

PHYSICS I.

PHY105

Midterm Exam

First Semester - Term 241

Tuesday, October 22, 2024



AL NOJOUN ACADEMY

Part 1 (11 Marks): 11 multiple choice questions, 1 mark each

Indicate the answer choice that best completes the statement or answers the question.

Q1. When the velocity of an object is constant, it means that:

- a) the object is in equilibrium
- b) the object is moving at a steady speed in a straight line
- c) the net force acting on the object is zero
- d) all of the above

Q2. A person with a mass of 70 kg stands on a scale in an elevator. The scale reads a weight of 500 N. What can you conclude about the elevator's motion?

- a) The elevator is accelerating upward.
- b) The elevator is accelerating downward.
- c) The elevator is moving at a constant speed.
- d) The elevator is in free fall.

Q3. If you multiply the vector $A = -3\hat{x} + 4\hat{y}$ by -4 , what will be its x-component?

- a) 12
- b) -3
- c) -4
- d) 0

Q4. Which of the following quantities has the dimensions of distance?

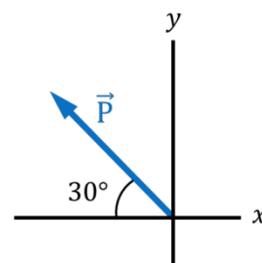
- a) $\frac{1}{2}a^2t$
- b) v/t
- c) at^2
- d) $2vt^2$

Q5. Convert the speed of 30 mi/h to m/s. (Given: 1 mile = 1609 m).

- a) 16.7 m/s
- b) 13.4 m/s
- c) 33.3 m/s
- d) 67.1 m/s

Q6. The vector $\vec{P}$ shown in the figure has a magnitude of $P = 50$. Which of the vectors below is equal to P ?

- a) $\vec{P} = 43.3\hat{x} + 25\hat{y}$
- b) $\vec{P} = -43.3\hat{x} + 25\hat{y}$
- c) $\vec{P} = -25\hat{x} + 43.3\hat{y}$
- d) $\vec{P} = 25\hat{x} - 43.3\hat{y}$



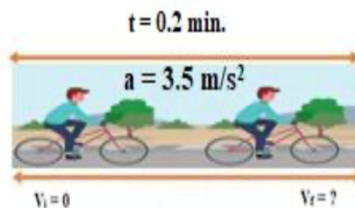
Q7. A boat moves from position $\vec{r} = 5\hat{x} - 3\hat{y} \text{ m}$ to position $\vec{r} = -\hat{x} + 2\hat{y} \text{ m}$ in 2 seconds. What is its average velocity?

- a) $-3\hat{x} + 2.5\hat{y} \text{ m/s}$
- b) $6\hat{x} - 5\hat{y} \text{ m/s}$
- c) $3\hat{x} - 6\hat{y} \text{ m/s}$
- d) $-6\hat{x} - 5\hat{y} \text{ m/s}$

AL NOJOUM ACADEMY

Q8. A bicycle starts moving from rest with a constant acceleration of 3.5 m/s^2 for a time interval of 0.2 minutes. What is the final speed of the bicycle?

- a) 21 m/s
- b) 42 m/s
- c) 7 m/s
- d) 210 m/s

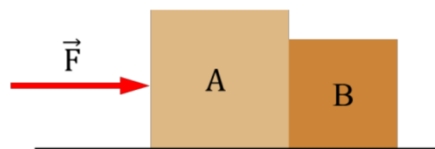


Q9. A car is moving along a straight road at 90 km/h . The driver suddenly applies the brakes, and the car stops in 2.5 seconds. What is the stopping distance of the car?

- a) 31.25 m
- b) 36 m
- c) 10 m
- d) 62.5 m

Q11. Block with mass $m_A = 35 \text{ kg}$ is placed next to block B with mass $m_B = 15 \text{ kg}$ on a smooth horizontal table. When block A is pushed with a horizontal force F , both blocks accelerate at 3.0 m/s^2 . What is the magnitude of the force that block A exerts on block B (the force of contact)?

- a) 150 N
- b) 75 N
- c) 45 N
- d) 105 N

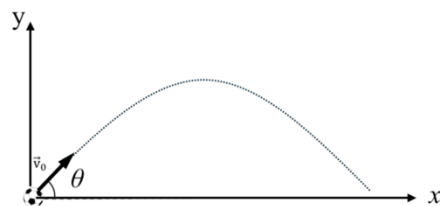


Part 2 (9 Marks):

Solve the following two problems. Show your detailed solution and include units.

Q1. (5 marks) A ball is kicked from the ground with an initial velocity of 45 m/s directed 40° above the horizontal.

a) (1 mark) Determine the initial velocity vector $\mathbf{v}_0$ using **unit vector notation**



b) (1 mark) Determine the maximum height reached by the ball.

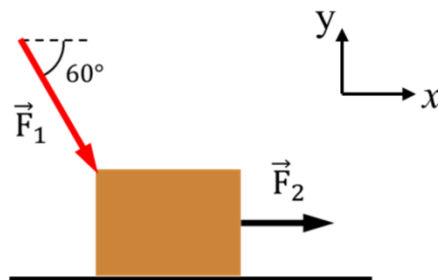
c) (1 mark) Determine its x and y positions after 4 seconds.

d) (2 marks) Determine the magnitude and direction of its velocity after 4 seconds.

AL NOJOUM ACADEMY

Q2. (4 marks) A 14 kg box rests on a smooth horizontal surface. The box is then pushed with a force of magnitude $F_1 = 40\text{ N}$ directed 60° below the horizontal and is pulled with a horizontal force of magnitude $F_2 = 15\text{ N}$, as shown in the figure. The box starts to accelerate as a result of the applied forces.

a) (1 mark) Draw a free-body diagram of the box.



b) (1.5 marks) Calculate the acceleration of the box

c) (1.5 mark) Calculate the normal force acting on the box

AL NOJOUM ACADEMY