King Abdulaziz University
Faculty of Science
Physics Dept

C

PHYS 110 1st EXAM | 11/4/1430H | **Time: 90 min.**

Student Name: Morouj Q | Student Number: | Section:

Q.1 10^4 milliseconds is equal to:
(A) 10^3 s (B) 10^2 s (C) 1 s (D) 10 s (E) 10^{-1} s

Q.2 A cubic box with an edge of exactly 3 cm has a volume of: (volume = edge^3)
(A) 10^{-6} m^3 (B) 8×10^{-6} m^3 (C) 2.7×10^{-5} m^3 (D) 6.4×10^{-5} m^3 (E) 4×10^{-6} m^3

Q.3 The speed υ in m/s of a car is given by $\upsilon = bt^3$ where the time t is in seconds. The unit of b is:
(A) m/s^4 (B) ms (C) m/s (D) m/s^3 (E) m/s^2

Q.4 The instantaneous acceleration $\vec{a}$ is given as:
(A) $\frac{dx}{dt}$ (B) $\frac{d}{dt}\left(\frac{d^2x}{dt^2}\right)$ (C) $\frac{d^2}{dt^2}\left(\frac{dx}{dt}\right)$ (D) $\frac{d^2}{dt^2}\left(\frac{dv}{dt}\right)$ (E) $\frac{d}{dt}\left(\frac{dx}{dt}\right)$

Q.5 A particle is moving along the negative x-axis with constant velocity. The magnitude of its acceleration is:
(A) -9.8 m/s^2 (B) zero (C) constant (D) 9.8 m/s^2 (E) 980 cm/s^2

Q.6 A car moves along a straight line with velocity in m/s given by $\upsilon = t^2 + 3$. The velocity at t=0 is:
(A) zero (B) 4 m/s (C) 3 m/s (D) 2 m/s (E) 6 m/s

Q.7 Referring to question 6, the acceleration of the car at t = 4s is:
(A) 6 m/s^2 (B) 8 m/s^2 (C) 10 m/s^2 (D) 12m/s^2 (E) 4m/s^2

Q.8 The position of an object is given by $x = 4t + 2t^2$. Its average velocity over the time interval from t = 0 to t = 4 s is:
(A) 8 m/s (B) 10 m/s (C) 12 m/s (D) 14 m/s (E) 16 m/s

Q.9 A particle is moving along a straight line. At t=3s its velocity is 20 m/s and at t=8s its velocity is zero. The average acceleration is:
(A) -6 m/s^2 (B) -2 m/s^2 (C) -3 m/s^2 (D) -4m/s^2 (E) -5 m/s^2

Q.10 A car travels in a straight line with an initial velocity of 4 m/s and an acceleration of 2 m/s^2 . The distance traveled in 4s is:
((A) 36 m (B) 40 m (C) 24 m (D) 28 m (E) 32 m

Q.11 A car, initially at rest, travels 32 m in 4 s along a straight line with constant acceleration. The acceleration of the car is:
(A) 4 m/s^2 (B) 5 m/s^2 (C) 6 m/s^2 (D) 2 m/s^2 (E) 3 m/s^2

Q.12 What is the initial speed of a car moving a distance of 60 m in 6 s if the final speed was 15 m/s?
(A) 15 m/s (B) 10 m/s (C) 5 m/s (D) zero (E) 20 m/s

Q.13 A baseball is thrown vertically up into the air. The acceleration of the ball at its highest point is:
(A) -19.6 m/s^2 (B) 19.6 m/s^2 (C) + 9.8 m/s^2 (D) - 9.8 m/s^2 (E) zero

Q.14 An object is thrown straight up from ground level with a speed of 30 m/s. Its height after 1.0 s is:
(A) 15.1 m (B) 5.1 m (C) 45.1 m (D) 35.1 m (E) 25.1 m

Q.15 Referring to question 14, the maximum height is:
(A) 10.2 m (B) 127.6 m (C) 81.6 m (D) 45.9 m (E) 20.4 m

Q.16 A stone dropped off a 75 m high building reaches the ground in:
(A) 3.91 s (B) 2.86 s (C) 1.35 s (D) 5.53 s (E) 4.95 s

Q.17 Referring to question 16,the speed of the stone just before reaching the ground is: Morouj Q

(A) 54.2 m/s (B) 48.5 m/s (C) 38.3 m/s (D) 28 m/s (E) zero

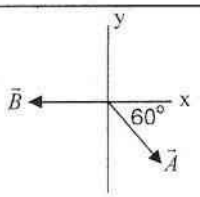
Q.18 A vector $\vec{A}$ has x-component of 10 m and y-component of 15 m. The magnitude of this vector is:

(A) 14.14 m (B) 18 m (C) 22.36 m (D) 35.12 m (E) 11.18 m

Q.19 A vector has a magnitude of 14 units makes an angle of 30° with the x axis. Its y component is:

A) 8 units (B) 9 units (C) 5 units (D) 6 units (E) 7 units

Q.20 As shown in the figure , if the magnitudes of $\vec{A}$ *and* $\vec{B}$ are 10 units and 15 units respectively then the x-component of the resultant of $\vec{A}$ *and* $\vec{B}$ is:



(A) -10 units (B) -15 units (C) -20units (D) zero (E) -5 units

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Q.21 The scalar product $\hat{i}\cdot\hat{j}$ is equal to:

(A) $\hat{k}$ (B) $2\hat{i}$ (C) $2\hat{j}$ (D) zero (E) $\hat{i}\hat{j}$

Q.22 if $\vec{A}=4\hat{i}-6\hat{j}$ then the vector $\frac{1}{2}\vec{A}$ is:

A) $2\hat{i}-\hat{j}$ (B) $2\hat{i}-5\hat{j}$ (C $2\hat{i}-4\hat{j}$ (D) $2\hat{i}-3\hat{j}$ (E) $2\hat{i}-2\hat{j}$

Q.23 Two vectors are given as $\vec{A}=2\hat{i}-2\hat{j}+4\hat{k}$ and $\vec{B}=-\hat{i}+\hat{j}+4\hat{k}$. The result of $\vec{A}-\vec{B}$ is:

(A) $5\hat{i}-3\hat{j}$ (B) $4\hat{i}-3\hat{j}$ (C) $3\hat{i}-3\hat{j}$ (D) $2\hat{i}-3\hat{j}$ (E) $\hat{i}-3\hat{j}$

Q.24 If the magnitude of a vector is 18m and its x-component of 10m. The angle it makes with the positive x-axis is:

(A) 48.2° (B) 63.4° (C) 66.4° (D) 60° (E) 56.25°

Q.25 If the magnitude of two vectors are 10 units and 20 units and the angle between them is 60° then their scalar product is:

(a) 100 (B) 125 (C) zero (D) 25 (E) 75

Q.26 Two vectors are given as $\vec{A}=5\hat{j}+4\hat{k}$ and $\vec{B}=-\hat{i}+\hat{j}$, their scalar product $\vec{A}\cdot\vec{B}$ is:

(A) 4 (B) 5 (C) 6 (D) 7 (E) 3

Q.27 The vector product $\hat{j}\times\hat{i}$ is equal to:

(A) $\hat{j}$ (B) $-\hat{i}$ (C) $\hat{k}$ (D) 1 (E) $-\hat{k}$

Q.28 The value of $\hat{i}\cdot(\hat{k}\times\hat{j})$ is:

(A) $\hat{j}$ (B) zero (C) $\hat{k}$ (D) -1 (E) 1

Q.29 Two vectors $\vec{A}=8\hat{i}+6\hat{j}$ and $\vec{B}=-6\hat{i}$, their vector product $\vec{A}\times\vec{B}$ is:

(A) $48\hat{k}$ (B) $30\hat{k}$ (C) $36\hat{k}$ (D) $42\hat{k}$ (E) $48\hat{k}$

Q.30 If the angle between $\vec{A}$ *and* $\vec{B}$ is 30°, and A = 5 units, B = 10 units, then the magnitude of the vector product $\vec{A}\times\vec{B}$ is:

(A) 25 (B) 20 (C) 15 (D) 30 (E) 35

SOLUTIONS: A. Z. ALZAHRANI

(1) 10^4 milliseconds = $10^4 \times 10^{-3}$ =10 seconds
because 1 sec = 10^3 millisecond

(2) a=3 cm = 0.03 m

$V=a^3= (0.03)^3=0.000027\ m^3=2.7 \times 10^{-5}\ m^3$

(3) $v=bt^3$ ======> $b = v/t^3$ ======> $[b] = [v]/[t^3]= (L/T)/ T^3 = L/ T^4 = m/ s^4$

(4) $a=dv/dt = d/dt\ (dx/dt)$

(5) Since the particle moves with constant velocity, its acceleration is zero

(6) $v=t^2 +3$ =========> v(t=0) = 0+3 = 3 m/s

(7) $a=dv/dt = 2t$ =====> a(t =4) = 2×4 = 8 m/s^2

(8) $x= 4t +2t^2$ =====> average velocity = Dx/Dt

$x(t=4) = 4\times4 +2\times4^2=48$ m, x(t=0) = 0

average velocity = Dx/Dt =(48-0)/(4-0) =12 m/s

(9) average acceleration=Dv/Dt = (0-20)/(8-3) = -4 m/s^2

(10) $x=v_0t +0.5\ at^2 = 4\times4 +0.5\times2\times4^2=$ 32 m

(11) $x=v_0t +0.5at^2$ but the car is intially at rest, that means $v_0=0$

$x=0.5at^2$ =======> $a = 2x/t^2 = 2\times32/4^2=4\ m/s^2$

(12) x= 0.5 (v+v0)t ======> $v_0 = 2x/t -v = 2\times60/6 -15 =$ 5 m/s

(13) Since the object is moving under the influence of the gravity, its acceleration at ant instant is constant and equals to 9.8 m/s^2. Note that the acceleration is always downwords. However, its vector description is -9.8 m/s^2

(14) $y=v0t - 0.5\ gt^2 = 30\times1 - 0.5\times9.8\times1 =$ 25.1 m

(15) $H = v_0^2/2g = 30^2/19.6 =$ 45.9 m

(16) $y = v_0t - 0.5\ gt^2$ but the stone is freely dropped, then its initial speed is zero

$y = -0.5\ gt^2$ ======> $t = (2y/-g)^{0.5} = [(2\times(-75))/(-9.8)\ ]^{0.5} = 3.91$ s

(17) $v = v_0 - gt = 0 - 9.8 \times 3.91 =$ -38.3 m/s, but the speed is the magnitude of the velocity, therefore the right answer is 38.3 m/s

(18) The magnitude of the vector $A = [A_x^2 + A_y^2]^{0.5} = [10^2 + 15^2]^{0.5} = 18$ m

(19) $A_y = A\ \sin Q = 14\ \sin(30) = 7$ units

(20) $A_x = A\ \cos Q = 10\ \cos(60) = 5$ units, $B_x = -15$ units,

$(A+B)_x = A_x + B_x = 5 - 15 = -10$ units

(21) i.j = 0 because they are prependicular (angle between them is 90) and their scalr product is zero.

(22) A = 4i -6j =====> ½ A = 2i -3j

(23) A-B = (2-(-1))i + (-2-1)j + (4-4)k = 3i -3j

(24) The angle the vector A makes with +x-axis is calculated from

$A_x = A\ \cos Q$ =====> $Q = \cos^{-1}[A_x/A] = \cos^{-1}[10/18] = 56.25^o$

(25) The scalar product of any A and B vectors is given by

$A.B = |A||B|\ \cos Q = 10\times20\times\cos(60) = 100$

(26) $A.B = A_xB_x + A_yB_y + A_zB_z = 0\times(-1) + 5\times1 + 4\times0 = 5$ units

(27) j×i = -k

(28) i.(k×j) = i.(-i) = -1

(29) $A\times B = A \times B = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 8 & 6 & 0 \\ -6 & 0 & 0 \end{vmatrix} = 0\hat{i} + 0\hat{j} + (8\times 0 - 6\times(-6))\hat{k} = 36\hat{k}$

(30) $A\times B = |A||B|\ \sin Q = 5\times10\times\sin(30) = 25$ units

مع تمنياتي للجميع بالتوفيق