حل اختبار الدوري الأول

لمادة الفيزياء

مع تحيات فريق ٢٠٢٠

1

id	Question	A	B	C	D
1	The SI base units have the dimensions of:	mass, length, time	length, density, time	mass, weight, time	weight, length, time
2	A circle with radius of 1 cm has an area of: (in SI units)	π	2π	$\pi\times10^{-4}$	$2\pi\times10^{-2}$
3	1 inch is equivalent to 2.54 cm so 14 inches are:	24.48 cm	35.56 cm	5.51 cm	28 cm
4	Given a $v = c_1t^2 - c_2t^3$ where t is time in seconds and v is the velocity in m/s, the units of c_1 and c_2 respectively are:	$m/s^2; m/s^3$	m/s; m/s	$m/s^3; m/s^4$	$m/s; m/s^2$
5	A nanosecond is:	10^{-9} s	10^{6} s	10^{-6} s	10^{-12} s
6	$(5.0\times10^{4})\times(3.0\times10^{-6})$ =	1.5×10^{-3}	15×10^{-1}	15×10^{-3}	1.5×10^{-1}
7	Given a vector $\mathbf{A} = 1.50\hat{i} + 4.50\hat{j} - 2\hat{k}$ the magnitude $\lvert\mathbf{A}\rvert$ is:	26.5	5.15	4.3	18.5
8	A two-dimensional vector $\mathbf{r} = 25\hat{i} + 16\hat{j}$, what is its angle with the positive x-axis?	57.38°	120.53°	32.62°	0.75°
9	Given $\mathbf{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ and $\mathbf{B} = 4\hat{i} + 2\hat{j} + \hat{k}$, the vector sum $\mathbf{S} = \mathbf{A} + \mathbf{B}$ is:	$8\hat{i} + 4\hat{j} - 2\hat{k}$	$-2\hat{i} + 4\hat{j} - 4\hat{k}$	$6\hat{i} + 8\hat{j} - 2\hat{k}$	$-2\hat{i} + 6\hat{j} - 4\hat{k}$
10	Given $\mathbf{A} = \hat{i} + 3\hat{j} - \hat{k}$ and $\mathbf{B} = 2\hat{i} - 2\hat{j} + \hat{k}$, the vector difference $\mathbf{D} = \mathbf{A} - \mathbf{B}$ is:	$-\hat{i} + 5\hat{j}$	$-\hat{i} + 5\hat{j} - 2\hat{k}$	$-\hat{i} + \hat{j}$	$-\hat{i} + \hat{j} - 2\hat{k}$
11	Given $\mathbf{A} = \hat{i} - 2\hat{j} + \hat{k}$ and $\mathbf{B} = 3\hat{i} + \hat{j} + 4\hat{k}$, the angle between the two vectors is:	66.4°	70.92°	90°	61.29°
12	The value of $\hat{i}\cdot(\hat{k}\times\hat{j})$	0	+1	1	-1
13	Two vectors **A** and **B** have the same magnitude *L*, the angle between the two vectors is 30°, the magnitude $\lvert\mathbf{A}\times\mathbf{B}\rvert$ is:	$\sqrt{3}L^2/2$	L^2	$L^2/2$	$2L^2$
14	Given $\mathbf{A} = 2\hat{i} - \hat{j} + \hat{k}$ and $\mathbf{B} = \hat{i} + 2\hat{j} + 4\hat{k}$, then $2\mathbf{A} - \mathbf{B}$ is:	$\hat{i} - 3\hat{j} - 3\hat{k}$	$-2\hat{i} + 4\hat{j} - 4\hat{k}$	$3\hat{i} - 4\hat{j} - 2\hat{k}$	$2\hat{i} - 6\hat{j} - 6\hat{k}$
15	A two-dimensional vector has an x-component equals half the magnitude of the vector ($A_x = A/2$, where *A* is the magnitude of the vector), what is the angle of the vector with the positive x-axis?	90°	60°	30°	26.57°
16	A vector with magnitude 12 lies in the first quadrant making an angle with the positive x-axis $\theta = 30°$, what is the *y*-component of the vector?	-11.86	1.85	$6\sqrt{3}$	6
	Given two vectors $\mathbf{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\mathbf{B} = \hat{i} - 3\hat{k}$.				
	Group Questions From 17 to 18				
17	The dot product $\mathbf{A}\cdot\mathbf{B}$ is:	-7	14	5	-4
18	The cross product $\mathbf{A}\times\mathbf{B}$ is:	$-9\hat{i} + 5\hat{j} - 3\hat{k}$	$-9\hat{i} - 5\hat{j} + 3\hat{k}$	$-9\hat{i} - 5\hat{j} - 3\hat{k}$	$9\hat{i} + 5\hat{j} - 3\hat{k}$

$$v = v_o + a\,t$$

$$\Delta x = v_o\,t + \frac{1}{2}a\,t^2$$

$$v^2 = v_o^2 + 2\,\Delta x\,a$$

id	Question	A	B	C	D
19	Given the position of a particle as a function of times as $x = 7t^2-3t$, where x is in meters and t in seconds, what is the velocity of the particle at t = 2 s?	22 m/s	28 m/s	0 m/s	25 m/s
20	A rocket ascending vertically upwards at speed 90 m/s, one of its fuel tanks detaches from the rocket and falls, ignoring air resistance, what is the speed of the fuel tank after 40 s?	302 m/s	482 m/s	205.8 m/s	Zero
21	A vehicle moving 22 m/s east has a constant acceleration of 2 m/s² west, after 6 s its velocity will be:	10 m/s west	34 m/s east	10 m/s east	34 m/s west
22	The coordinates of a particle as a function of time are given by $x = 18t - t^2$, where x is in meters and t is in seconds, at what time t is the particle at rest?	18 s	9 s	Zero	14 s
23	The velocity of a particle as a function of time is given by $v = 98 - 2t^2$, what is the particles acceleration when it is at rest?	Zero	-7 m/s²	7 m/s²	-28 m/s²
24	How far does a car travel in 6 s, given that its initial velocity is 2 m/s and its acceleration is 2 m/s² in the same direction as the velocity?	48 m	61 m	14 m	10 m
25	A ball is thrown upward from the ground level with speed 50 m/s, its distance above the ground level after 6 s is:	241.8	476.4 m	123.6 m	294.3
26	Two rockets are directed to collide with each other, initially they are 200 km apart, the first rocket moves with constant velocity 50 km/h while the second rocket moves at constant velocity 70 km/h, how long does it take before the two rockets collide?	1h 40m	2h	2h 6m	1h 6m
27	A car with initial velocity 10 m/s, after 60 m its new velocity is found to be 50 m/s, what is its acceleration?	21.6 m/s²	20 m/s²	43.3 m/s²	40 m/s²
28	A disk rolling down an incline, its velocity at t = 2 is v = 15 m/s, it is found at rest when t = 7, what is the average acceleration between the second and seventh second?	-2.14 m/s²	-2.49 m/s²	2.14 m/s²	-3 m/s²
29	The coordinates of a particle as a function of time is $x = t^2+3t$, where x is in meters and t in seconds, what is the average velocity of the particle in the interval t=0 s to t=3 s?	6 m/s	18 m/s	2 m/s	3 m/s
30	A toy car moves in a straight line with an initial speed of 10 m/s, the magnitude of the acceleration is 1.8 m/s² opposite to the velocity, the toy car stops at:	t = 6.45 s	t = 1.4 s	t = 5.56 s	t = 13.35 s

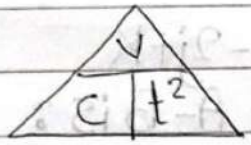
2

(1) The SI base units have the dimensions of
* mass, length, time (A)

(2) A circle with radius of 1cm has an area of in SI units
$r = 1cm \xrightarrow{\times 10^{-2}} m$
* area of a circle $= \pi r^2 \rightarrow \pi \times (10^{-2})^2 = \pi \times 10^{-4}$ (C)

(3) 1 inch is equivalent to 2.54 cm so 14 inches are:
* 1 inch = 2.54cm
14 inch = ??
$\frac{14 \times 2.54}{1}$ (B)
$= 35.56 cm$

(4) Given a $V = C_1 t^2 - C_2 t^3$ where t is time in second and v is the velocity in m/s, the units of C_1 and C_2 are:
*
$V = C_1 t^2$



$v = m/s$ $t = s$

$C = \frac{V}{t^2} = \frac{1}{1} = \frac{m}{s \cdot s^2} = \frac{m}{s^3}$

$v = C_2 t^3$

$C_2 = \frac{V}{t^3} = \frac{m}{s \cdot s^3} = \frac{m}{s^4}$ (C)

(5) A nanosecond is: * $10^9 s$ (A)

(6) $(5.0 \times 10^4) \times (3.0 \times 10^{-6}) = 0.15$
* $= 1.5 \times 10^{-1}$ (D)

(7) Given a vector $A = 1.50i + 4.50j - 2K$ the magnitude $|A|$ is:

$$|A| = \sqrt{(1.50)^2 + (4.50)^2 + (-2)^2} = 5.14$$ (B)

(8) A two dimensional vector $r = 25i + 16j$ what is its angle with the positive x-axis?

$$\tan^{-1}\left(\frac{y}{x}\right) = \tan^{-1}\left(\frac{16}{25}\right) = 32.62^\circ$$ (C)

(9) Given $A = 2i + 6j - 3K$ and $B = 4i + 2j + K$ the vector sum $S = A + B$ is:

$A = 2i + 6j - 3K$
$+ B = 4i + 2j + K$
$6i + 8j - 2K$ (C)

(10) Given $A = i + 3j - K$ and $B = 2i - 2j + K$ the vector difference $D = A - B$ is:

$A = i + 3j - K$
$- B = 2i - 2j + K$
$-i + 5j - 2K$ (B)

(11) Given $A = i - 2j + K$ and $B = 3i + j + 4K$, the angle between the two vectors is:

$$\cos^{-1}\left(\frac{A \cdot B}{|A||B|}\right) = \cos^{-1}\left(\frac{5}{\sqrt{6} \times \sqrt{26}}\right) = 66.4^\circ$$ (A)

$A \cdot B = 3 - 2 + 4 = 5$

$|A| = \sqrt{1^2 + (2)^2 + 1^2} = \sqrt{6}$

$|B| = \sqrt{3^2 + 1^2 + 4^2} = \sqrt{26}$

(12) The value of $i.(K \times j)$

i, K, j (3)

$i.i = 1$

$i \times -i = -1$ (D)

(13) Two vectors A and B have the same magnitude 1, the angle between the two vectors is 30°, the magnitude $|A \times B|$ is:

$|A \times B| = |A||B| \sin 30°$

$1 \times 1 = 1^2 \times \frac{1}{2} = \frac{1^2}{2}$ (C)

(14) Given $A = 2i - j + K$ and $B = i + 2j + 4K$ the $2A - B$ is:

$2A \quad 2i - j + K$

$\quad \downarrow \quad 4i - 2j + 2K$

$B \quad - \; i + 2j + 4K$

$\quad 3i - 4j - 2K$ (C)

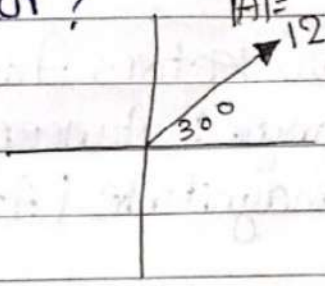
(15) A two dimensional vector has an x-component equals half the magnitude of the vector ($A_x = \frac{A}{2}$) where A is the magnitude of the vector), what is the angle of the vector with the positive x-axis?

$A = 4$, $A_x = 2$

$A_x = A \cos\theta$

$2 = 4 \cos\theta \qquad \theta = \cos^{-1}\left(\frac{2}{4}\right) = 60°$ (B)

(16) A vector with magnitude 12 lies in the first quadrant making an angle with the positive x-axis $\theta = 30°$, what is the y-component of the vector?



$A_y = |A| \sin\theta$

$12 \sin 30 = \underline{6}$ (D)

(17) Given two vectors

$A = 2i + 3j - K$ and $B = i - 3K$

(17) The dot product $A \cdot B$ is

$A = 2i + 3j - K$

$B = i + 0j - 3K$

$2 + 0 + 3 = \underline{5}$ (C)

(18) The cross product $A \times B$ is

$$\begin{vmatrix} i & -j & K \\ 2 & 3 & -1 \\ 1 & 0 & -3 \end{vmatrix}$$

$i((3\times-3)-(-1\times0)) - j((2\times-3)-(-1\times1)) + K((2\times0)-(3\times1))$

$-9i-(-5)j-3K$

$-9i+5j-3K$ (A)

(19) Given the position of a particle as a function of times as $x = 7t^2 - 3t$ where x is in meters and t in seconds, what is the velocity of the particle at t = 2s?

$x \xrightarrow{\text{نشتق}} v$

$7t^2 - 3t$

$14t - 3 \qquad t = 2$

$14(2) - 3 = 25$ m/s (D)

(20) A rocket ascending vertically upward at speed 90 m/s, one of its fuel tanks detaches from the rocket and falls, ignoring air resistance, what is the speed of the fuel tank after 40s?

(X) miss
T ✓
V ✓
V_0 ✓
a ✓

$V = V_0 + at$

$V = 90 + (-9.8)(40)$

$= -302$ (الاشارة لأنه هابط) (A)

$V_0 = 90$ m/s
$a = -9.8 m/s^2$
$t = 40$ sec

(21) A vehicle moving 22 m/s east has a constant acceleration of $2 m/s^2$ west, after 6s its velocity will be:

(X) miss
T ✓
V ✓
V_0 ✓
a ✓

$V = V_0 + at$

$22 + (-2)(6)$

$= 10$ m/s east (C)

لأنه بالموجب مع اتجاه الحركة.

$V_0 = 22$ m/s east
$a = -2 m/s^2$ west
$T = 6$ sec

(22) The coordinates of a particle as a function of time are given by $x = 18t - t^2$, where x is in meters and t is in seconds, at what time t is the particle at rest?

$x \xrightarrow{\text{נגזרת}} v$

at rest $\rightarrow v = 0$

$v = 18 - 2t$

$0 = 18 - 2t$

$18 = 2t$ $\quad t = 9$ (B)

(23) The velocity of a particle as a function of time is given by $v = 98 - 2t^2$ what is the particles acceleration when it is at rest?

at rest $\rightarrow v = 0$

$v = 98 - 2t^2$

$0 = 98 - 2t^2$

$98 = 2t^2$ $\quad \underline{t = 7}$

$v \xrightarrow{\text{נגזרת}} a$

$98 - 2t^2$

$-4t$ at $t = 7$ $\quad -4(7) = -28\ m/s^2$ (D)

(24) How far does a car travel in 6s, given that its initial velocity is 2m/s and its acceleration is $2\ m/s^2$ in the same direction as the velocity?

x ✓
t ✓
v — miss
v_0 ✓
a ✓

$x = v_0 t + \frac{1}{2} a t^2$

$2(6) + \frac{1}{2}(2)(6)^2$

$= 48m$

$t = 6\ sec$

$v_0 = 2\ m/s$

$a = 2\ m/s^2$

(A)

(25) A ball is thrown upward from the ground level with speed 50 m/s, its distance above the ground level after 6s is:

X ✓
T ✓
V — miss
V_0 ✓
a ✓

$X = V_0 t + \frac{1}{2} a t^2$

$50(6) + \frac{1}{2}(-9.8)(6)^2$

$= 123.6\ m$

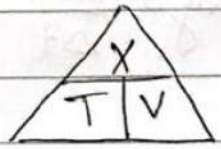
$T = 6\ sec$

$V_0 = 50\ m/s$

$a = -9.8\ m/s^2$

(C)

(26) Two rockets are directed to collide with each other, initially they are 200 Km apart, the first rocket moves with constant velocity 50 Km/h while the second rocket moves at constant velocity 70 Km/h. how long does it takes before the two rockets collide?



$T = \frac{X}{V}$

$V = 50 - (-70) = 120\ m/s$

$X = 200\ Km$

$T = \frac{200}{120} = 1.67\ h$

$0.67\ h \xrightarrow{\times 60} min$ 40m

1h 40m

(A)

(27) A car with initial velocity 10 m/s, after 60 m its new velocity is found to be 50 m/s, what is its acceleration?

X ✓
T — miss
V ✓
V_0 ✓
a ✓

$V^2 = V_0^2 + 2aX$

$50^2 = 10^2 + 2(a)(60)$

$a = 20\ m/s^2$

$X = 60m$

$V_0 = 10\ m/s$ $V = 50\ m/s$

(B)

(28) A disk rolling dowing an incline its velocity at $t=2$ is $v=15\ m/s$, it is found at rest when $t=7$, what is the average acceleration between the second and seventh second?

$$a_{avg} = \frac{\Delta V}{\Delta t} = \frac{V_2 - V_1}{t_2 - t_1} = \frac{0 - 15}{7 - 2} = -3\ m/s^2$$

at rest

(D)

(29) The coordinates of a particle as a function of time is $x = t^2 + 3t$. where x is in meters and t in seconds, what is the average velocity of the particle in the interval $t=0$ to $t=3$ sec?

$$V_{avg} = \frac{\Delta x}{\Delta t} = \frac{x_2 - x_1}{t_2 - t_1}$$

$$x_2 = (3)^2 + 3(3) = 18$$

$$x_1 = (0)^2 + 3(0) = 0$$

$$\frac{18 - 0}{3 - 0} = 6\ m/s$$

(A)

(30) A toy car moves in a straight line with an initial speed of 10 m/s, the magnitude of the acceleration is $1.8\ m/s^2$ opposite to the velocity, the toy car stops at:

x — miss
T ✓
V ✓
V_0 ✓
a ✓

$$V = V_0 + at$$

$$V_0 = 10\ m/s$$

$$0 = 10 + (-1.8)(t)$$

$$a = -1.8\ m/s^2$$

$$t = 5.56\ s$$

لما توقف $V = 0$ stop

(C)