



Department of Physics
College of Arts and Sciences
American University of Sharjah (AUS)
Fall 2014

Suggested Practice Problems (set #2) for the Physics Placement Test

This document contains 25 suggested problems that are designed to help prospective science and engineering students prepare for the physics placement test. To adequately measure readiness for the placement test, those 25 problems should be solved in **NO MORE THAN 90 minutes**.

1) Suppose an equation relating position, x , to time, t , is given by $x = b t^3 + c t^4$, where b and c are constants and x is meters and t is in seconds. The units of b and c respectively are;

- A) s^3, s^4 .
- B) $1/s^3, 1/s^4$.
- C) $m/s^3, m/s^4$.
- D) $m^2 \cdot s^3, m^2 \cdot s^4$.

2) The density of aluminum is 2.70 g/cm^3 ; what is the density of aluminum in kg/m^3 ?

- A) 2.7×10^3
- B) 2.7×10^{-3}
- C) 2.7×10^{-2}
- D) 2.7×10^2

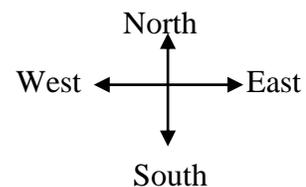
3) Newton's law of universal gravitation is represented by

$$F = G \frac{m_1 m_2}{r^2}$$

where F is the gravitational force, m_1 and m_2 are masses, r is the separation between the two masses and G is force proportionality constant; re-arrange this equation so as to express r in terms of F , G , m_1 and m_2

- A) $r = G m_1 m_2 / F$.
- B) $r = \sqrt{G m_1 m_2 / F}$.
- C) $r = F / G m_1 m_2$.
- D) $r = \sqrt{F / G m_1 m_2}$.

- 4) Which pair contains one vector and one scalar quantity?
- displacement; acceleration
 - force; kinetic energy
 - momentum; velocity
 - power; speed
- 5) A metal sphere of radius r (*in meters*) is released into a tank of water. As it sinks at speed v (in meters per second) it experiences a drag force F (*in Newtons*) given by $F = krv$, where k is a constant. What are the SI base units of k ?
- $\text{kg m}^2 \text{s}^{-1}$
 - $\text{kg m}^{-2} \text{s}^{-2}$
 - $\text{kg m}^{-1} \text{s}^{-1}$
 - kg m s^{-2}
- 6) A man travels 30 % of the distance of his trip alone, then walks another 1.5 km with a friend and then finishes the last half of the trip alone. What is the total length of the trip?
- 5 km.
 - 4.5 km.
 - 7.5 km.
 - 6 km.
- 7) A motorist drives north for 36 minutes at 85 km/h and then stops for 24 minutes. He then continues north, traveling 132 km in 2 h. What is average speed for the entire trip?
- 61 km/h
 - 70.4 km/h
 - 39 km/h
 - 45 km/h
- 8) A car travels north at 50 km/h for 1 h. It then travels east at 120 km/h for 1 h. What is the magnitude of the car's average velocity for the trip?
- 85 km/h
 - 170 km/h
 - 65 km/h
 - 130 km/h



- 9) The weight of an object is
- the same as its mass
 - the force gravity acting on it
 - dependent upon the velocity of an object
 - the difference between gravitational attraction and air resistance
- 10) An object of mass 10 kg is accelerated downward at 2 m/s^2 . If $g = 10 \text{ m/s}^2$, what is the force of air resistance?
- 100 N upward
 - 100 N downward

- C) 80 N upward
- D) 120 N upward

11) If the length of a box is reduced to one third ($1/3$) of its original value and the width and height are doubled (two times as much), by what factor has the volume changed?

- A) $3/4$
- B) $4/3$
- C) 12
- D) $1/3$

12) An apple falls from a tree. Compare its kinetic energy K to its potential energy U .

- A) K increases and U decreases.
- B) K decreases and U decreases
- C) K increases and U increases
- D) K decreases and U increases

13) Two blocks are released from the top of a building. One falls straight down while the other slides down a smooth ramp. If friction is ignored, which one is moving faster when it reaches the bottom?

- A) The block that went straight down.
- B) The block that went down the ramp.
- C) They both will have the same speed.
- D) Insufficient information to work the problem.

14) Two cars traveling in opposite directions pass each other at 1:00 p.m. One of the cars travels at a speed of 90 km/h, while the other travels at a speed of 72 km/h. How far apart will they be at 2:00 p.m.?

- A) 162 km
- B) 108 km
- C) 144 km
- D) 180 km

15) The magnitude and the direction of the resultant force respectively are

- A) 110 N, 0° , with the + x-axis
- B) 70 N, 90° , with the + x-axis
- C) 50 N, 53.1° , with the + x-axis
- D) 50 N, 36.9° , with the + x-axis



16) A mass accelerates uniformly when the resultant force on it

- A) increases uniformly with respect to time
- B) is constant but not zero
- C) is proportional to the displacement from a fixed point
- D) is proportional to velocity

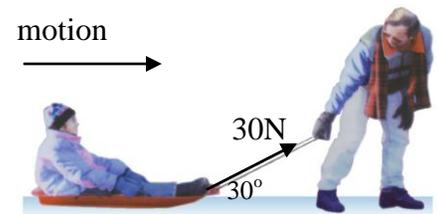
- 17) Neglecting air resistance, just before it reaches the peak of the path of its motion an object thrown upward has
- A) its velocity directed upward and its acceleration directed upward
 - B) its velocity directed upward and its acceleration directed downward
 - C) its velocity directed downward and its acceleration directed upward
 - D) its velocity directed downward and its acceleration directed downward

- 18) A train slowly climbs a 500-m mountain track which is at an angle of 10.0° with respect to the horizontal. How much altitude does it gain?
- A) 86.8 m
 - B) 88.2 m
 - C) 341 m
 - D) 492 m

- 19) A stone is thrown with an initial speed of 15 m/s at an angle of 53° above the horizontal from the top of a 35-m building. What is the magnitude of the horizontal component of velocity as the rock strikes the ground?
- A) 29 m/s
 - B) 12 m/s
 - C) 9 m/s
 - D) 21 m/s

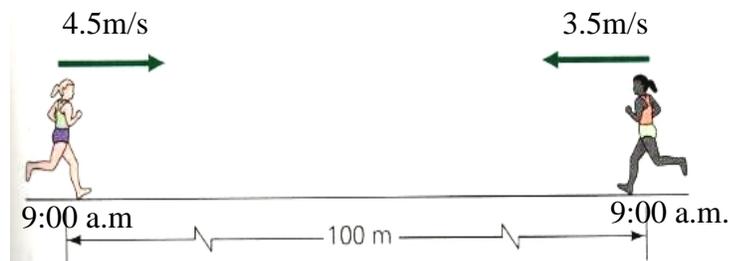
- 20) A father pulls his young 40 kg daughter with a force of 30 N at an angle of 30° on a frictionless horizontal surface, as shown. What is the acceleration of the box?

- A) 0.75 m/s^2
- B) 1.33 m/s^2
- C) 0.65 m/s^2
- D) 0.375 m/s^2



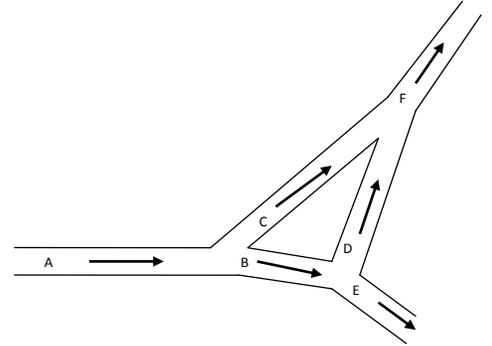
- 21) At 9:00 a.m., two runners run towards each other on a straight line with constant speed of 4.5 m/s and 3.5 m/s, respectively, when they are 100 m, as shown in the figure. How long will it take for the runners to meet if they maintain these constant speeds?

- A) 25 s
- B) 12.5 s
- C) 6.25 s
- D) 11.1 s



22) Water flows in a pipe (A) that splits into two pipes (B and C). $\frac{5}{8}$ of the water goes into pipe B, which then splits into 2 pipes (D and E), with D joining with C to form the F pipe (see figure). If $\frac{3}{5}$ of the water in B went into D, determine the percentage of the initial water that ends up in the F pipe.

- A) 65 %.
- B) 62.5 %.
- C) 75 %.
- D) 77.5 %.

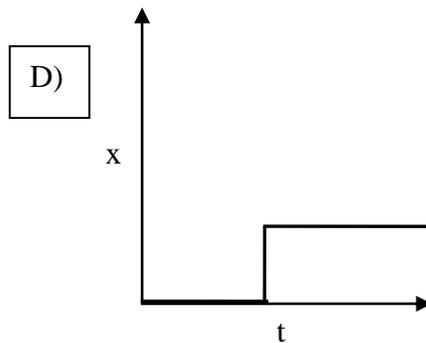
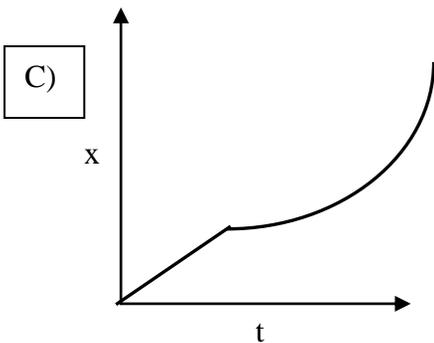
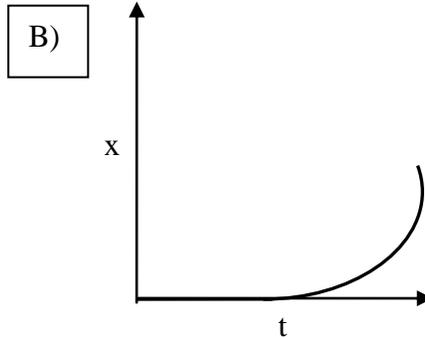
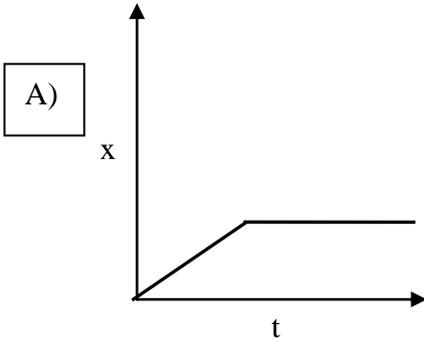
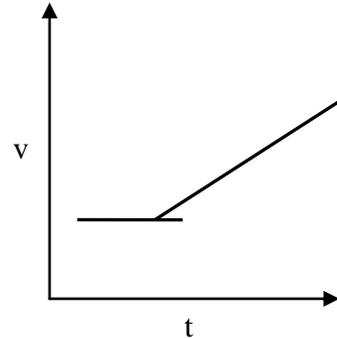


23) You have a machine which can accelerate a disk on frictionless ice. Starting from rest, the disk travels a distance x in time t when force F is applied. If force $3F$ is applied, the distance the puck travels in time t is

- A) x .
- B) $1.5x$.
- C) $4.5x$.
- D) $3x$.

Questions 24 and 25:

The graph to the right shows the velocity v of an object moving in a straight line as a function of time t .



- 24) Which graph correctly describes the distance traveled as a function of time?
- A) Graph A
 - B) Graph B
 - C) Graph C
 - D) Graph D
- 25) Which graph correctly describes the acceleration of the object as a function of time?
- A) Graph A
 - B) Graph B
 - C) Graph C
 - D) Graph D