

**AUS** | الجامعة الأميركية في الشارقة  
American University of Sharjah  
**College of Arts and Sciences**  
**Department of Physics**  
**Physics Placement Test**

**90 Minutes Exam**

Write down your name and ID number on the question paper in ***ink***.

**Name** \_\_\_\_\_

**ID #:** \_\_\_\_\_

Instructions:

- 1) This test has 25 multiple-choice questions on 6 pages, including this cover.
- 2) Use the space provided below the statement of each question for scratch work.
- 3) Fill the scantron sheet with 2 HB pencil only. DO NOT use INK or any other pencil.
- 4) Only Built-in calculators are allowed.
- 5) Please turn off your cell phone and you cannot use it as a calculator.

- 1) Given 1 angstrom unit =  $10^{-10}$  m and 1 fermi =  $10^{-15}$  m, what is the relationship between these units?  
 A) 1 angstrom =  $10^{+25}$  fermi  
 B) 1 angstrom =  $10^{-5}$  fermi  
 C) 1 angstrom =  $10^{+5}$  fermi  
 D) 1 angstrom =  $10^{-25}$  fermi  
 E) none of the given answers
- 2) If we find  $v = A \lambda$ , where  $\lambda$  is a length and  $v$  is a speed, what are the mks units for the A?  
 A) kg-m/s                      B)  $m^2/s$                       C) s                      D)  $s^{-1}$                       E)  $m/s^2$
- 3) Using dimensional analysis, which one of the following equations is dimensionally correct?  
 (  $a \Rightarrow m/s^2$ ,  $v \Rightarrow m/s$ ,  $x \Rightarrow m$ ,  $t \Rightarrow s$  )  
 A)  $x^2 = 2av$                       B)  $x = v/t$                       C)  $x = a t$                       D)  $v = 2ax$                       E)  $t^2 = x/a$
- 4) The average density of blood is  $1.06 \times 10^3$  kg/m<sup>3</sup>. If you donate a pint of blood to the Red Cross, what mass of blood have you donated, in grams? (1 pt = 1/2 L, 1 L = 1000 cm<sup>3</sup>)  
 A)  $5.30 \times 10^3$  g                      B) 530 g                      C) 5.30 g                      D) 0.530 g                      E)  $5.30 \times 10^5$  g
- 5) The density of water is 1.00 grams/cm<sup>3</sup>. What is the density in kg/m<sup>3</sup>?  
 A)  $1.00 \times 10^6$                       B)  $1.00 \times 10^{-3}$                       C) 0.000100                      D) 1.00                      E)  $1.00 \times 10^3$
- 6) A motorist travels for 3.0 h at 80 km/h and 4.0 h at 60 km/h. What is her average speed for the trip?  
 A) 73 km/h                      B) 140 km/h                      C) 69 km/h                      D) 74 km/h                      E) 70 km/h
- 7) If you run a complete loop around an outdoor track (400 m) in 100 s, your average velocity is  
 A) 40,000 m/s.                      B) 4.00 km/s.                      C) 4.0 m/s.                      D) 0.25 m/s.                      E) zero.
- 8) An airplane increases its speed from 100 m/s to 160 m/s, at the average rate of  $15 \text{ m/s}^2$ . How much time does it take for the complete increase in speed?  
 A) 4.0 s                      B) 17.3 s                      C) 8.0 s                      D) 0.25 s                      E) 0.0577 s
- 9) An object is thrown upwards with a speed of 14 m/s. How high above the projection point does it reach?  
 A) 5.0 m                      B) 10 m                      C) 20 m                      D) 25 m                      E) 15 m
- 10) A bullet shot straight up returns to its starting point in 10 s. Its initial speed was  
 A) 9.8 m/s.                      B) 32. ft/s.                      C) 49 m/s.                      D) 24.5 m/s.                      E) 98 m/s.
- 11) A boy jumps at a speed of 20.0 m/s at an angle of  $25.0^\circ$  above the horizontal. What is the horizontal component of the boy's velocity?  
 A) 15.6 m/s                      B) 18.1 m/s                      C) 8.5 m/s                      D) 12.6 m/s                      E) 20.0 m/s
- 12) A vector  $\vec{A}$  has components  $A_x = 12$  m and  $A_y = 5.0$  m. What is the magnitude of vector  $\vec{A}$ ?  
 A) 13 m                      B) 7.0 m                      C) 60 m                      D) 21 m                      E) 17 m
- 13) A vector  $\vec{A}$  has components  $A_x = 12.0$  m and  $A_y = 5.00$  m. What is the angle that vector  $\vec{A}$  makes with the  $x$ -axis?  
 A)  $12.6^\circ$                       B)  $32.6^\circ$                       C)  $22.6^\circ$                       D)  $42.8^\circ$                       E)  $6.6^\circ$

- 14) Vector  $\vec{A} = 6.0$  m and points  $30^\circ$  north of east. Vector  $\vec{B} = 4.0$  m and points  $30^\circ$  south of west. The resultant vector  $\vec{A} + \vec{B}$  is given by
- A) 2.0 m at an angle  $30^\circ$  north of east.
  - B) 10.0 m at an angle  $30^\circ$  north of east.
  - C) 2.0 m at an angle  $60^\circ$  north of east.
  - D) 10.0 m at an angle  $60^\circ$  north of east.
  - E) 10.0 m at an angle  $60^\circ$  east of north.

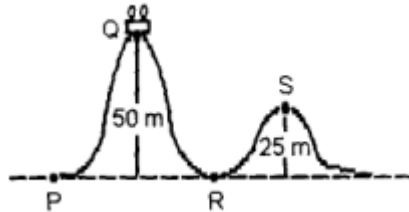
- 15) Three vectors, expressed in Cartesian coordinates, are

	x-comp	y-comp
S	3.50	-4.50
T	2.00	0
U	-5.50	2.50

The magnitude of the resultant vector is

- A) 11.1
  - B) 2.0
  - C) 5.5
  - D) 13.0
  - E) 7.0
- 16) A force of 120 N is applied to an object whose mass is 30 kg. The object's acceleration is
- A)  $0.25 \text{ m/s}^2$ .
  - B)  $3600 \text{ m/s}^2$ .
  - C)  $4.0 \text{ m/s}^2$ .
  - D)  $2.0 \text{ m/s}^2$ .
  - E)  $150 \text{ m/s}^2$ .
- 17) A 2.00-kg object moves with constant velocity 3.00 m/s toward the east. Two forces act on the object. The first is a 40.0 N force toward the west. What is the second force that acts on the object?
- A) 46.0 N west
  - B) 40.0 N east
  - C) 26.7 N east
  - D) 46.0 N east
  - E) 23.0 N east
- 18) Starting from rest, a 4.0-kg body reaches a speed of 8.0 m/s in 2.0 s. What is the net force acting on the body?
- A) 8.0 N
  - B) 2.0 N
  - C) 16 N
  - D) 32 N
  - E) 4.0 N
- 19) The following four forces act on a 4.00 kg object:
- $F_1 = 300$  N east
  - $F_2 = 700$  N north
  - $F_3 = 500$  N west
  - $F_4 = 600$  N south
- What is the acceleration of the object?
- A) 300 N in a direction  $63.4^\circ$  north of west
  - B) 224 N in a direction  $63.4^\circ$  north of west
  - C) 300 N in a direction  $26.6^\circ$  north of west
  - D) 224 N in a direction  $26.6^\circ$  north of west
  - E) 2100 N in a direction  $26.6^\circ$  north of west
- 20) If a force accelerates 4.5 kg at  $40. \text{m/s}^2$ , that same force would accelerate 18. kg by how much?
- A)  $0.16 \text{ km/s}^2$
  - B)  $0.18 \text{ km/s}^2$
  - C)  $32. \text{ft/s}^2$
  - D)  $10. \text{m/s}^2$
  - E)  $40. \text{m/s}^2$
- 21) An elevator weighing 10,000. N is supported by a steel cable. Determine the tension in the cable when the elevator is accelerated upward at  $3.0 \text{ m/s}^2$ . ( $g = 9.8 \text{ m/s}^2$ )
- A) 7.0 kN
  - B) 10. kN
  - C) 40. kN
  - D) 11. kN
  - E) 13. kN

- 22) A toy rocket, weighing 10. N, blasts off from ground level. At the exact top of its trajectory, its energy is 140. J. To what vertical height does it rise?  
 A) 1.4 km                      B) 1.4 m                      C) 12. m                      D) 14. m                      E) 0.12 km
- 23) A 4.0 kg box of fruit slides 8.0 m down a ramp, inclined at  $30.^\circ$  from the horizontal. If the box slides at a constant velocity of 5.0 m/s, the work done by gravity is  
 A) zero.                      B) +78. J.                      C) 0.16 kJ.                      D) -78. J.                      E) -0.16 kJ.



- 24) Refer to Figure. If the roller coaster leaves point Q from rest, how fast is it traveling at point R?  
 A) 0.49 km/s                      B) 31 m/s                      C) 0.98 km/s                      D) 22 m/s                      E) 51 m/s
- 25) Refer to Figure. If the roller coaster leaves point Q from rest, what is its speed at point S (at the top of the 25. m peak) compared to its speed at point R?  
 A) 4                      B) zero                      C) 2                      D)  $1/\sqrt{2}$                       E)  $\sqrt{2}$

## Answer Key

Testname: SAMPLE

- 1) C
- 2) D
- 3) E
- 4) B
- 5) E
- 6) C
- 7) E
- 8) A
- 9) B
- 10) C
- 11) B
- 12) A
- 13) C
- 14) A
- 15) B
- 16) C
- 17) B
- 18) C
- 19) D
- 20) D
- 21) E
- 22) D
- 23) C
- 24) B
- 25) D