امتحان الدوري الأول للفصل الأول سنة ١٤٣٤ هـ

King Abdulaziz University
Faculty of Sciences
Physics Department

First Exam - Phys 110

First Term
1433-1434 H

Date: 30 /11/ 1433H

A

Name: ID No: Section:

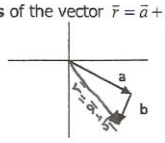
CHOOSE THE CORRECT ANSWER

1. Vectors $\overline{C}$ and $\overline{D}$ have magnitude of **5** units and **3.6** units, respectively (على التوالي).
What is the angle between $\overline{C}$ and $\overline{D}$ if $\overline{C}\times\overline{D}$ equals to **+6** units

a) -18⁰ **b)** 110⁰ **c)** 95⁰ **d)** +19⁰ $\theta = \sin^{-1}\left(\frac{C\times D}{C\,D}\right) = \sin^{-1}\frac{1}{3} = 19.5^{\circ}$

2. In the figure, **the signs of the x and y components** of the vector $\vec{r} = \vec{a} + \vec{b}$ are:

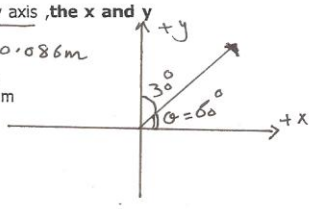
$r_x = +,\ r_y = -$



a) $r_x = +, r_y = -$ **b)** $r_x = -, r_y = +$ **c)** $r_x = -, r_y = -$ **d)** $r_x = +, r_y = +$

3. A vector $\vec{N}$ has a length **0.1 m** making an angle of **30⁰** with positive y axis ,**the x and y components are:** $N_x = N\cos\theta = 0.1\cos 60 = 0.05m$ $\}$ $N_y = N\sin\theta = 0.1\sin 60^{\circ} = 0.086m$

a) N_x= 0.05 m, N_y= 0.086 m **c)** N_x= 50 m, N_y= 86 m
b) N_x= 58 m, N_y= 86 m **d)** N_x= 0.5 m, N_y= 0.86 m



4. **The magnitude** of the unit vector

a) less than 1 **b)** equals 1 **c)** greater than 1 **d)** equals zero

5. Which of the following **is not** used as a unit of **time**,

a) hour (h) **b)** day (d) **c)** meter (m) **d)** seconds (s)

6. A circle with radius r of 5 cm has an area of (area = πr^2) square meter given by:

a) $2.5\times10^{-4}\,\pi$ (m^2)
b) $2.5\times10^{-2}\,\pi$ (m^2)
c) $2.5\times10^{-3}\,\pi$ (m^2)
d) $2.5\times10^{-5}\,\pi$ (m^2)

area $= \pi r^2 = \pi (5\times10^{-2})^2$
$= \pi (25\times10^{-4})$
$= 2.5\times10^{-3}\,\pi\ m^2$

7. **9.35×10^{-12} s =**

a) 9.35 μs b) 9.35 ns c) 9.35 ms d) 9.35 ps

$ps = 10^{-12}\ s$

8. The position of a particle moving along the x-axis is given by: **$x(t) = 8+5t+2t^3$** . Its **acceleration function** is:

$v(t) = 0 + 5 + 6t^2$
$a(t) = 0 + 0 + 12t$

a) $5 + 12t$ b) $6t^2$ c) $12t$ d) $5 + 6t^2$

9. A particle had a speed of 12 m/s in the positive **x** direction and after 2.4 s its speed was 28 m/s in the negative **x** direction. Its **average acceleration** during this time is:

v_i (+x) t v_f (−x)

a) $\bar{a}_{avg} = \dfrac{28-12}{2.4}$
b) $\bar{a}_{avg} = \dfrac{12-28}{2.4}$
c) $\bar{a}_{avg} = \dfrac{-28-12}{2.4}$
d) $\bar{a}_{avg} = \dfrac{12+28}{2.4}$

$a_{avg} = \dfrac{-28-12}{2.4}$

10. The **base quantities** are:

a) (Speed, Mass, Time)
b) (Length, Mass, Time)
c) (Length, Speed, Time)
d) (Length, Mass, Speed)

Use the following to answer questions 11-12:

A car travelled **60 km** in **1.33 h** along a straight line, then returned back for **40 km** in **0.67 h**.

11. Its **average speed** is:

a) 120 km/h b) 50 km/h c) zero d) 30 km/h

$s_{avg} = \dfrac{60+40}{1.33+0.67} = \dfrac{100}{2} = 50\ km/h$

12. Its **average velocity** is:

a) 30 km/h b) 120 km/h c) zero d) 10 km/h

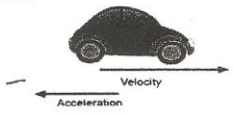
$v_{avg} = \dfrac{x_2-x_1}{t_2-t_1} = \dfrac{(-40+60)-0}{(0.67+1.33)-0}$
$= \dfrac{20}{2} = 10\ km/h$

13. If $\vec{a} = 14\hat{i} - 30\hat{j}$ and $\vec{b} = -66\hat{i} + 38\hat{j}$, then $\vec{b} - \vec{a} =$

a) $152\hat{i} - 38\hat{j}$ b) $-70\hat{i} + 63\hat{j}$ c) $52\hat{i} + 8\hat{j}$ d) $-80\hat{i} + 68\hat{j}$

$b - a = (-66-14)\hat{i} + (38+30)\hat{j}$
$= -80\hat{i} + 68\hat{j}$

14. From the figure, the Car's **speed**



a) decreases **b)** constant **c)** zero **d)** increases

15. The position of a particle on the x axis is given by **x(t)= 16 t –12 t³**, at **what time the velocity v = 0?**

$v(t) = 16 - 36t^2$

$0 = 16 - 36t^2 \Rightarrow t^2 = \frac{16}{36} \Rightarrow t = \sqrt{\frac{16}{36}} = \frac{4}{6} = 0.667$

a) 0.17 s **b)** 6.7 s **c)** 0.67 s **d)** 1.67 s

16. If $\bar{A} = 2\hat{i} - \hat{j} + 3\hat{k}$, then $-3\bar{A}$ equals

$-3A = -6\hat{i} + 3\hat{j} - 9\hat{k}$

a) $-6\hat{i} + 3\hat{j} - 9\hat{k}$ **c)** $-3\hat{i} - 3\hat{j} - 9\hat{k}$

b) $2\hat{i} - 3\hat{j} - 9\hat{k}$ **d)** $+6\hat{i} + \hat{j} - 12\hat{k}$

17. The position of a particle moving on an x axis is given by: **X(t) = 2 t ² + 4,** its **average velocity** in the time interval from **t=1s** to **t=2s** is:

$x(1) = 2(1)^2 + 4 = 6m$, $x(2) = 2(2)^2 + 4 = 12\ m$

$v_{avg} = \frac{12 - 6}{2 - 1} = 6\ m/s$

a) 12 m/s **b)** 9 m/s **c)** 3 m/s **d)** 6 m/s

18. The components of $\bar{a}$ are: a_x = 25 m, and a_y = 11m , **the magnitude of $\bar{a}$ is:**

$a = \sqrt{a_x^2 + a_y^2} = \sqrt{(25)^2 + (11)^2} = 27.3\ m$

a) 27.3 m **b)** 625 m **c)** 32.5 m **d)** 121 m

19. The **conversion factor** is:

a) Greater than one
b) A small number of physical quantities
c) A ratio (النسبة) of units that is equal to unity
d) A base quantity

20. A car travels with a velocity of 11 m/s ,if this car was going under acceleration of - 5 m/s² .
What is the distance traveled until it stops

$v^2 = v_0^2 + 2a(x - x_0)$

$0 = (11)^2 - 10(x - x_0)$

$x - x_0 = \frac{121}{10} = 12.1\ m$

a) 21.2 m **b)** 2.1 m **c)** 11.2 m **d)** 12.1 m

21. The difference between **speed and velocity** that **velocity includes**

a) distance **b)** time **c)** mass **d)** direction

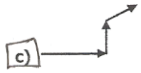
22. If vector $\vec{A} = A_x\hat{i} + 2\hat{j} - 3\hat{k}$ is perpendicular to vector $\vec{B} = 3\hat{i} - 6\hat{j} + 4\hat{k}$, the value of A_x will be: $\vec{A} \perp \vec{B} = 0$, $\vec{A} \cdot \vec{B} = 0$ $3A_x + (2)(6) + (-3)(4) = 0 \Rightarrow 3A_x = 24 \Rightarrow A_x = \frac{24}{3} = 8$

a) -5 **b)** $6\hat{j}$ **c)** 4 **d)** 8

23. The position of a particle is given by: **x(t)= 6 +5t+ 8 t²** ,the **instantaneous acceleration** at **t= 1** s is: $v(t) = 0 + 5 + 16t \Rightarrow a(t) = 16\ m/s^2$

a) 37 m/s² **b)** 16 m/s² **c)** 8 m/s² **d)** 31 m/s²

24. A car is driven east for a distance of 50 km , then north for 30 km , and then in a direction 30⁰ east of north for 25 km . **The vector diagram that represents geometrically the motion is**

a)  **b)**  **c)**  **d)** 

Use the following to answer questions 25-26:

The position of a body moving along the x axis is given by **x = 5 t − 2 t² + t³** .

25. The **position** at **t = 2 s** is: $x(2) = 5(2) - 2(2)^2 + (2)^3 = 10 - 8 + 8 = 10m$

a) 36 m **b)** 18 m **c)** 8 m **d)** 10 m

26. The **displacement** of the object in the time interval **t = 0** to **t = 5 s** is: $x(0) = 0$ $x(5) = (5)(5) - 2(5)^2 + (5)^3 = 25 - 50 + 125 = 100$ $\Delta x = 100$

a) $\Delta x = 100m$ **b)** $\Delta x = 50m$ **c)** $\Delta x = 125m$ **d)** $\Delta x = 25m$

27. **(0.000 000 000 535)** is equal to: 5.35×10^{-10}

a) 5.35 x 10^{+10} **b)** 5.35 x 10^{+7} **c)** 5.35 x 10^{-10} **d)** 5.35 x 10^{-8}

28. In which situation of the following the displacement with **the largest magnitude**?

Situation	X_1(m)	X_2(m)
L	-4	10
M	-2	-12
N	-10	-9
P	12	-5

$\Delta x = x_2 - x_1$

$= 10 - (-4) = 14 \Rightarrow 14$

$= -12 - (-2) = -10 \Rightarrow 10$

$= -9 - (-10) = +1 \Rightarrow 1$

$= -5 - 12 = -17 \Rightarrow 17$

a) N **b)** L **c)** P **d)** M

Use the following to answer questions 29-30:

An object dropped from a building **80m high,** $v_0 = 0, y_0 = 0 \Rightarrow y = 80m$

29. The velocity of the object before reaching the ground is $v^2 = v_0^2 - 2g(y - y_0) = -2(9.8)(-80) = +1568 \ m/s$

a) +78.4 m/s **b)** +39.6 m/s **c)** -19.6 m/s **d)** -39.6 m/s

$v = \pm 39.6$

-39.6 نأخذ $-y$ لأنها باتجاه

30. Its **speed** after 3s is: $v = v_0 - gt = (-9.8)(3)$

Speed بدون إشارة $= -29.4 \ m/s$

a) 39.8 m/s **b)** 19.6 m/s **c)** 29.4 m/s **d)** 9.8 m/s

31. The direction of vector $\vec{A} = (-25m)\hat{i} + (55m)\hat{j}$ is:

$\theta = \tan^{-1}\left(\frac{55}{-25}\right) = -65.55 \approx -66^0$

a) -113^0 **b)** 29^0 **c)** 151^0 **d)** -66^0

32. When an object is thrown vertically upward ↑, **During the descent (هبوط) from the highest point** :

a) its velocity and acceleration are both downward ↓
b) its velocity and acceleration are both upward ↑
c) its velocity is downward ↓ and its acceleration is upward ↑
d) its velocity is upward ↑ and its acceleration is downward ↓

33. A car, initially at rest ($v_0 = 0$), travels 20 m (x) in 4 s (t) along a straight line with constant acceleration. **The acceleration of the car is:**

$x - x_0 = v_0 + \frac{1}{2} a t^2$

$20 = \frac{1}{2}(a)(4)^2$

$a = \frac{(20)(2)}{16} = 2.5 \ m/s^2$

a) 1.3 m/s² **b)** 2.5 m/s² **c)** 4.9 m/s² **d)** 0.4 m/s²

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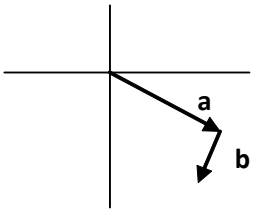
a) -18^0 **b)** 110^0 **c)** 95^0 **d)** -19^0

2. In the figure, **the signs of the x and y components** of the vector $\vec{r}=\vec{a}+\vec{b}$ are:



a) $r_x=+, r_y=-$ **b)** $r_x=-, r_y=+$ **c)** $r_x=-, r_y=-$ **d)** $r_x=+, r_y=+$

3. A vector $\vec{N}$ has a length **0.1 m** making an angle of **30^0** with positive y axis **,the x and y components are:**

a) N_x= 0.05 m, N_y= 0.086 m
b) N_x= 58 m, N_y= 86 m
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7. **9.35×10^{-12} s =**

a) 9.35 μs **b)** 9.35 ns **c)** 9.35 ms **d)** 9.35 ps

8. The position of a particle moving along the x-axis is given by: **$x(t) = 8+5t+2\ t^3$** . Its **acceleration function** is:

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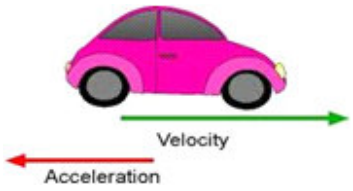

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a) $-6\hat{i} + 3\hat{j} - 9\hat{k}$ **c)** $-3\hat{i} - 3\hat{j} - 9\hat{k}$

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23. The position of a particle is given by: **$x(t) = 6 + 5t + 8t^2$** ,the **instantaneous acceleration** at **t= 1** s is:

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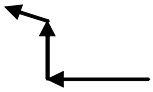
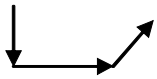
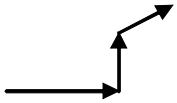
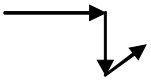
a)  **b)**  **c)**  **d)** 

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25. The **position** at **t = 2 s** is:

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26. The **displacement** of the object in the time interval **t = 0** to **t = 5 s** is:

a) $\Delta x = 100m$ **b)** $\Delta x = 50m$ **c)** $\Delta x = 125m$ **d)** $\Delta x = 25m$

27. (0.000 000 000 535) is equal to:

a) 5.35 x 10^{+10} **b)** 5.35 x 10^{+7} **c)** 5.35 x 10^{-10} **d)** 5.35 x 10^{-8}

28. In which situation of the following the displacement with **the largest magnitude**?

Situation	X_1(m)	X_2(m)
L	-4	10
M	-2	-12
N	-10	-9
P	12	-5

a) N **b)** L **c)** P **d)** M

Use the following to answer questions 29-30:

An object dropped from a building **80m high,**

29. The velocity of the object before reaching the ground is

a) +78.4 m/s **b)** +39.6 m/s **c)** -19.6 m/s **d)** -39.6 m/s

30. Its **speed** after 3s is:

a) 39.8 m/s **b)** 19.6 m/s **c)** 29.4 m/s **d)** 9.8 m/s

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32. When an object is thrown vertically upward ↑, **During the descent (هبوط) from the highest point** :

a) its velocity and acceleration are both downward ↓
b) its velocity and acceleration are both upward ↑
c) its velocity is downward ↓ and its acceleration is upward ↑
d) its velocity is upward ↑ and its acceleration is downward ↓

33. A car, initially at rest, travels 20 m in 4 s along a straight line with constant acceleration. **The acceleration of the car is:**

a) 1.3 m/s^2 **b)** 2.5 m/s^2 **c)** 4.9 m/s^2 **d)** 0.4 m/s^2

Answer Key

1. d
2. a
3. a
4. b
5. c
6. c
7. d
8. c
9. c
10. b
11. b
12. d
13. d
14. a
15. c
16. a
17. d
18. a
19. c
20. d
21. d
22. d
23. b
24. c
25. d
26. a
27. c
28. c
29. d
30. c
31. d
32. a
33. b

CHOOSE THE CORRECT ANSWER:

1. Change in position is called:
   a) displacement b) equations c) acceleration d) speed

2. A nanosecond is:
   a) 10^{9} s b) 10^{-9} s c) 10^{-10} s d) 10^{10} s

3. A gram is:
   a) 10^{-6} kg b) 10^{3} kg c) 1 kg d) 10^{-3} kg

4. km / h^2 is a unit of;
   a) velocity b) speed c) acceleration d) distance

5. A square with an edge of exactly 1 cm has an area of:
   a) 10^{-6} m^2 b) 10^{-4} m^2 c) 10^{2} m^2 d) 10^{4} m^2

6. A car starting from rest has a constant acceleration of 4 m/s^2. How fast is it traveling after 5 seconds?
   a) 100 m/s b) 50 m/s c) 20 m/s d) 10 m/s

7. The average speed of a moving object during a given interval of time is always:
   a) The magnitude of its average velocity over the interval
   b) the distance covered during the time interval divided by the time interval
   c) one-half its speed at the end of the interval
   d) its acceleration multiplied by the time interval

8. An object moves with a constant velocity of 9.8 m/s, its acceleration in m/s^2 is;
   a) 9.8 b) 98 c) 0 d) -9.8

9. In which of the following statements the acceleration is constant?
   a) $v = -4t + 3t^2$
   b) $v = 2t + 3$
   c) $v = 6 + 2t - 4t^3$
   d) $v = 5t^4$

10. A particle moves along the x axis from x_1 to x_2. Of the following values of the x_1 and x_2, which results in the displacement with the **largest magnitude**?

	x_1	x_2
a)	4m	6m
b)	-4m	-8m
c)	-4m	2m
d)	-4m	4m

11. The position of an object is given as a function of time by $x = 4t - 3t^2$, where x is in m and t is in seconds. Its average velocity over the interval from t = 0 to t = 2s is:
a) 0 b) −2m/s c) 2m/s d) −4m/s

12. How long will it take for a falling object to reach velocity of – 108 m/s if its initial velocity is –10 m/s
a) 98 s b) 118 s c) 0.093 s d) 10 s

13. Each of four particles move along an x axis. Their coordinates (in meters) as functions of time (in seconds) are given by;
particle 1: $x(t) = 3.5 - 2.7t^3$
particle 2: $x(t) = 3.5 + 2.7t^3$
particle 3: $x(t) = 3.5 + 2.7t^2$
particle 4: $x(t) = 3.5 - 3.4t - 2.7t^2$
Which of these particles have constant acceleration?
a) All four b) Only 1 and 2 c) Only 2 and 3 d) Only 3 and 4

14. A car, initially at rest, travels 20 m in 4 s along a straight line with constant acceleration. The acceleration of the car is:
a) $0.4 m/s^2$ b) $1.3 m/s^2$ c) $2.5 m/s^2$ d) $4.9 m/s^2$

15. You are throwing a ball straight up in the air. At the highest point, the ball's
a) Velocity and acceleration are zero.
b) Velocity is nonzero but its acceleration is zero
c) Acceleration is nonzero, but its velocity is zero
d) Velocity and acceleration are both nonzero

16. The Associative law is given as;
a) $(\vec{a} + \vec{b}) + \vec{c} = \vec{a} + (\vec{b} + \vec{c})$
b) $(\vec{a} + \vec{b}) + \vec{c} = (\vec{a} + \vec{b}) + \vec{c}$
c) $\vec{a} + \vec{b} = \vec{b} + \vec{a}$
d) $(\vec{a} - \vec{b}) = \vec{a} - (\vec{b})$

17. If $\vec{A} = (6\text{m})\hat{\imath} - (8\text{ m})\hat{\jmath}$ then $\vec{A}$ has magnitude:
a) 10 m b) 20 m c) 30 m c) 40 m

18. The angle between $\vec{A} = (25\text{ m})\,\hat{\imath} + (45\text{ m})\,\hat{\jmath}$ and the positive x axis is:
a) 29^o b) 61^o c) 151^o d) 209^o

19. The scalar products of $\vec{P} = 2\hat{i} - 5\hat{j}$ and $\vec{Q} = -3\hat{i} + 4\hat{j}$ is
a) $P \cdot Q = -2$ b) $P \cdot Q = -26$ c) $P \cdot Q = 14$ d) $P \cdot Q = 20$

20. If a =10 units, b = 20 units and φ= 60^0 , $\vec{c} = \vec{a} \times \vec{b}$
a) c = 200 b) c = 173.2 c) c = zero d) c = 100.4

21. If $R \cdot S = 0$. Then;
a) R and S are perpendicular
b) R and S are in the same direction
c) R and S are in the opposite direction
d) The angle between R and S is 60^o

22. If the components of a_x =6m a_y=5m the direction of $\vec{a}$ is:
a) 56.4^0 b) 90^0 c) 180^0 d) 39.8^o

23. The position of a particle is given by $x = 2t^2 - t^3$, its velocity will be zero at time:
a) t=4/3 s b) 2/3 s c) 1/3 s d) 3/2 s

24. The vector $-\vec{A}$ is:
a) greater than $\vec{A}$ in magnitude
b) in the same direction as $\vec{A}$
c) less than $\vec{A}$ in magnitude
d) in the direction opposite to $\vec{A}$

25. Let $\vec{A} = (2\text{m})\,\hat{\imath} + (6\text{ m})\,\hat{\jmath} - (3\text{ m})\,\hat{k}$ and $\vec{B} = (4\text{m})\,\hat{\imath} + (2\text{ m})\,\hat{\jmath} + (1\text{m})\,\hat{k}$. The vector sum $\vec{S} = \vec{A} + \vec{B}$ is:
a) $(6\text{ m})\,\hat{\imath} + (8\text{ m})\,\hat{\jmath} - (2\text{ m})\,\hat{k}$
b) $(-2\text{m})\hat{\imath} + (4\text{ m})\,\hat{\jmath} - (4\text{ m})\,\hat{k}$
c) $(2\text{ m})\,\hat{\imath} - (4\text{ m})\,\hat{\jmath} + (4\text{ m})\,\hat{k}$
d) $(8\text{ m})\,\hat{\imath} + (12\text{ m})\,\hat{\jmath} - (3\text{ m})\,\hat{k}$

26. Let $\vec{A} = (2\text{m})\,\hat{\imath} + (6\text{ m})\,\hat{\jmath} - (3\text{ m})\,\hat{k}$ and $\vec{B} = (4\text{m})\,\hat{\imath} + (2\text{ m})\,\hat{\jmath} + (1\text{ m})\,\hat{k}$. Then $\vec{A} \cdot \vec{B}$ =
a) $(8\text{ m})\,\hat{\imath} + (12\text{ m})\,\hat{\jmath} - (3\text{ m})\hat{k}$
b) 23 m^2
c) $(12\text{ m})\,\hat{\imath} - (14\text{ m})\,\hat{\jmath} - (20\text{ m})\,\hat{k}$
d) 17 m^2

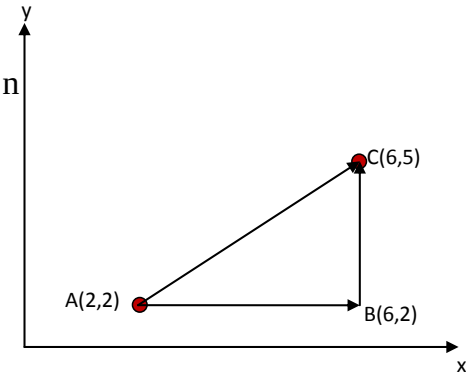
27. Quantity that is defined as the rate of change of displacement:

a) velocity b) acceleration c) distance d) speed

28. An object moving in the positive direction of the x-axis with a relation $x(t) = 6 + t + 3t^2$. The instantaneous velocity after 4 s is:
a) 25 m/s b) 20 m/s c) 15 m/s d) 10 m/s

29. Two birds are flying directly towards each other at the same speed. If the first bird is flying at a velocity *v*, the velocity of the second bird
a) *v* b) - *v* c) 2*v* d) $v/2$

30. If a person walking from point A to B to C as shown in the figure. The magnitude of the displacement is



a) 3m b) 4m c) 5m d) 6m

31. The value of $\hat{\imath} \cdot (\hat{\jmath} \times \hat{k})$ is:
a) zero b) +1 c) −1 d) 3

32. The vector product of $\vec{a}$ and vector $\vec{b}$ produces a third vector $\vec{c}$ whose direction is:
a) Perpendicular to the plane that contain $\vec{a}$ and $\vec{b}$.
b) Parallel to the two vectors $\vec{a}$ and $\vec{b}$.
c) In the opposite direction of $\vec{a}$.
d) In the opposite direction of $\vec{b}$.

33. If the initial velocity is 4 m/s and the final velocity is 10 m/s in 3 s. What is the average acceleration?
a) 6 m/s^2 b) 12 m/s^2 c) 3 m/s^2 d) 2 m/s^2

KING ABDULAZIZ UNIVERSITY
FACULTY OF SCIENCE
Physics department
1st Semester
First Exam

A

Physics 110 **27/11/1432H** **Time: 2Hours**

Name:	**Number:**	**Section:**

Choose the correct answer:

1. $(5\times10^4)\times(5\times10^6) =$ $25\times10^{10} = 2.5\times10^{11}$

A) 2.5×10^{10} **B)** 2.5×10^{11} **C)** 2.5×10^{6} **D)** 2.5×10^{8}

2. 3 days = $3\times24\times60\times60 = 259200$ s

A) 30240 s **B)** 1814400 s **C)** 259200 s **D)** 2419200 s

3. 7.87 g/cm³ = $7.87\frac{\times10^{-3}}{\times10^{-6}} = 7.87\times10^{3} = 7870$

A) 7870 kg/m³ **B)** 0.00787 kg/m³ **C)** 7.87×10^{6} kg/m³ **D)** 7.87×10^{-6} kg/m³

4. The conversion factor $\left(\frac{10^6\,\text{mm}}{1\,\text{km}}\right)$ is used to convert .....Km.....to *mm*

A) 1 m **B)** 1 mm **C)** 1 km **D)** 1 mi

5. 500 kg = $500\times10^{3} = 5\times10^{5}$ g

A) 5×10^{3} g **B)** 5×10^{4} g **C)** 5×10^{5} g **D)** 5×10^{6} g

6. 2.71 gigawatts =

A) 2.71×10^{9} Watts **B)** 2.71×10^{6} Watts **C)** 271×10^{9} Watts **D)** 271×10^{6} Watts

$X_{t=0} = 0$

$X_{t=4} = (3\times4) - (4\times16) + (16\times4) = 12$

$\Delta X = X_2 - X_1 = 12 - 0 = 12$ m

7. The position of a body moving along the $x-$axis is given by $x = 3t - 4t^2 + t^3$, where x in meters and t in seconds. Its **displacment** in the time interval $t = 0$ to $t = 4$ s is

A) $\Delta x = 140$ m **B)** $\Delta x = 12$ m **C)** $\Delta x = 52$ m **D)** $\Delta x = 40$ m

8. The **position** of an object is given by $x = t - 2t^2$, where x in meters and t in seconds. At $t = 10$ s, it is

$X = 10 - 2(10)^2 = -190$ m

A) -190 m **B)** -100 m **C)** -10 m **D)** -90 m

9. A car travelled 50 km in 0.75 h, then travelled 100 km in 1.2 h. The **average speed** is

$S_{avg} = \frac{X_1 + X_2}{t_1 + t_2} = \frac{50+100}{0.75+1.2} = \frac{150}{1.95} = 77$

Speed

A) 77 km/h **B)** 333 km/h **C)** 111 km/h **D)** 26 km/h

10. A car changed position from $x = 25$ m to $x = 150$ m in the time interval from 3 s to 8 s, the **average velocity** of the car is

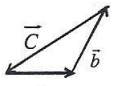
$V_{avg} = \frac{150-25}{8-3} = \frac{125}{5} = 25$ m/s

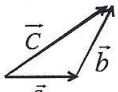
velocity

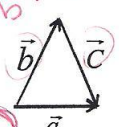
A) 25 m/s **B)** 11.4 m/s **C)** 35 m/s **D)** 16 m/s

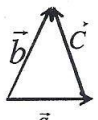
11. The vectors $\vec{a}$, $\vec{b}$ and $\vec{c}$ are related by $\vec{a} = \vec{b} + \vec{c}$. **Which diagram below illustrates this relationship?**

$\vec{b} + \vec{c} = \vec{a}$

A) 

B) 

C) 

D) 

12. A particle is moving along $x-$axis according to the equation $x = 12t - 2t^2$, where x in meters and t in seconds. Its **velocity** and **acceleration** at $t = 3$ s, respectively (على التوالي), are

$V = 12 - 4t$ m/s

$V = 12 - 4(3) = 0$

$a = -4$ m/s²

A) $v = 0$, $a = -4$ m/s² **C)** $v = 24$ m/s, $a = 8$ m/s²

B) $v = 18$ m/s, $a = 0$ **D)** $v = -24$ m/s, $a = 4$ m/s²

13. The position of a particale is given by $x(t) = 20t - 5t^3$, where x in meters and t in seconds, its velocity is zero at $t =$

$V = 20 - 15t^2$

$0 = 20 - 15t^2$

$15t^2 = 20$

$t^2 = \frac{20}{15}$, $t = \sqrt{\frac{20}{15}} = 1.2$ s

A) 1.2 s **B)** 0.87 s **C)** 1.4 s **D)** 0.7 s

$v^2 = v_0^2 + 2a(x - x_0)$
$v = 0$, $v_0 = 5 \times 10^6$
$a = -1.25 \times 10^{14}$ m/s²
$0 = (5 \times 10^6)^2 + 2(-1.25 \times 10^{14}) x$

14. A particle has a constant acceleration (-1.25×10^{14} m/s²) enters a region with a speed of 5×10^6 m/s. **How far does the particle take to stop**

$x - x_0 = \frac{-(5 \times 10^6)^2}{2(-1.25 \times 10^{14})} = 0.1$

A) 0.1 m **B)** -0.1 m **C)** 1 m **D)** -1 m

15. An electron has a constant acceleration +3.2 m/s² at a certain instant, its velocity is +9.6 m/s. What is **the velocity** at t =2.5s $v = v_0 + at$

$v = 9.6 + 3.2 \times 2.5$
$v = 17.6$ m/s

A) 17.6 m/s **B)** 8 m/s **C)** 27.2 m/s **D)** 0.8 m/s

$y = -100$

16. The **velocity** of a stone falling from a height of 100 m just before hitting the ground is

$v^2 = 2gy$
$= 2 \times 9.8 \times -100$
$v = -44.3$ m/s

A) -1960 m/s **B)** -980 m/s **C)** -31.3 m/s **D)** -44.3 m/s

سرعة الجسم أثناء سقوط

17. A ball dropped from a building, its **velocity and position** after 3 s are

A) v=-29 m/s, y = -44 m
B) v=-44 m/s, y = -29 m
C) v=0, y = 0
D) v=0, y = -44 m

S.P. 2-7 page 25

$v = -gt$
$y = -\frac{1}{2}gt^2$

18. A baseball is thrown vertically into the air. The **acceleration** of the ball at its highest point is

A) a =zero **B)** a >9.8 m/s² **C)** a =9.8 m/s² **D)** a =-9.8 m/s²

-9.8 تسارع السقوط الحر دائماً

19. If $\vec{R} \times \vec{S} = \vec{C}$, then the direction of $\vec{C}$ is

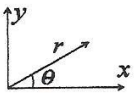
A) perpendicular to both $\vec{R}$ and $\vec{S}$
B) perpendicular to $\vec{R}$
C) perpendicular to $\vec{S}$
D) in the same direction of $\vec{R}$ and $\vec{S}$

20. The magnitudes of displacment $\vec{a}$ and $\vec{b}$ are 8 m and 15 m, respectively (على التوالي). **The maximum possible magnitude** for $\vec{c}$ according to the equation $\vec{c} = \vec{a} + \vec{b}$ is

$\vec{C} = 8 + 15 = 23$ m

A) 7 m **B)** 23 m **C)** 15 m **D)** 8m

21. A displacment vector $\vec{r}$ in xy plane is 15 m long and directed at angle $\theta = 30^0$ as in the figure, **the $x-$component** and **$y-$component** of the vector $\vec{r}$ is



$X = 15 \cos 30$
$Y = 15 \sin 30$

A) $r_x = 13$ m, $r_y = 7.5$ m
B) $r_x = 7.5$ m, $r_y = 13$ m
C) $r_x = 0.9$ m, $r_y = 0.5$ m
D) $r_x = 0.5$ m, $r_y = 0.9$ m

22. For the vectors $\vec{a} = 6\,\hat{i} + 5\,\hat{j}$ and $\vec{b} = -3\,\hat{i} - \hat{j}$. **The magnitude** of $|\vec{a} + \vec{b}|$ is

$\vec{a} + \vec{b} = (6-3)\hat{i} + (5-1)\hat{j}$
$= 3\hat{i} + 4\hat{j}$

$|a+b| = \sqrt{3^2 + 4^2}$
$= 5$ m

A) 7.8 m **B)** 5 m **C)** 2.2 m **D)** 10.8 m

23. The $x-$component of $\vec{A}$ is 81 m and the $y-$component of $\vec{A}$ is 200 m, then **the angle** θ between the direction of $\vec{A}$ and the positive direction of x is

$\theta = \tan^{-1}\frac{Y}{X} = \tan^{-1}\frac{200}{81}$

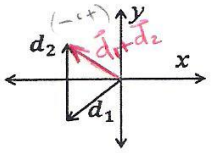
A) $\tan^{-1}(\frac{200}{81})$ **B)** $\tan^{-1}(\frac{-200}{81})$ **C)** $\tan^{-1}(\frac{81}{200})$ **D)** $\tan^{-1}(\frac{-81}{200})$

24. The **speed** of a particle moves with an instantaneous velocity $v = -25$ m/s is:

speed = 25 m/s
مقدار السرعة

A) $S = 5$ m/s **B)** $S = -25$ m/s **C)** $S = 25$ m/s **D)** $S = -5$ m/s

25. In the figure, what are **the signs of x and $y-$components** of the sum $\vec{d}_1 + \vec{d}_2$, respectively



A) (+, -) **B)** (+ , +) **C)** (- , +) **D)** (- , -)

26. If $\vec{a} = 3\,\hat{i} + 3\,\hat{j} - 2\,\hat{k}$ and $\vec{b} = -\,\hat{i} - 4\,\hat{j} + 2\,\hat{k}$, then $3\vec{a} \cdot \vec{b} =$

A) -57 **B)** -19 **C)** 12 **D)** -21

$3\vec{a}.\vec{b} = 3(3\hat{i} + 3\hat{j} - 2\hat{k}) \cdot (-\hat{i} - 4\hat{j} + 2\hat{k}) = 3[-3 - 12 - 4]$
$= 3[-19]$
$= -57$

27. Vectors $\vec{C}$ and $\vec{D}$ have magnitude of 5 units and 3.6 units, respectively (على التوالي). **What is the angle** between the direction of $\vec{C}$ and $\vec{D}$ if $\vec{C}\cdot\vec{D}$ equals to -6 units

$\vec{C}\cdot\vec{D} = CD\cos\theta$

$-6 = (5)(3.6)\cos\theta$

$\cos\theta = -\frac{6}{18} = -\frac{1}{3}$

$\theta = \cos^{-1}(-\frac{1}{3})$

A) 109.5° **B)** -19.4° **C)** -18.4° **D)** 95°

28. If $\vec{A}$ = 18 unit, $\vec{B}$ =12 unit and ϕ=90°. If $\vec{C} = \vec{A}\times\vec{B}$, then **the magnitude** of a vector $\vec{C}$ is

$C = \vec{A}\times\vec{B} = AB\sin\theta$

$= 18(12)\sin 90$

$= 216$

A) 216 **B)** 0 **C)** 187.1 **D)** 108

29. The value of $\hat{i}\cdot(\hat{k}\times\hat{i}) =$

$\hat{i}\cdot(\hat{k}\times\hat{i}) = \hat{i}\cdot\hat{j} = 0$

A) Zero **B)** 1 **C)** $\hat{i}\cdot\hat{i}$ **D)** $\hat{i}\cdot\hat{k}$

30. The **right-hand rule** (قاعدة اليد اليمنى) is used to find

A) The cross product of two vectors
B) The direction of third vector produced from cross product
C) The magnitude of third vector produced from cross product
D) The angle between the vectors in the cross product

31. A particle moves in the positive $x-$direction with increasing speed

A) its velocity is +ve and acceleration is -ve ✗
B) its velocity is -ve and acceleration is +ve ✗
C) its velocity and acceleration are both +ve ✓
D) its velocity is +ve and acceleration is zero ✗

32. In which situation of the following the velocity is in negative $x-$direction

$V=-4t$ $V=9t^2$ $V=+4t^{-3}$ $V=+5$

A) $x = -2\,t^2 - 2$ **B)** $x = 3\,t^3 - 5$ **C)** $x = -2\,t^{-2} + 1$ **D)** $x = -5 + 5\,t$

33. Let $\vec{C} = \vec{A}\times\vec{B}$ and ϕ is the angle between $\vec{A}$ and $\vec{B}$, which of the following is **true**?

A) The angle between $\vec{C}$ and $\vec{A}$ = 0°
B) The magnitude of $\vec{C} = AB\cos\phi$
C) $\vec{A}\times\vec{B} = -\vec{B}\times\vec{A}$
D) $-\vec{C} = \vec{A}$

King Abdulaziz University
Faculty of Sciences
Physics Department

First Exam - Phys 110

Second Term
1432-1433 H

Date: 13/ 4 / 1433H

A

Name: **ID No:** **Section:**

CHOOSE THE CORRECT ANSWER

1. Convert 5.86 x 10^6 **cm to km** $[5.86\times10^6\,cm]\left(\frac{1\,km}{10^5}\right)=5.86\times10=58.6\,km$

   a) 5.86 km b) 586 km c) 0.586 km **d)** 58.6 km

2. How many **seconds** are in **36 days** $(36\,days)(24h)(60min)(60s)=31.104\times10^5 s$

   a) 31.104 x 10^5 s
   b) 31.104 x 10^6 s
   c) 31.104 x 10^4 s
   d) 31.104 x 10^2 s

3. If $\vec{a}=a_x\hat{i}+a_y\hat{j}+a_z\hat{k}$, the quantities (a_x, a_y, a_z) are called:

   a) vector sum
   b) scalar components
   c) vector components
   d) unit vectors

4. Electric power of magnitude 2.17 x 10^9 watts equals:

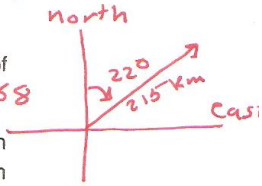
   a) 2.17 kilowatts
   b) 2.17 megawatts
   c) 2.17nanowatts
   d) 2.17 gigawatts

5. **The conversion factor** used to convert a volume of 64 cm^3 to SI units is

   $C.F=\frac{1\,m^3}{10^6\,cm^3}$

   a) $\frac{10^2 cm}{1m}$ b) $\frac{10^6 cm^3}{1m^3}$ c) $\frac{1m}{10^2 cm}$ **d)** $\frac{1m^3}{10^6 cm^3}$

6. A car moved a distance of 215 km ,in a direction making an angle of 22° east of north . **How far east and north has the car moved?** $\theta=90^\circ-22=68$



   a) 199 km east, and 81km north
   b) 91 km east, and 188 km north
   c) 81 km east, and 199 km north
   d) 188 km east, and 91 km north

$d_x(east)=215\cos(68^\circ)=80.54\approx81\,km$

$d_y(north)=215\sin(68^\circ)=199.3\approx199\,km$

Use the following to answer questions 7-8:

Two vectors, $\vec{C}$, *and* $\vec{D}$, have magnitudes $|\vec{C}| = 16m$, and $|\vec{D}| = 78m$

7. If the vectors are **anti-parallel** (متوازيان ومتعاكسان في الإتجاه), Their vector sum has a magnitude = $|sum| = 78 - 16 = 62\,m$

   a) 0 **b)** 62 m c) 80 m d) 94 m

8. If the **vectors are perpendicular**, their vector sum has a magnitude = $\sqrt{16^2 + 78^2} = 79.6 \approx 80\,m$

   a) 62 m b) 94 m c) 0 **d)** 80 m

9. If $\vec{A} = 3\hat{i} - 3\hat{j}$, $\vec{B} = \hat{i} - 2\hat{j}$, and $C = 5\hat{i} - 12\hat{j}$ **then** $\vec{A} - 2\vec{B} + C =$

   $= 13\hat{i} - 3\hat{j} - 2(\hat{i} - 2\hat{j}) + (5\hat{i} - 12\hat{j})$

   $= (3\hat{i} - 2\hat{i} + 5\hat{i}) + (-3\hat{j} + 4\hat{j} - 12\hat{j})$

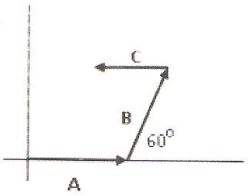
   $= 6\hat{i} - 11\hat{j}$

   a) $6\hat{i} - 11\hat{j}$ b) $8\hat{i} - 17\hat{j}$ c) $\hat{i} + \hat{j}$ d) $9\hat{i} + 17\hat{j}$

10. In the diagram, the magnitude of $|\vec{A}| = 12m$, the magnitude of $|\vec{B}| = 10m$ and the magnitude of $|\vec{C}| = 6m$. The **x component** of $\vec{A} + \vec{B} + \vec{C} =$

    $(A_x + B_x + C_x) = 12 + 10\cos 60^\circ - 6$

    $= 12 + 5 - 6 = 11\,m$



   a) 23 m **b)** 11 m c) 17 m d) 28 m

11. The density of silver is 10.49 g/cm³, **its density in kg/m³ equals:** $= \frac{10.49 \times 10^3\ kg}{m^3}$

    a) 10.49×10^{-3} kg/m³
    b) 10.49×10^{3} kg/m³
    c) 10.49×10^{-6} kg/m³
    d) 10.49×10^{6} kg/m³

12. If $\vec{a} = 4\hat{i} - 3\hat{j}$ and $\vec{b} = 6\hat{i} - 8\hat{j}$, then **the magnitude** of $\vec{b} - \vec{a} =$

    $= 2\hat{i} - 5\hat{j}$

    $|\vec{b} - \vec{a}| = \sqrt{2^2 + (-5)^2} = \sqrt{29} = 5.4$

    a) 12.5 b) 14.87 c) 18.9 **d)** 5.4

13. Here are three vectors in meters $\vec{d}_1 = 3\hat{i} - 3\hat{j}$, $\vec{d}_2 = \hat{i} - \hat{j}$,and $\vec{d}_3 = 2\hat{i} - 4\hat{j}$.
What is the result of $\vec{d}_1 \cdot (\vec{d}_2 + \vec{d}_3)$

$\vec{d}_2 + \vec{d}_3 = (\hat{i} - \hat{j}) + (2\hat{i} - 4\hat{j}) = 3\hat{i} - 5\hat{j}$

$\vec{d}_1 \cdot (\vec{d}_2 + \vec{d}_3) = (3\hat{i} - 3\hat{j}) \cdot (3\hat{i} - 5\hat{j}) = 9 + 15 = 24\,m$

a) 34 m **b)** 24 m **c)** 14 m **d)** 4 m

14. If $|\vec{A}|$ = 44 units, $|\vec{B}|$ = 16 units, and the angle ϕ=30°, **then the vector product** $\vec{C} = \vec{A} \times \vec{B}$ **is** $= (44)(16)\sin 30^\circ = 352$ units

a) $|\vec{C}| = 352$ units, perpendicular to $\vec{A}$ and $\vec{B}$

b) $|\vec{C}| = 532$ units, perpendicular to $\vec{A}$ and $\vec{B}$

c) $|\vec{C}| = 352$ units, parallel to $\vec{A}$ and $\vec{B}$

d) $|\vec{C}| = 532$ units, parallel to $\vec{A}$ and $\vec{B}$

15. If $\vec{a} = 2\hat{i} + 2\hat{j}$ and $\vec{b} = \hat{i} + 3\hat{k}$ **,then** $\vec{a} \times \vec{b} =$

$$\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & 2 & 0 \\ 1 & 0 & 3 \end{vmatrix} = (6-0)\hat{i} - (6-0)\hat{j} + (0-2)\hat{k} = 6\hat{i} - 6\hat{j} - 2\hat{k}$$

a) $6\hat{i} - 6\hat{j} - 2\hat{k}$ **b)** $2\hat{i} - \hat{j} - 6\hat{k}$ **c)** $2\hat{i} - 6\hat{j} - 2\hat{k}$ **d)** $6\hat{i} - 2\hat{j} - 6\hat{k}$

16. If $\vec{C} = 35\hat{i} + 21\hat{j} - 14\hat{k}$, **then** $\frac{2\vec{C}}{7} = \frac{2}{7}(35\hat{i} + 21\hat{j} - 14\hat{k}) = 10\hat{i} + 6\hat{j} - 4\hat{k}$

a) $6\hat{i} + 6\hat{j} - 10\hat{k}$ **b)** $5\hat{i} + 3\hat{j} - 2\hat{k}$ **c)** $10\hat{i} + 3\hat{j} - 4\hat{k}$ **d)** $10\hat{i} + 6\hat{j} - 4\hat{k}$

17. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j}$, $\vec{B} = -3\hat{i} + 2\hat{j}$. **Find** $\vec{A} \cdot 2\vec{B}$

$\vec{A} \cdot 2\vec{B} = (2\hat{i} + 3\hat{j}) \cdot 2(-3\hat{i} + 2\hat{j})$

$= (2\hat{i} + 3\hat{j}) \cdot (-6\hat{i} + 4\hat{j}) = -12 + 12 = 0$

a) 6 **b)** 12 **c)** zero **d)** 5

18. A particle enters a region with a speed of 4 x 10^6 m/s and then slowed at the rate of -1.5 x 10^{12} m/s^2 . **The distance the particle takes to stop** is

$v^2 = v_0^2 + 2a(x - x_0)$

$0 = (4 \times 10^6)^2 - 2(1.5 \times 10^{12})(x - x_0) \Rightarrow x - x_0 = 5.33\,m$

a) 0.15 m **b)** 2 m **c)** 0.2 m **d)** 5.33 m

19. An apple fell from a 19.6 m tree, **how long did it take to reach the ground level?** $v_0 = 0$

$y - y_0 = v_0 t - \frac{1}{2} g t^2$

$-19.6 = -\frac{1}{2} g t^2 \Rightarrow t = \sqrt{\frac{19.6 \times 2}{9.8}} = 2\,s$

a) 4.9 s **b)** 4 s **c)** 9.8 s **d)** 2 s

20. An object is thrown straight up from ground level and reached its highest point after 3.4 s . **Its initial velocity** is: $v_0 = ?$, $v = 0$

$v = v_0 - gt$

$0 = v_0 - (9.8)(3.4) \Rightarrow v_0 = 33.32\,m/s$

a) 35.3 m/s **b)** 30.32 m/s **c)** 33.32 m/s **d)** 43.31 m/s

21. A change from an initial position to a final position is called:

a) speed b) displacement c) acceleration d) velocity

22. A car can go from zero to 32 m/s in 16 s. **The average acceleration** of the car is:

a) 2 m/s² b) 3 m/s² c) 4 m/s² d) 7 m/s²

23. **The speed** of a particle moving with instantaneous velocity of - 15 m/s is:

a) 15 m/s b) 10 m/s c) 5 m/s d) 12 m/s

Use the following to answer questions 24-25:

A particle moves from y_1 = - 5 m to y_2 = - 2 m

24. **The magnitude** of the displacement is:

a) -3 m b) 3 m c) -7 m d) 7 m

25. **The direction** of the displacement is:

a) up b) down c) right d) left

26. A particle's position on x-axis is: $x(t) = \frac{2}{t^2} - \frac{4}{t} + 9$ with **x** in meters and **t** in seconds. **Its position at t = 3 s is**

a) 10.34 m b) 7.89 m c) 6.87 m d) 9.37 m

27. A man drives a truck from a gasoline station a long a straight road for 11.2 km in 0.23 h , then he returns back to the station in 45 min , his **average speed and average velocity , respectively**, are :

a) s_{avg} = 0 , v_{avg} = 22.86 km/h
b) s_{avg} = 22.86 km/h , v_{avg} = 0
c) s_{avg} = 0 , v_{avg} = 12.7 km/h
d) s_{avg} = 12.7 km/h , v_{avg} = 0

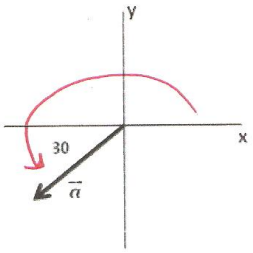
28. A particle's position on x-axis is: $x(t) = 13 - 24t + 2t^3$ with **x** in meters and **t** in seconds. **Its acceleration at t = 5 s is:**

a) 60 m/s² b) 12 m/s² c) 36 m/s² d) 52 m/s²

29. In the following sentences, **which one is wrong**?
" the free fall acceleration ....."

a) is the same for all objects.
b) has a magnitude of 9.8 m/s^s.
c) is the same during ascent and descent.
d) is equal to zero at the highest point.

30. From the figure, the angle that vector $\vec{a}$ makes with the +x axis (counterclockwise) is: $\theta = 180^0 + 30 = 210^0$



a) 30^0 b) 210^0 c) 150^0 d) 120^0

Use the following to answer questions 31-32:

Two vectors: $\vec{A} = 3\hat{i} + 2\hat{j}$ **and** $\vec{C} = 5\hat{i}$

31. The angle between vector $\vec{A}$ and the x axis is: $\theta = \tan^{-1}(\frac{2}{3}) = 33.7^0$

a) 21.8^0 b) 30.9^0 c) 56.3^0 d) 33.7^0

32. The angle between vector $\vec{A}$ and vector $\vec{C}$ is: $\varphi = \cos^{-1}\frac{\vec{A}\cdot\vec{C}}{AC}$

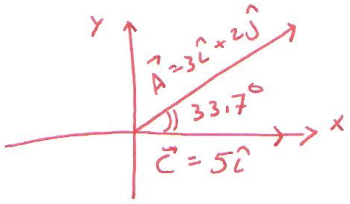
a) 33.7^0 b) 137^0 c) 130^0 d) 37.3^0

$\vec{A}\cdot\vec{C} = 15$

$AC = \sqrt{3^2+2^2}\sqrt{5^2}$

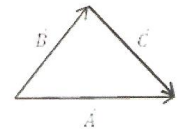
$= 18$

$\therefore \varphi = \cos^{-1}\frac{15}{18} = 33.7^0$

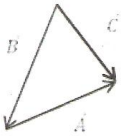


33. In which figure of the following $\vec{C}$ is the vector sum?

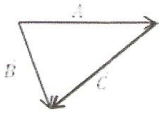
a)



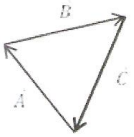
b)



c)



d)



King Abdulaziz University
Faculty of Sciences
Physics Department

First Exam - Phys 110

Second Term
1432-1433 H

Date: 13/ 4 / 1433H

A

Name: **ID No:** **Section:**

CHOOSE THE CORRECT ANSWER

1. Convert 5.86 x 10^6 **cm to km**

a) 5.86 km **b)** 586 km **c)** 0.586 km **d)** 58.6 km

2. How many **seconds** are in **36 days**

a) 31.104 x 10^5 s
b) 31.104 x 10^6 s
c) 31.104 x 10^4 s
d) 31.104 x 10^2 s

3. If $\vec{a} = a_x \hat{i} + a_y \hat{j} + a_z \hat{k}$, the quantities (a_x, a_y, a_z) are called:

a) vector sum
b) scalar components
c) vector components
d) unit vectors

4. Electric power of magnitude 2.17 x 10^9 watts equals:

a) 2.17 kilowatts
b) 2.17 megawatts
c) 2.17nanowatts
d) 2.17 gigawatts

5. **The conversion factor** used to convert a volume of 64 cm^3 to SI units is

a) $\frac{10^2 cm}{1m}$ **b)** $\frac{10^6 cm^3}{1m^3}$ **c)** $\frac{1m}{10^2 cm}$ **d)** $\frac{1m^3}{10^6 cm^3}$

6. A car moved a distance of 215 km ,in a direction making an angle of 22^0 east of north . **How far east and north has the car moved?**

a) 199 km east, and 81km north
b) 91 km east, and 188 km north
c) 81 km east, and 199 km north
d) 188 km east, and 91 km north

Use the following to answer questions 7-8:

Two vectors, $\vec{C}, and\ \vec{D}$ **, have magnitudes** $|\vec{C}| = 16m$ **,and** $|\vec{D}| = 78m$

7. If the vectors are **anti-parallel (** متوازيان ومتعاكسان في الإتجاه **)** , Their vector sum has a magnitude =

a) 0 **b)** 62 m **c)** 80 m **d)** 94 m

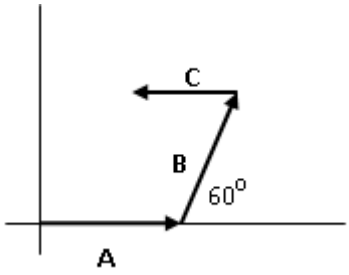
8. If the **vectors are perpendicular**, their vector sum has a magnitude =

a) 62 m **b)** 94 m **c)** 0 **d)** 80 m

9. If $\vec{A} = 3\hat{i} - 3\hat{j}$, $\vec{B} = \hat{i} - 2\hat{j}$,and $C = 5\hat{i} - 12\hat{j}$ **then** $\vec{A} - 2\vec{B} + C =$

a) $6\hat{i} - 11\hat{j}$ **b)** $8\hat{i} - 17\hat{j}$ **c)** $\hat{i} + \hat{j}$ **d)** $9\hat{i} + 17\hat{j}$

10. In the diagram, the magnitude of $|\vec{A}| = 12m$, the magnitude of $|\vec{B}| = 10m$ and the magnitude of $|\vec{C}| = 6m$. The **x component** of $\vec{A} + \vec{B} + \vec{C} =$



a) 23 m **b)** 11 m **c)** 17 m **d)** 28 m

11. The density of silver is 10.49 g/cm^3 , **its density in kg/m^3 equals:**

a) 10.49 x 10^{-3} kg/m^3
b) 10.49 x 10^{3} kg/m^3
c) 10.49 x 10^{-6} kg/m^3
d) 10.49 x 10^{6} kg/m^3

12. If $\vec{a} = 4\hat{i} - 3\hat{j}$ and $\vec{b} = 6\hat{i} - 8\hat{j}$,then **the magnitude** of $\vec{b} - \vec{a} =$

a) 12.5 **b)** 14.87 **c)** 18.9 **d)** 5.4

13. Here are three vectors in meters $\vec{d}_1 = 3\hat{i} - 3\hat{j}$, $\vec{d}_2 = \hat{i} - \hat{j}$,and $\vec{d}_3 = 2\hat{i} - 4\hat{j}$. **What is the result of** $\vec{d}_1 \cdot \left(\vec{d}_2 + \vec{d}_3\right)$

a) 34 m **b)** 24 m **c)** 14 m **d)** 4 m

14. If $\left|\vec{A}\right|$ = 44 units, $\left|\vec{B}\right|$ = 16 units, and the angle ϕ=30°, **then the vector product** $\vec{C} = \vec{A} \times \vec{B}$ **is**

a) $\left|\vec{C}\right| = 352$ units, perpendicular to $\vec{A}$ and $\vec{B}$

b) $\left|\vec{C}\right| = 532$ units, perpendicular to $\vec{A}$ and $\vec{B}$

c) $\left|\vec{C}\right| = 352$ units, parallel to $\vec{A}$ and $\vec{B}$

d) $\left|\vec{C}\right| = 532$ units, parallel to $\vec{A}$ and $\vec{B}$

15. If $\vec{a} = 2\hat{i} + 2\hat{j}$ and $\vec{b} = \hat{i} + 3\hat{k}$ **,then** $\vec{a} \times \vec{b} =$

a) $6\hat{i} - 6\hat{j} - 2\hat{k}$ **b)** $2\hat{i} - \hat{j} - 6\hat{k}$ **c)** $2\hat{i} - 6\hat{j} - 2\hat{k}$ **d)** $6\hat{i} - 2\hat{j} - 6\hat{k}$

16. If $\vec{C} = 35\hat{i} + 21\hat{j} - 14\hat{k}$, **then** $\frac{2\vec{C}}{7} =$

a) $6\hat{i} + 6\hat{j} - 10\hat{k}$ **b)** $5\hat{i} + 3\hat{j} - 2\hat{k}$ **c)** $10\hat{i} + 3\hat{j} - 4\hat{k}$ **d)** $10\hat{i} + 6\hat{j} - 4\hat{k}$

17. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j}$, $\vec{B} = -3\hat{i} + 2\hat{j}$. **Find** $\vec{A} \cdot 2\vec{B}$

a) 6 **b)** 12 **c)** zero **d)** 5

18. A particle enters a region with a speed of 4 x 10^6 m/s and then slowed at the rate of -1.5 x 10^{12} m/s^2 . **The distance the particle takes to stop** is

a) 0.15 m **b)** 2 m **c)** 0.2 m **d)** 5.33 m

19. An apple fell from a 19.6 m tree, **how long did it take to reach the ground level?**

a) 4.9 s **b)** 4 s **c)** 9.8 s **d)** 2 s

20. An object is thrown straight up from ground level and reached its highest point after 3.4 s . **Its initial velocity** is:

a) 35.3 m/s **b)** 30.32 m/s **c)** 33.32 m/s **d)** 43.31 m/s

21. A change from an initial position to a final position is called:

a) speed **b)** displacement **c)** acceleration **d)** velocity

22. A car can go from zero to 32 m/s in 16 s. **The average acceleration** of the car is:

a) 2 m/s^2 **b)** 3 m/s^2 **c)** 4 m/s^2 **d)** 7 m/s^2

23. **The speed** of a particle moving with instantaneous velocity of - 15 m/s is:

a) 15 m/s **b)** 10 m/s **c)** 5 m/s **d)** 12 m/s

Use the following to answer questions 24-25:

A particle moves from y_1 = - 5 m to y_2 = - 2 m

24. **The magnitude** of the displacement is:

a) -3 m **b)** 3 m **c)** -7 m **d)** 7 m

25. **The direction** of the displacement is:

a) up **b)** down **c)** right **d)** left

26. A particle's position on x-axis is: $x(t) = \frac{2}{t^2} - \frac{4}{t} + 9$ with **x** in meters and **t** in seconds. **Its position at t = 3 s is**

a) 10.34 m **b)** 7.89 m **c)** 6.87 m **d)** 9.37 m

27. A man drives a truck from a gasoline station a long a straight road for 11.2 km in 0.23 h , then he returns back to the station in 45 min , his **average speed and average velocity , respectively**, are :

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b) s_{avg} = 22.86 km/h , v_{avg} = 0
c) s_{avg} = 0 , v_{avg} = 12.7 km/h
d) s_{avg} = 12.7 km/h , v_{avg} = 0

28. A particle's position on x-axis is: $x(t) = 13 - 24t + 2t^3$ with **x** in meters and **t** in seconds. **Its acceleration at t = 5 s is**:

a) 60 m/s^2 **b)** 12 m/s^2 **c)** 36 m/s^2 **d)** 52 m/s^2

29. In the following sentences, **which one is <u>wrong</u>**?
" the free fall acceleration ....."

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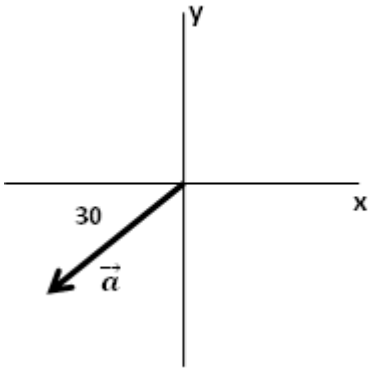
c) is the same during ascent and descent.
d) is equal to zero at the highest point.

30. From the figure, the angle that vector $\vec{a}$ makes with the +x axis (counterclockwise) is:



a) 30^0 **b)** 210^0 **c)** 150^0 **d)** 120^0

Use the following to answer questions 31-32:

Two vectors: $\vec{A} = 3\hat{i} + 2\hat{j}$ **and** $\vec{C} = 5\hat{i}$

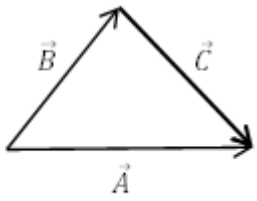
31. The angle between vector $\vec{A}$ and the x axis is:

a) 21.8^0 **b)** 30.9^0 **c)** 56.3^0 **d)** 33.7^0

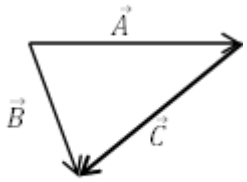
32. The angle between vector $\vec{A}$ and vector $\vec{C}$ is:

a) 33.7^0 **b)** 137^0 **c)** 130^0 **d)** 37.3^0

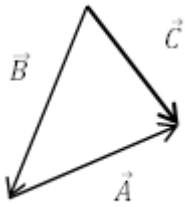
33. In which figure of the following $\vec{C}$ is the vector sum?



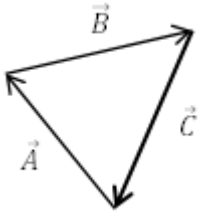
a)



c)



b)



d)

Answer Key

1. d
2. a
3. b
4. d
5. d
6. c
7. b
8. d
9. a
10. b
11. b
12. d
13. b
14. a
15. a
16. d
17. c
18. d
19. d
20. c
21. b
22. a
23. a
24. b
25. a
26. b
27. b
28. a
29. d
30. b
31. d
32. a
33. b

امتحان الدوري الأول لعام ١٤٣٤هـ - الترم الثاني

King Abdulaziz University
Faculty of Sciences
Physics Department

First Exam - PHYS 110

Second Term
1433-1434 H

Date : 7 / 5 / 1434 H

A

Name: _____ ID No: _____ Section: _____

CHOOSE THE CORRECT ANSWER:

1. The time rate of position is $V = \frac{x_2 - x_1}{t_2 - t_1}$
   A) acceleration B) distance C) speed (D) velocity

2. The SI units of base quantities (Length , Mass , Time) are
   A) Km , Kg , s B) cm , g , s C) cm , Kg , s (D) m , Kg , s

3. (0.000 000 0782) is equal to:
   A) 7.82×10^{-6} (B) 7.82×10^{-8} C) 7.82×10^{-9} D) 7.82×10^{-7}

Use the following to answer questions 4-6:

If $\vec{a} = 4\hat{i} - 3\hat{j}$ and $\vec{b} = 6\hat{i} + 8\hat{j}$

4. $\vec{b} - \vec{a}$ is equal $(6-4)\hat{i} + (8-(-3))\hat{j} = 2\hat{i} + 11\hat{j}$
   A) $\hat{i} + 3\hat{j}$ B) $-2\hat{i} - 5\hat{j}$ C) $4\hat{i} - 3\hat{j}$ (D) $2\hat{i} + 11\hat{j}$

5. The direction of $\vec{b}$ $\theta = \tan^{-1}\left(\frac{b_y}{b_x}\right) = \tan^{-1}\left(\frac{8}{6}\right) = 53.1^\circ$
   A) 58° (B) 53° C) 43° D) 60°

6. The magnitude of $\vec{a}$ $|a| = \sqrt{a_x^2 + a_y^2} = \sqrt{(4)^2 + (-3)^2} = 5$
   (A) 5 B) 6 C) 7 D) 4

Use the following to answer questions 7-8:

The position of a body moving along the x axis is given by: $x = 3t - 4t^2 + t^3$.

7. The average velocity for the time interval from t=0 to t=5 s is:
   A) v_{avg} =48 m/s B) v_{avg} =20 m/s (C) v_{avg} =8 m/s D) v_{avg}= 40 m/s

$t_1=0 \rightarrow x_1=0,\ t_2=5s \rightarrow x_2=40,\ V_{avg}=\frac{x_2-x_1}{t_2-t_1}=\frac{40-0}{5-0}=8m/s$

8. The position of a body at t=4s is:
   A) $x=3m$ B) $x=-3m$ (C) $x=12m$ D) $x=-12m$

$t=4s \rightarrow x=3(4)-(4)(4)^2+(4)^3$
$x=12m$

Use the following to answer questions 9-10:

Two vectors $\vec{a}$ and $\vec{b}$ of magnitudes 10 units and 6 units respectively and the angle between the directions of $\vec{a}$ and $\vec{b}$ is 60^0.

$a=10units,\ b=6units,\ \theta=60^0$

$\vec{a}\cdot\vec{b}$

9. The scalar product of the two vectors $\vec{a}$ and $\vec{b}$ is:
   A) 50 units B) 20 units (C) 30 units D) 60 units

$\vec{a}\cdot\vec{b}=ab\cos\theta=10\times6\cos60$
$=30\ units$

$\vec{a}\times\vec{b}$

10. The magnitude of the vector product of $\vec{a}$ and $\vec{b}$ is:
   (A) 52 units B) 40 units C) 26 units D) 20 units

$\vec{a}\times\vec{b}=ab\sin\theta=10\times6\times\sin60$
$=51.96\simeq52$

---

11. $(1\ nm)^2$
   A) $10^{-9}\,m^2$ B) $10^{+9}\,m^2$ C) $10^{+18}\,m^2$ (D) $10^{-18}\,m^2$

$1nm=10^{-9}m$
$(1nm)^2=(10^{-9})^2m^2=10^{-18}m^2$

Δx v_{avg} t

12. The displacement of a boy moving with average velocity of 1.2 m/s in t=2 minutes is
   A) 200 m B) 100 m (C) 144 m D) 150 m

$V_{avg}=\frac{\Delta x}{\Delta t}$
$\Delta x=V_{avg}\cdot\Delta t=(1.2)(2)(60)$
$=144\ m$

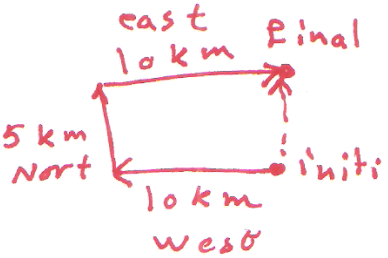
---

13. The position of a particle is given by: $x(t)= 20t - 5t^3$ (with x in meters and t in seconds). Is there ever a time when a = 0 ?
   A) at t=30 s B) at t=10s (C) at t=0 D) at t=15 s

$t=?\Rightarrow a=0,\ a=\frac{d^2x}{dt^2}=-30t$
$a=-30t$
$a=0,\ t=0$

---

14. A boat (قارب) moves (10 km west), then (5 km north), and finally (10 km east).
The displacement of the boat from its initial position is
   A) 0 km B) 5 km, South (C) 5 km, North D) 10 km, East



15. A car's speed is 30 m/s , after travels 50 m it reaches 15 m/s with constant acceleration ,a car's acceleration is

A) $-6.75\ m/s^2$ B) $-11.25\ m/s^2$ C) $6.75\ m/s^2$ D) $11.25\ m/s^2$

---

16. The position of an object moving on an x axis is given by $x = 4 - 46t - 4t^3$ (with x in meters and t in seconds), therefore, at t=0 s :

A) The speed is zero.
B) The speed is in the positive direction of x with 50 m/s.
C) The speed is in the negative direction of x with 46 m/s.
D) The speed is in the positive direction of x with 46 m/s.

---

17. A vector $2\vec{B}$ has x,y and z -components as 2,4 and 10 respectively. The vector $\vec{B}$ can be written as

A) $2\hat{i}+2\hat{j}+10\hat{k}$ B) $2\hat{j}+5\hat{k}$ C) $\hat{i}+2\hat{j}+5\hat{k}$ D) $2\hat{i}+4\hat{j}+10\hat{k}$

---

18. 467 micrometer =

A) 4.67×10^{-2} m B) 4.67×10^{-4} m C) 4.67×10^{-5} m D) 4.67×10^{-3} m

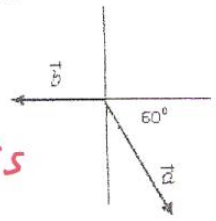
---

19. Which of the following situations is NOT possible?

A) A body having positive velocity and negative acceleration.
B) A body having changing velocity and constant acceleration.
C) A body having constant velocity and changing acceleration.
D) A body having positive velocity and positive acceleration.

---

20. As shown in the figure, if the magnitudes of $\vec{a}$ and $\vec{b}$ are 10 units and 25 units respectively, the x-component of the resultant of $\vec{a}$ and $\vec{b}$ is:



A) r_x = -2.5 units B) r_x = -20 units C) r_x = -22.5 units D) r_x = -30 units

---

21. Raindrops (قطرات المطر) fall 1700 m from a cloud to the ground, the drops's velocity as they reached the ground is:

A) v = 58 m/s B) v = -129 m/s C) v = -183 m/s D) v = 0

---

22. If 1 inch = 2.54 cm, the conversion factor to convert 2 inch to cm is

A) $\frac{2.54\ cm}{1\ inch}$ B) $\frac{1\ inch}{2.54\ cm}$ C) $\frac{2.54\ cm}{2\ inch}$ D) $\frac{2\ inch}{2.54\ cm}$

$\frac{2.54\ cm}{1\ inch}$

---

23. How long does it take an apple falling from a 29.4m high tree to hit the ground ?

A) 2.45 s B) 1.56 s C) 3.72 s D) 2.04 s

$y-y_0 / v_0=0,\ t=?$

$y-y_0 = v_0 t - \frac{1}{2} g t^2$

$-29.4 = 0 - \frac{1}{2}(9.8)t^2$

---

24. The x-component of $\vec{a}$ is a_x=2.6m, if the angle between $\vec{a}$ and the positive x-axis is -41°, then the magnitude of $\vec{a}$ is equal

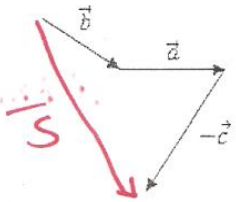
A) 4.58m B) 2m C) 3.45 m D) 3m

$a_x = a\cos\theta$

$a = \frac{a_x}{\cos\theta} = \frac{2.6}{\cos(-41^\circ)} = 3.45\ m$

---

25. The vector sum $\vec{S}$ of the vectors in the diagram is equal to:



A) $\vec{S}=\vec{b}+\vec{a}$ B) $\vec{S}=\vec{b}+\vec{a}-\vec{c}$ C) $\vec{S}=\vec{a}+\vec{b}+\vec{c}$ D) $\vec{S}=\vec{b}-\vec{a}-\vec{c}$

---

26. A vector has a magnitude of 1 unit and in a direction 10° with the positive x-axis, we can write it in unit vector notation as

A) $0.98\hat{i}+0.17\hat{j}$ B) $0.29\hat{i}+20\hat{j}$ C) $0.53\hat{i}+0.42\hat{j}$ D) $0.23\hat{i}+14\hat{j}$

$a_x = a\cos\theta = 0.985$

$a_y = a\sin\theta = 0.174$

$\vec{a} = 0.98\hat{i}+0.17\hat{j}$

---

27. The speedometer (عداد السرعة) in a car measures : speed

A) displacement B) velocity C) acceleration D) speed

---

28. $10^3\ kg/m^3$ = ...

A) $10\ g/cm^3$ B) $10^2\ g/cm^3$ C) $10^3\ g/cm^3$ D) $1\ g/cm^3$

$\frac{10^3\ kg}{m^3} = \frac{10^3\ kg}{m^3}\cdot\frac{10^3\ g}{1\ kg}\cdot\frac{1\ m^3}{10^6\ cm^3} = 1\ g/cm^3$

---

29. $\vec{A}$ and $\vec{B}$ are two vectors as shown in the figure, which of the following is True?

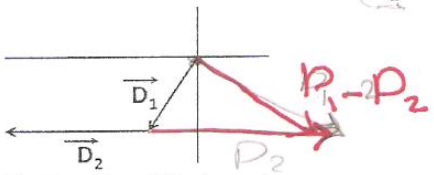
A) $\vec{A}.\vec{B}=1$ B) $\vec{A}\times\vec{B}=0$ C) $\vec{A}\times\vec{B}=-1$ D) $\vec{A}.\vec{B}=0$

$\theta = 180^\circ$

$\vec{A}.\vec{B} = -AB$

$\vec{A}\times\vec{B} = 0$

30. In the figure, the signs of the x and y components of the vector $\vec{D}_1 - \vec{D}_2$ are:



A) (-,-) B) (+,-) C) (-,+) D) (+,+)

---

31. A particle had a speed of 15m/s in the positive x direction and 2s later its speed was 33m/s in the opposite direction. The average acceleration of the particle is:

A) 24 m/s^2 B) -20 m/s^2 C) -24 m/s^2 D) 20 m/s^2

$a_{avg} = \frac{v_2 - v_1}{\Delta t} = \frac{-33-15}{2} = -24\,m/s^2$

---

32. Two vectors of the same magnitude(1 unit) are added; one is directed east and one is west. The magnitude of the resultant vector is

A) 3 B) 0 C) 1 D) 2

---

33. If the vectors $\vec{A} = \hat{i} + \hat{j}$ and $\vec{B} = -\hat{i} + \hat{j}$, then $\vec{A} \times \vec{B}$ is

A) $+2\hat{i} + 2\hat{k}$ B) $2\hat{k}$ C) $-2\hat{i} - 2\hat{k}$ D) $-\hat{i} + \hat{j} - \hat{k}$

$$\vec{A} \times \vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & 1 & 0 \\ -1 & 1 & 0 \end{vmatrix} = (1\times0 - 0\times1)\hat{i} - (1\times0 - (-1)\times0)\hat{j} + (1\times1 - (-1)(1))\hat{k}$$
$$= (1+1)\hat{k} = 2\hat{k}$$