15+2

جامعة بيرزيت

BIRZEIT UNIVERSITY

Physics 141

Coordinator: Tayseer AROURI

First H. Exam — **1st Sem. 2019**

TIME: 80 min — **21-10-2019**

Student Name: Omar Muktasch Student No.: 1122010

ضع إشارة (X) في كل من المربع المقابل لمدرس شعبتك ودائرة على رقم الشعبة.

	المدرس	الشعبة		المدرس	الشعبة
☐	تيسير عاروري	4	☐	اسماعيل بدران	8, 14
☐	غسان أنضوني	1; 6; 12	☒	غسان عباس	(10)
☐	غاده حامد	9	☐	وفاء خاطر	7
☐	يعقوب عنيني	5; 13	☐	عبدالله سيد أحمد	2, 3, 11

تعليمات:

1) لا تفتح ورقة الامتحان حتى يسمح لك بذلك.
2) اكتب اسمك ورقمك في أعلى هذه الصفحة.
3) اختر الجواب الأكثر قربا للجواب الصحيح وانقله على هذه الصفحة، وذلك بوضع إشارة (X) في الخانة المناسبة.
4) السؤال الذي له أكثر من إجابة يعطى علامة صفر.
5) يجب إعادة أوراق الامتحان كاملة.
6) عدد الأسئلة 17 سؤالا.
7) $g = 10\ m/s^2$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A	X				X					X							
B												X		X			
C				X				X									X
D							X				X		X		X	X	
E		X	X			X			X								

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1. An astronomical unit (AU) is the average distance between Earth and the Sun, equals 1.50×10^8 km. The speed of light is 3.0×10^8 m/s. The speed of light in AU per minute is:

A) 0.12 AU/min
B) 8.3 AU/min
C) 7.2 AU/min
D) 0.02 AU/min
E) none of these

2. As a historical fact, Palestine exported (صدرت) in the year 1939, 15 million boxes of oranges, (a box is 16 kg). According to the prices (وفق أسعار) of this year 2010, the value of the exported oranges (قيمة البرتقال المصدر) is equivalent to:

A) $ 3.0×10^{10}
B) $ 2.0×10^{9}
C) $ 4.0×10^{6}
D) $ 1.1×10^{7}
E) $ 1.2×10^{8}

3. A stone is released from a balloon that is ascending (يصعد) at a constant speed of 20 m/s. Neglecting air resistance, after 25 s the speed of the stone is:

A) 320 m/s
B) 180 m/s
C) 300 m/s
D) 280 m/s
E) 230 m/s

4. The area under a velocity-time graph represents:

A) acceleration
B) change in acceleration
C) displacement
D) change in velocity
E) speed

5. A stone is tied to the end of a string and is moving with constant speed around a horizontal circle with a radius of 2.0 m. If it makes two complete revolutions each second, its acceleration is :

$F = 2$ rev/s $\quad a = \frac{v^2}{r} \Rightarrow v = 2\pi f r$

$2 \times 3.14 \times 2 \times 2$

25.56

25

$v = 2\pi f r$

A) 316 m/s2
B) 158 m/s2
C) 220 m/s2
D) 247 m/s2
E) None of these

6. The inertia (القصور الذاتي) of a body tends to cause the body to:

A) speed up
B) slow down
C) decelerate due to friction
D) fall toward the earth
E) resist any change in its motion

7. A projectile's initial speed is four times (أربعة أضعاف / ثلاثة أضعاف) its speed at maximum height. Its launch angle (زاوية الإطلاق):

$V_0 = 4 V_0 \cos\phi$

$\frac{V_0}{V_0} = 4 \frac{V_0}{V_0} \cos\phi$

$1 = 4 \cos\phi$

$\cos\phi = \frac{1}{4}$

$\phi = \cos^{-1}\left(\frac{1}{4}\right)$

$\frac{1}{4} = \cos\phi$

A) 78.5^0
B) 70.5^0
C) 60.0^0
D) 75.5^0
E) 45.0^0

8. The coordinate of a particle in meters is given by $x(t) = 48t - t^3$, where the time t is in seconds. The particle is momentarily stops (تتوقف لحظيا) at t =

$V = 48 - 3t^2$

$3t^2 = 48$

$t^2 = 16$

$t = 4$

$48 - 3t^2$

A) 2.0 s
B) 3.0 s
C) 4.0 s
D) 1.0 s
E) None of these

$2i - 5j + 4k$
$4i - 2j + 2k$
$8 + 10 + 8 = 26$

$A \cdot B = AB\cos\theta$

9. The angle between the vectors:
A = 2**i** - 5**j** + 4**k** And **B** = 4**i** - 2**j** + 2**k** is

$A = 6.7$ $B = 4.89$

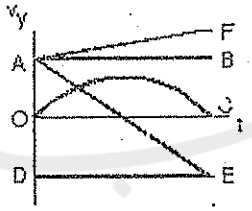
$8 + 10 + 8 = 26$

$26 = (6.7)(4.89)\cos\Phi$

A) 34°
B) 80°
C) 55°
D) 44°
E) None of these

10. Which of the curves on the graph below best represents v_y vs. t for a projectile fired at an angle of 45° above the horizontal?

$v_{vertical}$



A) AE
B) DE
C) OC
D) AB
E) AF

11. A 1000-kg airplane moves in straight flight at constant speed. The force of air friction is 1800 N. The magnitude of the net force on the plane is:

$a = 0$

$F_{net} = ma$

V_{zero}

A) 1800 N
B) 11800 N
C) 2800 N
D) zero N
E) none of these

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$V=0$

$S = -0.5t^2$

$\frac{-0.5}{2}t^2 + x$

$V = -\frac{0.5}{2}t^2 + 16$

$V(x) = -.025t^2 + 16$

$\frac{16}{0.25} = t^2$

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12. Snow is falling vertically at a constant speed of 12 m/s. The angle from the vertical the snow appears to be falling as viewed by the driver of a car traveling on a horizontal road with a speed of 108 km/h is:

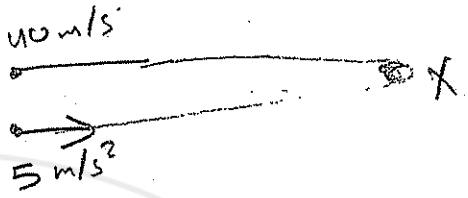
A) 37°
B) 68°
C) 59°
D) 64°
E) None of these

13. A 1000-kg elevator is ascending (يصعد) and its speed is increasing at 3.5 m/s^2. The tension in the elevator cable (حبل المصعد) is:

A) 6500 N
B) 11000 N
C) 10000 N
D) 13500 N
E) None of these

14. At a traffic light (إشارة ضوئية), a truck traveling at 40 m/s passes a car as it starts from rest. The truck travels at constant velocity and the car accelerates at 5 m/s^2. How many seconds will it take for the car to catch up (يلحق) to the truck?

A) 9
B) 16
C) 15
D) 11
E) none of these



$X = 40t$

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

$40t = \frac{1}{2} \times 5 \times t^2$

$0 = \frac{5}{2} t^2 - 40t$

$0 = 5t^2 - 40t$

$= (5t)(t-8)$

$0 \quad t = 0, 8$

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جامعة بيرزيت

BIRZEIT UNIVERSITY

Physics 141

Coordinator: Tayseer Arouri

١٧

1st H. EXAM **1st Sem. 2013/14**

TIME: 75 min **24.11.2013**

Student Name: _____ Student No.: _____

ضع إشارة (X) في كل من المربع المقابل لمدرس شعبتك ودائرة على رقم الشعبة.

	المدرس	الشعبة		المدرس	الشعبة
☐	تيسير عاروري	4; 11; 13	☐	عبدالعزيز شوابكه	2; 7
☐	غسان أنضوني	5	☐	غسان عباس	6; 10
☒	وفاء خاطر	3	☐	يعقوب عنيتي	9
☐	نضال حداد	12; 15	☐	اسماعيل بدران	1; 8; 14

تعليمات:

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4) [illegible]
5) يجب إعادة أوراق الامتحان كاملة.
6) عدد الأسئلة **17** سؤالاً.
7) $g = 10\ m/s^2$

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
A		X			X												X
B	X						X				X	X		X			
C																	
D			X	X		X	X		X						X	X	
E		X						X		X		X	X				

1. For the following three vectors:

$A = 2\hat{i} + 3\hat{j} - 4\hat{k}$
$B = 3\hat{i} - 5\hat{k}$
$C = 4\hat{i} - 2\hat{j}$
$C.(A \times B) =$

A) 36
B) - 56
C) 64
D) 56 k
E) zero

$A \times B = 10\hat{j} - 9\hat{k} - 15\hat{i} + 12\hat{j}$
$= (-15\hat{i} - 2\hat{j} - 9\hat{k})$
$-60 + 4$

$A \times B = +10\hat{j} + 9\hat{k} - 15\hat{i} + 12\hat{j}$
$C(A \times B) = -60\hat{i} + 4\hat{j}$
$(4\hat{i} - 2\hat{j})(22\hat{j} + 9\hat{k} - 15\hat{i})$
$-06\,\hat{i} - 44\hat{j}$

2. A girl of mass 60 kg stands on a scale in an elevator. If the elevator is moving down with acceleration of 3 m/s^2, the reading of the scale is:

A) 780 N
B) 600 N
C) 820 N
D) 240 N
E) 420 N

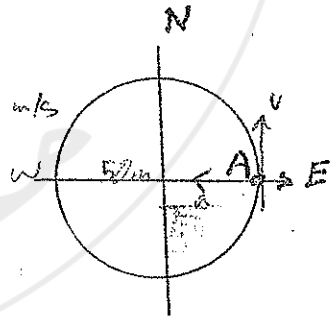
$N - 600 = -180$
$N = 420\,N$
$-ma = N - mg$
$-180 = N - 600$
$+600 \quad +600$
420

$a = 3\ m/s^2$
$mg = 600\,N$
$ma = N - mg \Rightarrow 180 = N - 600$
$N = ma + mg = 60(3 + 9.8)$

3. A car travels counterclockwise around a flat circle of radius 50 m at a constant speed of 90 km/h. When the car is at point A as shown in the figure, what is the car's acceleration?

A) 12.5 m/s^2, North
B) 1.6 m/s^2, West
C) 1.6 m/s^2, East
D) 12.5 m/s^2, West
E) 12.5 m/s^2, East

$r = 50\ m$
Constant $V = 90\ km/h = 25\ m/s$
$a = 0$
$a = \frac{v^2}{r} = \frac{90 \times 90}{50}$



$V = \frac{2\pi r}{T}$
$a = \frac{v^2}{r} = \frac{25}{50}$

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$R = t_{High} \times V_0 \cos\theta$

$45 = t_{Height} \times 15 \times \cos 53$

$T = 5\ sec$

4. A ball is thrown from the edge of the top of a building with an initial velocity of 15 m/s at an angle of 53° above the horizontal. The ball strikes the ground a horizontal distance of 45 m from the base of the building. Assume that the ground is level. How tall is the building

$V_0 = 15\ m/s$

$\theta = 53°$

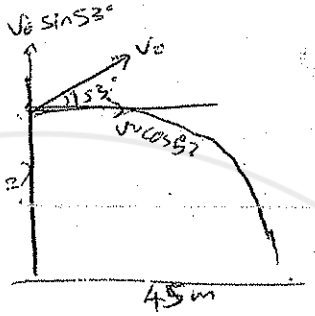
A) 75 m
B) 40 m
C) 37 m
D) 65 m
E) 25 m

$-h = V_0 \sin\theta\, t - \frac{gt^2}{2}$

$-h = -51^2$

$-h = V_0 \sin\theta\, t - \frac{gt^2}{2}$

$-h = -62.6$



$R = \frac{2 V_0 \sin\theta_0 \times V_0 \cos\theta}{g}$

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

$\frac{53 \times 2}{2}$

106

$t = 3.5\ s$

5. If the tension, T, is 33 N, M = 8 kg and the magnitude of the acceleration, a, is 4.0 m/s^2, what is the mass, m, of the suspended object? Assume that all surfaces and the pulley are frictionless?

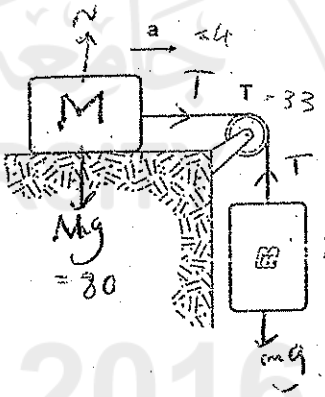
$-ma = T - mg$

$-m \times 4 = 33 - m \times 10$

$-4m = 33 - 10m$

$+10m \quad +10m$

$6m = 33$



$m\ a = 4$

A) 5.5 kg
B) 11 kg
C) 3.3 kg
D) 6.6 kg
E) 2.4 kg

$x(t) = 2t + t^3$

6. The velocity of an object moving in a straight line is given by $v(t) = 2 + 3t^2$, where t is in seconds and v is in m/s. the displacement of the object during the first 2 seconds of motion is:

$x = 2t + t^3$

Displacement $= \Delta x = x(2) - x(0)$

$= (4 + 8) - (0)$

$= 12\ m$

A) 20 m
B) 28 m
C) 4 m
D) 12 m
E) 0 m

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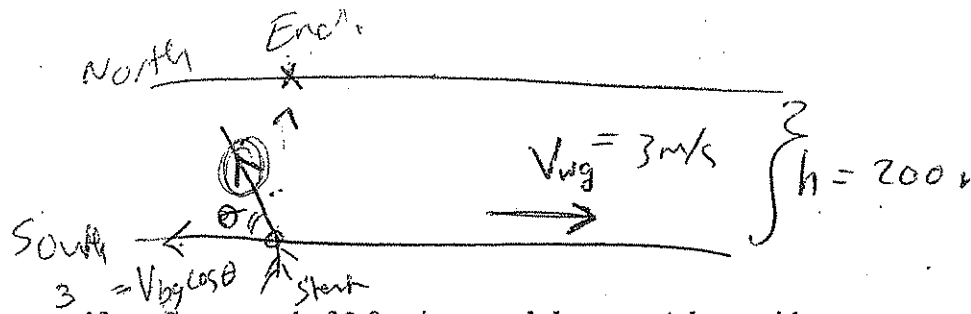
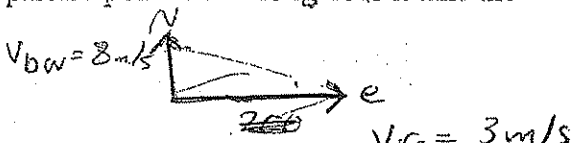


7. A 200-m wide river has a uniform flow speed of 3.0 m/s toward the east. A boat with a speed of 8.0 m/s relative to the water leaves the south bank and heads in such a way that it crosses to a point directly north of its departure point. How long does it take the boat to cross the river?



$V_{br} = ?$

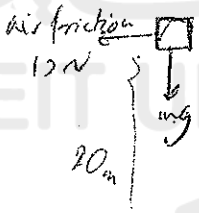
$V_{br} = +3\hat{i} + 8\hat{j}$

$|\vec{V_{br}}| = \sqrt{9+64} = 8.5$ m/s

$V = \frac{x}{t} \Rightarrow 8.5 = \frac{200}{t}$

A) 17 s
B) 25 s
C) 22 s
D) 27 s
E) 30 s

8. A 0.5 kg bird is flying with constant velocity at a hight of 20 m. The force of air friction on the bird is 12 N. The net force on the bird is:



$a = 0$

$\sum F_x = ma = 0$

$12 = 0$

$-ma = -mg \sin\theta$

$-10 = -10$

0

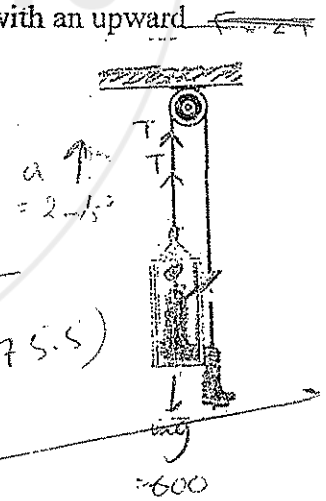
A) 5 N
B) 12 N
C) 17 N
D) 7 N
E) zero

9. A boy sitting in a chair that hangs from a massless rope, which runs over a massless, frictionless pully and back down to the boy's hand. The mass of the boy and the chair is 60 kg. With what force he must pull on the rope if he is to rise with an upward acceleration of 2 m/s^2.

$ma = 2T - mg$

$60 \times 2 = 2T - 600$

$120 = 2T - 600$



$t = \frac{h}{V_{bg}\sin\theta} = \frac{200}{8\sin(75.5)}$

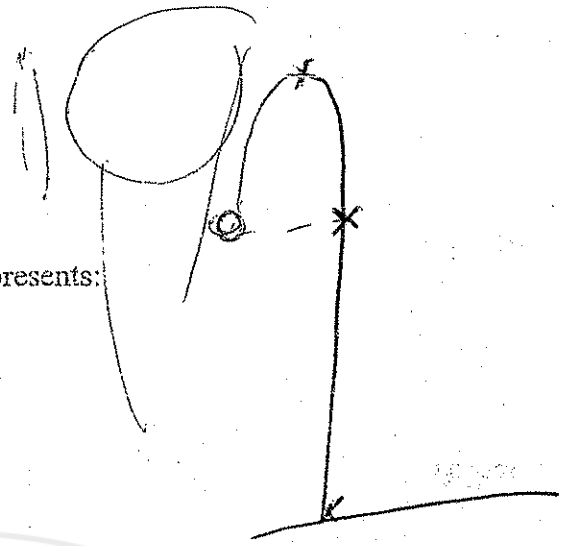
$t = 28.9$ sec

$3 = 8\cos\theta$

$\cos\theta = \frac{3}{8}$

$\theta = 75.5$

A) 720 N
B) 240 N
C) 300 N
D) 360 N
E) 600 N



10. The area under an acceleration-time graph represents:

A) speed
B) acceleration
C) change in acceleration
D) displacement
E) change in velocity

11. The angle between the vectors:
$\mathbf{A} = 2\mathbf{i} + 4\mathbf{j} - 5\mathbf{k}$ and $\mathbf{B} = 4\mathbf{i} - 5\mathbf{j} + 2\mathbf{k}$ is:

A) 45°
B) 119°
C) 37°
D) 29°
E) 61°

12. A balloon is ascending at a constant rate of 15 m/s and is 200 m above the ground when a stone is dropped from it. How long does the stone take to reach the ground?

A) 16 s
B) 5 s
C) 6.2 s
D) 3 s
E) 8 s

13. A particle starts from the origin at t = 0 with a velocity of $(16\mathbf{i} - 12\mathbf{j})$ m/s and moves in the xy plane with a constant acceleration of $\mathbf{a} = (3.0\,\mathbf{i} - 6.0\,\mathbf{j})$ m/s^2. What is the speed of the particle at t = 2.0 s?

A) 52 m/s
B) 39 m/s
C) 46 m/s
D) 43 m/s
E) 33 m/s

14. A book rests on a table. The reaction force to its weight is:

A) the force of the Earth on the table
B) the force of the book on the Earth
C) the force of the table on the book
D) the inertia of the book
E) the force of the Earth on the book

15. Newton's law of universal gravitation is $F = GMm/r^2$
Where F is the gravitatiuonal force between the masses M and m, r is the distance between them. The SI units of G are:

A) N.m.kg
B) N
C) $N.m^{-2}\ kg$
D) $N.m^2.kg^{-2}$
E) $N.kg^2$

$N = \frac{G(kg)^2}{m^2}$

$\frac{N.m^2}{kg^2} = G$

16. The position of a particle in meters is given by $x(t) = 32t - t^4$, where the time t is in seconds and x in meters. The particle momentarily stops at x =

A) 31 m
B) 24 m
C) 0 m
D) 48 m
E) 69 m

$V = 32 - 4t^3$

$0 = 32 - 4t^3$

$t^3 = 8$

$t = 2\ sec$

$x(2) = 64 - 16$

$= 48\ m$

17. The U.S.A. national debt in this year 2013 is about $17 trillion (one trillion = 10^{12}). If president Obama decides to pay the debt at the rate of $1000 per second, the time he needs to pay off the debt is:

A) 540 years
B) 2 years
C) 6 months
D) 1540 years
E) 54 years

$dept = 17 \times 10^{12}\ \$$

$rate = 1000\ \$/sec$

$V = \frac{x}{t} \Rightarrow 1000\$/sec = \frac{17 \times 10^{12}\ \$}{t\ (sec)}$

$t = 1.7 \times 10^{10}\ s$

$1\ year = 1 \times 365.25 \times 24 \times 3600$

$1\ year = 31557600\ sec$

$\approx 1.7 \times 10^{10}\ sec$

540 year.

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First Hour Exam

Physics 141 | Spring, 2014-15 | Time: 90 minutes

Student Name: [redacted] *Student No.:* [redacted]

- Write your name and student number in the above box.
- Check the class you are in by putting a (✓) mark in the appropriate cell.
- The exam consists of 15 multiple choice problems and one essay problem, solve the essay problem on the exam paper.
- Mark the correct answers of the multiple choice problems on the answer sheet.
- Turn in the whole exam sheets.

(✓)	Sec.	Instructor	Time		Room
( )	1	Ghassan Andoni	M, W	12:00 - 12:50	SCI215
( )	2	Isma'El Badran	M, W	10:00 - 10:50	SCI114
( )	3	Hebah Fatafta	S, W	11:00 - 11:50	SCI116
( )	4	Ghassan Andoni	M, W	09:00 - 09:50	SCI114
( )	5	Hebah Fatafta	S, W	13:00 - 13:50	SCI214
( )	6	Ghassan Andoni	M, W	13:00 - 13:50	SCI215
( )	7	Aziz Shawabkeh	M, W	14:00 - 14:50	SCI213
( )	8	Areej Abdel Rahman	M, W	08:00 - 08:50	SCI114

M.C./15	٥٩
Essay/5	
Total/20	

Answer Sheet (تنقل الإجابات على هذه الصفحة في الربع ساعة الأخيرة قبل تسليم ورقة الامتحان)

	a	b	c	d	e
1				/	
2	/				
3	/				
4	/				
5		/			
6				/	
7		/			
8					/
9		/			
10			/		
11		/			
12		/			
13	/				
14	/				
15				/	

USEFUL FORMULA and Constants

$g = 10\ m/s^2$

Kinematics equations in linear motion

1. $v = v_0 + at$
2. $x = x_0 + v_0 t + \frac{1}{2}at^2$
3. $v^2 = {v_0}^2 + 2a\Delta x$
4. $\vec{v} = \frac{1}{2}(v_1 + v_2)$

Relative motion

5. $\vec{v}_{AB} = \vec{v}_{AC} + \vec{v}_{CB}$

Projectile motion

6. $R = v^2 \sin(2\theta)/g$
7. $H = v^2 \sin^2(\theta)/2g$
8. $y = x\tan(\theta) - gx^2/2v_0^2\cos^2(\theta)$

Circular motion

9. $F = m\frac{v^2}{r}$

Friction and Drag forces

10. $f_k = \mu_k N$
11. $f_{s,max} = \mu_s N$
12. $f_D = \frac{1}{2}C\rho A v^2$

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1. Approximately how many times does an average human heart beat (يدق) in a lifetime (مدى الحياه)?

(a) 10^5
(b) 10^7
(c) 10^9
(d) 10^{11}
(e) 10^{13}

2. Express the speed of 4.50 km/h in units of ft/min. (1.00 m = 3.28 ft)

(a) 246 ft/min
(b) 0.246 ft/min
(c) 165 ft/min
(d) 82.3 ft/min
(e) 886 ft/min

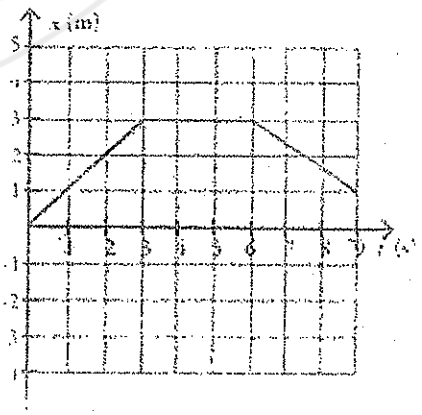
3. A bullet (رصاصة) is fired (أطلقت) straight up with an initial speed of 100.0 m/s. how long will the bullet be in the air?

(a) 20 s
(b) 25 s
(c) 30 s
(d) 40 s
(e) 80 s

4. Two objects are thrown from the top of a tall building and experience no appreciable (ملحوظ) air resistance. One is thrown up, and the other is thrown down, both with the same initial speed. Which statement is correct?

(a) The one thrown up has negative acceleration while the other has positive acceleration.
(b) The one thrown up has more displacement
(c) The one thrown down is traveling faster when hitting ground.
(d) They have the same time of flight.
(e) They are traveling at the same speed when hitting ground

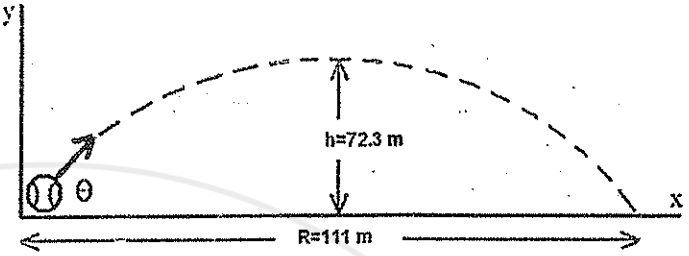
5. The figure shows the position of an object as a function of time. During the time interval from time t= 0.0 s to time t=9.0 s, The length of the path the object followed is



(a) 1 m
(b) 3 m
(c) 5 m
(d) 6 m
(e) 9 m

6. A projectile reaches a height of 72.3 m and lands 111 m from the launch point with no air resistance. The angle of launch (Θ) is?

(a) 20°
(b) 32°
(c) 45°
(d) 69°
(e) 85°



7. A 60.0 kg person rides in an elevator while standing on a scale (ميزان). The elevator is traveling downward but slowing at a rate of 2.00 m/s². The reading on the scale is

(a) 540 N
(b) 480 N
(c) 120 N
(d) 600 N
(e) 720 N

8. An object of mass 4.00 kg falls from rest subject to a frictional drag force given by $F_D = -bv^2$, where v is the speed of the object and $b = 2.5\,N.s^2/m^2$. What terminal speed will this object reach?

(a) 1.5 m/s
(b) 3.5 m/s
(c) 1.0 m/s
(d) 4.0 m/s
(e) 2.5 m/s

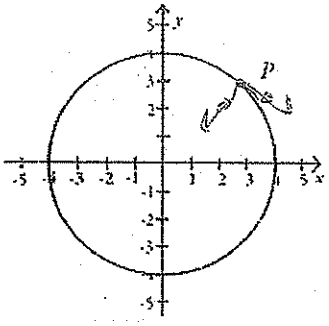
9. The position vector of a bee (نحلة) is given by $\vec{r} = -3t^2\hat{\imath} - (4t+3)\hat{\jmath} + \hat{k}$, where r is in meters and t is in seconds .The magnitude of the bee's acceleration is

(a) 2 m/s²
(b) 6 m/s²
(c) 8 m/s²
(d) 3 m/s²
(e) 4 m/s²

10. A boat travels at 5.0 km/h in still water (المياه الساكنة) aims at an angle such that it sails straight for the opposite bank of a 300.0 m wide river. If it reaches the opposite side in 0.1 h, what is the speed of the water in the river ?

(a) 3.2 km/h
(b) 5.0 km/h
(c) 4.0 km/h
(d) 2.3 km/h
(e) 4.5 km/h

11. Point P in the figure indicates the position of an object traveling at constant speed clockwise around the circle. Which arrow set best represent the directions of the velocity and acceleration of the object at point P respectively (بالترتيب)?



(a) ↘, ←
(b) ↘, ↙
(c) ↙, →
(d) ↗, ↘
(e) ↖, ↘

12. Given the two vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$, and $\vec{b} = \hat{i} + \hat{j} - 2\hat{k}$, The angle (in degrees) between $\vec{a} + \vec{b}$ and the y axis is

(a) 15
(b) 37
(c) 53
(d) 127
(e) 143

13. A 2 kg wooden block resting on a table is acted upon by a horizontal force of 8 N. If the coefficients of friction μ_s and μ_k between the block and the table are 0.5 and 0.3 respectively, then the force of friction between the block and the table is?

(a) 6 N
(b) 10 N
(c) 12 N
(d) 8 N
(e) 4 N

14. A spring stretches by 21.0 cm when a 135 N object is attached. What is the weight of a fish that would stretch the spring by 31.0 cm

(a) 199 N
(b) 91.0 N
(c) 279 N
(d) 469 N
(e) 145 N

15. Given the two none-zero vectors $\vec{A}$ and $\vec{B}$. If $|\vec{A} - \vec{B}| = |\vec{A} + \vec{B}|$, then the angle between the two vectors $\vec{A}$ and $\vec{B}$ is

(a) 0°
(b) 30°
(c) 45°
(d) 90°
(e) 180°

BIRZEIT UNIVERSITY 2017 2016

Essay Problem:

A car is 55 m from a stop sign and is traveling towards the stop sign at 20.0 m/s. The driver suddenly realizes that she must stop the car. If it takes 0.25 s for the driver to apply the brakes,

a) what must be the magnitude of the constant deceleration of the car after the brakes are applied so that the car will come to rest at the stop sign?

$V = V_0 + at$

$0 = 20 + a \cdot t$

$a = \frac{-20}{t}$

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

$55 = 20t + \frac{1}{2} a t^2$

$55 = 20t + \frac{1}{2} \cdot \frac{-20}{t} \cdot t^2$

$55 = 20t + 10t$

$55 = 30t$

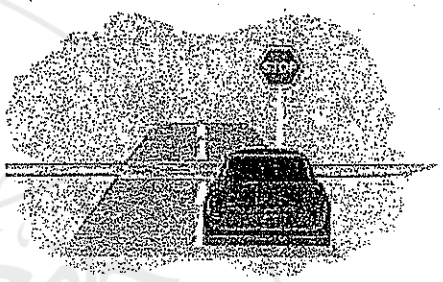
$t = 5.5$

$0 = 20 + a \cdot 95$

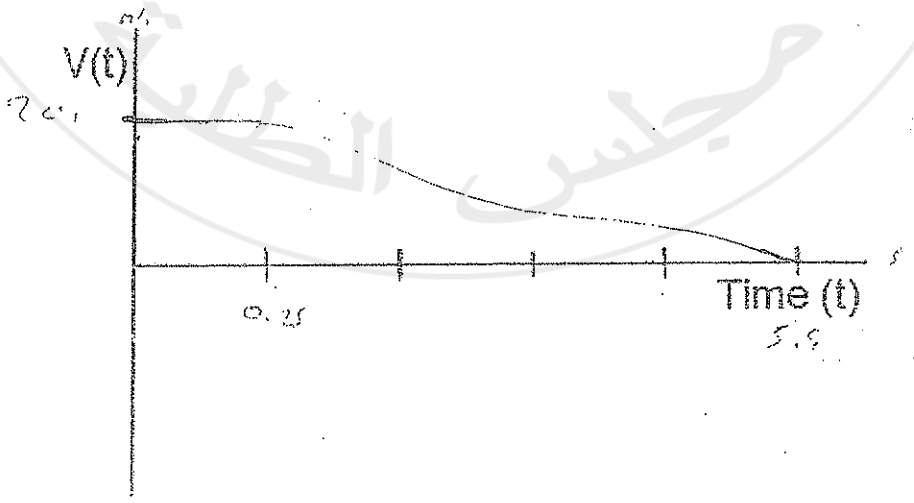
$\frac{-20}{95} = a$

$a = \frac{-20}{95}\ m/s^2$

$a = 0.45\ m/s^2$



b) On the adjacent graph paper, plot the velocity of the car as a function of time, indicate (أشر إلى) the starting point, the end point and t = 0.25 seconds on the graph



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2017 2016

20

BIRZEIT UNIVERSITY
First Hour Exam

Physics 141
Fall, 2015-16

Time: 90 minutes

Student Name: Osama Khlaif *Student No.:* 1151626

Please read these instructions and remarks before starting the exam:

- Write your name and student number in the above box.
- Check the class you are in by putting a (✓) mark in the appropriate cell.
- The exam consists of 20 multiple choice problems, answer all of them.
- Mark the correct answers of the multiple choice problems on the answer sheet.
- Turn in the whole exam sheets.

✓	Sec	Instructor Name	Classes Time		✓	Sec	Instructor Name	Classes Time	
○	1	Sa'Eda Talahmeh	M, W	11:00 - 11:50	○	11	Hebah Fatafta	S, W	14:00 - 14:50
○	2	Areej A. Rahman	M, W	12:00 - 12:50	◉	12	Hebah Fatafta	M, W	08:00 - 08:50
○	3	Hazem Abu Sara	S, W	09:00 - 09:50	○	13	Hazem Abu Sara	S, W	08:00 - 08:50
○	4	Isma'El Badran	S, W	12:00 - 12:50	○	14	Areej A. Rahman	M, W	09:00 - 09:50
○	5	Ghassan Abbas	M, W	14:00 - 14:50	○	15	Ghassan Abbas	M, W	13:00 - 13:50
○	6	Ghassan Andoni	M, W	14:00 - 14:50	○	16	Areej A.Rahman	M, W	14:00 - 14:50
○	7	Sa'Eda Talahmeh	M, W	13:00 - 13:50	○	17	Areej A. Rahman	M, W	08:00 - 08:50
○	8	Aziz Shawabkeh	M, W	13:00 - 13:50	○	18	Isma'El Badran	S, W	09:00 - 09:50
○	9	Sharif Ghithan	S, M	13:00 - 13:50	○	19	Areej A.Rahman	M, W	15:00 - 15:50
○	10	Hebah Fatafta	M, W	12:00 - 12:50	○	20	Sharif Ghithan	S, W	12:00 - 12:50

Answer Sheet

(تنقل الإجابات على هذه الصفحة في الربع ساعة الأخيرة قبل تسليم ورقة الامتحان)

	a	b	c	d	e
1			✓		
2				✓	
3	✓				
4			✓		
5				✓	
6				✓	
7					✓
8		✓			
9					✓
10			✓		
11				✓	
12	✓				
13				✓	
14			✓		
15		✓			
16	✓				
17				✓	
18				✓	
19			✓		
20					✓

USEFUL FORMULA and Constants

$g = 10\ m/s^2$

Kinematics equations in linear motion

1. $v = v_0 + at$
2. $x = x_0 + v_0 t + \frac{1}{2}at^2$
3. $v^2 = v_0^2 + 2a\Delta x$
4. $\bar{v} = \frac{1}{2}(v_1 + v_2)$

Relative motion

5. $\vec{v}_{AB} = \vec{v}_{AC} + \vec{v}_{CB}$

Projectile motion

6. $R = v^2 \sin(2\theta)/g$
7. $H = v^2 sin^2(\theta)/2g$
8. $y = x\tan(\theta) - gx^2/2v_0^2 cos^2(\theta)$

Circular motion

9. $F = m\frac{v^2}{r}$

$v_1^2 = v_0^2 + 2g\Delta y$

$= 2(10)(125-h)$

$= 20(125-h)$

$\therefore v_1 = \sqrt{20}\sqrt{125-h}$

$v_1 = 2\sqrt{5}\sqrt{125-h}$

$\frac{2\times10\times(40)}{20} = 125-h$

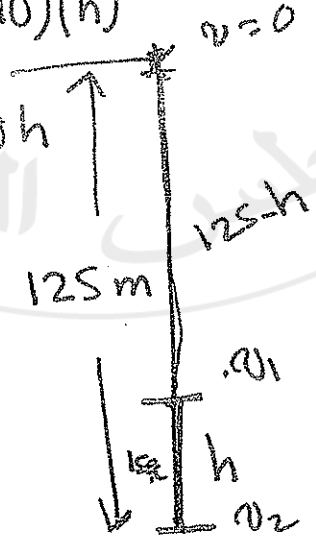
$h = 45$

$v_2^2 = v_1^2 + 2g\Delta y$

$\Rightarrow v_2^2 = 20(125-h) + 2(10)(h)$

$= 2500 - 20h + 20h$

$\Rightarrow v_2 = \sqrt{2500} = 50$



But ~~$v_2 = v_1 + gt$~~

$a = \frac{v_2 - v_1}{t}$

$\Rightarrow v_2 = v_1 + g = v_1 + 10 \Rightarrow \sqrt{20}\sqrt{125-h} = 40$

$\Rightarrow 20(125-h) = 40 \times 40$

$125 - h = 80$

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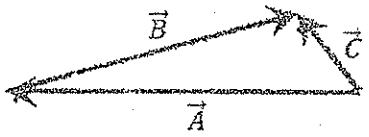
1. For the vectors shown in the figure, in terms of vectors $\vec{A}$ and $\vec{C}$, vector $\vec{B}$ is equal to

(a) $\vec{B} = \vec{A} + \vec{C}$
(b) $\vec{B} = \vec{A} - \vec{C}$
(c) $\vec{B} = \vec{C} - \vec{A}$
(d) $\vec{B} = 2\vec{A} - \vec{C}$
(e) $\vec{B} = \vec{A} - 2\vec{C}$

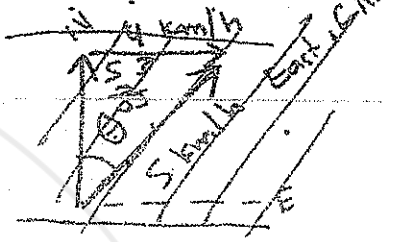


$\vec{A} + \vec{B} = \vec{C}$
$\vec{B} = \vec{C} - \vec{A}$

2. A swimmer is able to swim through still water at 5.0 km/h. She wishes to cross the river directly north. The current flows from west to east at 4.0 km/h. In what direction should she swim to make the swimming along a straight line to the north?

(a) 45° west of north
(b) 37° west of north
(c) 45° east of north
(d) 53° west of north
(e) 37° east of north

$\sin\theta = \frac{4}{5}$
$\theta = \sin^{-1}(0.8)$
$= 53^\circ$



3. An object is moving to the right, and is experiencing a net force that is directed to the right. The magnitude of the force is decreasing with time. The speed of the object is

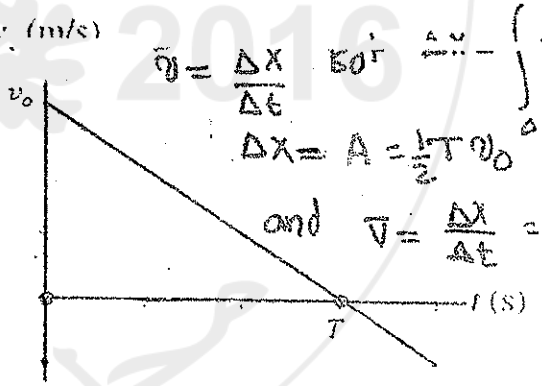
(a) increasing
(b) decreasing
(c) remaining constant
(d) remaining zero all the time
(e) none of the above

$F = ma$ (a) is decreasing
But v is still increasing.

4. The velocity of a particle moving along x-axis is plotted against time. The average velocity of the particle during T seconds is:

(a) v_o
(b) v_o/T
(c) $v_o/2$
(d) $-v_o/T$
(e) $-v_o/2$

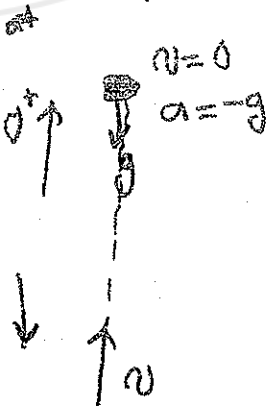
$\Delta x = \frac{1}{2} T v_0$



$\bar{v} = \frac{\Delta x}{\Delta t}$ for $\int_0^T v\,dt$
$\Delta x = A = \frac{1}{2} T v_0$
and $\bar{v} = \frac{\Delta x}{\Delta t} = \frac{v_0}{2}$

5. A ball is shot vertically upward into the air. Which of the following correctly describes the direction of velocity and acceleration of the ball at its maximum elevation?

(a) Velocity up, acceleration up
(b) Velocity zero, acceleration zero
(c) Velocity down, acceleration down
(d) Velocity zero, acceleration down
(e) Velocity zero, acceleration up



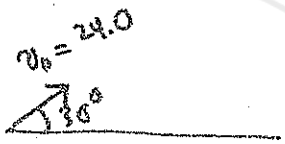
6. An object has a position vector given by $\vec{r} = [2.0 + 3.0\,t]\hat{i} + [3.0 - 2.0\,t^2]\hat{j}$, where all quantities are in SI units. What is the magnitude of the velocity of the object at time t = 1.0 s?

(a) 4.00 m/s
(b) 1.00 m/s
(c) 2.00 m/s
(d) 5.00 m/s
(e) 3.50 m/s

$$\vec{v} = \frac{d\vec{r}}{dt} = \frac{d}{dt}[2+3t]\hat{i} + (3-2t^2)\hat{j}$$
$$= 3\hat{i} - 4t\hat{j}$$
when $t=1 \Rightarrow \vec{v} = 3\hat{i} - 4\hat{j} \Rightarrow |\vec{v}| = \sqrt{9+16} = 5$

7. A boy throws a stone from level ground with an initial velocity of 24.0 m/s at 30.0° above the horizontal. How long does it take the stone to land on ground? t_f

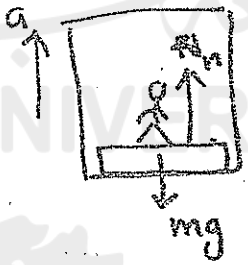
(a) 0.6 s
(b) 0.8 s
(c) 1.2 s
(d) 2.0 s
(e) 2.4 s



$$v_y = v_0 \sin\theta - gt$$
$$t_m = \frac{v_0 \sin\theta}{g}$$
$$t_f = 2\left(\frac{v_0 \sin\theta}{g}\right) = \frac{2(24)\left(\frac{1}{2}\right)}{10} = 2.4 \text{ sec}$$

8. A 60 kg girl stands on a scale inside a moving elevator. The scale reads 660 N. The acceleration of the elevator is

(a) 1.0 m/s² downward
(b) 1.0 m/s² upward
(c) 2.0 m/s² downward
(d) 2.0 m/s² upward
(e) 0.0 m/s²



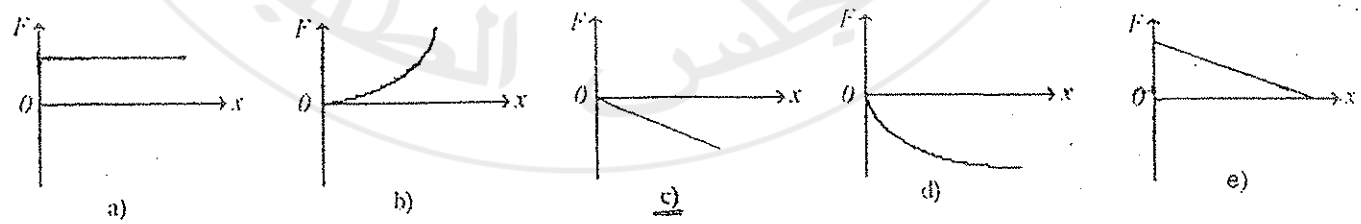
$$\Sigma F = ma$$
$$\Rightarrow n - mg = ma$$
$$\Rightarrow 660 - 600 = 60\,a$$
$$\Rightarrow a = +1 \text{ m/s}$$

9. Given the two vector $\vec{A} = 2\hat{i} + 8\hat{j}$ and $\vec{B} = 3\hat{i} - \hat{j}$, the magnitude of vector $\vec{C} = \vec{A} + 2\vec{B}$ is

(a) 14.0 units
(b) 12.0 units
(c) 4.0 units
(d) 6.0 units
(e) 10.0 units

$$\vec{C} = \vec{A} + 2\vec{B}$$
$$= 2\hat{i} + 8\hat{j} + 2(3\hat{i} - \hat{j})$$
$$= 2\hat{i} + 8\hat{j} + 6\hat{i} - 2\hat{j} = 8\hat{i} + 6\hat{j}$$
$$|C| = \sqrt{36+64} = \sqrt{100} = 10$$

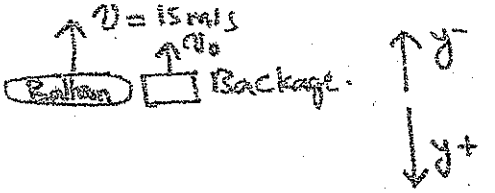
10. Which of the graphs in the figure best illustrates Hooke's Law (F vs x)? $F = -kx$



(a) Graph a)
(b) Graph b)
(c) Graph c)
(d) Graph d)
(e) Graph e)

11. A package is dropped from a balloon moving upward at 15 m/s. If it takes 16.0 s before the package strikes the ground, how high above the ground was the package when it was released if air resistance is negligible?

(a) 1200 m
(b) 810 m
(c) 1520 m
(d) 1040 m
(e) 1280 m



$\Delta y = v_0 t + \frac{1}{2} g t^2$

$= -15t + 5t^2$

$\Delta y = -15(16) + 5(16)^2 = 1040$ m

12. A fan of radius 10 cm completes one revolution in 3.14 seconds. The acceleration (in m/s²) of a point on the rim (حافة) of the fan is

$r = 10$ cm $= 0.1$ m

$T = 3.14$ secs

(a) 0.4
(b) 1.0
(c) 0.4 π
(d) 1.4 π
(e) 9.9

But $T = \frac{2\pi r}{v} \Rightarrow T^2 = 4\pi^2 r \left(\frac{r}{v^2}\right)$

$\Rightarrow T^2 = \frac{4\pi^2 r}{a} \Rightarrow a = \frac{4\pi^2 (0.1)}{\pi^2} = 0.4\pi$

13. A moving car, when applied the brakes, stopped in a distance of 200 m. If the car applied a constant deceleration of 1 m/s² during the stopping process, then the initial speed of the car was

(a) 10 km/h
(b) 20 km/h
(c) 57 km/h
(d) 72 km/h
(e) 90 km/h

(a)

$v^2 = v_0^2 - 2a\Delta x$

$\Rightarrow v_0^2 = 2a\Delta x$

$= 2(1)(200) = 400$

$\frac{2a \text{ m}}{s^2}\left(\frac{3600 s^2}{1 h}\right)\left(\frac{1 km}{1000 m}\right) = 72$ km/h $\quad v_0 = 20$ m/s

14. The equation of motion of an object is given by $x(t) = at - bt^2$, where x is in meter, t in sec, and a and b are constants. The units of a and b must be respectively

(a) m/s², m/s³
(b) m.s, m/s³
(c) m/s, m/s²
(d) m/s², m/s
(e) m.s², m.s³

$x = at - bt^2$

$(m) = (\;)(sec) - (\;)sec^2$

$\frac{m}{sec}$ $\quad \frac{m}{sec^2}$

15. In going from Birzeit to Ramallah, the number of rotations that a wheel of the car will make during the trip is approximately

(a) 5×10^2 rotation
(b) 5×10^3 rotation
(c) 5×10^4 rotation
(d) 5×10^5 rotation
(e) 5×10^6 rotation

Assume that distance from

Ramallah → Ber.2. $= 20$ km

and r of the wheel $= 40$ cm $= 0.4 \times 10^{-3}$ km

* For the wheel: $2\pi r = 2\pi (0.4 \times 10^{-3})$

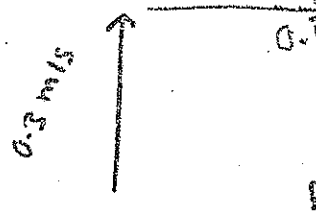
$= 2 \times 3 \times 0.4 \times 10^{-3}$

$= 2.5 \times 10^{-3}$ km

# of rotations $= \frac{20 \text{ km}}{2.5 \times 10^{-3}} = 8 \times 10^3 = 5 \times 10^3$

16. A 0.2 kg toy car drives North at a speed of 0.3 m/s, suddenly, after 0.5 seconds, it is found moving East at a speed of 0.4 m/s. The magnitude of the average net force acting on the car during this interval is

(a) 0.2 N
(b) 0.5 N
(c) 1.0 N
(d) 2.0 N
(e) 3.0 N



$\Delta \vec{v} = \vec{v}_2 - \vec{v}_1 = (0.3\hat{j} - 0.4\hat{i})$

$\vec{a} = \frac{\Delta \vec{v}}{\Delta t} = -\frac{3}{5}\hat{j} + \frac{4}{5}\hat{i} \Rightarrow |\vec{a}| = 1$

$F = ma = 0.2\,kg\left(1\,\frac{m}{sec}\right) = 0.2\ N$

17. The acceleration of an object as a function of time is given by $a(t) = (3.0 m/s^3)t$, where t is in seconds. If the object is at rest at time t = 0.0 s, what is the velocity of the object at t = 4.0 s?

(a) 35.0 m/s
(b) 0.00 m/s
(c) 12.0 m/s
(d) 24.0 m/s
(e) 48.0 m/s

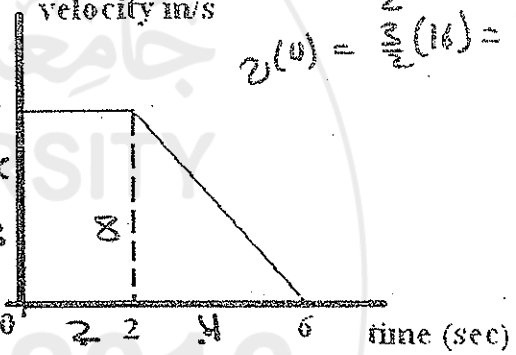
$a(t) = 3t$ But $v(0) = 0$

$\Delta v = \int_0^t 3t\,dt = \frac{3}{2}t^2$ Then

$v(t) = \frac{3}{2}t^2$

$v(4) = \frac{3}{2}(16) = 24$

18. The figure shows velocity vs time for a particle that started at x = -10m. Its position at t = 6 sec is:



(a) 38 m
(b) 32 m
(c) 42 m
(d) 22 m
(e) 18 m

$\Delta x = \text{Area Under Curve}$

$= 2(8) + \frac{1}{2}\left(\frac{8}{4}\right)(8)$

$= 32$

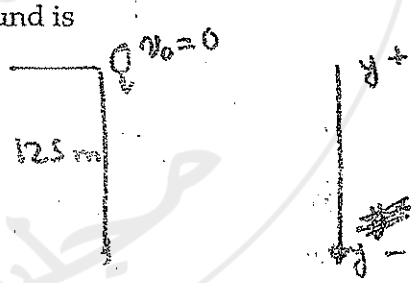
$\Delta x|_{[0,6]} = x(6) - x(0) = 32$

$x(6) - (-10) = 32 \Rightarrow x(6) = 22$

19. A ball is dropped from the top of a building 125 m high. The distance travelled by the ball during the last second of motion before hitting ground is

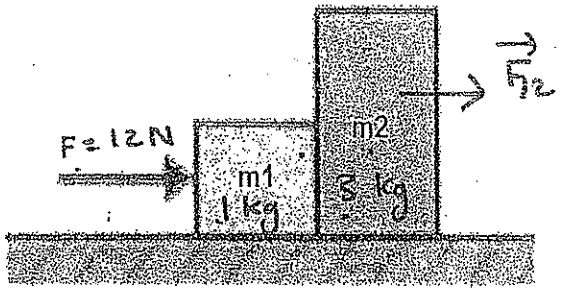
(a) 20 m
(b) 25 m
(c) 45 m
(d) 65 m
(e) 80 m

$y(t) = y_0 + \frac{1}{2}gt^2$



20. In the adjacent figure, if F= 12N, m_1=1 kg, m_2 = 3 kg, then the force acting on m_2 due to m_1 is:

(a) 0 N
(b) 12 N
(c) 3 N
(d) 5 N
(e) 9 N



$F = (m_1 + m_2)a$

$12 = (1+3)a \Rightarrow a = \frac{12}{4} = 3 m/s^2$

$F_{12} = m_2 a = \frac{3}{2}(3)$

BIRZEIT UNIVERSITY
Spring, 2015-16

First Hour Exam
Physics 141

Sunday, April 3rd ,2016
Time: 90 minutes

12/20 +2

Student Name: Waseem Awashra *Student No.:* 115.2168

Please read these instructions and remarks before starting the exam:

- Write your name and student number in the above box.
- Check the class you are in by putting a (✓) mark in the appropriate cell.
- The exam consists of 20 multiple choice problems, answer all of them.
- Mark the correct answers of the multiple choice problems on the answer sheet.
- Turn in the whole exam sheets.

✓	#	Instructor	Time	✓	#	Instructor	Time
☐	1	Sa'Eda Talahmeh	MW 12:00 - 12:50	☐	6	Ghassan Andoni	MW 13:00 - 13:50
☑	2	Sa'Eda Talahmeh	MW 10:00 - 10:50	☐	7	Hebah Fatafta	MW 14:00 - 14:50
☐	3	Ra'Ed Hasan	SW 11:00 - 11:50	☐	8	Aziz Shawabkeh	MW 08:00 - 08:50
☑	4	Sa'Eda Talahmeh	MW 09:00 - 09:50	☐	9	Hebah Fatafta	MW 15:00 - 15:50
☐	5	Hazem Abu Sara	SW 13:00 - 13:50	☐	10	Ra'Ed Hasan	MW 08:00 - 08:50

Answer Sheet

	a	b	c	d	e
1			X		
2					X
3				X	
4		X			
5					
6	X				
7			X		
8			X		
9	X				
10		X			
11	X				
12			X		
13	X				
14	X				
15		X			
16					X
17				X	
18	X				
19			X		
20					X

USEFUL FORMULA and Constants

$g = 10\ m/s^2$

Kinematics equations in linear motion

1. $v = v_0 + at$
2. $x = x_0 + v_0 t + \frac{1}{2}at^2$
3. $v^2 = {v_0}^2 + 2a\Delta x$
4. $\bar{v} = \frac{1}{2}(v_1 + v_2)$

Relative motion

5. $\vec{v}_{AB} = \vec{v}_{AC} + \vec{v}_{CB}$

Projectile motion

6. $R = v^2 \sin(2\theta)/g$
7. $H = v^2 sin^2(\theta)/2g$
8. $y = x\tan(\theta) - gx^2/2v_0^2 cos^2(\theta)$

Circular motion

9. $F = m\frac{v^2}{r}$

Friction and Drag forces

10. $f_k = \mu_k N$
11. $f_{s,max} = \mu_s N$
12. $D = \frac{1}{2}C\rho A v^2$

$0 = V_0^2 - 5 \times 2 \times 2.5$

$2d = C\rho V^2 A$

$V^2 = \frac{2d}{C\rho A}$

$V = 20\ m/s$

$\Delta x = 50$

F

$N\ M\ F =$

$V^2 = \sqrt{\frac{2d}{C\rho A}}$

$V_2 = \sqrt{\frac{2d}{C\rho 2A}}$

$= \sqrt{\frac{d}{C\rho A}}$

$V_2^2 = \frac{d}{C\rho A} \quad / 2$

$2V_2 = V_1$

$V_2 = \frac{1}{2}V_1$

$V_1^2 = \frac{2d}{C\rho A}$

$V_1 = 2V_2$

2

BIRZEIT UNIVERSITY 2017 2016

1. An object is moving, uniformly, in a circular path of radius 10 cm completes one revolution in π seconds. The acceleration of the object is

(a) 0.4 π m/s²
(b) 1.0 m/s²
(c) 0.4 m/s²
(d) 1.4 π m/s²
(e) 9.9 m/s²

$r = 0.1\ m$ $\quad a = \frac{V^2}{r}$
$t = \pi$
$a = \frac{(0.2)^2}{0.1}$ $\quad V = \frac{2\pi r}{t}$
$= \frac{2 \times 0.1 \times \pi}{\pi}$
$V = 0.2$

2. A vector of magnitude 3 units is added to another vector of magnitude 4 units. The resultant vector can't have a magnitude

$A = 3, B = 4$
$A + B = 10$

(a) = 1 unit
(b) = 2 units
(c) < 3 units
(d) = 5 units
(e) > 7 units

3. A banked circular road of radius 49 meters is tilted at an angle of 22 degrees. Assuming no friction between the road and the tires of the car, the maximum speed that the car can have without skidding out of the road is about

$r = 49\ m, \theta = 22°$
$= 14 \times 3.6$
$50\ km/h$
$V_{max} = \sqrt{\tan 22 \times r \times g}$
$= \sqrt{49 \times 10 \times \tan 22}$
$= 14\ m/s$

(a) 20 km/h
(b) 25 km/h
(c) 30 km/h
(d) 50 km/h
(e) 70 km/h

4. If the effective area of a sky diver is doubled (becomes 2 times as the original area), then compared with the original terminal speed, her new terminal speed will be

$a_2 = 2a_1$
$V_2 = \frac{1}{2} V_1$

(a) doubled
(b) Half as much
(c) 1.73 times as much
(d) 0.71 times as much
(e) The same

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

5. A small bird starts from rest flies in a horizontal circle of radius π/2 meters. If it increases its speed at the rate of 3.0 m/s², its acceleration when it completes one turn is approximately

$x_0 = 0$
$V_F = V_0 + at$
$r = \frac{\pi}{2}$
$a = \frac{V^2}{r}$
$=$
$a = \sqrt{a_c^2 + a_t^2}$
$a_t = 3\ m$
$a_c = \frac{V^2}{r}$
$V^2 = 2 * 2\pi / \frac{\pi}{5}$ $\quad = 6\pi^2$

(a) 6.0 m/s²
(b) 1.0 m/s²
(c) 3.0 m/s²
(d) 4.0 m/s²
(e) 7.0 m/s²

6. The equation of motion of an object is given by $x(t) = bt + ct^3$, where x is in m, t in sec, b and c are constants. The units of b and c must be respectively

(a) m/s, m/s³
(b) m.s, m/s³
(c) m/s, m/s²
(d) m/s², m/s
(e) m.s², m.s³

$x = bt$
$m = b\,s$
$b = \frac{m}{s}$

$ct^3 = m$
$c\,s^3 = m$
$c = \frac{m}{s^3}$

7. A ball is thrown with initial velocity of 50 m/s at an angle θ =37 with the horizontal. The time needed by the ball to have its velocity perpendicular to its acceleration is:

(a) 1.5 seconds
(b) 4.5 seconds
(c) 3.0 seconds
(d) 6.0 seconds
(e) 9.0 seconds

$V_0 = 50$, 37°
$V_x = V_0 \cos 50$
$V \perp a$
$t_F = \frac{V_0 \sin\theta}{g}$
$t_{as=6}$
$t_{(V=0)} = 3$
$= 3$

8. The acceleration of an object as a function of time is given by $a(t) = 2.0\ t$ m/s², where t is in seconds. If the object is at rest at time t = 0.0 s, then the velocity of the object at time t = 5.0 s is?

(a) 45.0 m/s
(b) 0.00 m/s
(c) 25.0 m/s
(d) 10.0 m/s
(e) 125.0 m/s

$t_0 = 0$
$\int a = V$
$t^2 \Big|_0^t$
$V = t^2$

9. A swimmer is able to swim through still water at 5.0 km/h. She wishes to cross directly to the north a 400 m wide river. The current flows from west to east at 3.0 km/h. how long does it take her to cross the river?

(a) 0.1 hour
(b) 0.3 hour
(c) 0.4 hour
(d) 0.5 hour
(e) 0.2 hour

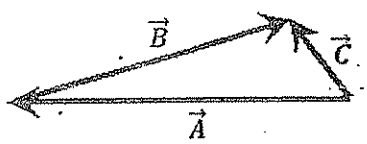
V_{PW}
5 km
400 m
3 km
V_{WE}
V

$25 = V^2 + 9$
$V^2 = 25 - 9$
$V = 4$

$V = \frac{400}{2}$
$\frac{9}{1} = \frac{400}{2}$
$\frac{9}{1} = \frac{0.9}{2}$
$42 = \frac{4}{10}$
$2 = \frac{1}{10}$

10. For the vectors shown in the figure, which statement is true

(a) $\vec{C} = \vec{A} - 2\vec{B}$
(b) $\vec{C} = \vec{A} + \vec{B}$
(c) $\vec{A} = 2\vec{C} - \vec{B}$
(d) $\vec{C} = \vec{B} - \vec{A}$
(e) $\vec{C} = \vec{A} - \vec{B}$



$B + A = C$

$C =$

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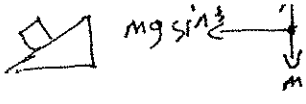
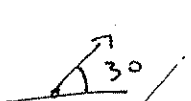
$Mg \sin 30 = Ma$ $\quad a = 10$



$N = mg$

11. A wooden block starts from rest on a smooth inclined plane which makes an angle of 30 degrees with the horizontal. The speed of the block after it goes 2.5 m down the incline is

(a) 5 m/s
(b) 2 m/s
(c) 10 m/s
(d) 12 m/s
(e) 15 m/s



$V = V_x \cos 30 + V_y \sin 30$
$= V_x \frac{9}{10} + \frac{1}{5} V_y$

$2.5 = (0+V)t$
$2.5 = Vt$
$V = \frac{2.5}{t}$

12. A 4.0-kg mass attached to the end of a string swings in a vertical circle of radius 2.0 m. When the mass is at its highest point, the speed of the mass is 5.0 m/s. At this instant what is the magnitude of the tension in the string?

(a) 10 N
(b) 50 N
(c) 90 N
(d) 120 N
(e) 150 N

$m = 4$, $r = 2$, $V = 5$

$a = \frac{25}{2}$ $\quad a = 12.5$ $\quad a = \frac{V^2}{r}$

$T - mg = m \times \frac{1}{8}$
$T - 4 \times 10 = \frac{4}{8}$

$T - 40 = \frac{1}{2}$
$T - 40 = 4 \times \frac{25}{2}$
$T - 40 = 50$
$T = 90\,N$

13. A boy runs North at a speed of 7.0 m/s, then East at 7.0 m/s. If it took the boy 1.0 second to change his direction, what is the magnitude and direction of the average acceleration of the boy?

(a) 10 m/s², South -East
(b) 10 m/s², North -East
(c) 7 m/s², South -East
(d) 7 m/s², South -West
(e) 14 m/s², South -West

$V = 7\hat{i} + 7\hat{j}$

$\sum F = \frac{\Delta V}{\Delta t}$

$9 + 16 \quad V_0 = 5$

14. An object starts at the origin, has an initial velocity $\vec{v}_i = (3\hat{i} - 4\hat{j})$ m/s, and has a constant acceleration $\vec{a} = (-1\hat{i} + 4\hat{j})$ m/s², the maximum positive x-coordinate that the object reached is

(a) $x_{max} = 3.0$ m
(b) $x_{max} = 4.5$ m
(c) $x_{max} = 1.5$ m
(d) $x_{max} = 0.5$ m
(e) $x_{max} = 6.0$ m

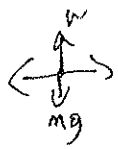
$a = 4$

$V_F = V_0 + at$
$\Delta x = \frac{1}{2}(V_0 + V_F)t$

$0 = 25 + 2a\Delta x$
$0 = 25$ $\quad 25 = 2 \times 4 \Delta x$
$\Delta x = \frac{25}{5}$

15. A car is driving along a straight horizontal road at a speed of 20.0 m/s. The driver applies the brakes and the car comes to a rest uniformly in a distance of 50 m. What was the coefficient of kinetic friction between the wheels of the car and the road?

(a) 0.30
(b) 0.25
(c) 0.50
(d) 0.40
(e) 0.60



$V = 20$ m/s, $\Delta x = 5$ $\quad \mu_k$

$t = 2.5$

$mg = N$

$F_K = F$

$N\mu_k = ma$

$\frac{V}{1} = \frac{\Delta x}{t}$

$\Delta x = Vt$

$t = \frac{\Delta x}{V}$

$20 =$

16. The number of table tennis balls that can fit inside a one cubic meter barrel is approximately

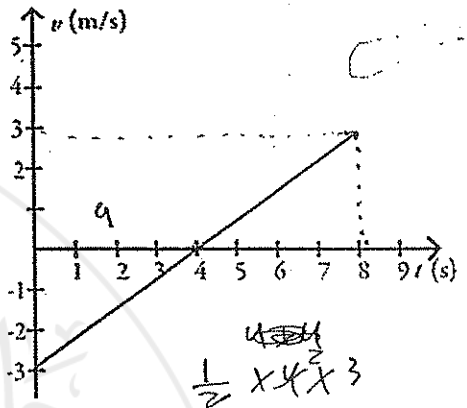
(a) 2×10^6
(b) 2×10^2
(c) 2×10^4
(d) 2×10^8
(e) 2×10^9

$\frac{3}{4}\pi r^3 \; 1\,m^3$

2.94375

$n = \frac{1\,m^3}{8}$

17. The motion of a particle along the x-axis is described in the velocity versus time graph shown in the figure. If the particle starts at x=0, then the maximum distance reached in the negative x-direction is

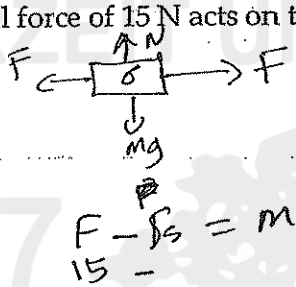


(a) 3 m
(b) 4 m
(c) 8 m
(d) 6 m
(e) 2 m

$\frac{1}{2} \times 4 \times 3$

6 m

18. An object of mass M = 6kg, rests on a horizontal rough surface that has $\mu s = 0.3$ and $\mu k = 0.2$. An applied horizontal force of 15 N acts on the object. The magnitude of the frictional force is:



(a) 18 N
(b) 25 N
(c) 9 N
(d) 32 N
(e) 15 N

$mg = N \Rightarrow N = 60$

$F_s = \frac{3}{10} \times 60$ (18)

$F_s = 18$

$F - f_s = ma$

$15 -$

19. A 50 kg girl stands on a scale inside a moving elevator. The scale reads 450 N. The acceleration of the elevator is

(a) 2.0 m/s² downward
(b) 1.0 m/s² upward
(c) 1.0 m/s² downward
(d) 2.0 m/s² upward
(e) 0.0 m/s²

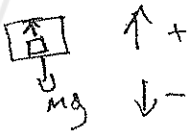
$N - mg = ma$

$450 - 50 \times 10 = 50 \times a$

$450 - 500 = 50\,a$

$-50 = 50\,a$

$a = -1$



20. A package is dropped from a helicopter flying horizontally. the package took 12 seconds to hit ground, how high above the ground was the package when it was released

(a) 1200 m
(b) 810 m
(c) 520 m
(d) 1040 m
(e) 720 m

$t = \sqrt{\frac{2y}{g}}$

$12 = \sqrt{\frac{2xy}{10}}$

$12 = \sqrt{\frac{y}{5}}$

$\frac{144}{1} = \frac{y}{5}$ $\quad y =$

April 3rd 2016 حلول فورم Key Phy 141 // مركز تصوير العلوم

Q1 $r = 0.1\,m$, $t = H$, $V = \frac{2\pi \cdot 0.1}{H} = 0.2\ m/s$, $a = \frac{(0.2)^2}{0.1} = 0.4\ m/s^2$

Q2 $3 + 4 = 7$ (أقصى قيمة لما تكون الزاوية بين اتجاهين ٩٠) $\xrightarrow{3}\xrightarrow{4}$

∴ can't have magnitude > 7 unit

Q3 $V_{max} = \sqrt{\tan\theta\, rg} = \sqrt{\tan 22 \times 99 \times 10}$

$= 19\ m/s$

$19 \times 3.6 = 50\ km/h$

Q4 $F_d = \frac{1}{2} C \rho A V^2$, $\frac{V_1}{V_2} = ?$ (ρ ثابت لنفس المادة)

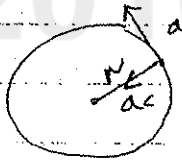
$D = CAV^2 \Rightarrow V^2 = \frac{D}{CA}$ // $V_1 = \sqrt{\frac{D}{CA}}$

$V_2 = \sqrt{\frac{D}{C\,2A}} = \frac{1}{\sqrt{2}} \times \sqrt{\frac{D}{CA}} =$

$= 0.71$ time as much

Q5 $r = \frac{H}{2}$, $a_t = 3.0\ m/s^2$

$a_c = \frac{V^2}{r}$, $V = ??$



$V^2 = V_0^2 + 2a\Delta S$, $\Delta S = 2\pi r$

$V^2 = 0 + 2 \times 3 \times 2\pi \times \frac{\pi}{2}$

$V^2 = 6\pi^2 \Rightarrow a_c = \frac{6\pi^2}{\frac{\pi}{2}} = 6\pi^2 \times \frac{2}{\pi} = 12\pi$

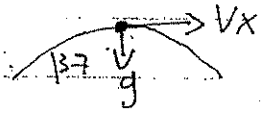
$a = \sqrt{(a_c)^2 + (a_t)^2} = \sqrt{(3)^2 + (12\pi)^2} = 37.8\ m/s^2$

لا يوجد جواب ضمن الخيارات

Q6 $x = bt \Rightarrow m = bs \Rightarrow b = m/s$

$x = ct^3 \Rightarrow m = cs^3 \Rightarrow c = m/s^3$

Q7 $t_F = \frac{V_0 \sin 37}{g}$



$= \frac{5g \sin 37}{10} = 3\ s$

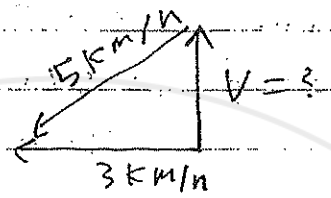
هنا يكون $V \perp a$

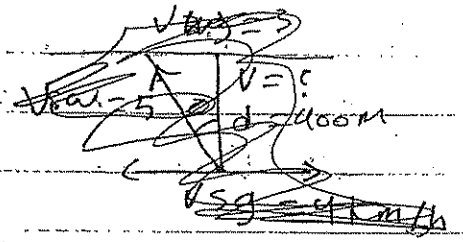
Q8) $a_t = 2t$, $t(0) = 0$, $V(5) = ?$

$$V = \int a\,dt = \int_0^t 2t\,dt$$

$$V = t^2 \Big|_0^t = t^2 \quad // \quad V(5) = 5^2 = 25 \text{ m/s}$$

Q9 $\vec{V}_{sg} = \vec{V}_{sw} + \vec{V}_{wg}$





$25 = 9 + V^2$

$V^2 = 16$

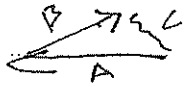
$V = 4$ km/h

$V = \frac{d\,km}{t} \Rightarrow \frac{4}{1} = \frac{400m}{t} \Rightarrow 400m = 4t$

~~$400 \times 1000\,km = 4t$ (1)~~

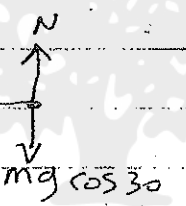
$\frac{400}{1000}$ km $= 4t$ (h)

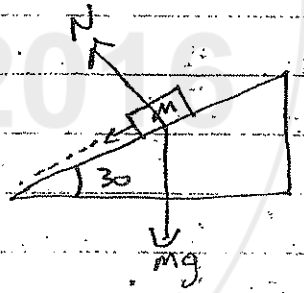
$t = \frac{400}{4 \times 1000} = \frac{1}{10}$ hour :D

Q10 

$\Rightarrow A + B = C$

Q11)





$\Sigma F = m\vec{a}$

$mg \times \frac{1}{2} = ma \Rightarrow \boxed{a = 5\ m/s^2}$

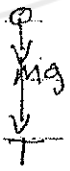
$\Delta z = 2.5$ m $\Rightarrow$ UF

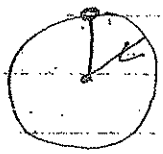
$V^2 = 0 + 2 \times 5 \times 2.5$

$= 25 \Rightarrow V = 5$ m/s

Q12 $mg + T = ma$

$mg + T = m\frac{V^2}{r}$





$T = m(g + \frac{V^2}{r})$

$= 9(10 + \frac{25}{2})$

$= 9(2.5)$

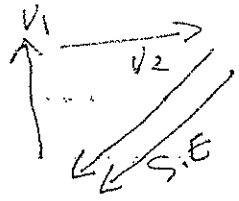
10 N :C

Q13 $\Delta V = V_2 - V_1$

$\Delta V = 7\hat{i} - 7\hat{j}$, $\Delta t = 1$

$a = \frac{\Delta V}{\Delta E} = 7\hat{i} - 7\hat{j}$

$|a| = \sqrt{49+49} = 9.8 \approx 10\ m/s^2$ S.E



Q14 $\vec{V} = V_0 + \vec{a}t$

$= (3\hat{i} - 4\hat{j}) + (9\hat{j} - \hat{i})t$ // $\hat{i} \Rightarrow x_p$, $\hat{j} \Rightarrow y_p$

at max $V = 0$

$V_x = 0 \Rightarrow 3\hat{i} - \hat{i}t = 0$ $\boxed{t = 3\ sec}$

$x = x_0 + V_0 x t + \frac{1}{2} a x t^2$

$x = 0 + 3x3 + \frac{1}{2}(-1)(3)^2$

$= 9 + -\frac{9}{2}$

$= 9 - 4.5 = \boxed{4.5\ m}$

Q15 $V^2 = V_0^2 + 2a\Delta x \Rightarrow 0 = (20)^2 + 2xax50$

$\Rightarrow 0 = 400 + 100a$

$\Rightarrow a = -4\ m/s^2$ عكس السرعة

$MK\,g = a \Rightarrow MK = \frac{a}{g} = \frac{4}{10}$

Q16 تقدير $\frac{1}{8 \times 10^{-6}}$

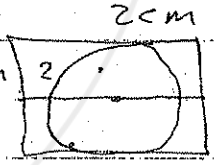
$= 0.125 \times 10^6$

$= 125000$

بس في واحدات بتضارب وأقل بتشوي خايفة جرابات

$a \times 10^5$

$\boxed{a \times 10^4}$



$V_b = (2)^2 2cm$

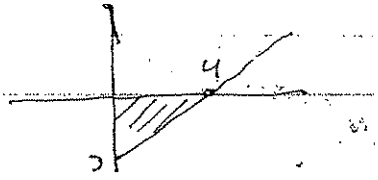
$= 8\ cm^3$

$= 8 \times 10^{-6}$

Q17 المساحة السالبة تحت المنحنى السيني وهي تمثل مسافة مقطوعة

$M = \frac{1}{2} \times 3 \times 4$

$= 6\ m$



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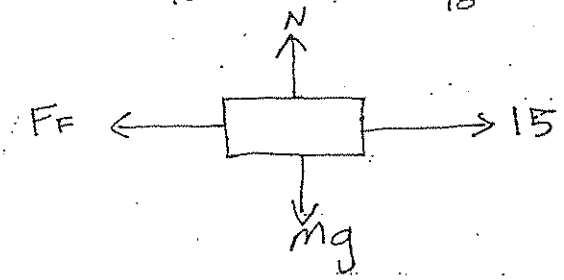
Q18) $m = 6\,kg$, $\mu_s = \frac{3}{10}$, $\mu_k = \frac{2}{10}$, $F_{APP} = 15\,N$

$f_{Friction} = ?$



$N = mg$ — ①

① أولا نفحص قوة الإحتكاك السكونية إذا كانت أكبر من القوة المؤثرة على الجسم فإن الجسم يتحرك وتكون له قوة إحتكاك مخالفة بمقدار القوة المؤثرة . أما إذا كانت قوة الإحتكاك السكونية أقل من القوة المؤثرة على الجسم فإن الجسم لا يتحرك وتكون قوة الإحتكاك المعاكسة للقوة تساوي القوة المؤثرة مقداراً ومعاكسة لها في الإتجاه

$$F_s = N\mu_s = mg \times \frac{3}{10} = 6 \times 10 \times \frac{3}{10} = 18\,N$$

$F_s > F_{APP} \Rightarrow F_{Friction} =$ (15 N)

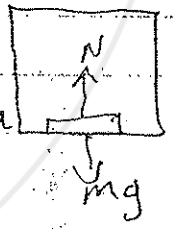
$f_F - F_{APP} = ma \Rightarrow a = 0$ الجسم لا يتحرك

$f_F = F_{APP} = 15\,N$

تم كتابة حضرة المالاحظات لكي لا تضيع على العبد الفقير لله.

Q19)

$m_{girl} = 50\,kg$ // $g(50) = N$ قوة



$N - mg = ma \Rightarrow 950 - 50 \times 10 = ma$

$-50 = 50a$

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

بما أن التسارع سالب اذا هي يتحرك لأسفل :D

Q20) $t = 12\,s$

$$t = \sqrt{\frac{2y}{g}} \Rightarrow 12 = \sqrt{\frac{2y}{\frac{10}{5}}} \Rightarrow (12)^2 = \left(\sqrt{\frac{y}{5}}\right)^2$$

$5 \times 144 = \frac{y}{5}$

$y = 720\,m$

Engineer

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