TEST BANK

PHYS 110

FIRST TERM 1439H

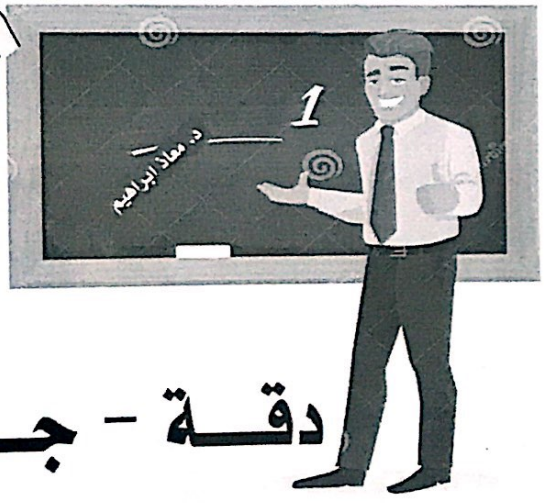
الدوري الثاني (طالبات)

جامعة الملك عبد العزيز

مركز النخبة للطباعة والتصوير
ملخصات جامعية
ملخصات لجميع المراحل
نسخة أصلية لا يسمح بتصويرها

1. شرح كامل للمقرر
2. ملخص للقوانين
3. نماذج الاختبارات السابقة
4. مراجعة عامة شاملة لمقرر الدوري الثاني
5. شرح مفصل لحل جميع الأسئلة

Before Exam



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دقة - جودة - تميز

Chapter 4: MOTIN IN 2D AND 3D

الحركة في بعدين وثلاث ابعاد

1. If the x component of vector $\vec{r}$ is 2.6 m and the y component is -2.3 m then $\vec{r}$ in unit-vector notation is:

(A) $2.6\,\hat{i} - 2.3\,\hat{j}$ (B) $-2.3\,\hat{i} + 2.6\,\hat{j}$ (C) $6.2\,\hat{i} + 3.2\,\hat{j}$ (D) $3.2\,\hat{i} - 6.2\,\hat{j}$

$$\vec{r} = r_x i + r_y j$$

$$\vec{r} = 2,6\,i - 2,3\,j \quad \text{"A"}$$

2. The displacement of a particle moving from $\vec{r}_1 = 5\hat{i} - 6\hat{j} + 2\hat{k}$ to $\vec{r}_2 = -2\hat{i} + 6\hat{j} + 2\hat{k}$ is

(A) $-7\hat{i} + 12\hat{j}$ (B) $3\hat{i} + 4\hat{k}$ (C) $7\hat{i} - 12\hat{j}$ (D) $-3\hat{i} - 4\hat{k}$

$$\Delta r = \vec{r_2} - \vec{r_1}$$

$$(-2\,i + 6j + 2k) - (5\,i - 6j + 2k)$$

$$= -7\,i + 12\,j$$

"A"

3. A particle goes from (x_1=-2m, y_1=3m, z_1=1m) to (x_2=3m, y_2=-1m, z_2=4m). Its displacement is:

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

OR $\Delta \vec{r} = \vec{r_2} - \vec{r_1}$

$\Delta \vec{x} = \vec{x_2} - \vec{x_1}$

$\Delta x = (3-(-2))\,i \quad (-1-3)\,j \quad (4-1)\,k$

$5i - 4j + 3k$ "b"

4. The coordinates of a car's position as function of time is given by: $x = 5t^2 - 16$, and $y = -t^3 + 5$, the magnitude of position vector $\vec{r}$ at t=2s is:

(a) 5 m (b) 1 m (c) 2.6 m (d) 4 m

$\Rightarrow x = 5t^2 - 16$

$x = 5(2)^2 - 16$

$x = 4$ m

$\Rightarrow y = -t^3 + 5$

$y = -(2)^3 + 5$

$y = -3$

$\vec{r} = \sqrt{4^2 + (-3)^2} \Rightarrow 5$ m [a]

∴ Get at both

t = 2 sec

5. The components of a car's velocity as a function of time are given by :

$V_x = 2t + 3$, and $V_y = 4t - 1$, its velocity $\vec{V}$ at (t= 1 s) is:

(A) $\vec{V} = 9\hat{i} + 11\hat{j}$ (B) $\vec{V} = 5\hat{i} + 3\hat{j}$ (C) $\vec{V} = 7\hat{i} + 7\hat{j}$ (D) $\vec{V} = 11\hat{i} + 15\hat{j}$

* عوض بـ $t = 1$ في المركبتين

$V_x = 2t + 3$

$V_x = 2(1) + 3$

$V_x = 5\,im$

$V_y = 4t - 1 \Rightarrow V_y = 3\,jm \Rightarrow \vec{V} = 5i + 3j$

6. Velocity is defined as:

(a) rate of change of position with time (b) position divided by time (c) a speeding up or slowing down (d) change of position

rate of chang of Position with time

* تعرف السرعة بأنها :-

معدل التغير في الموضع بالنسبة للزمن .

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

(a) 4 m/s (b) 2 m/s (c) 3 m/s (d) 1 m/s

ملاحظة :- عوضي بكل زمن في X بتلاقيه يكون معاكي $x_2 > x_1$ دايما

$x = t^2 + 2$

$t_1 = 1\ sec$

$t_2 = 2\ sec$

V_{ave}

$$V_{ave} = \frac{x_2 - x_1}{t_2 - t_1}$$

$x_1 = 1^2 + 2 \Rightarrow 3$

$x_2 = 2^2 + 2 \Rightarrow 6$

$$\therefore V_{ave} = \frac{6 - 3}{2 - 1}$$

$= 3\ m/s$ [c]

8. A car travels east at 200 m/s and then travels west at 200 m/s, the change in its velocity is:

(a) zero (b) 400 m/s east (c) 400 m/s west (d) 200 m/s west

$V_1 = 200\ m/s \rightarrow$

$V_2 = 200\ m/s \leftarrow$

$\Delta V = ??$

change in its velocity

$\Delta V = V_2 - V_1$

$\therefore \Delta V = -200 - 200$

$= -400$

عوضنا بسالب لان هنا في اتجاه الغرب

$\therefore \Delta V = 400\ m/s$ we

9. The position vector for a moving particle is: $\bar{r} = \hat{i} + 4t^2\hat{j} + t\hat{k}$, its velocity and acceleration as a function of time are:

(a) $\bar{v} = 8t\hat{j} + \hat{k}$, $\bar{a} = 8\hat{j}$ (b) $\bar{v} = \hat{i} + 8t\hat{j} + \hat{k}$, $\bar{a} = 8\hat{j} + \hat{k}$ (c) $\bar{v} = 8t\hat{j}$, $\bar{a} = \hat{i} + 8\hat{j}$ (d) $\bar{v} = 8t^2\hat{j} + t\hat{k}$, $\bar{a} = 8\hat{j}$

$\vec{r} = i + 4t^2 j + t k$

$\vec{V} = 8tj + k$

$a = 8j$

10. A particle moves in the xy plane. In which situation of the following V_x and V_y are both constant

Situation	X(m)	Y(m)
A	$2t^2$	$4t + 3$
B	$4t^3 - 2$	+3
C	$5t$	$2t + 1$
D	$-3t$	$t^2 - 1$

(a) A (b) B (c) C (d) D

* حالة ثبوت السرعة تكون قيمة السرعة بعد الاشتقاق لا تحتوي على t

$x = 5t$ — اشتقاق → $V = 5 m/s$

$y = 2t + 1$ — اشتقاق → $V = 2 m/s$

[C]

11. The components of a car's velocity as a function of time are given by $v_x = 6t^2 - 5$, $v_y = -3t^3$. The acceleration components are:

(A) $a_x = 10t$, $a_y = -12t^2$ (B) $a_x = 4t$, $a_y = -6t^2$ (C) $a_x = 6t$, $a_y = -15t^2$ (D) $a_x = 12t$, $a_y = -9t^2$

$V_x = 6t^2 - 5$

linear ↓

$a_x = 12t$

$V_y = -3t^3$

linear ↓

$a_y = -9t^2$

12. A particle moving with initial velocity $\vec{v}_0 = -2\hat{i} + 4\hat{j}$ m/s, and acceleration $\vec{a} = -5\hat{i} + 8\hat{j}$ m/s², the x-component v_x of the final velocity at (t=1 s) is ?

(A) -7 m/s (B) - 17 m/s (C) -27 m/s (D) -37 m/s

$V_0 = -2i + 4j$

$a = -5i + 8j$

$t = 1$ sec

$v = ??$

$\vec{V} = V_0 + at$

$\vec{V} = -2i + 4j + (-5i + 8j)$

$\vec{V} = -2i + 4j - 5i + 8j$

$\vec{V} = -7i + 12j$

$\therefore \vec{V}_x = -7i$ m/s

14. A particle had a speed of 18 m/s in the +x direction and after 2.4 s its speed was 30 m/s in the –x direction. Its average acceleration during this time is:

(a) $a = \frac{-30-18}{2.4}$ (b) $a = \frac{30-18}{2.4}$ (c) $a = \frac{18+30}{2.4}$ (d) $a = \frac{18-30}{2.4}$

$V_1 = +18 \text{ m/s}$

$V_2 = -30 \text{ m/s}$

$t = 2,4$

$a_{ave} = ??$

$$a_{ave} = \frac{V_2 - V_1}{t_2 - t_1}$$

$$= \frac{-30 - 18}{2,4}$$

15. A particle moving with $\vec{v}_0 = 2\hat{i} + 5\hat{j}$ and acceleration $\vec{a} = 5\hat{j}$. Its velocity after 2s is:

(a) 15 m/s (b) 12 m/s (c) $\sqrt{29}$ m/s (d) $\sqrt{43.2}$ m/s

$V_0 = 2i + 5j$

$a = 5j$

$t = 2 \text{ sec}$

$V = ??$

$$\vec{V} = V_0 + at$$

$$\vec{V} = 2i + 5j + (5j)\,2$$

$$\vec{V} = 2i + 5j + 10j$$

$$\vec{V} = 2i + 15j$$

$$\vec{V} = \sqrt{2^2 + 15^2} = 15 \text{ m/s}$$

16. A particle leaves the origin with initial velocity $\bar{v}_0 = 8\hat{i} + 12\hat{j}$ m/s and a constant acceleration $\bar{a} = 4\hat{i} - 2\hat{j}$ m/s^2. The particle's velocity at t = 6 s is:

(a) $\bar{v} = 24\hat{j}$ $\bar{v} = 32\hat{i} + 24\hat{j}$ (c) $\bar{v} = 32\hat{i}$ (d) $\bar{v} = 32\hat{i} - 12\hat{j}$

$V_0 = 8i + 12j$

$a = 4i - 2j$

$t = 6\,sec$

$V = ??$

$\vec{V} = V_0 + at$

$\vec{V} = 8i + 12j + (4i - 2j)6$

$\vec{V} = 8i + 12j + 24i - 12j$

$\vec{V} = 32i$

17. Acceleration is equal to

(a) $\frac{d\bar{v}}{dt}$ (b) $\frac{d\bar{r}}{dt}$ (c) $\frac{d\bar{v}}{dr}$ (d) $\frac{\Delta\bar{r}}{\Delta t}$

* $\text{Acceleration} = \frac{d\vec{V}}{dt}$

$\text{velocity} = \frac{dx}{dt}$

32. You are to launch a rocket, from just above the ground, with one of the following initial velocity vectors: (1) $\vec{v}_0 = 20\hat{i} + 70\hat{j}$, (2) $\vec{v}_0 = -20\hat{i} + 70\hat{j}$, (3) $\vec{v}_0 = 20\hat{i} - 70\hat{j}$, (4) $\vec{v}_0 = -20\hat{i} - 70\hat{j}$. Rank the vector according to the launch speed greatest first.

(a) 4 >3 > 2 > 1 (b) 4 > 2 > 3 >1 (c) 1 > 2 > 3 > 4 (d) all the same

[1] $\vec{V_0} = \sqrt{(20)^2 + (70)^2} = 72,8$

[2] $\vec{V_0} = \sqrt{(-20)^2 + (70)^2} = 72,8$ → All the same

[3] $\vec{V_0} = \sqrt{(20)^2 + (-70)^2} = 72,8$

[4] $\vec{V_0} = \sqrt{(-20)^2 + (-70)^2} = 72,8$

[d]

33. In the projectile motion, the vertical velocity component v_y

(a)changes continuously (b) remains constant (c) equals zero (d) $v_y$equals v_x

* المركبة الرأسية للسرعة V_y تتغير بشكل ثابت لأن التسارع ثابت $g = -9,8$

* Chang continuously *

[a]

30. In question 28, the maximum range of the ball is:

(a) 1469.4 m (b) 1272.5 m (c) 1649.4 m (d) 1722.5 m

$V_0 = 120$

$g = 9,8$

$R_{max} = ??$

$$R_{max} = \frac{V_0^2}{g}$$

$$R_{max} = \frac{(120)^2}{9,8}$$

$$= 1469,4 \text{ m}$$

---

31. The horizontal range is the horizontal distance the projectile has traveled when it returns to .....

(a) the origin (b) its max. height (c) its final height (d) its initial height

* تعريف هي (المسافة الأفقية) ١-

هو المسافة التي يتحركها المقذوف ثم يعود الى نفس

ذو ارتفاع الابتدائي .

its inital height

[d]

28. A ball is thrown with initial velocity v_0=120 m/s at an angle θ_0=60° above the horizontal, the velocity v_0 in unit vector notation is:

(a) $\vec{v}_0 = 104\hat{i} + 60\hat{j}$ (b) $\vec{v}_0 = 60\hat{i} + 104\hat{j}$ (c) $\vec{v}_0 = 60\hat{i}$ (d) $\vec{v}_0 = 104\hat{j}$

$V_{0x} = V_0 \cos\theta$

$= 120 \cos 60$

$= 60\, i$

$\therefore V_0 = 60i + 104j$

"b"

$V_{0y} = V_0 \sin\theta$

$= 120 \sin 60$

$= 104\, j$

29. In question 28, the acceleration in the horizontal direction when t=5 s is:

(a) 24 m/s^2 (b) – 9.8 m/s^2 (c) zero (d) 600 m/s^2

---

* the acceleration in the horizontal direction is:-

zero

التسارع على المحور الأفقي يساوي صفر

26. In question 25, the horizontal component of the ball's velocity V_{x0} is:

(a) V_{x0} = unchanged (b) V_{x0} = zero (c) $V_{x0} = V_0$ (d) V_{x0} is changed

$V_{x_0} = V_0 \cos\theta$

دائماً ثابتة

unchanged

[a]

27. In question 25, at the maximum height, the vertical component of the ball's velocity V_y is:

(a) $V_y = V_x$ (b) $V_y = V_0$ (c) V_y = zero (d) $V_y = V_{0y}$

* at the maximum hight

V_y = zero

السرعة عند اقصى ارتفاع = صفر

24. Two projectiles are in flight at the same time. The acceleration of one relative to the other:

(a) is always 9.8 m/s^2 (b) can be as large as 19.8 m/s^2 (c) can be horizontal (d) is zero

* تسارع اى جسم بالنسبة للاخر يساوي

صفر

is zero [d]

25. A ball is thrown at V_0 and angle θ_0 above horizontal and returned to its initial height. The path of the ball is called:

(a) Range (b) Trajectory (c) Horizontal (d) Vertical path

* trajectory *

[b]

* ملحوظة :-

اذا عاد الجسم الي نفس مستوى الارتفا فشكل المسار الذي يتبعه trajectory

22. A large cannon fired a ball at an angle of 30^0 above the horizontal with initial speed 980m the projectile will travel what horizontal distance before striking the ground?

(a) 4.3 km (b) 8.5 km (c) 43 km (d) 85 km

Horizontal distance = Rang

$V_0 = 980\ m/s$

$\theta = 30^\circ$

$R = ??$

$$R = \frac{V_0^2 \sin 2\theta}{g}$$

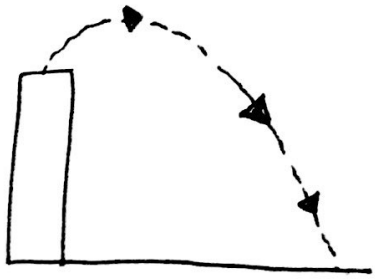
$$R = \frac{(980)^2 \sin(2 \times 30)}{9,8}$$

$R = 84870\ m \Rightarrow \frac{84870}{1000}$

$= 85\ km$

23. A stone thrown from the top of a tall building follows a path that is:

(a) circular (b) parabolic (c) hyperbolic (d) a straight line



Parabolic

* قطع مكافئ *

* إذا سقط حجر من قمة مبنى يكون شكل المسار على شكل قطع مكافئ *

20. In the projectile motion the acceleration in the horizontal direction is:

(A) 19.6 m/s^2 (B) zero (C) 9.8 m/s^2 (D) 4.9 m/s^2

* في المقذوفات دائماً التسارع في
اتجاه = صفر

zero

21. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(A) 318.1 m (B) 267.3 m (C) 373.4 m (D) 220.9 m

$$R = \frac{V_0^2 \sin 2\theta}{g}$$

$$R = \frac{V_0^2 (\sin 2\theta)}{9,8}$$

$$= 220,9 \text{ m}$$

18. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(A) 318.1 m (B) 267.3 m (C) 373.4 m <u>(D) 220.9 m</u>

$$R = \frac{V_o^2 \sin 2\theta}{g}$$

$$= \frac{50^2 \sin(2 \times 30)}{9,8}$$

$$= 220,9 \text{ m}$$

19. The maximum range of a projectile is at launch angle

(A) θ = 25° (B) θ = 35° <u>(C) θ = 45°</u> (D) θ = 55°

الزاوية عند اقصى مدى تساوي

45°

the angle at maximum rangis

45°

34. The maximum range of a projectile is at launch angle

(a) $\theta = 25°$ (b) $\theta = 35°$ (c) $\theta = 45°$ (d) $\theta = 55°$

$\theta = 45^\circ$

* واتما الزاويه عند اقصى مدى هى 45°

35. In the projectile motion the horizontal velocity component v_x remains constant because the acceleration in the horizontal direction is:

(a) $a_x > 0$ (b) $a_x = g$ (c) $a_x > g$ (d) $a_x = 0$

$\boxed{a_x = 0}$

السرعة على محور x تبقى ثابتة لعدم وجود

التسارع في الاتجاه الافقي (محور x) يساوي صفر

36. The range of a ball is thrown at an angle of 30° above the horizontal with an initial speed 50 m/s is:

(a) 318.1 m (b) 267.3 m (c) 373.4 m (d) 220.9 m

$$R = \frac{V_0^2 \sin 2\theta}{g}$$

$$R = \frac{50^2 \sin(2 \times 30)}{9,8}$$

$$= 220,9 \text{ m}$$

[d]

37. A ball is thrown at an angle of 30° above the horizontal with an intial speed 980 m/s. The ball's range is:

(a) 4.3 km (b) 8.5 km (c) 43 km (d) 85 km

$$R = \frac{V_0^2 \sin(2\theta)}{g}$$

$$= \frac{(980)^2 \sin(2 \times 30)}{9,8}$$

$$= \frac{84870}{1000} \quad \div 1000$$

قسمنا على 1000 عشان نحولها الى km

$$\approx 85 \text{ km}$$ [d]

38. In the projectile motion the horizontal velocity component v_x remains constant because the acceleration in the horizontal direction is:

(a) $a_x = 0$ (b) $a_x > 0$ (c) $a_x = g$ (d) $a_x > g$

$$a_x = 0$$

* التسارع على محور x يساوي صفر *

39. A ball is thrown at V_0 and angle θ_0 above horizontal and returned to its initial height. The path of the ball is called:

(a) Range (b) Trajectory (c) Horizontal path (d) Vertical path

* حينما يقذف جسم بسرعة إبتدائية V_0 وزاوية θ
ثم يعود الجسم الي نفس الارتفاع الابتدائي فإن
مسار (Path) هذا الجسم يسمى

* trajectory *

40. In question 39, the horizontal component of the ball's velocity V_{x0} is:

(a) V_{x0} = unchanged (b) V_{x0} = zero (c) $V_{x0} = V_0$ (d) V_{x0} is changed

* اذا كانت التسارع ثابت فان السرعة لا تتغير

V_{0x} = un changed

[a]

41. In question 39, at the maximum height, the vertical component of the ball's velocity V_y is:

(a) $V_y = V_x$ (b) $V_y = V_0$ (c) V_y = zero (d) $V_y = V_{0y}$

* السرعة الرأسية عند اقصى ارتفاع = 0

V_y at maximum height

= zero

[c]

42. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(A) π s (B) 2π s (C) 4π s (D) 8π s

$V = 4\ m/s$

$r = 2m$

$t = ??$

$$t = \frac{2\pi r}{V}$$

$$t = \frac{2\pi 2}{4}$$

$$= \frac{4\pi}{4}$$

π s [A]

43. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(A) π s (B) 2π s (C) 4π s (D) 8π s

$$t = \frac{2\pi r}{V}$$

$$t = \frac{4\pi}{4}$$

$t = \pi$ sec

[A]

44. A particle moves at constant speed in a circular path. The instantaneous velocity and instantaneous acceleration vectors are:

(a) both tangent to the circular path | (b) both perpendicular to the circular path | (c) perpendicular to each other | (d) opposite to each other

* السرعت والتسارع في الحركت الدائريت يكونان متعامدان

* prependicular to each other

[c]

45. For a biological sample in a 1:0-m radius centrifuge to have a centripetal acceleration of 25g, its speed must be:

(a) 11 m/s (b) 16 m/s (c) 50 m/s (d) 122 m/s

$a = 25\ g$

$\therefore 25 \times 9{,}8$

$= 245\ m/s^2$

$r = 1\ m$

$V = ??$

$$a = \frac{V^2}{r}$$

$$245 = \frac{V^2}{1}$$

$V^2 = 245$ "$\sqrt{}$"

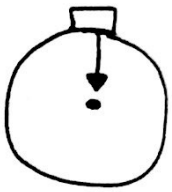
$V = 15{,}6 \approx 16\ m/s$

[b]

46. A stone is tied to a 0.50-m string and whirled at a constant speed of 4m/s in a vertical circle. Its acceleration at the top of the circle is:

(a) 9.8 m/s^2, up (b) 9.8 m/s^2, down (c) 32 m/s^2, up (d) 32 m/s^2, down

$$a = \frac{V^2}{R}$$



$r = 0,50\,m$

$V = 4\,m/s$

$a = ??$

$$a = \frac{4^2}{0,5}$$

$a = 32\,m/s^2$ down [d]

47. A stone is tied to a 0.50-m string and whirled at a constant speed of 40m/s in a vertical circle. Its acceleration at the bottom of the circle is:

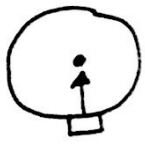
(a) 9.8 m/s^2, up (b) 9.8 m/s^2, down (c) 32 m/s^2, up (d) 32 m/s^2, down

$r = 0,50\,m$

$V = 40\,m/s$

$a = ??$

$$a = \frac{V^2}{R}$$



$$a = \frac{40^2}{0,50}$$

$= 32\,40$

[C]

48. A car rounds a 20-m radius curve at 10m/s. The magnitude of its acceleration is:

(a) zero (b) 0.2 m/s^2 (c) 5 m/s^2 (d) 40 m/s^2

$r = 20\,m$

$V = 10\,m/s$

$a = ??$

$$a = \frac{V^2}{r}$$

$$= \frac{10^2}{20}$$

$$= 5\,m/s^2$$

[c]

49. The speed of a car moving in a circular path of radius 20 m with a centripetal acceleration of 5 m/s^2 is:

(a) 10 m/s (b) 100 m/s (c) 4 m/s (d) 2000 m/s

$r = 20\,m$

$a = 5\,m/s^2$

$V = ??$

$$a = \frac{V^2}{r}$$

$$5 = \frac{V^2}{20}$$

$$V^2 = \sqrt{5 \times 20} \qquad V = 10\,m/s$$

[a]

50. The period of a plane that enters a horizontal circular turn with $\bar{v}_i = 200\hat{i} + 600\hat{j}$ m/s and 32 s later leaves the turn with $\bar{v}_f = 200\hat{i} + 600\hat{j}$ is:

(a) 12 (b) 16 (c) 32 (d) 64

$V_i = 200i + 600j$

$V_f = 200i + 600j$

$t_1 = 32\ s$

$t_2 = ??$

* اذا كانت السرعة الابتدائية هي نفسها السرعة النهائية . فانه مقدار الزمن الابتدائي هو نفسه الزمن النهائي "دورة كاملة"

$t = 32 sec$ [C]

51. The period of an objects moving at a constant speed of 4 m/s on a circular path of radius 2 m is:

(a) π s (b) 2π s (c) 4π s (d) 8π s

$V = 4\ m/s$

$r = 2\ m$

$t = ??$

$$t = \frac{2\pi r}{V}$$

$$t = \frac{2\pi 2}{4}$$

$$t = \frac{4\pi}{4}$$

$t = \pi\ sec$

[a]

52. Referring to question 51, the acceleration of the object is:

(a) 1 m/s^2 (b) 2 m/s^2 (c) 4 m/s^2 (d) 8 m/s^2

$V = 4\ m/s$

$r = 2m$

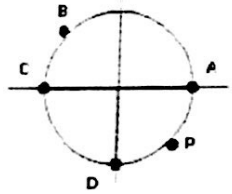
$a = ??$

$$a = \frac{V^2}{r}$$

$$a = \frac{4^2}{2} = 8\ m/s^2$$

[d]

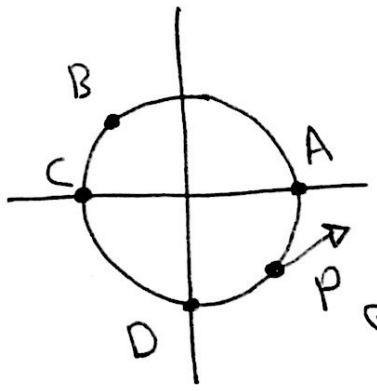
53. A particle is moving in circular path, at point P the particles velocity is: $\vec{v} = 3\hat{i} + 4\hat{j}$ at which point the velocity is $\vec{v} = -3\hat{i} - 4\hat{j}$



(a) A (b) B (c) C (d) D

$\vec{V}_p = 3i + 4j$

$\vec{V} = -3i - 4j$



* بداية الحركة تعتبر هي الربع الأول

∴ فإنه B هي الربع الثالث (−,−)

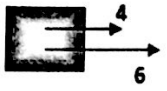
B

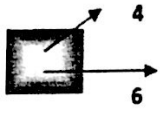
[b]

Chapter 5: FORCE AND MOTIN I

القوة والحركة

1. The figures below shows four situation in which forces act on a block that lies on a frictionless floor. In which figure the block has the **greatest acceleration**?

(a) 

(b) 

(c) 

(d) 

* اكبر قيمة للقوة تكون فيما القوتان في نفس ذو اتجاه

بدون زاوية

a) $4 + 6 = 10\,N$

b) $4\cos 45 + 6 = 8,83\,N$

c) $4 - 6 = -2\,N$

d) $6 - 4 = 2\,N$

$\therefore$ 10 N is great

(a)

2. A force of **0.2 N** acts on a mass of **100 g**, what is its **acceleration**?

(a) $2 \times 10^{-2}\ m/s^2$ (b) $2 \times 10^{-6}\ m/s^2$ (c) $2 \times 10^{-3}\ m/s^2$ (d) $2\ m/s^2$

$f = 0,2\,N$

$m = \frac{100}{1000}$

$= 0,1\,kg$

$a = ??$

$F = m\,a$

$0,2 = 0,1\,a \quad \div 0,1$

$a = \frac{0,2}{0,1}$

$= 2\ m/s^2$

[d]

3. A man **pulls** a box of **mass 3 kgvertically upward** with a force of magnitude **40 N.** What is the **acceleration of the box**?

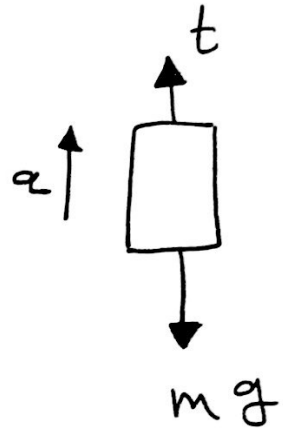
(a) $a=\frac{T-mg}{m}$ (b) $a=\frac{mg-T}{m}$ (c) $a=\frac{T+mg}{m}$ (d) $a=\frac{m}{T+mg}$

$$t - mg = ma$$

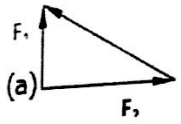
$\div m$

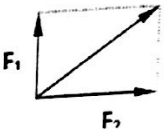
$$\therefore a = \frac{t-mg}{m}$$

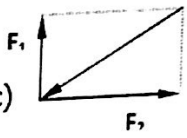
[a]

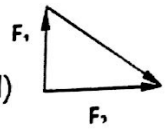


4. Which of the following figures correctly show the vector **addition of forces F_1 and F_2** ?

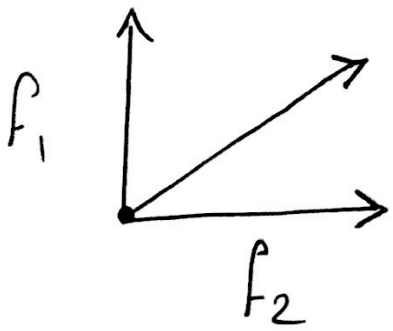
(a) 

(b) 

(c) 

(d) 

* حاصل جمع قوتين هي اله يبدأ المتجه من بداية كل قوة .



[b]

5. If the **1 kg** body has an **acceleration of 2 m/s²** at an angle of **20°** above the positive direction of the x-axis. What is the **net force** in unit vctor notation?

(a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$

$$\Sigma F = F_x i + F_y j$$

$$\Rightarrow F_x = m a \cos\theta \Rightarrow 1 \times 2 \times \cos 20$$

$$F_x = 1,88\, i$$

$$F_y = m a \sin\theta \Rightarrow 1 \times 2 \times \sin 20$$

$$F_y = 0,68\, j$$

$$\therefore \Sigma f = 1,88 i + 0,68 j \quad \boxed{b}$$

6. Two forces act on a particle that moves with **constantvelocity** $\vec{v} = 3\hat{i} - 4\hat{j}$ **m/s**, one of the forces is $\vec{F}_1 = 2\hat{i} - 6\hat{j}$ **N**,what is the other force?

(a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

* إذا وجدت كلمة constant velocity نتذكر قانون نيوتن الأول ←

$$\Sigma f = 0$$

$$F_1 + F_2 = 0$$

$$2i - 6j + F_2 = 0$$

عكس الإشارة

$$\therefore f_2 = -2i + 6j \quad \boxed{c}$$

7. A particle has a **weight of 22 N** at a point where **g = 9.8 m/s²**, what are its **mass and weight** at a point where **g = 0** ?

(a) m = 2.2 kg, W = 0 (b) m = 0, W = 2.2 N (c) m = 0.45 kg, W = 0 (d) m = 0, W = 45 N

$W = 22N$

$g = -9,8$

$m = ??$

$w = ??$

[1] $W = m\,g$

$22 = m \cdot 9,8$

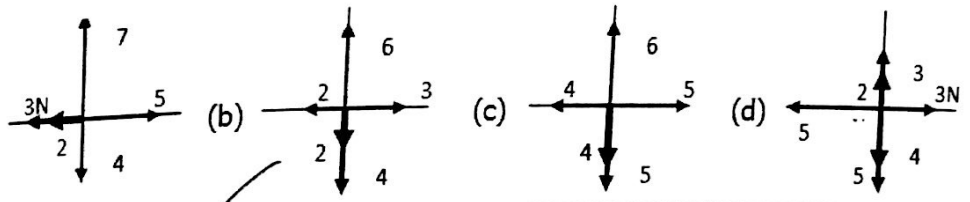
$m = \frac{22}{9,8} \Rightarrow 2,2\ kg$

[2] $W = m\,g$

$W = 2,2 \times (0) \Rightarrow 0$ [a]

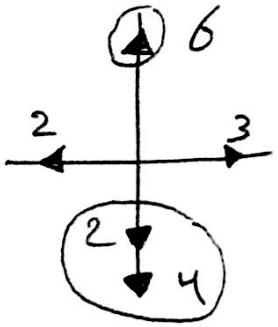
8. In which figure of the following the **y-component of the net force is zero**?

(a) (b) (c) (d)



$F_y = 0$

* المركبة y للقوة تساوي صفر



$6 - (2+4) = zero$

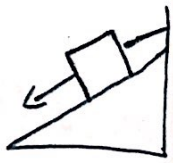
[b]

اذا قطع الحبل

11. **In question9,** if the cord is **cut** then the mass will slide with **acceleration equals:**

(a) a = - 4.9 m/s^2 (b) a = - 9.8 m/s^2 (c) a = - 8.5 m/s^2 (d) a = - 3.4 m/s^2

* اذا كان الجسم لا تؤثر عليه قوة خارجية t أو f . يتحرك تحت تأثير وزنه فقط فان :-



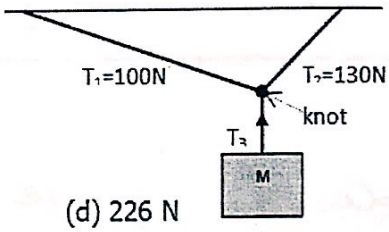
$$a = g \sin\theta$$

$$a = 9,8 \times \sin 30$$

$$a = -4,9 \Rightarrow$$ سالب لانه سيتحرك لاسفل

[a]

12. A block of mass **M= 20 kg** hangs from three cords by means of a knot, **(**the mass M does not move**), what is the value of tensionT_3?**



(a) 230 N (b) 196 N (c) 426 N (d) 226 N

$m = 20\ kg$

$t_3 = ??$

$g = 9,8$

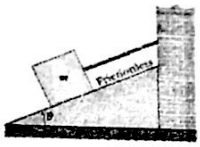
$$t_3 = m\,g$$

$$t_3 = 20 \times 9,8$$

$$t_3 = 196\ N$$

[b]

9. In the figure a cord holds stationary a block of mass **m = 8.5 kg** on a frictionless plane that is inclined at An angle **θ = 30°, the tension in the cord T** equals:

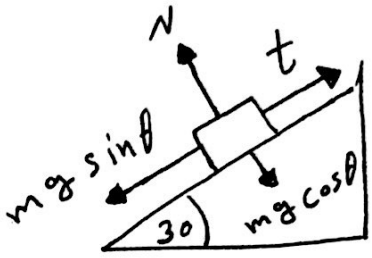


(a) 72.14 N (b) 83.3 N (c) 53.14 N (d) 41.65 N

$t = m g \sin\theta$

$t = 8,5 \times 9,8 \times \sin 30$

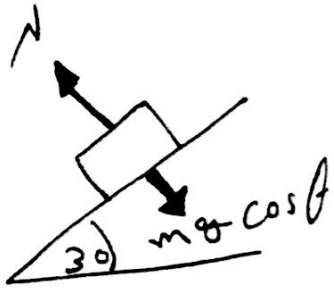
$t = 41,65\ N$ [d]



10. **In question9,** the **Normal forceN** acting on the block is:

(a) $N = F_g - mg\cos\theta$ (b) $N = F_g\cos\theta$ (c) $N = F_g + mg\cos\theta$ (d) $N = F_g$

$N = m g \cos\theta$ [b]



$N = 8,5 \times 9,8 \times \cos 30$

$= 72,1\ N$

f_g

قوة الجاذبية

13. **What is the net force** acting on a body of a **mass of 48 kg** , when its **acceleration is 6 m/s²** ?

(a) 758 N (b) 182 N (c) 288 N (d) 470 N

$m = 48\ kg$

$a = 6\ m/s^2$

$\Sigma f = ??$

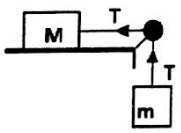
$\Sigma f = m\,a$

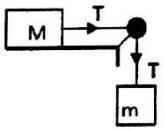
$\Sigma f = 48 \times 6$

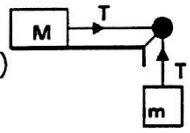
$= 288\ N$

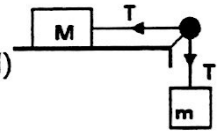
C

14. Which figure of the following shows **the right direction of the tension T**? (the two masses are stationary).

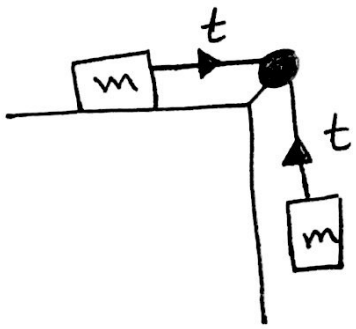
(a) 

(b) 

(c) 

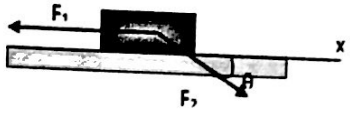
(d) 

* قاعدة هامة :- دائماً إتجاه الشد t في إتجاه البكرة .



C

15. Two forces act on a block of mass **m= 0.5 kg** that Moves along the x-axis on a frictionless table, F_1= **3 N** and F_2= **1 N** directed at angle **θ=30°** as shown, **What is the acceleration of the block?**



(a) – 4.3 m/s² (b) – 7.7 m/s² (c) - 5 m/s² (d) - 7 m/s²

$m = 0,5\ kg$

$F_1 = -3\ N$ ← للسيار

$F_2 = 1\ N$

$\theta = 30^\circ$

$a = ??$

$$F_2 \cos\theta - f_1 = m\,a$$

$$1\cos 30 - 3 = 0,5\,a$$

$$\frac{-2,133}{0,5} = \frac{0,5\,a}{0,5} \qquad \div 0,5$$

$$a = -4,3\ m/s^2 \quad [a]$$

16. If m_1= **2 kg** and m_2= **4 kg** and the **same force is applied to both masses**, then the **ratio of their accelerations is:**

(a) $\frac{a_2}{a_1} = \frac{1}{2}$ (b) $\frac{a_2}{a_1} = 2$ (c) $\frac{a_2}{a_1} = \frac{1}{4}$ (d) $\frac{a_2}{a_1} = 4$

$m_1 = 2\ kg$

$m_2 = 4\ kg$

$\frac{a_2}{a_1} = ??$

$$F_1 = F_2$$

$$m_1 a_1 = m_2 a_2$$

$$\frac{2\,a_1}{4} = \frac{4\,a_2}{4} \qquad \div a_1$$

[a] $\therefore \frac{a_2}{a_1} = \frac{2}{4} \Rightarrow \frac{a_2}{a_1} = \frac{1}{2}$

17. A force **F** applied to a body of mass m_0 giving it an acceleration a_0, what is the mass of a body **x** if the same force is applied to it and accelerate it by a_x ?

(a) $m_x = m_0 \frac{a_x}{a_0}$ (b) $m_x = m_0 \frac{a_0}{a_x}$ (c) $m_x = \frac{a_x}{a_0}$ (d) $m_x = \frac{a_0}{a_x}$

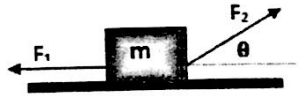
$$F_0 = F_x$$

$$m_0 a_0 = m_x a_x \qquad \boxed{\div a_x}$$

$$m_x = \frac{m_0 a_0}{a_x} \quad \text{OR} \quad m_x = m_0 \frac{a_0}{a_x}$$

b

18. In the figure, two forces acting on a box of mass **m** moving over a **frictionless** ice along the **x-axis** .
What is the **acceleration** of the box?



(a) $a_x = \frac{F_1 + F_2 \cos\theta}{m}$ (b) $a_x = \frac{F_2 \cos\theta - F_1}{m}$ (c) $a_x = \frac{F_2 \cos\theta}{m}$ (d) $a_x = \frac{F_1 - F_2}{m}$

$$F_2 \cos\theta - f_1 = m a$$

$$\boxed{\div m}$$

$$a_x = \frac{f_2 \cos\theta - f_1}{m} \qquad \boxed{b}$$

19. The magnitude of the **centripetal force** is

(a) $F = m\frac{v^2}{R^2}$ (b) $F = \frac{v^2}{R}$ (c) $F = m\frac{v}{R}$ (d) $F = m\frac{v^2}{R}$

$$f = m\frac{V^2}{R}$$

[d]

20. Two forces act on a particle that moves with **constantvelocity** $\vec{v} = 3\hat{i} - 4\hat{j}$ **m/s**, one of the forces is $\vec{F}_1 = 2\hat{i} - 6\hat{j}$ **N**,what is the other force?

(a) $\vec{F}_2 = 2\hat{i} - 6\hat{j}$ (b) $\vec{F}_2 = 6\hat{i} - 10\hat{j}$ (c) $\vec{F}_2 = -2\hat{i} + 6\hat{j}$ (d) $\vec{F}_2 = -6\hat{i} + 10\hat{j}$

constant velocity

$$\therefore \Sigma f = 0$$

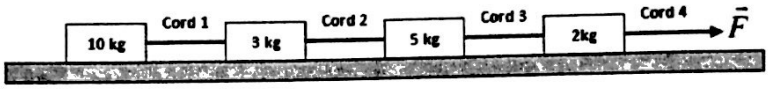
$$f_1 + f_2 = 0$$

$$2i - 6j + F_2 = 0$$

$$\therefore F_2 = -2i + 6j$$

[c]

21. The figure shows a train of four blocks being pulled across a frictionless floor by force $\bar{F}$, what **total mass is accelerated to the right byCord 2?**



(a) 10 kg (b) 18 kg (c) 13 kg (d) 7 kg

---

* الحبل الثانى (cord 2) يسحب :-

$10 + 3 = 13\ kg$

[c]

22. A particle has a **weight of 22 N** at a point where **g = 9.8 m/s²**, what are its **mass and weight** at a point where **g = 0** ?

(a) m = 2.2 kg, W = 0 (b) m = 0, W = 2.2 N (c) m = 0.45 kg, W = 0 (d) m = 0, W = 45 N

$W = 22\ N$

$g = 9,8$

$w = ??$

$m = ??$

* $W = m\ g$

$22 = m \cdot 9,8$

$m = 2,2\ kg$

* at $g = 0$

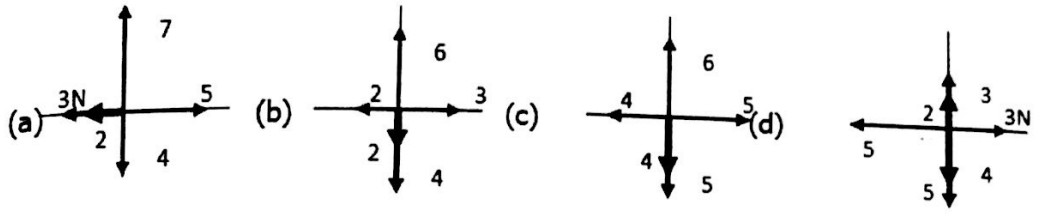
$\therefore W = m\ g$

$\therefore W = 2,2 \times 0$

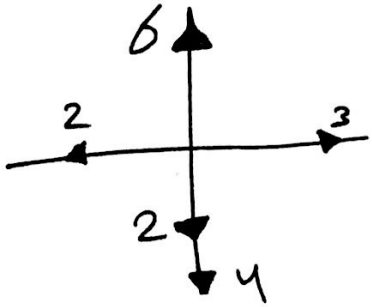
$W = 0$

[a]

23. In which figure of the following the **y-component of the net force is zero?**



* محصلت القوي للمركبت y تساوى صفر فى الحالت

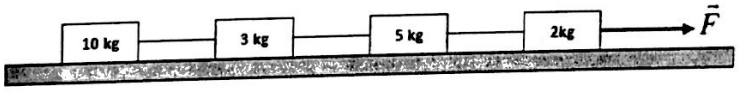


6 - (2+4)

= zero

b

24. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F}$, what total mass is accelerated to the right by force $\vec{F}$?



(a) 20 kg (b) 18 kg (c) 13 kg (d) 245 m/s

* مجموع الكتل التى تسبب عن طريق القوة F :-

10 + 3 + 5 + 2

= 20 kg

a

25. Three forces act on a particle that moves with **unchanging** velocity $\vec{v} = 2\hat{i} - 7\hat{j}$, two of the forces are $\vec{F}_1 = 2\hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{F}_2 = -5\hat{i} + 8\hat{j} - 2\hat{k}$. what is the **third force** ?

(a) $3\hat{i} - 11\hat{j} + 4\hat{k}$ (b) $7\hat{i} - 5\hat{j}$ (c) $-3\hat{i} + 11\hat{j} - 4\hat{k}$ (d) $-7\hat{i} + 5\hat{j}$

---

un changing = constant velocity

حالة ثبوت

$$\Sigma F = 0$$

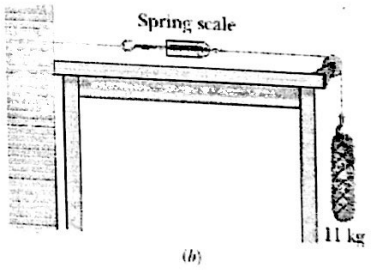
$$F_1 + F_2 + F_3 = 0$$

نجمع المتشابهات ← المركبات

$$2i + 3j - 2k - 5i + 8j - 2k + F_3 = 0$$

$$\therefore F_3 = 3i - 11j + 4k \quad [a]$$

26. An **11 kg** object is supported by a cord that Runs around a pulley and to a scale. The opposite end of the scale is attached by a cord to a wall.
What is the reading on the scale?



(b)

(a) 11 N (b) 9.8 N (c) 107.8 N (d) 215.6 N

$m = 11\,kg$

$g = 9,8$

$t = ??$

$$t = mg$$

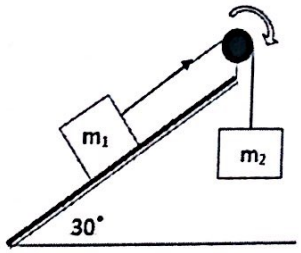
$$t = 11 \times 9,8$$

$$= 107,8\ N$$

[c]

27. A block of mass m_1=**3.7 kg** on frictionless inclined plane of angle **30°** is connected by a cord over a massless frictionless pulley to a second block of mass m_2=**2.3 kg** hanging vertically **as shown.**

If the magnitude of the **acceleration** of each block is **0.735 m/s²**, what is the **tension in the cord** ?



(a) 36.3 N (b) 22.5 N (c) 20.8 N (d) 18.1 N

$m_1 = 3,7 kg$

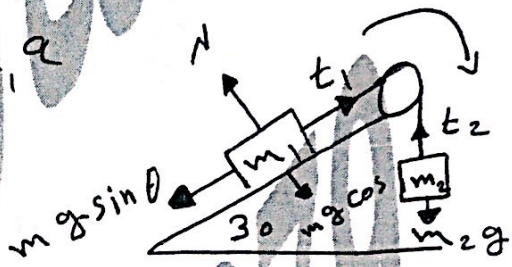
$m_2 = 2,3 kg$

$\theta = 30°$

$a = 0,735$

$t = ??$

$t - m_1 g \sin\theta = m_1 a$



$t - 3,7 \times 9,8 \times \sin 30 = 3,7 \times 0,735$

$t - 18,13 = 2,7195$

$\therefore t = 20,8\ N$ [C]

28. **In question 27**, what is the **normal force** acting on the block m_1?

(a) $N = F_g \cos\theta - m_1 g$ (b) $N = F_g \cos\theta$ (c) $N = F_g + m_1 g \cos\theta$ (d) $N = F_g$

$N = mg\cos\theta$

OR

$N = F_g \cos\theta$

"b"

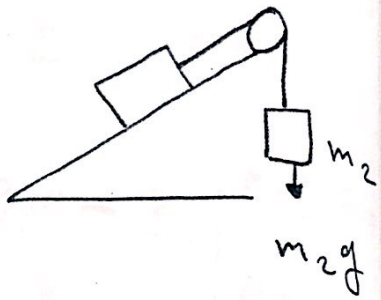
29. In question 27, if the cord is cut what is the **acceleration** of mass m_2 ?

(a) a = - 4.9 m/s² (b)a = - 9.8 m/s² (c) a = -0.735 m/s² (d) a = zero

* Cord is cut *

لحبل قطع

$\therefore g = -9,8 \, m/s^2$



"b"

30. If the **1 kg** body has an **acceleration of 2 m/s²** at an angle of **20°** above the positive direction of the x-axis. What is the **net force** in unit vctor notation?

(a) $\vec{F} = 0.34\hat{i} + 0.94\hat{j}$ (b) $\vec{F} = 1.88\hat{i} + 0.68\hat{j}$ (c) $\vec{F} = 0.68\hat{i} + 1.88\hat{j}$ (d) $\vec{F} = 0.94\hat{i} + 0.34\hat{j}$

$m = 1 \, kg$

$a = 2 \, m/s^2$

$\theta = 20^\circ$

$\Sigma f = ??$

$$\boxed{\Sigma f = F_x + F_y}$$

$F_x = m \, a \cos\theta$

$= 1 \times 2 \cos 20$

$= 1,88 \, i$

$F_y = m \, a \sin\theta$

$1 \times 2 \sin 20$

$= 0,68 \, j$

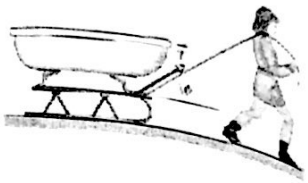
"b" so $\therefore \Sigma f = 1,88 \, i + 0,68 \, j$

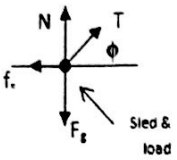
Ch 6

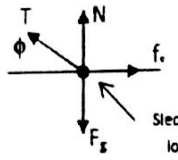
Friction

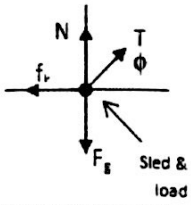
الاحتكاك

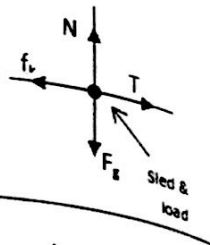
1. In the figure a woman **pulls** a loaded sled of mass **m** along a horizontal surface at **constant velocity.** The coefficient of kinetic friction between the runners and the snow is μ_k .
Which figure shows the correct **free body diagram** for the sled and load?



(a) 

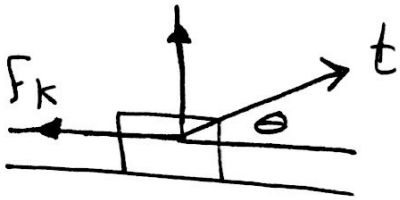
(b) 

(c) 

(d) 

* Constant velocity *
السرعة ثابتة

* الجسم يتحرك بسرعة ثابتة
فإن القوة هي قوة الاحتكاك
F_K



[C]

2. In question 2, The **equation of the forces acting on the load and sled** (from Newton's second law) is:

(a) $\bar{T}+\bar{N}+\bar{F}_g+\bar{f}_k=0$
(b) $\bar{T}+\bar{N}+\bar{F}_g+\bar{f}_s=0$
(c) $\bar{T}+\bar{N}+\bar{F}_g+\bar{f}_k=m\bar{a}$
(d) $\bar{T}+\bar{N}+\bar{F}_g+\bar{f}_s=m\bar{a}$

* الجسم يتحرك بسرعة ثابتة فإن :-

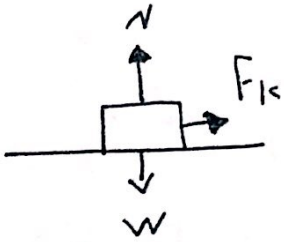
$$\Sigma F = 0$$

$$t + N + F_g + F_K = 0$$

[a]

3. A **12 N** horizontal force pushes a block of **weight 5 N** to make it move with **constant speed**, the value of the **coefficient of friction** μ_k is:

(a) 2.4 (b) 0.24 (c) 4.1 (d) 0.41



$F_k = 12\,N$

$W = 5\,N$

$\mu_{1<} = ??$

$F_k = \mu_{1<} \cdot N$

$12 = \mu_{1<} \cdot 5 \quad \div 5$

$\therefore \mu_{1<} = \frac{12}{5} \Rightarrow 2,4$ [a]

4. A car has a **weight of 1.1 N** slides on the road with acceleration **a=1.24 m/s^2, what is the force of friction** between the car and the road?

(a) - 1.13 N (b) - 11 N (c) - 1.4 N (d) - 0.14 N

$W = 1,1\,N$

$a = 1,24\,m/s^2$

$F_{1<} = ??$

$\therefore W = m\,g$

$1,1 = m \cdot 9,8$

$\therefore m = \frac{1,1}{9,8} \Rightarrow 0,11\,kg$

$\therefore F = m \cdot a$

$\therefore f = 0,11 \times 1,24$

$\therefore f_{1<} = -0,14\,N$

[d]

قوة الاحتكاك دائماً عكس الحركة لذلك تأخذ سالبة

5. A **12 N** horizontal force pushes a block of **weight 5 N** to make it move with **constant speed**, the value of the **coefficient of friction** μ_k is:

(a) 2.4 (b) 0.24 (c) 4.1 (d) 0.41

$F_k = 12\ N$

$W = 5\ N$

$\mu_k = ??$

$W = N = 5\ N$

$\therefore F_k = \mu_k \cdot N$

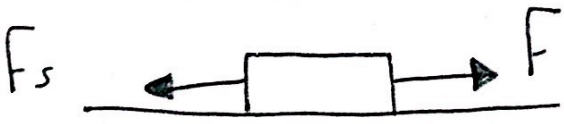
$12 = \mu_k \cdot 5 \quad \div 5$

$\therefore \mu_k = \frac{12}{5} \Rightarrow 2,4$ [a]

6. A block lies on a floor. If the maximum value $f_{x,max}$ of the static frictional force on the block is **10 N**, what is the magnitude of the **frictional force** if the magnitude of the horizontally applied force is **8 N**?

(a) 10 N (b) 8 N (c) 2 N (d) 18 N

$f_{x,max} = 10\ N$



$\therefore f = F_s = 8\ N$

"b"

ملحوظة :-

اذا كان الجسم ساكن

فان القوة المؤثرة

تساوى قوة الاحتكاك

7. A **470 N** horizontal force pushes a block of **mass 79 kg** to make it move with **constant speed**, what is the value of the **coefficient of friction** μ_k ?

(a) 0.61 (b) 6 (c) 1.6 (d) 0.06

$F = 470\ N$

$m = 79\ kg$

* constant speed *

$N = mg = 79 \times 9,8$

$\therefore N = 774,2\ N$

$F_k = F = 470\ N$

$F_k = \mu_k \cdot N$

$\therefore \mu_k = \frac{F_k}{N} \Rightarrow \mu_k = \frac{470}{774,2}$

$= 0,61$ [a]

8. A block lies on a floor.If the maximum value $f_{x,max}$ of the static frictional force on the block is **10 N**, what is the magnitude of the frictional force if the magnitude of the horizontally applied force is **12 N**?

(a) 10 N (b) 12 N (c) 2 N (d) 22 N

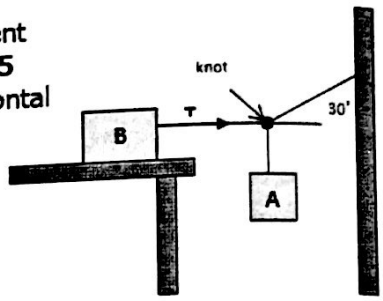
$F_{x,max} = 10\ N > F = 12\ N$

$\therefore f_s = f_{x,max} = 10\ N$

(a)

9. In the figure, **block B weighs 711 N**. The coefficient of static friction between the block and the table is **0.25** assume that the cord between **B** and the **knot** is horizontal

What is the magnitude of the tension T?



(a) 205.2 N (b) 355.5 N (c) 820.1 N (d) 1422 N

$W_B = 711\ N$

$\mu_s = 0,25$

$t = ??$

$t = f_s$ $\quad W_B = m_B \cdot g$

$\therefore f_s = \mu_s \cdot m_B g$

$= 0,25 \times 711$

$= 177,75\ N$

$\therefore t = 177,75\ N$

10. **In question 9**, the weight of block **A** is :

(a) T cos 30 (b) T sin 30 (c) F_g – T cos 30 (d) F_g – T sin 30

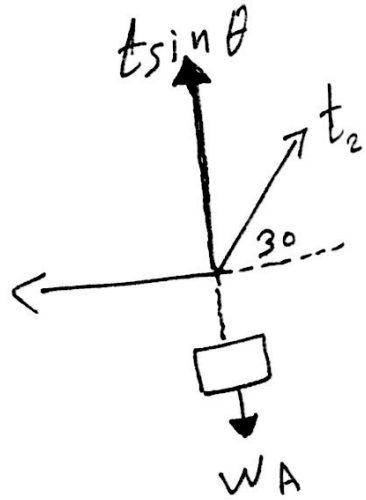
$W_A = t \sin\theta$

لانك حللتي الزاويتين فصارت

$t \sin 30$ "y" عند

$W_A = t \sin 30$

او "b"



نموذج اختبار الترم الماضي ١٤٣٨هـ

King Abdulaziz University

Faculty of Science

Physics Department

Second Exam - PHYS 110

First Term
1437- 1438H
2017
Date : 15/3/1438

A

Name: _____ _____ ID No: _____ Section: _____

Choose the correct answer:

1. A block of weight 99 N moves on a horizontal surface with constant speed by a force of 40 N. The value of the coefficient of friction μ_k is:

   a. 0.53
   b. 0.17
   c. 0.64
   d. 0.40

2. A particle moving with initial velocity $v_o = -0.5i + 3j$ (m/s), and constant acceleration $a = -5i + 6j$ (m/s^2). The y-component of final velocity v_y at t=3s is

   a. 21 m/s
   b. -28 m/s
   c. 84 m/s
   d. -47 m/s

3. A boy of 55 kg running in a circular path of R = 3 m at a velocity of 6 m/s. The centripetal force is:

   a. 660 N
   b. 110 N
   c. 330 N
   d. 165 N

4. A certain force is applied to a mass of m_1=3 kg with acceleration of 3 m/s^2. The same force is applied to another mass m_2 and accelerated it by 3 m/s^2. The mass of the second object is:

   a. 14.0 kg
   b. 3.0 kg
   c. 2.0 kg
   d. 6.2 kg

5. A particle moves in the xy plane. In which situation of the following a_x and a_y are both constant

   a. $\boldsymbol{v} = (4\,t^3 - 2)\,\mathbf{i} + (3)\,\mathbf{j}$
   b. $\boldsymbol{v} = (-3\,t)\,\mathbf{i} + (t^2 - 1)\,\mathbf{j}$
   c. $\boldsymbol{v} = (2\,t^2)\,\mathbf{i} + (4\,t + 3)\,\mathbf{j}$
   d. $\boldsymbol{v} = (10\,t)\,\mathbf{i} + (9\,t + 1)\,\mathbf{j}$

6. A 40 kg box moves over a frictionless floor along the x-axis. The magnitude of the normal force on the box is:

a. 40 N
b. 9.8 N
c. 39.2 N
d. 392 N

7. A 810 N person is standing in an elevator. If the normal force on the person is 580 N, the person is:

a. stationary
b. moving up with a constant speed
c. accelerating upward
d. accelerating downward

8. A ball is thrown with an initial speed 15.6 m/s. The maximum range of the ball is:

a. 152.9 m
b. 24.8 m
c. 15.6 m
d. 42.6 m

9. A ball is fired horizontally from the top of a table. At t =0.25 s, the horizontal distance from table to the point that the ball reach the ground is 0.58 m. The ball's initial velocity is:

a. 17.3 m/s
b. 11.5 m/s
c. 2.3 m/s
d. 6.2 m/s

10. A body of mass 10 kg at a point where g = 9.8 m/s^2. Its weight at a point where g = 0 is:

a. 0
b. 9.8 N
c. 98 N
d. 10 N

11. Two blocks are suspended by a rope. If M_1=10kg and M_2=15kg, the tension in the top rope is:

a. 49.0N
b. 245.0N
c. 98.0N
d. 147.0N

12. A 1800 kg car is moving on a circular road as shown in the figure. If the radius of circular road is 379.2 m, and the coefficient of friction between the tires (الكفرات) and the road is 0.7, the speed of the car is:

a. 26 m/s
b. 51 m/s
c. 37 m/s
d. 62 m/s

13. A body is rotated (تدور) in a horizontal circle of radius 2.3 m. If the centripetal acceleration has a magnitude of 7.0 m/s^2, the body's speed is:

a. 4 m/s
b. 7 m/s
c. 21 m/s
d. 10 m/s

14. Three forces $F_1 = 3i - 4j$, $F_2 = -3i + 4j$ and $F_3 = -8j$ acting on a body, the value of $F_{net,x}$ and $F_{net,y}$ are:

a. $F_{net,x} = -7$ N and $F_{net,y} = 8$ N
b. $F_{net,x} = 9$ N and $F_{net,y} = 11$ N
c. $F_{net,x} = 0$ and $F_{net,y} = -8$ N
d. $F_{net,x} = 6$ N and $F_{net,y} = -7$ N

15. The gravitational force of earth acting on a 15 kg is:

a. 115 N
b. 9.8 N
c. 147.0 N
d. 15 N

16. A ball is thrown with initial velocity $V_0 = 38$ m/s at an angle $\theta_0 = 60^0$ above the horizontal. The x component of the initial velocity (V_{0x}) is:

a. 19.0 m/s
b. 65 m/s
c. 50 m/s
d. 46 m/s

17. At the maximum height in projectile motion, the horizontal component of the acceleration is:

a. $a_x > -9.8\ m/s^2$.
b. $a_x = a_y$.
c. $a_x = -9.8\ m/s^2$.
d. $a_x = 0$.

18. Two boxes slide on a rough horizontal surface, where $m_1 = 12$kg and $m_2 = 16$kg , with constant speed. Which statement is true:

a. $f_{k1} = f_{k2}$
b. $f_{k1} > f_{k2}$
c. $f_{k1} = f_{k2} = 0$
d. $f_{k1} < f_{k2}$

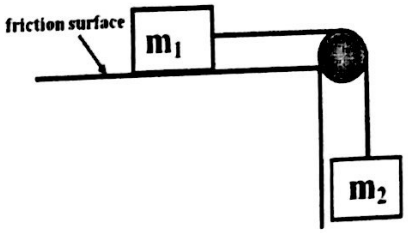
19. The position vector for a particle is initially r = 14 i -5 j +k and then later is r = 5 i - 5 j + 6 k, all in meters. The particle's displacement vector is:

a. **-9 i + 5 k**
b. **9 i -10 j -5 k**
c. **-9 i -5 k**
d. **-9 i -10 j -5 k**

20. The coefficient of static friction between a block and the surface is 0.2. If the maximum horizontal force that can be applied to the block before it slides is 49 N, the block's mass is:

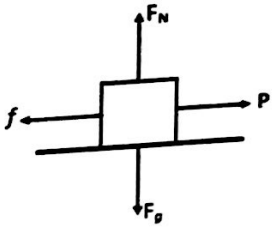
a. 25 kg
b. 69 kg
c. 70 kg
d. 20 kg

21. In the figure, two boxes of mass m_1= 62 kg and m_2= 19.4 kg are connected to each other by a massless cord (حبل عديم الكتلة). If m_2 descends (يهبط) with constant velocity, the magnitude of the frictional force between the surface and m_1 is:



a. 19.4 N
b. 190 N
c. 62 N
d. 608 N

22. A boy pulls (يسحب) a 58 N box along a friction horizontal floor by a force P as shown in the figure. The frictional force between box and floor is f=29 N. If the box does not move, which of the following is true?



a. $P > 29$ N and $F_N = 58$ N
b. $P < 29$ N and $F_N = 58$ N
c. $P = 29$ N and $F_N < 58$ N
d. $P = 29$ N and $F_N = 58$ N

23. A projectile is launched (أطلقت) at an angle of 30^0 to the horizontal with a speed of 20 m/s. The maximum height of the projectile is:

a. 7.1 m
b. 5.1 m
c. 6.1 m
d. 4.1 m

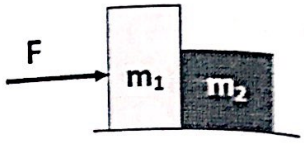
24. A horizontal force of 98 N acts on a 50 kg box lying (موضوع) on the floor but the box does not move. The magnitude of static frictional force (f_s) is:

a. 490 N
b. 98 N
c. 9.9 N
d. 50 N

25. A plane (طائرة) enters a horizontal circular turn (مسار) with v_i = (200i +600 j) m/s and 23 s later leaves the turn with v_f = (200i +600 j) m/s. The period of the plane is:

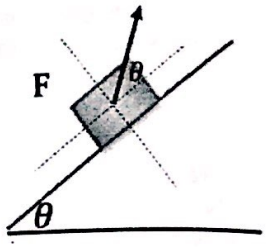
a. 600 s
b. 46 s
c. 200 s
d. 23 s

26. From the figure, if m_1= 10 kg and m_2 = 40 kg, the force acting to accelerate the two bodies by 2 m/s^2 equals



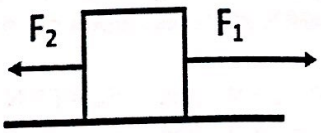
a. 100 N
b. 80 N
c. 66 N
d. 410 N

27. A box of mass m= 62kg is pushed up at constant speed over the frictionless inclined plane of angle θ=42° by an applied force F as shown in the figure. The magnitude of applied force F is:



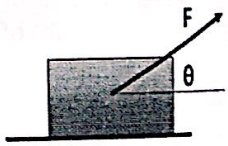
a. 46.1 N
b. 547.1 N
c. 607.6 N
d. 406.6 N

28. In the figure, If F_1 = 21 N and F_2 = 8 N , the net force on the block is:



a. 29 N
b. -29 N
c. 13 N
d. -13 N

29. In the figure, a 10 kg block moves over a frictionless floor along the x axis pushed by a force F = 96 N directed θ= 20° above + x-axis. The magnitude of the block's acceleration is:

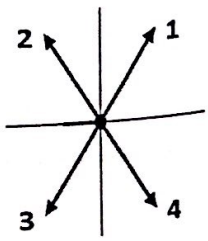


a. 15.4 m/s^2
b. 38.9 m/s^2
c. 23.4 m/s^2
d. 9.0 m/s^2

30. A particle initially has v = 7i + 2j (m/s) and then 2 s later has v = -2i + 5j (m/s). The average acceleration (a_{avg}) is

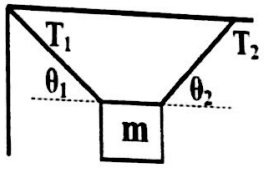
a. - 0.3**i** + 7**j**
b. **i** + 2**j**
c. 0.4**i** + 5**j**
d. - 4.5**i** + 1.5**j**

31. Two forces F_3 = 3i - 4j and F_4 = 5i + 6j acting on a body, from the free body diagram the vectors that represent F_3 and F_4 are



a. F_3 is vector **3** , F_4 is vector **1**
b. F_3 is vector **1** , F_4 is vector **3**
c. F_3 is vector **2** , F_4 is vector **4**
d. F_3 is vector **4** , F_4 is vector **1**

32. A block of mass m = 10 kg is hanging (معلق) by two ropes as shown in the figure. If $\theta_1 = 30^\circ$ and $\theta_2 = 45^\circ$, by using Newtons' laws , the y-component of net force ($F_{net,y}$) on the block is:



a. $T_1 \sin 45 + T_2 \sin 30 - mg = 0$
b. $T_1 \sin 30 + T_2 \sin 45 - mg = 0$
c. $T_1 \sin 30 + T_2 \sin 45 - mg = m\, a_y$
d. $T_1 \sin 45 + T_2 \sin 30 - mg = m\, a_y$

33. The components of a car's position as a function of time are given by $x = 5t^2 - 14$, $y = -t^3 - 4$. The velocity components are:

a. $v_x = 10t - 14$ and $v_y = -3t^2 - 4$
b. $v_x = 10t$ and $v_y = -3t^2$
c. $v_x = 10t^2$ and $v_y = -3t^2$
d. $v_x = 10t - 14$ and $v_y = -3t^2$

[1] $N = W = mg$

$N = mg \Rightarrow 99\,N$

$W = 99\,N$

$F = 40\,N$

$\mu_k = ??$

$F_k = \mu_k \cdot N$

$40 = \mu_k \cdot 99$

$\mu_k = \frac{40}{99} \Rightarrow 0,40$

[2] $V_0 = -0,5i + 3j$

$a = -5i + 6j$

$t = 3\,sec$

$V_y = ??$

$V = V_0 + at$

$V = -0,5i + 3j + (-5i + 6j)3$ (نوزع)

$V = -0,5i + 3j - 15i + 18j$

$\therefore V_y = 3j + 18j$

$= 21\ m/s$

[3] $m = 55\,kg$

$R = 3\,m$

$V = 6\,m/s$

$F = ??$

$F = m\frac{V^2}{R}$

$= 55\frac{6^2}{3} \Rightarrow 660\,N$

4 $m_1 = 3 kg$

$a_1 = 3 m/s^2$

$m_2 = ??$

$a_2 = 3 m/s^2$

$\therefore F_1 = F_2$

$\therefore m_1 a_1 = m_2 a_2$

$3 \times 3 = m_2 3$

$9 = m_2 \times 3$ ÷ 3

$m_2 = \frac{9}{3} \Rightarrow 3 kg$

* إذا وجدت كلمة "situation" في

5 رأس السؤال اختاري $\vec{t}$ لـ تحتوي على أس

$V = (10t)\,i + (9t+1)\,j$

"d"

6

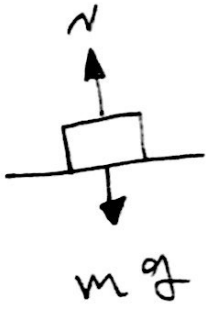
$m = 40 kg$

$N = ??$

$N = mg$

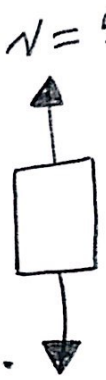
$N = 40 \times 9.8$

$N = 392 N$



7 $W = 810\ N$

$N = 580\ N$



* الجسم وزنه اكبر فبالتالي تسارعه وصل

accelerating downward

d

8 $V_0 = 15,6\ m/s$

$g = 9,8\ m/s^2$

$$R_{max} = \frac{V_0^2}{g}$$

$$= \frac{(15,6)^2}{9,8}$$

$$= 24,8\ m$$

9 $t = 0,25$

$x = 0,58m$

$V_0 = ??$

$\theta = 0 \rightarrow$ horizontally

$$x = V_0 \cos\theta \cdot t$$

$$0,58 = V_0 \cos(0)\ 0,25$$

$$0,58 = V_0\ 0,25$$

$$\therefore V_0 = \frac{0,58}{0,25} \Rightarrow 2,3$$

C

10 $m = 10\,kg$

$g = 0$

$w = ??$

$W = m\,g$

$w = 10 \times 0$

$= 0$ [a]

11

$m_1 = 10\,kg$

$m_2 = 15\,kg$

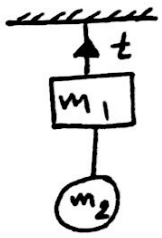
$t = ??$

$g = 9{,}8\,m/s^2$

$t = \Sigma m \cdot g$

$t = (10+15) \times 9{,}8$

$t = 245\,N$



12

$m = 1800\,kg$

$r = 379{,}2\,m$

$\mu = 0{,}7$

$V = ??$

* حل مختصر :-

$V = \sqrt{\mu \cdot r \cdot g}$

$\sqrt{0{,}7 \times 379{,}2 \times 9{,}8}$

$= 51\,m/s$ "b"

Test bank phys 110

13

$r = 2,3\ m$

$a = 7\ m/s^2$

$V = ??$

$$a = \frac{V^2}{r}$$

$$7 = \frac{V^2}{2,3}$$

$$\therefore V = \sqrt{7 \times 2,3}$$

$$= 4\ m/s$$ (a)

14

$F_1 = 3i - 4j$

$F_2 = -3i + 4j$

$F_3 = -8j$

$$F_{net.x} = 3i - 3i$$

$$= 0$$

$$F_{net.y} = -4j + 4j - 8j$$

$$= -8j\ N$$

$F_{net.x} = 0 \qquad F_{net.y} = -8j\ N$

15

$m = 15\ kg$

$g = 9,8$

$F_g = ??$

$$W = F_g = mg$$

$$\therefore F_g = mg$$

$F_g = 15 \times 9,8 \Rightarrow 147$ (c)

0568148379

16

$V_0 = 38\ m/s$

$\theta = 60^\circ$

$V_{0x} = ??$

$V_{0x} = V_0 \cos\theta$

$V_{0x} = 38 \cos 60$

$V_{0x} = 19\ m/s$

a

17

* horizontal component of acceleration

$a_x = 0$ "d"

لان التسارع على الافقي يساوي صفر وعلى الرأسي يساوي -9.8

18

$m_1 = 12\ kg$

$m_2 = 16\ kg$

*ملحوظة :- كلما زادت الكتلة زاد الاحتكاك

$\therefore m_1 < m_2$

$\therefore f_{k_1} < f_{k_2}$ "d"

19

$r_1 = 14i - 5j + 1k$

$r_2 = 5i - 5j + 6k$

$\Delta r = ??$

$\Delta r = r_2 - r_1$

$\Delta r = 5i - 5j + 6k - 14i - 5j + 1k$

$\Delta r = -9i + 5k$

a

20

$F_s = 49\ N$

$\mu_s = 0,2$

$m = ??$

$F_s = \mu_s \cdot N$

$49 = 0,2 \cdot N \quad \div$

$N = 245$

$\because N = m\,g$

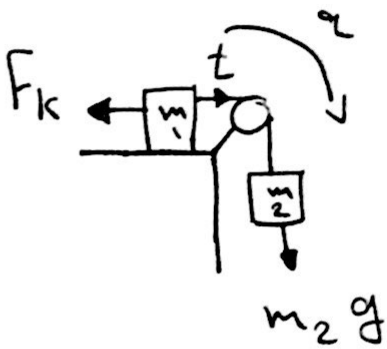
$245 = m \cdot 9,8 \quad \div 9,8$

$\therefore m = \frac{245}{9,8}$

$m = 25\ kg$ a

السرعة ثابتة

21 * Constant velocity *



$\therefore \Sigma F = 0$

$m_1 = 62\ kg$

$m_2 = 19\ kg$

$F_k = ??$

$m_2 g - F_k = 0$

$19,4 \times 9,8 - F_k = 0$

$-F_k = -190,12$

$\therefore F_k = 190,12\ N$

"b"

22

ملحوظة: كلمة (does not move) تعني ساكن

الجسم ساكن يعني جميع القوى متساوية

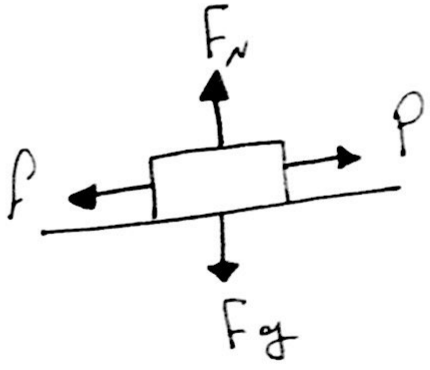
$F_g = 58\ N$

$F = 29\ N$

$P = F$

$P = 29\ N$

$F_N = 58\ N$



[d]

23

$\theta = 30^\circ$

$V = 20\ m/s$

$h = ??$

$$h = \frac{V_0^2 (\sin\theta)^2}{2g}$$

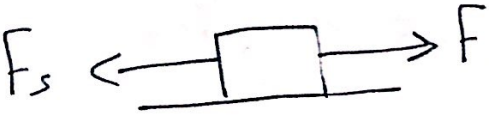
$$h = \frac{20^2 (\sin 30)^2}{2 \times 9,8}$$

$$= 5,1 \quad m$$ b

24 * كلمة ساكن يعني (does Not move) واذا كانه ساكن فانه القوة المؤثرة مساويت لقوة الاحتكاك

$F = 98\ N$

$\therefore F = F_s$



$\therefore f_s = 98\ N$

25

$v_i = (200i + 600j)$

$v_f = (200i + 600j)$

$t_1 = 32 \text{ sec}$

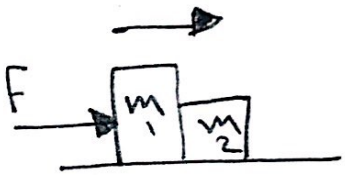
$t_2 = ??$

* اذا تساوت السرعة البدائية مع السرعة النهائية .... فإن الزمن البدائي يساوي الزمن النهائي

23

d

26



$m_1 = 10 kg$

$m_2 = 40 kg$

$F = ??$

$a = 2 m/s^2$

$\therefore F = \Sigma m \cdot a$

$\therefore F = (10 + 40)\ 2$

$F = 100 N$

27

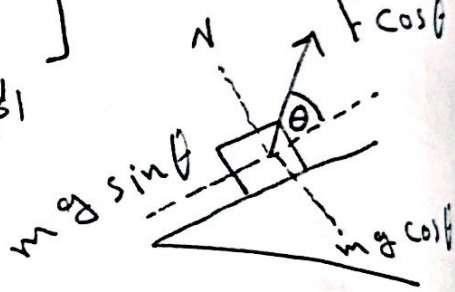
[constant speed]

الجسم يتحرك بسرعة ثابتة

$m = 62\ kg$

$\theta = 42^\circ$

$F = ??$



$F\cos\theta = mg\sin\theta$

$F\cos42 = 62 \times 9.8 \times \sin42$

$\frac{F\cos42}{\cos42} = \frac{62 \times 9.8 \times \sin42}{\cos42}$

$\therefore F = 547.1\ N$

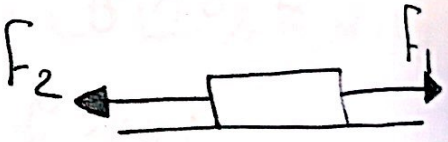
28

$F_1 = +21\ N$ (→)

$F_2 = -8\ N$ (←)

هذا في اتجاه الغرب

$\Sigma f = ??$

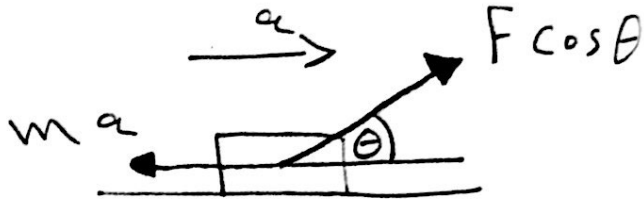


$\Sigma F_{net} = F_1 + F_2$

$F_{net} = 21 - 8$

$= 13\ N$ C

Test bank phys 110



29 $m = 10\ kg$

$\theta = 20^\circ$

$a = ??$

$F = 96\ N$

$F\cos\theta = m a$

$96\cos 20 = 10\ a \quad \div 10$

$$a = \frac{96\cos 20}{10}$$

$a = 9\ m/s^2$ [d]

30 $V_1 = 7i + 2j$

$V_2 = -2i + 5j$

$t = 2\ sec$

$a_{ave} = ??$

$$a_{ave} = \frac{V_2 - V_1}{t_2 - t_1}$$

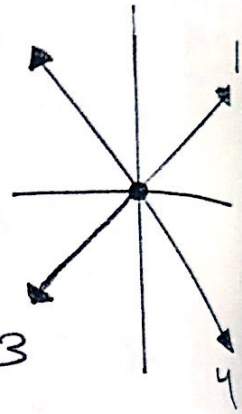
$$a_{ave} = \frac{-2i + 5j \ominus 7i + 2j}{2}$$

$$= \frac{-9i + 3j}{2}$$

$$= -4.5i + 1.5j$$

[d]

31



$F_3 = 3i - 4j$

$F_4 = 5i + 6j$

$F_3 (+, -)$ → ربع رابع

$F_4 = (+, +)$ → ربع أول

$\therefore F_3$ is vector 4 **[d]**

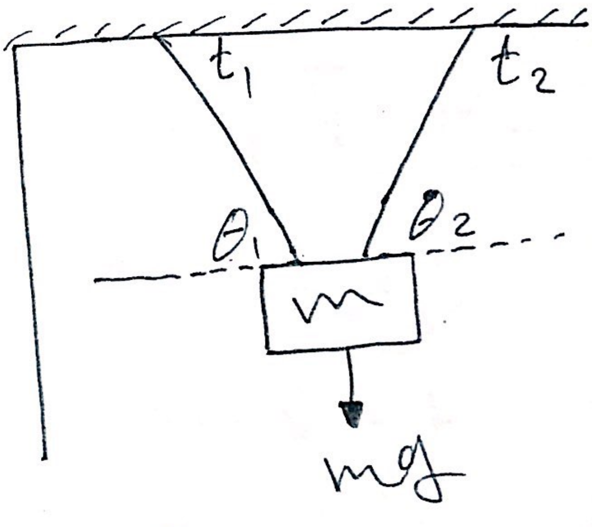
F_4 is vector 1

32

$m = 10 \text{ kg}$

$\theta_1 = 30°$

$\theta_2 = 45°$



$t_1 \sin 30 + t_2 \sin 45 = mg$ *الجسم متزن

$\therefore t_1 \sin 30 + t_2 \sin 45 - mg = 0$ **[b]**

33 $x = 5t^2 - 14$ | $y = -t^3 - 4$

اشتق ↓ | اشتق ↓

$v_x = 10t$ m/s | $v_y = -3t^2$ m/s

$\therefore v_x = 10t$ and $v_y = -3t^2$ m/s

b

مع خالص دعائي لكم بالتوفيق

والسداد

أخوكم / معاذ إبراهيم

0568148379

نموذج اختبار عـــــام ١٤٣٣هـ

King Abdulaziz University
Faculty of Sciences
Physics Department

Second Exam - Phys 110

First Term
1432-1433 H

Date: 10/ 1/ 1433H

A

Name: ID No: Section:

CHOOSE THE CORRECT ANSWER

1. A girl of mass 50 kg standing in a stationary elevator, her **weight** is:

   a) 490 N b) 550 N c) 245 N d) 392 N

2. Three forces act on a 2 kg object give it an acceleration $\vec{a} = -8\hat{i} + 6\hat{j}$. if $\vec{F}_1 = 30\hat{i} + 16\hat{j}$ and $\vec{F}_2 = -12\hat{i} + 8\hat{j}$ the **third force** is

   a) $\vec{F}_3 = 34\hat{i} + 12\hat{j}$
   b) $\vec{F}_3 = -34\hat{i} - 12\hat{j}$
   c) $\vec{F}_3 = -30\hat{i} - 6\hat{j}$
   d) $\vec{F}_3 = 8\hat{i} - 16\hat{j}$

3. A particle in uniform circular motion of radius r = 2m moved one period. **The distance that the particle travelled** in meters is:

   a) 4π b) 2π c) π d) 3π

4. A particle is said to be in uniform circular motion if

   a) its velocity has a constant magnitude
   b) its velocity has a constant direction
   c) its velocity is directed towards the center
   d) its velocity equals zero

5. 10.3 N is **equal to**

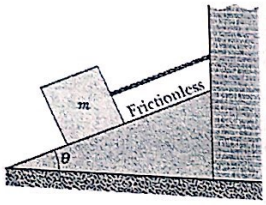
   a) $10.3\frac{kg.m}{s^2}$ b) $10.3\frac{kg.m^2}{s^2}$ c) $10.3\frac{kg^2.m^2}{s^2}$ d) $10.3\frac{kg.m}{s}$

6. At the maximum height of a projectile, **what of the following is correct?**

a) Its velocity is zero
b) Its y-component velocity is zero
c) Its x-component velocity is zero
d) Its acceleration is zero

Use the following to answer questions 7-9:

In the figure, a cord holds stationary a block of mass m = 8.5 kg on a frictionless plane that is inclined at an angle $\theta = 30^0$.



7. The **tension in the cord T equals:**

a) 72.14 N b) 83.3 N c) 53.14 N d) 41.65 N

8. The **normal Force F_N** acting on the block is

a) 53.14 N b) 41.65 N c) 83.3 N d) 72.14 N

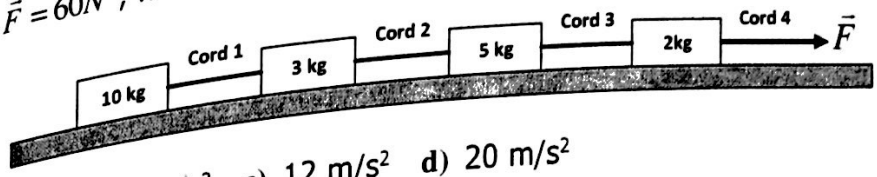
9. If the cord is cut, the magnitude of the **acceleration** of the block is

a) zero b) 4.9 m/s² c) 6 m/s² d) 4 m/s²

10. A bag rests on a table, exerting a downward force on the table. The **reaction to this force is:**

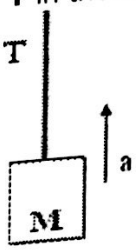
a) The force of Earth on the bag
b) The force of the table on the bag
c) The force of the Earth on the table
d) The force of the bag on Earth

11. The figure shows a train of four blocks being pulled across a frictionless floor by force $\vec{F} = 60N$, what is the **magnitude** of the system's **acceleration?**



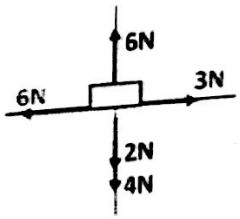
a) 3 m/s² b) 6 m/s² c) 12 m/s² d) 20 m/s²

12. The cable in the figure is raising a box of mass M = 250 kg with an upward acceleration of 4 m/s². **The tension T** in the cable is



a) 863 N b) 1725 N c) 3450 N d) 6900

13. In the figure the **net force** on the block is:



a) 1 N -right b) 6 N -up c) 3 N -left d) 4 N -down

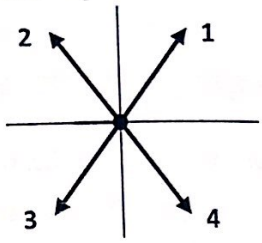
14. Ignoring air resistance, the **acceleration** of any projectile along the x-direction a_x in (SI units) is

a) 9.8 m/s² b) zero c) not constant d) less than zero

15. Three forces $\vec{F}_1 = 3\hat{i} - 4\hat{j}$, $\vec{F}_2 = -3\hat{i} + 4\hat{j}$ and $\vec{F}_3 = -6\hat{j}$ acting on a body, **the value of $F_{net,x}$** and **$F_{net,y}$** are:

a) $F_{net,x}$= 6 N and $F_{net,y}$ = -8 N
b) $F_{net,x}$= -6 N and $F_{net,y}$ = 8 N
c) $F_{net,x}$= 0 and $F_{net,y}$ = -6 N
d) $F_{net,x}$= 9 N and $F_{net,y}$ = 16 N

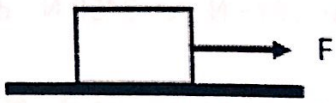
16. Two forces $\vec{F}_1 = 3\hat{i} - 4\hat{j}$ and $\vec{F}_2 = -3\hat{i} + 4\hat{j}$ acting on a body, from the free body diagram the vectors that represent $\vec{F}_1$ and $\vec{F}_2$ are



a) $\vec{F}_1$ is vector **1** , $\vec{F}_2$ is vector **3**
b) $\vec{F}_1$ is vector **2** , $\vec{F}_2$ is vector **4**
c) $\vec{F}_1$ is vector **3** , $\vec{F}_2$ is vector **1**
d) $\vec{F}_1$ is vector **4** , $\vec{F}_2$ is vector **2**

Use the following to answer questions 17-20:

A block lies on a floor as shown in the figure



17. The **magnitude of the frictional force** on it from the floor when **F = 0**

a) 0 b) 5 N c) 20 N d) 8 N

18. When F pulls the block to the right with an acceleration a_x , **The coefficient of Kinetic friction** μ_K is:

a) $\mu_k = \frac{F - ma_x}{F_N}$ b) $\mu_k = \frac{F_N}{F - ma_x}$ c) $\mu_k = \frac{ma_x}{F_N}$ d) $\mu_k = \frac{ma_x - F}{F_N}$

19. The **magnitude of the frictional force** on it from the floor when **F = 8 N** ,but the block does not move

a) 0 b) 5 N c) 20 N d) 8 N

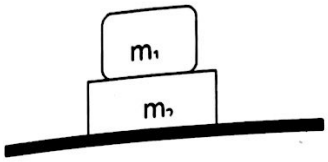
20. If the maximum static frictional force $f_{s,max}$= 20 N ,**the block will move to the right when F is equal to**

a) 21 N b) 15 N c) 19 N d) 12 N

21. A car moves in a circular road of radius r = 7.6 m with a speed 96.6 km/h, the car's **acceleration** is:

a) 18.4×10^3 km/h^2
b) 12.3×10^5 km/h^2
c) 20.7×10^3 km/h^2
d) 15.8×10^2 km/h^2

22. Two boxes m_1=10 kg and m_2=15 kg, **the gravitational force (Fg) on m_2** is



a) 25 N b) 245 N c) 2450 N d) 5 N

23. The position vector of a moving car in meters is: $\vec{r} = (3t^3)\hat{i} + (4t^2 + 3)\hat{j}$, its **acceleration** at **t = 1** s is:

a) $\vec{a} = 18\hat{i} + 8\hat{j}$ b) $\vec{a} = 8\hat{i} + 18\hat{j}$ c) $\vec{a} = 9\hat{i} + 18\hat{j}$ d) $\vec{a} = 9\hat{i} + 8\hat{j}$

24. The position of a moving particle is $\vec{r} = \hat{i} + 4t^2\,\hat{j} + t\,\hat{k}$, its **velocity** as a function of time is;

a) $\vec{v} = 8\hat{j}$ b) $\vec{v} = 8t\,\hat{j} + \hat{k}$ c) $\vec{v} = \hat{i} + 8t\,\hat{j} + \hat{k}$ d) $\vec{v} = 8t\,\hat{j}$

25. According to Newton's second law, the **force and acceleration** are:

a) in the opposite direction.
b) in the same direction.
c) perpendicular to each other.
d) scalar quantities.

26. The position of a particle was initially at $\vec{r} = 5\hat{i} - 6\hat{j} + 2\hat{k}$ and later at $\vec{r} = -2\hat{i} + 6\hat{j} + 2\hat{k}$. The particle's **displacement vector** is:

a) $\Delta\vec{r} = -7\hat{i} + 12\hat{j}$
b) $\Delta\vec{r} = 3\hat{i} + 4\hat{j}$
c) $\Delta\vec{r} = 7\hat{i} - 12\hat{j}$
d) $\Delta\vec{r} = 3\hat{i} + 12\hat{j} + 4\hat{k}$

27. A rabbit runs across a field. The coordinates of the rabbits position as a function of time are given by: $x = -2t^2 + 10t + 30$, and $y = t^2 - 5t + 10$ **at t = 10 s** the **position vector** $\vec{r}$ is:

a) $\vec{r} = 70\hat{i} - 60\hat{j}$
b) $\vec{r} = 60\hat{i} - 70\hat{j}$
c) $\vec{r} = -60\hat{i} + 70\hat{j}$
d) $\vec{r} = -70\hat{i} + 60\hat{j}$

Use the following to answer questions 28-30:

A ball rolls horizontally off the top of a building with a speed of 30 m/s. If the ball landed on the ground in a time t = 3.03 s

28. The **height of the building** from the ground is

a) 45 m b) 14.8 m c) 90 m d) 22 m

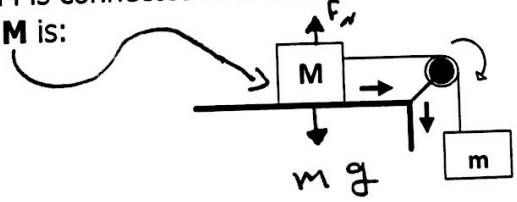
29. At what **horizontal distance** from the rolling point does the projectile strikes the ground

a) 9.9 m b) 90.9 m c) 0.9 m d) 99 m

30. What is the magnitude of **the vertical component of its velocity** as it strikes the ground

a) 2.9 m/s b) 0.31 m/s c) 3.2 m/s d) 29.7 m/s

31. A block of mass M is connected to a block of mass m as shown. The **normal force on block M** is:



a) $F_N = M g$ b) $F_N = M g - T$ c) $F_N = m g - T$ d) $F_N = m g$

32. A particle moves from $\vec{r}_1 = (-10m)\hat{k}$ to $\vec{r}_2 = (24m)\hat{i}$ in 2 s. Its **average velocity** is:

a) $\vec{v}_{avg} = \left(24\frac{m}{s}\right)\hat{i} + \left(10\frac{m}{s}\right)\hat{k}$

b) $\vec{v}_{avg} = \left(12\frac{m}{s}\right)\hat{i} + \left(5\frac{m}{s}\right)\hat{k}$

c) $\vec{v}_{avg} = \left(-10\frac{m}{s}\right)\hat{i} + \left(24\frac{m}{s}\right)\hat{k}$

d) $\vec{v}_{avg} = \left(-5\frac{m}{s}\right)\hat{i} + \left(12\frac{m}{s}\right)\hat{k}$

33. A force F is applied to an object of mass m_1= 45 kg produces an acceleration of 2 m/s^2. The same force is applied to a second object of mass m_2 produces an acceleration of 1.5 m/s^2. **The value of m_2** is

a) 45 kg b) 60 kg c) 30 kg d) 67 kg

Answer Key

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

Test bank phys 110

[1] $W = m g$

$W = 50 \times 9.8 \Longrightarrow 490\ N$ [a]

[2] $\Sigma F = m \cdot a$

$F_1 + F_2 + F_3 = m \cdot a$

$30i + 16j + (-12i + 8j) + F_3 = (-8i + 6j) \cdot 2$

$18i + 24j + F_3 = -16i + 12j$

$F_3 = -16i + 12j - 18i - 24j$

$F_3 = -34i - 12j$ [b]

[3] $t = \frac{2\pi r}{v}$

$1 = \frac{2 \times \pi \times 2}{v}$

$\therefore v = 4\pi$

$\therefore x = v \cdot t$

$\therefore x = 4\pi \times 1 = 4\pi m$ [a]

[4]

its velocity has constant magntud

مقدار السرعة في الحركة الدائرية ثابت

[a]

[5] $1\,N = 1\,kg \cdot m/s^2$

$\therefore 10{,}3\,N = 10{,}3\,kg \cdot m/s^2$

أو

$$10{,}3\ \frac{kg \cdot m}{s^2}$$

[6]

at maximum height of projectile

عند اقصى ارتفاع للمقذوف تكون

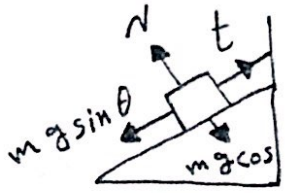
$\Longrightarrow$ its y-component velocity is zer

[b]

7 $t = m g \sin\theta$

$t = 8,5 \times 9,8 \times \sin 30$

$t = 41,65\ N$ d



8 $N = m g \cos\theta$

$N = 8,5 \times 9,8 \times \cos 30$

$= 72,14\ N$ f

و * لو الحبل قطع *

* ملحوظات :-

لو الحبل قطع الجسم يتجه لأسفل عمودي على قوة الجاذبية والزاوية

$a = g \sin\theta$

$= 9,8 \sin 30 \Rightarrow 4,9\ m/s^2$ b

10 * قوة رد الفعل *

* the force of the table on the bag

b

11

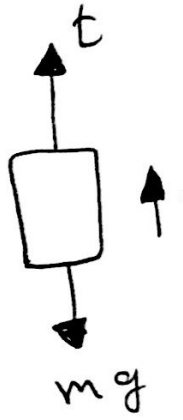
$$F = \sum m \cdot a$$

$$60 = (10+3+5+2)\, a$$

$$600 = 20\, a \qquad \div 20$$

$$a = \frac{60}{20} = 3\ m/s^2$$ [9]

12



$$t - mg = ma$$

$$t - 250 \times 9.8 = 250 \times 4$$

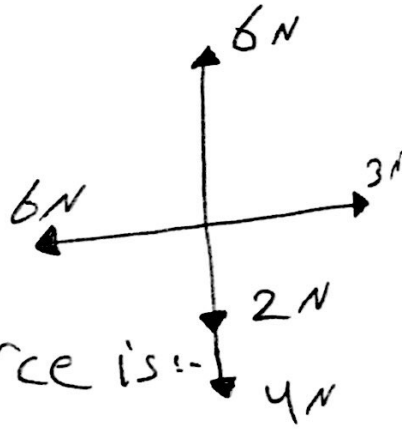
$$t - 2450 = 1000$$

$$\therefore t = 3450\ N$$ [C]

13

$$* F_{net,x} = -6 + 3 = -3\ N$$

$$* F_{net,y} = 6 - (2+4) = 0$$



ملحوظة :-
القوة في محور y صفر
فليست هي القوة المحصلة

∴ the net Force is :-
3 - Left [C]

14 the acceleration in the x-component "a_x" is: zero

التسارع على محور x يساوي صفر

15 $F_1 = 3i - 4j$ $F_2 = -3i + 4j$

$F_3 = -6j$

ملحوظة :-
إجمعي او اطرحي المركبات (i ، j) على حسب الاشارات

$\Rightarrow F_x = 0$ and $F_y = -6j$ N

C

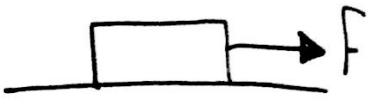
16 $F_1 = (3i - 4j)$ ربع رابع $F_2 = (-3i + 4j)$ ربع ثاني

$\therefore F_1$ is vector 4 ; F_2 is vector 2

d

17 قوة الاحتكاك في حالة السكون

$= Zero$ [a]



18 $F_N = mg$

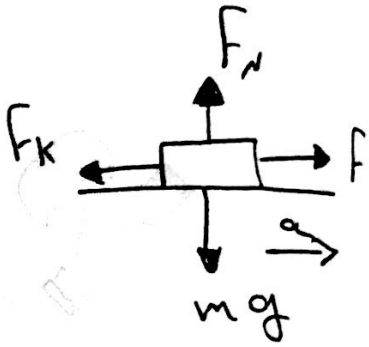
$F_k = \mu_k \cdot F_N$

$F - F_k = m a_x$

$F_k = F - m a_x$

$\mu_k \cdot F_n = F - m a_x \quad \div F_n$

$\therefore \mu_k = \frac{F - m a_x}{F_N}$ [a]



19 does Not move → الجسم ساكن

$\Sigma F = 0$

$\therefore F_k = 8N$ [a]

20 $F_{s,max} = 20N$

$F > F_{s,max}$

$F = 21\ N$

لانه هو الوحيد الاكبر من 20

ملحوظة :

حتى يتحرك الجسم يجب ان تكون القوة الكبر من قوة الاحتكاك

21

$$a = \frac{v^2}{r} \Rightarrow \frac{(96,6)^2}{0,0076}$$

$r = 7,6\ m \div 1000$

$= 0,0076\ km$

$V = 96,6\ km/hr$

$= 1227836,84$

$\approx 12,3 \times 10^5\ km/h^2$

b

22 $m_1 = 10\ kg$

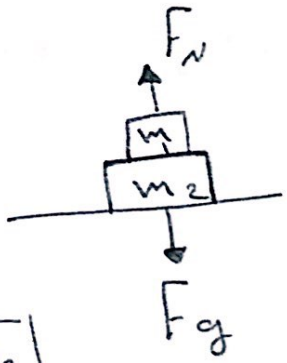
$m_2 = 15\ kg$

$g = 9,8$

$F = \Sigma m \cdot a$

$F = (10+15)9,8$

$245\ N$ b



23 $\vec{r} = (3t^3)i + (4t^2+3)j$

اشتق 1 $\Rightarrow v = 9t^2 i + 8t j$

اشتق 1 $\Rightarrow a = 18t i + 8 j$

عوض $t=1$ $\Rightarrow \vec{a} = 18(1) i + 8 j$

$\vec{a} = 18 i + 8 j$ a

24 $\vec{r} = i + 4t^2 j + t k$

اشتق 1 $\Rightarrow \vec{v} = 8t j + k$ b

25 دائماً اتجاه القوة والتسارع في نفس الاتجاه

in the same direction

b

26 $\Delta r = r_2 \ominus r_1$

$\Delta r = -2i + 6j + 2k \ominus 5i - 6j + 2k$

$\Delta r = -7i + 12j$ a

27 the Posation vector $\vec{r}$

$x = -2t^2 + 10t + 30$

$y = t^2 - 5t + 10$ at $t = 10$ sec

فقط عوض $\leftarrow \vec{r}_x = -2(10)^2 + 10(10) + 30$

$r_x = -70\,i$

فقط عوض $\leftarrow \vec{r}_y = 10^2 - 5(10) + 10$

$= 60\,j$

$\therefore \vec{r} = -70i + 60j$

28

$V_{oy} = 0$

$\theta = 0$

$g = -9,8$

$t = 3,03$ sec

$h = ??$

$y = V_o y t + \frac{1}{2} g t^2$

$y = 0 + \frac{1}{2}(-9,8)(3,03)^2$

$y = -45$ m

$|y| = 45$m a

* ملاحظات :-
اذا وجدت كلمة horizontally
نعتبر V_{oy} بصفر
نعتبر θ بصفر

29

$x = V_o \cos\theta \; t$

$x = 30 \cos(0)(3,03)$

$x = 90,9$ m b

30

horizontal ⇐ افقي $V_{oy} = 0$

$g = -9,8$

$t = 3,03$ sec

$V_y = ??$

$V_y = V_{oy} + g t$

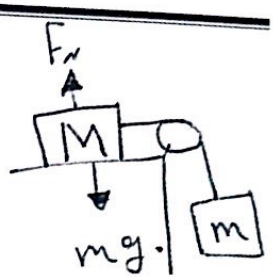
$V_y = 0 - 9,8 \times 3,03$

$V_y = -29,7$

$|V_y| = 29,7$ m/s

d

31 $F_N = Mg$



32 $V_{ave} = \dfrac{r_2 - r_1}{t_2 - t_1}$

$= \dfrac{24i}{2} - \dfrac{-10k}{2}$

$= \left(12i \dfrac{m}{s}\right) + \left(5kj \dfrac{m}{s}\right)$ b

33 $F_1 = F_2$

$m_1 = 45kg$
$a_1 = 2m/s^2$
$m_2 = ??$
$a_2 = 1,5m/s^2$

$m_1 a_1 = m_2 a_2$
$45 \times 2 = m_2 \times 1,5$ ÷1,5
$\therefore m_2 = \dfrac{90}{1,5} = 60kg$ b

نموذج اختبار عـــــام ١٤٣١هـ

جامعة الملك عبد العزيز/ كلية العلوم/ قسم الفيزياء (A) الدوري الثاني/ زمن الاختبار ساعة و نصف 1431/1/14هـ

1- In the projectile motion, the y-component of the velocity at the maximum height is:
(a)Zero (b) constant (c) the maximum value (d) Negative

2- In the projectile motion, the x-component of the velocity is:
(a) $v_0 \sin\theta$ (b) $-v_0 \sin\theta$ (c) $v_0 \cos\theta$ (d) $-v_0 \tan\theta$

3- In the projectile motion, the angle for the maximum range is:
(a)90^0 (b) 75^0 (c) 180^0 (d) 45^0

4- In the projectile motion, the maximum range is:
(a) $\frac{v_0^2}{g}(\cos 2\theta)$ (b) $\frac{v_0^2}{g}$ (c) $\frac{v_0}{g}$ (d) $\frac{v_0^2}{g}(\cos\theta)^2$

5-A body move with a velocity $\vec{v} = 2\hat{i} - 3\hat{j}\ \ m/s$ and acceleration $\vec{a} = 2\hat{i} + \hat{j}\ \ m/s^2$.The velocity after 2s (in SI unit) is:
(a) $\vec{v} = 6\hat{i} - \hat{j}$ (b) $\vec{v} = 6\hat{i} + \hat{j}$ (c) $\vec{v} = -6\hat{i} - \hat{j}$ (d) $\vec{v} = +6\hat{i} + \hat{j}$

6-A ball is thrown with a velocity of 15 m/s at an angle of 30^0. The y-component of the velocity is :
(a)30 m/s (b) 7.5 m/s (c)15 m/s (d) 13m/s

7- In question (6), the x-component of the velocity is:
(a)30 m/s (b) 7.5 m/s (c)15 m/s (d) 13m/s

8- In question (6), the maximum height is :
(a)2870m (b)287m (c)2.87 m (d) 28.7 m

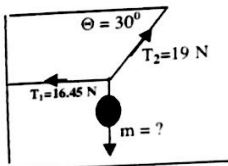
9- In question (6), the range is:
(a) 19.88 m (b)198.8 m (c) 1988 m (d) 1.988 m

10- In question (6), the time of flight is:
(a)0.015 s (b)0.15 s (c) 15 s (d) 1.5 s

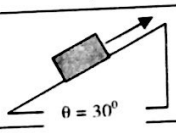
11- A boy hold a rope of 30 cm long, from one end and the other end a stone, he rotate the stone in a horizontal circle with speed of 3 m/s. The acceleration of the stone is:
(a) 0.03 m/s^2 (b) 30 m/s^2 (c)3.0 m/s^2 (d) 300 m/s^2

12- A man stand on the ground level, if his mass is 80 kg, his weight is:
(a) 7.84 N (b)784 N (c) 78.4 N (d)7840 N

13- A body of mass m, is hung by the ropes, at equilibrium, as shown in the figure.
The value of mass is:
(a) 950 kg (b) 0.97 kg (c) 9.5 kg (d) 95 kg

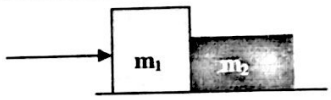


14- The force needed to keep the mass (m=20 kg) at rest , as shown in the figure, the force is:
(a) 98 N (b)980 N (c)9.8 N (d)0.98 N



15- In question (14), the normal force on the body is:
(a) 1.69 N (b) 10.0 N (c) 16.97 N (d) 169.7 N

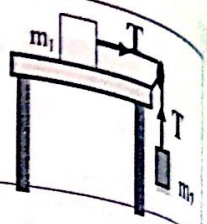
16- From the figure m_1=20kg and m_2 =10 kg. The force acting to accelerate the two bodies by 2 m/s^2, the force is:
(a) 60 N (b) 6.0 N (c)600 N (d)0.06 N



17- A racing car of mass 600 kg moves is decelerated by 4.5 m/s^2 using the brakes, the frictional force is:
(a) 225 N (b)0.225 N (c)2700 N (d) 2.25 N

18- In the figure shown, if m_1=5kg and the system move with acceleration of 2 m/s^2 and the tension in the rope was 10 N. The value of m_2 is:

(a)2.5 kg (b)1.28 kg (c)8.0 kg (d)50 kg

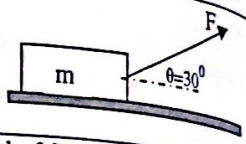


19- In question (18), the normal force on the m_1 is:

(a) 0.49 N (b) 490 N (c) 4.9 N (d) 49 N

20- A block of mass 10 kg, was pulled by a force 30 N, the block was going with a constant speed (as shown in the figure) on a rough surface. The friction force is:

(a) 25.98 N (b)259.8 N (c) 2.598 N (d) 0.2598N

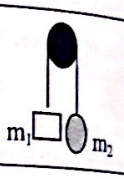


21- A space satellite moves in a circular orbit around the earth, at altitude of 530 km and with speed of 8.2 km/s. The acceleration of the satellite is: (the earth radius 6.37×10^6m)

(a) 0.974 m/s^2 (b)3 m/s^2 (c)9.74 m/s^2 (d)5.5 m/s^2

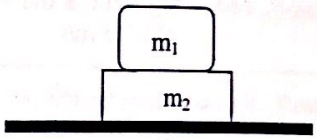
22- In the figure shown two bodies are hung by a rope over a frictionless pulley. If m_1=3 kg and m_2= 1.5 kg. the acceleration of the two bodes is:

(a) 2.7 m/s^2 (b) 0.327 m/s^2 (c) 7.27 m/s^2 (d)3.27 m/s^2



23- In the figure, two boxes m_1=10 kg and m_2=15 kg, the gravitational force on m_2 is

(a)25 N (b)245 N (c)2450 N (d)5 N



24- In question 23, the gravitational force on m_1 is:

(a)0.98 N (b)9.8 N (c)98 0 N (d)98 N

25- A man of mass 80 kg stand on elevator, if the elevator is going upward with acceleration of 2 m/s^2, the apparent weight of the man is:

(a)944 N (b)80 N (c)44 N (d)9.8 N

26- In question (25), if the elevator is going with constant velocity 5 m/s, the weight of the man is:

(a) 80 N (b)7.84 N (c)784 N (d)78.4 N

27- A box stands on rough incline plane of 30^0, when just about to move, the static coefficient of friction is:

(a) 1.00 (b) 5.8 (c) Zero (d) 0.58

28- A box stands on rough incline plane of θ, the box is moving with a constant velocity, the frictional force is:

(a) mg sin θ (b) mg tan θ (c) mg cos θ (d) mg

29- A box of mass 5 kg is sliding down with a constant velocity on a rough incline surface at an angle 20^0 with the horizontal. The kinetic friction coefficient is:

(a) 0.1 (b) 2.6 (c)0.36 (d) 1.00

30- A car was going in a circular road with a radius of 50m with constant velocity of 25 m/s, the static friction coefficient is:

(a) 0.816 (b) 1.27 (c) 1.00 (d) 1.27

Referring	العودة الى	Initial	ابتدائي	Hitting	اصطدم
Thrown	قذف	altitude	إرتفاع عن سطح الارض	Magnitude	القيمة العددية
Vertically	عامودي	Elevator	مصعد	Prevent	يمنع
Hangs	معلق	Circular	دائري	Apparent weight	الوزن الظاهري
Horizontal	أفقي	Rough	خشن	Gravitational	الجاذبية الارضية
Radius	نصف قطر	Coefficient	معامل	Frictional	الاحتكاك
Sliding	ينزلق	Static	السكوني	Floor	الارض
Upward	إلى اعلى	Kinetic	الحركي	Stand	يقف

Test bank phys 110

[1] the velocity at maximum hight is zero [a]

[2] x-component of velocity is

$$V_{0x} = V_0 \cos\theta \quad [c]$$

[3] the angle at maximum rang is:-

45° [d]

[4] $$R_{max} = \frac{V_0^2}{g} \quad [b]$$

[5]

$V_0 = 2i - 3j$

$a = 2i + j$

$t = 2 sec$

$V = ??$

$$V = V_0 + at$$

$$V = 2i - 3j + (2i + j)\,2$$

$$V = 2i - 3j + 4i + 2j$$

$$V = 6i - j \quad [a]$$

6

$V = 15\,m/s$

$\theta = 30^\circ$

$V_y = ??$

$V_y = V \sin\theta$

$V_y = 15 \sin 30$

$V_y = 7,5\,m/s$ "b"

b

7

$V_x = V \cos\theta$

$V_x = 15 \cos 30$

$= 13\,m/s$ d

8

$$h = \frac{V_0^2 (\sin\theta)^2}{2g}$$

$$h = \frac{(15)^2 (\sin 30)^2}{2 \times 9,8}$$

$= 2,87\,m$ c

Test bank phys 110

[9] $R = \dfrac{V_0^2 \sin 2\theta}{g}$

$V = 15\ m/s$

$\theta = 30^\circ$

$r = ??$

$= \dfrac{(15)^2 \sin(2\times 30)}{9,8}$

$= 19,88\ m$ [a]

[10]

$t = \dfrac{2V_0 \sin\theta}{g}$

$= \dfrac{2\times 15 \sin 30}{9,8} = 1,5\ sec$ [d]

[11] $r = 30\ cm$

$= 0,30\ m$

$V = 3\ m/s$

$a = ??$

$a = \dfrac{V^2}{r}$

$= \dfrac{3^2}{0,30} \Rightarrow 30\ m/s^2$

[b]

12

$m = 80\,kg$

$g = 9,8$

$w = ??$

$w = mg$

$w = 80 \times 9,8$

$= 784\,N$ b

13

$t_2 = 19\,N$

$t_1 = 16,45\,N$

$\theta = 30$

$m = ??$

$t_2 \sin\theta = mg$

$19 \sin 30 = m\ 9,8$

$\therefore m = \frac{19 \sin 30}{9,8}$

$= 0,97\,kg$ b

14 $m = 20\,kg$

$\theta = 30$

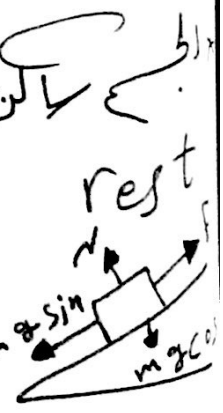
$g = 9,8$

$F = ??$

$F = mg \sin\theta$

$F = 20 \times 9,8 \times \sin 30$

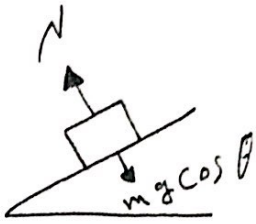
$F = 98\,N$ a



15 $N = m g \cos\theta$

$N = 20 \times 9,8 \times \cos 30$

$= 169,7\ N$ d



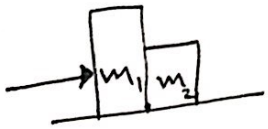
16

$m_1 = 20\ kg$

$m_2 = 10\ kg$

$a = 2\ m/s^2$

$F = ??$



$F = \Sigma m \cdot a$

$F = (20+10) \cdot 2$

$= 60\ N$ a

$F = F_k$

$F_k = m\ a$

$F_k = 600 \times 4,5$

$F_k = 2700\ N$ c

*ملحوظات :-

السائق استخدم الفرامل وبالتالي تتوقف السيارة فإن القوتان متساويتان

17

$m_1 = 600\ kg$

$a = 4,5\ m/s^2$

$F_k = ??$

18

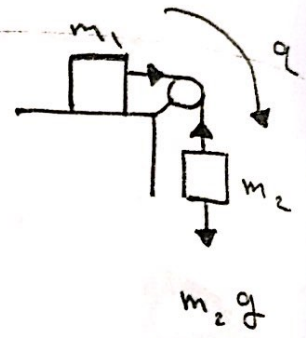
$m_1 = 5\,kg$

$a = 2\,m/s^2$

$t = 10\,N$

$m_2 = ??$

$$a = \frac{m_2 g}{m_1 + m_2}$$



$$\frac{2}{1} = \frac{m_2 9{,}8}{5 + m_2}$$

$$m_2 9{,}8 = 10 + 2m_2$$

$$m_2 9{,}8 - 2m_2 = 10$$

$$7{,}8\, m_2 = 10 \quad \div 7{,}8$$

$$\therefore m_2 = \frac{10}{7{,}8} \Rightarrow 1{,}28\,kg$$ b

19

$$N = m_1 g$$

$$N = 5 \times 9{,}8$$

$$49\,N$$ d

20

* رجلي يتحرك بسرعة ثابتة *

$m = 10\,kg$

$F = 30\,N$

$F_k = ??$

$F = F_k$

$F\cos\theta = F_k$

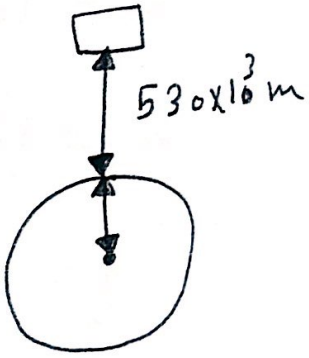
$30\cos 30 = F_k$

$F_k = 25,98\,N$ [a]

21

$r = 530\times10^{3} + 6,37\times10^{6}$ نحولها

$= 6,9\times10^{9}\,m$



$V = 8,2\,km/s$ حولنا بالضرب بـ 10^3

$V = 8200\,m/s$

$a = \frac{V^2}{r}$

$= \frac{(8200)^2}{6,9\times10^{6}} \Rightarrow 9,74$ [c]

22

$m_1 = 3\,kg$

$m_2 = 1,5\,kg$

$a = ??$

$g = 9,8$

$$a = \frac{m_1 - m_2}{m_1 + m_2} \cdot g$$

$$a = \frac{3 - 1,5}{3 + 1,5} \times 9,8$$

$$a = 3,27\ m/s^2$$ d

23

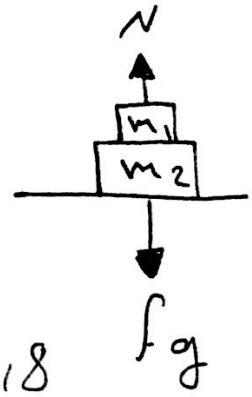
$m_1 = 10\,kg$

$m_2 = 15\,kg$

$F_{g_2} = ??$

$$F_{g_2} = (m_1 + m_2)\,g$$

$$F_{g_2} = (10 + 15) \times 9,8$$



$245\,N$ b

24

$F_{g_1} = ??$

$$F_g = m_1\,g$$

$$= 10 \times 9,8$$

$$= 98\,N$$ d

25 $m = 80 kg$

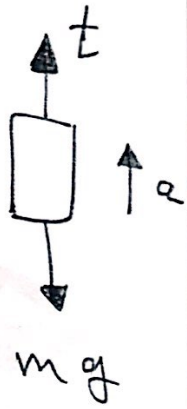
$a = 2 m/s^2$

$w = ??$

$t - mg = ma$

$t - 784 = 2 \times 80$

$t = 160 + 784$



$t = w$

$\therefore w = 944 N$ [a]

26 Constant speed يتحرك بسرعة ثابتة

$w = mg$

$= 80 \times 9,8$

$= 784 N$ [c]

27 $\theta = 30^\circ$

$\mu = ??$

$\mu = \tan\theta$

$\mu = \tan 30$

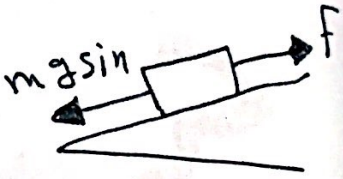
$= 0,58$ [c]

28 *Constant velocity*

الجسم يتحرك بسرعة ثابتة

إذاً فان :-

$$F = F_K$$



$$\therefore F_K = mg \sin\theta$$

a

29

$m = 5\,kg$

$\theta = 20^\circ$

$\mu_K = ??$

$$\mu_K = \tan\theta$$

$$\mu_K = \tan 20$$

$$= 0,36$$

30

$r = 50\,m$

$V = 25\,m/s$

$\mu_K = ??$

$$a = \frac{v^2}{r}$$

$$= \frac{(25)^2}{50} \Rightarrow 12,5\,m/s^2$$

$$\mu_K = \frac{a}{g} \Rightarrow \frac{12,5}{9,8} = 1,27$$

b

ملخص قوانين الدوري الثاني

ملخص قوانين الشابتر الرابع

$\vec{r}$ = **Position vector**

Displacement $D\vec{r} = \vec{r}_2 - \vec{r}_1$

$$\vec{r}\ (t) = x\ (t)\ i + y\ (t)\ j$$

$$(\vec{r}\ ) = \sqrt{x^2 + y^2}$$

$$\vec{v} = \frac{d\vec{r}}{dt} = V_x\ (t)\ i + V_y\ (t)$$

$\vec{a}$ = **acceleration vector** متجه التسارع

$$\vec{a} = \frac{d\vec{v}}{dt} = a_x\ (t)\ i + a_y\ (t)\ j \qquad (M/S^2)$$

$$R = \frac{V_0^2 \sin(2\theta)}{g} \qquad H = \frac{V_0^2 (\sin\theta)^2}{2g}$$

$$\text{الكلى } t = \frac{2V_0 \sin\theta}{g} \qquad \tan\theta = \frac{4H}{R}$$

$$R_{max} = \frac{V0^2}{g}$$ **maximum Rang**

ملخص قوانين الشابتر الخامس

* Net force = $\Sigma F = 0$ at constant speed

* $\boxed{W = mg}$

* net force = $\Sigma F = ma$

* $\boxed{mg - T = ma}$

* $N = mg - F \sin\theta$

* $F - (m_1 + m_2) g$

$a = g \sin\theta$ $\qquad$ $a = - g \sin\theta$

ملخص قوانين الشابتر السادس

$F_s = \mu_s N$

μ_s = Coefficient of static friction

N = Normal force قوة رد الفعل العمودى

$\mu_s = \tan\theta$

$\theta = \tan^{-1}(\mu_s)$

$a = -\mu_k g$

$a = g\sin\theta - \mu_k g\cos\theta$

$a_\perp = \frac{V^2}{R}$

$F_\perp = ma_\perp = m\frac{V^2}{R}$

$\theta = \tan^{-1}\left(\frac{v^2}{Rg}\right)$