\mu_k = 0.2$ for all surfaces. Find the maximum value of mass m (in kg) such that mass M2 will move with mass M1 without sliding. Ignore masses of all strings and the mass of the pulley.

A) 2.8
B) 3.7
C) 4.0
D) 5.6
E) 4.9

$m = \left(\frac{\mu_k + \mu_s}{1 - \mu_s}\right) * (m_1 + m_2)$



Q10) A 12.0-kg child is sitting on the back seat of a car that is moving at a constant velocity of 10 m/s along a horizontal road. The driver notices a red traffic light ahead of him and applies the breaks. If the car comes to a stop in 12 m, calculate the minimum value of the coefficient of static friction such that the child does not slide. (Assume only the force of friction acts on the child in the horizontal direction).

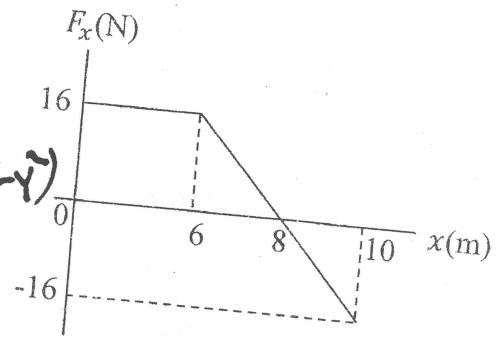
A) 0.4
B) 0.5
C) 0.2
D) 0.7
E) 0.1

$-\mu_s mg = ma$, $v_f^2 = v_i^2 + 2ad$ $\Rightarrow \mu_s = \frac{v_i^2}{2gd}$

Q11) A 4.0-kg object starts moving from the origin with a speed of 2 m/s under the effect of a variable force F_x that acts along the x-axis as shown in the figure. The speed (in m/s) of the object at $x = 10$ m is:

A) 9.8
B) 6.9
C) 7.2
D) 10.0
E) 1.1

$\Delta K = 16*6 = \frac{m}{2}(v_f^2 - v_i^2)$
$v_f = \sqrt{52}$



Q12) You run a race with a friend. At first your kinetic energy is the same as his kinetic energy, but he is running faster than you are. When you increase your speed by 20 percent, you are running at the same speed he is. If your mass is 85 kg, what is his mass (in kg)?

A) 71
B) 59
C) 78
D) 89
E) 67

m_1 m_2

1) $m_1 v_{1i}^2 = m_2 v_{2i}^2$
2) $v_{2i} > v_{1i}$
⇒ Thus we know right off that $m_1 > m_2$.

If $v_{1f} = (1.2)v_{1i} \rightarrow v_{1f} = v_{2i}$

$\therefore m_2 = \left(\frac{v_{1i}}{v_{2i}}\right)^2 m_1$

$m_2 = \left(\frac{v_{1i}}{1.2 v_{1i}}\right)^2 m_1 \rightarrow m_2 = \frac{m_1}{(1.2)^2}$