second

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جامعة بيرزيت

BIRZEIT UNIVERSITY

Physics 141

Coordinator: Tayseer AROURI

2nd. H. EXAM   **1st Sem. 2012**

TIME: 85 min   **16/12/2012**

Student Name: omar Muhtaseb   Student No.: 1122010

عمر عبدالكريم المحتسب

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

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

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				X				
C										X				X			
D			X			X					X						
E	X	X		X			X	X							X		

1. Particle A, with a mass of 0.20 kg, travels on a horizontal track at 3.0m/s and hits paeticle B, which has a mass of 0.40 kg and is initially traveling in the same direction with A at 6.0m/s. After the collision the center of mass of the two particles has a speed of:

A) zero
B) 0.33 m/s
C) 2.3 m/s
D) 3.5 m/s
E) 5.0 m/s

2. A 0.4-kg object attached to the end of a string (خيط، حبل) swings in a vertical circle (radius = 80 cm). At the top of the circle the speed of the object is 4 m/s. What is the magnitude of the tension in the string at this position?

A) 14 N
B) 8.5 N
C) 28 N
D) 3.1 N
E) 4.0 N

3. What is the correct angle of banking of a circular road designed for trafic moving at 25m/s if the radius of the curve is 50m.?

A) 16°
B) 38.7°
C) 30°
D) 51.3°
E) 24.2°

4. If a satellite moves above Earth's atmosphere in a circular orbit with constant speed, then:

A) its acceleration and velocity are always in the same direction
B) the net force on it is zero
C) its velocity is constant
D) it will fall back to Earth when its fuel is used up
E) its acceleration is toward the Earth

$F_{net} = ma$

$F_{net} = m\frac{dv}{dt}$

$K = \frac{1}{2}$

$\Delta K = ct$

Fn

$Fd = ct$

$\frac{V}{t}$

$F = t$

~~$F_{net} = m\frac{dv}{dt}$~~

$\int F$

$w = \int F dx = \Delta K$

$\int F d = \int t\,dt$

$F = \frac{t^2}{2}$

5. A person with mass 75 kg stands at one end of an 20 m long boat (قارب) of mass 25 kg. The person walks to the other end of the boat. Assuming (افترض) no friction between the boat and the water, **relative to Earth**, the person moved a distance :

A) 2 m
B) 5 m
C) 3 m
D) 4 m
E) 6 m

6. A force on a particle is conservative if:

A) its work equals the change in the kinetic energy of the particle
B) it obeys Newton's second law
C) it obeys Newton's third law
D) its work depends on the end points of the motion, not on the path
E) it is not a frictional force

7. The work done by a force $\mathbf{F} = 3x^2\,\mathbf{i} + 2y\,\mathbf{j}$, with x and y are in meters, that moved a particle from $\mathbf{r}_1 = 2\mathbf{i} + 3\mathbf{j}$ m, to $\mathbf{r}_2 = -2\mathbf{i} - 3\mathbf{j}$ m is:

A) -35 J
B) 19 J
C) -72 J
D) -133 J
E) -16 J

8. At time t = 0 a particle starts moving along the x axis. If its kinetic energy increases uniformly with t , the net force acting on it must be

A) constant
B) proportional to t
C) inversely proportional to t
D) proportional to $\sqrt{t}$
E) proportional to $1/\sqrt{t}$

9. When you step on the accelerator to increase the speed of your car, the force that accelerates the car is:

A) the force of your foot on the accelerator
B) the force of static friction of the road on the tires
C) the force of the engine on the drive shaft
D) the normal force of the road on the tires
E) none of the above

10. The potential energy of a 0.20-kg particle moving along the x axis is given by $U(x) = 8x^2 + 2x^4$, where U is in joules and x is the coordinate of the particle in meters. If the particle has a speed of 10.0 m/s when it is at x = 1.0 m, its speed when it is at the origin is:

$8+2=10 \quad +10=20$

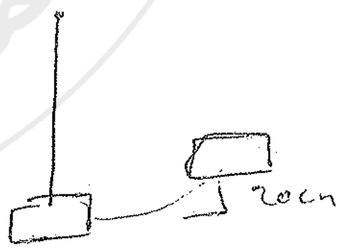
$\frac{1}{2}mv^2 = 20$

$v^2 = \frac{40}{0.2}$

A) 0
B) 12.8 m/s
C) 14.1 m/s
D) 8.6 m/s
E) 11.7 m/s

11. A 60-g bullet is fired horizontally into a 12-kg block of wood suspended by a rope from the ceiling. The block swings in an arc, rising 20cm above its lowest position. The velocity of the bullet was:

A) unknown since the heat generated in the collision was not given
B) 602 m/s
C) 482 m/s
D) 402 m/s
E) 326 m/s



$(0.06)v = (12.06)2$

0.2

$mgh = \frac{1}{2}mv^2$

$2gh = v^2$

$v = \sqrt{2gh}$

$v = 2$

$= \frac{1}{2} K X^2$

$\left(\frac{1}{2}\right)$

$\frac{1}{2} m v^2 = 2.5$

$\frac{1}{2} m v^2 = \frac{1}{2} m v_1^2 + \frac{1}{2} K X^2$

$m v^2 = (2)(4) + K X^2$

$m v^2 = 8 + (80)(0.25^2)$

$8 + 5$

$m v^2 = 13$

$v^2 = \frac{13}{2} =$

$\frac{1}{2} m v^2 = \frac{1}{2} m v^2 + \frac{1}{2} K X^2$

$(2)(4)$

$8 + (80)(0.25)$

12. The potential energy of a 1.0 kg particle is given by:
$U(x) = 7/x^2 + 12/x$; $x > 0$
If the total mechanical energy $E = 4$ J , then the turning point for the particle is:

A) 3.5 m
B) 2.0 m
C) 0.75 m
D) 1.5 m
E) 5.0 m

13. A 0.4 kg ball is dropped from a building. It strikes the ground below at 40 m/s and rebounds up (ترتــد لأعلـى) at 30 m/s. The magnitude of the impulse due to the collision with the ground is:

A) 21 N·s
B) 28 N·s
C) 32 N·s
D) 14 N·s
E) 8 N·s

14. A 2-kg block attached to an ideal spring with a spring constant of 80N/m oscillates on a horizontal frictionless surface. When the spring is 25 cm longer than its equilibrium length, the speed of the block is 2 m/s. The greatest speed of the block is:

A) 0.71 m/s
B) 5.4 m/s
C) 2.8 m/s
D) 4.8 m/s
E) 0.32 m/s

$m = 6$

$A = 4\pi r^2$

$= (4)(3.14)(64)(10^{-4})$

A (0.0803)

$\frac{1}{2} C \rho A V^2 = mg$

$\frac{4}{3}\pi r^3$

$4\pi r^2$

$= 60$

0.08038

$V^2 (2)(1.2)(0.0803) = 120$

$D_{ag} = \frac{1}{2} C A \rho V^2$

$= (\frac{1}{2})(2)$

A

$PA = 0.024$

$A \rho V^2$

0.024

$4\pi r^2$

$r\ 4\pi r^2$

$(4)(3.14)(0.08)^2$

$0.0803\ V^2$

$\frac{mg}{0.0803} = V^2$

$\frac{1}{2} C A \rho V^2 = mg$

mg ×

9.8

15. The potential energy of a body of mass m is given by $U = mgx + (1/2)kx^2$. The corresponding force is:

A) mg + kx
B) $mgx^2/2 + kx^3/3$
C) mg + kx/2
D) -kx
E) -mg - kx

16. A 6.0 kg spherical (كروية) ball that has a radius of 8.0 cm and a drag coefficient C = 2 falls through air whose density is 1.2 kg/m^3. The terminal speed v_t of the ball is:

A) 49.9 m/s
B) 112 m/s
C) 66.5 m/s
D) 86.0 m/s
E) 79.8 m/s

17. A rocket exhausts fuel (يطلق الوقود) with a velocity of 6000 m/s, relative to the rocket. Its mass is 40000kg. It starts from rest in outer space (الفضاء الخارجي) with fuel comprising 90 % (90% الوقود يشكل) of the total mass. When all the fuel has been exhausted its speed is:

A) 49740 km/h
B) 41450 km/h
C) 14400 km/h
D) 33160 km/h
E) 23180 km/h

$m = 6$

$r = 0.08$ $\quad c = 2$

$\rho = 1.2$

$\frac{1}{2} \not{c} A \rho v^2 =$

$(3.14)(0.08)^2 (4)(1.2) v^2$

جامعة بيرزيت

BIRZEIT UNIVERSITY

Physics 141

Coordinator: Tayseer Arouri

2nd H. EXAM
TIME: 80 min

2nd Sem. 2013
2.5.2013

Student Name: Noola Shweiki   Student No.: 1121035

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

الشعبة	المدرس		الشعبة	المدرس	
9	عبدالله سيد أحمد	☐	3	تيسير عاروري	☐
1	غسان عباس	☐	(7); 8	غسان أنضوني	☒
5	يعقوب عنيني	☐	2; 4; 6	غاده حامد	☐

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

16

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

1. A car is traveling at 25 m/s on a horizontal road. The brakes are applied and the car skids to a stop in 5.0 s. The coefficient of kinetic friction between the tires and road is:

μ = ?

A) 0.6
B) 0.3
C) 0.4
D) 0.8
E) 0.5

2. A rocket exhausts fuel with a velocity of 4000 m/s, relative to the rocket. Its mass is 40000 kg. It starts from rest in outer space with fuel comprising 95 % of the total mass. When all the fuel has been exhausted its speed is:

A) 33160 km/h
B) 9.2 km/s
C) 23180 km/h
D) 16 km/s
E) 12 km/s

3. The potential energy of a 2-kg particle moving along the x axis is given by $U(x) = 8x^2 + 2x^3$, where U is in joules and x is the coordinate of the particle in meters. If the particle has a speed of 5.0 m/s when it is at x = 2.0 m, its speed when it is at the origin is:

A) 0
B) 13.5 m/s
C) 11.2 m/s
D) 7.3 m/s
E) 8.5 m/s

4. A 2-kg block attached to an ideal spring with a spring constant of 800 N/m oscillates on a horizontal frictionless surface. When the spring is 20 cm shorter than its equilibrium length, the speed of the block is 2.0 m/s. The greatest speed of the block is:

k = 800 N/m

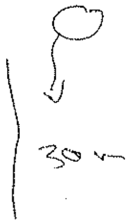
A) 2.8 m/s
B) 6.4 m/s
C) 5.6 m/s
D) 3.6 m/s
E) 4.5 m/s

5. A 3-kg cat jumped from a high building. If its effective cross-sectional area is 250cm^2, the drag coefficient is 0.5 and the air density is 1.2 kg/m^3, then the cat"s terminal speed is:

A) 33 m/s
B) 47 m/s
C) 41 m/s
D) 63.2 m/s
E) 29 m/s

6. A 2.0-kg mass is projected from the edge of the top of a 30-m tall building with a velocity of 30 m/s at some unknown angle above the horizontal. Ignore air resistance and assume the ground is horizontal. What is the kinetic energy of the mass just before it strikes the ground?

m = 2 kg   h = 30 m
V = 30 m/s   K = ? (kJ)



A) 1.7 kJ
B) 1.5 kJ
C) 0.9 kJ
D) 1.3 kJ
E) 2.0 kJ

$K = \frac{1}{2} m V$

$K = \frac{1}{2} m v_f^2$

$= \frac{1}{2} (2) (38.73)^2$

$v_f^2 = v_i^2 + 2ah$

$v_f^2 = 900 + 2(10)(30)$

$v_f = 38.73$ m/s

7. A 0.4 kg ball is dropped from a building. It strikes the sidewalk below at 50 m/s and rebounds up at 30 m/s. The magnitude of the impulse due to the collision with the sidewalk is:

A) 16 N ·s
B) 40 N ·s
C) 32 N ·s
D) 8 N ·s
E) 28 N ·s

8. A car moves on a level horizontal road in a circle of radius 80 m. The coefficient of friction between tires and road is 0.60. The maximum speed (in m/s) with which this car can round this curve is:

A) 32.5
B) 31.0
C) 18.5
D) 26.8
E) 21.9

9. A person with mass 75 kg stands at one end of an 8 m long boat of mass 25 kg. The person walks to the other end of the boat. Assuming no friction between the boat and the water, **relative to Earth**, the boat moved a distance :

A) 5 m
B) 2 m
C) 8 m
D) 6 m
E) 4 m

10. A nonconservative force:

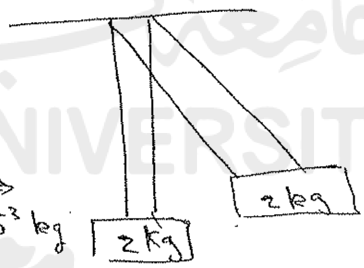
A) must be perpendicular to the velocity of the particle on which it acts
B) cannot do any work
C) none of these
D) violates Newton's third law
E) violates Newton's second law

11. Three particles are placed in the xy plane. A 40-g particle is located at (4, 4) m, and a 50-g particle is positioned at (-2, -6) m. Where must a 20-g particle be placed so that the center of mass of this three-particle system is located at the origin?

A) (-3, 7) m
B) (-5, 7) m
C) None of these
D) (-1, 7) m
E) (2, 7) m

12. A 5-gram bullet is fired horizontally into a 2-kg block of wood suspended by a rope from the ceiling . The bullet comes to rest in the block. The block swings upwards 2 cm above its lowest position. The velocity of the bullet was:

A) 98 m/s
B) 254 m/s
C) 284 m/s
D) 196 m/s
E) 160 m/s



$\vec{m}_b = 5\times10^{-3}$ kg

2 cm = 0.02 m

13. The work done by a force $\mathbf{F} = 8x^3\,\mathbf{i} + 2y\,\mathbf{j}$, with x and y are in meters, that moved a particle from $\mathbf{r}_1 = \mathbf{i} + 3\mathbf{j}$ m, to $\mathbf{r}_2 = -2\mathbf{i} - \mathbf{j}$ m is:

A) - 42 J
B) 22 J
C) - 35 J
D) 40 J
E) - 17 J

$$W = \int_{r_1}^{r_2} F(x)\,dx$$

$$W = \int_{1}^{-2} 8x^3 dx + \int_{3}^{-1} 2y\,dy$$

$$= \frac{8x^4}{4}\Big]_1^{-2} + \frac{2y^2}{2}\Big]_3^{-1}$$

$$= 2x^4\Big]_1^{-2} + y^2\Big]_3^{-1}$$

$$= 2(-2)^4 - 2(1)^4 + (-1)^2 - (3)^2$$

$$= 32 - 2 + 1 - 9 = 22 \text{ Joule.}$$

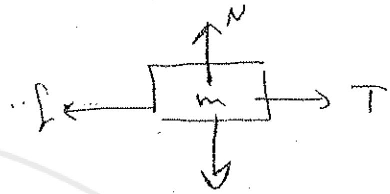
14. A box weighing 6000 N is pulled across a frozen lake by means of a horizontal rope. The coefficient of kinetic friction is 0.05. How much work is done in pulling the box 500 m if its speed is increasing at a constant rate of 0.20 m/s^2? $\mu_k = 0.05$

A) 2.1×10^5 J
B) 4.2×10^5 J
C) 1.2×10^6 J
D) -1.2×10^6 J
E) 8.4×10^5 J

$T - f = ma$

$T - \mu_k N = (600)(0.2)$

$T = 420$ N



$N = mg = 6000$ N

$\Rightarrow W = T d \cos \overset{0}{\theta}$

$= 2.1\times10^5$ J

15. The only force acting on a 4.0 kg body moving along the x axis is F(x) = 6x N, with x in meters. If the velocity of the body at x = 3.0 m is 6.0 m/s, then its velocity at x = 8.0 m is:

A) 4.7 m/s
B) 10.9 m/s
C) 9.3 m/s
D) 12.7 m/s
E) 7.1 m/s

$W = \int F(x)\,dx = \int_3^8 6x\,dx = \frac{6x^2}{2}\Big]_3^8$

$= 3(8)^2 - 3(3)^2 = 192 - 27$

$= 165$

16. A 100 kg block is pulled at a constant speed of 5 m/s across a horizontal floor by an applied force of 160 N directed 60° above the horizontal. The power due to the force is:

A) 800 W
B) 690 W
C) 400 W
D) 490 W
E) 500 W

Power = $F(v)(\cos\theta)$

Power = $(160)(5)\cos 60$

17. The potential energy of a 1.0 kg particle is given by:
$U(x) = 6/x^2 + 4/x$; $x > 0$
If the total mechanical energy $E = 16$ J , then the turning point for the particle is:

A) 0.25 m
B) 2.0 m
C) 0.75 m
D) 1.5 m
E) 0.5 m

$m = 1$ kg

$$U(x) = \frac{6}{x^2} + \frac{4}{x}$$

$E = 16$ J , turning point ⇓ $K = 0 \Rightarrow E = U$

$$16 = \frac{6}{x^2} + \frac{4x}{x^2}$$

$$16x^2 = 6 + 4x$$

$$16x^2 - 4x - 6 = 0$$

$$x^2 - 0.25x - 0.375 = 0$$

$$x = \frac{0.25 \pm \sqrt{0.0625 + 1.5}}{2} = \frac{0.25 \mp 1.25}{2}$$

$x = 0.75$ m

جامعة بيرزيت

BIRZEIT UNIVERSITY

Physics 141

Coordinator: Tayseer AROURI

2nd. H. EXAM | **1st Sem. 2013/14**

TIME: 75 min | **12.1.2014**

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 عنيني	9
☑	نضال حداد	12; 15	☐	اسماعيل بدران	1; 8; 14

تعليمات:

1) لا تفتح ورقة الامتحان حتى يسمح لك بذلك.
2) اكتب اسمك ورقمك في أعلى هذه الصفحة.
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4) السؤال الذي له أكثر من إجابة يعطى علامة صفر.
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		X		X		X			
B																	
C	X					X			X		X				X		X
D													X			X	
E		X		X	X												

1. At time t = 0 a 2-kg particle has a velocity in m/s of $4\hat{i} - 3\hat{j}$. At t = 3 s its velocity in m/s is $6\hat{i} + 3\hat{j}$. During this time the work done on it was:

A) 0 J
B) 38 J
C) 20 J
D) -40 J
E) -12 J

2. A 2-kg object attached to the end of a string swings in a vertical circle (radius = 80 cm). At the top of the circle the speed of the object is 6 m/s. What is the magnitude of the tension in the string at this position?

A) 20 N
B) 70 N
C) 31 N
D) 3.1 N
E) 110 N

3. A man pushes an 8 kg block a distance of 6 m upward along a frictionless slope that makes an angle of 30° with the horizontal. The force he exerts is parallel to the slope. If the speed of the block is constant, then the work done by the man is:

A) 240 J
B) 480 J
C) 61 J
D) 200 J
E) 416 J

4. The potential energy of a 1.0 kg particle is given by:
$U(x) = 9/x^2 + 9/x$; $x > 0$. If the total mechanical energy E = 4 J , then the turning point for the particle is at x = :

A) 0.25 m
B) 1.5 m
C) 0.75 m
D) 1.0 m
E) 3.0 m

5. F is the only force acting on a 4 kg particle. The position of the particle is given by: $x = 3t - 6t^2 + t^3$ with x in meters and t in seconds. The work done by F from t = 0 to t = 2 s is:

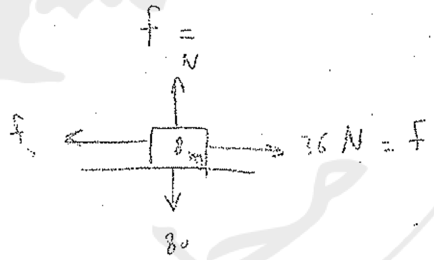
A) 180 J
B) 60 J
C) 224 J
D) 0 J
E) 144 J

6. A 0.50-kg block attached to an ideal spring with a spring constant of 80 N/m oscillates on a horizontal frictionless surface. The total mechanical energy is 25 J. The maximum speed of the block is:

A) 0.69 m/s
B) 0.85 m/s
C) 7.1 m/s
D) 5 m/s
E) 10 m/s

7. A 36-N horizontal force is applied to a 8-kg block initially at rest on a rough horizontal surface. If the coefficients of friction are $\mu_s = 0.5$ and $\mu_k = 0.4$, the magnitude of the frictional force on the block is:

A) 36 N
B) 40 N
C) 32 N
D) 26 N
E) 18 N



8. A projectile of mass 2 kg is fired with an initial speed of 10 m/s at an angle of 60° above the horizontal. The potential energy (relative to ground level) of the projectile at its highest point is:

A) 25 J
B) 18.75 J
C) 12.5 J
D) 100 J
E) 75 J

9. The potential energy of a 0.4-kg particle moving along the x axis is given by $U(x) = 8x^2 + 2x^4$, where U is in joules and x is the coordinate of the particle in meters. If the particle has a speed of 5.0 m/s when it is at x = 1.0 m, its speed when it is at the origin is:

A) 11.2 m/s
B) 18.7 m/s
C) 0
D) 8.7 m/s
E) 5.7 m/s

10. A force acting on a particle is conservative if:

A) it is not a frictional force
B) its work depends only on the end points of the motion, not the path between them
C) its work equals the change in the kinetic energy of the particle
D) it obeys Newton's second law
E) it obeys Newton's third law

11. An elevator has a mass of 400 kg moves 20 m up in 40 sec at constant speed. The average power of the elevator motor is:

A) 800 W
B) 2500 W
C) 2000 W
D) 5000 W
E) 250 W

12. The potential energy of a 0.7-kg particle moving along the x axis is given by $U(x) = 3x^2 - 5x^4$ J. When the particle is at x = 1.0 m , its acceleration is:

A) 20 m/s^2
B) - 20 m/s^2
C) 10 m/s^2
D) 0
E) - 40 m/s^2

13. A 0.2 kg ball is released from rest 80 m above the surface of the Earth. Just before it hits the surface its speed is 30 m/s. During the fall the work done by air friction is:

A) 250 J
B) -15 J
C) 70 J
D) -70 J
E) 15 J

14. A car is traveling at a speed of 24 m/s where the coefficients of friction with the road are $\mu_s = 0.8$ and $\mu_k = 0.6$. The shortest distance in which the car can stop is:

A) 25 m
B) 78 m
C) 48 m
D) 36 m
E) 52 m

15. A 6.0 kg spherical ball that has a radius of 5.0 cm and a drag coefficient C = 1.60, falls through air whose density is 1.20 kg/m^3. The terminal speed v_t of the ball is;

A) 15 m/s
B) 105 m/s
C) 89 m/s
D) 112 m/s
E) 49 m/s

16. A car travels around an unbanked highway curve (radius 0.15 km) at a constant speed of 20 m/s. What is the magnitude of the resultant force acting on the 75 kg driver?

A) 200 N
B) 550 N
C) 0 N
D) 750 N
E) 333 N

17. The work done by a force $\mathbf{F} = 3x^2\,\mathbf{i} + 2y\,\mathbf{j} - 4z\,\mathbf{k}$; with x , y and z are in meters, that moved a particle from $\mathbf{r}_1 = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$ m, to $\mathbf{r}_2 = -3\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$ m is:

A) - 49 J
B) - 31 J
C) - 41 J
D) 54 J
E) - 35 J

unbanked	غير مائل - مستوي
string	خيط ، حبل
swings	يتأرجح، يدور
spherical	كروي
elevator	مصعد
oscillate	يتذبذب
shortest distance	أقصر مسافة

Instructor	Date	Time	Room	Section
Isma'el Badran	M, W	11:00 - 11:50	SCI- 213	1
	M, W	13:00 - 13:50	SCI- 113	8
	M, W	9:00 - 9:50	SCI- 021	14
Abdelaziz Shawabkeh	M, W	12:00 - 12:50	SCI- 216	2
	M, W	13:00 - 13:50	SCI- 115	7
Ghassan Abbas	M, W	14:00 - 14:50	SCI- 214	6
	M, W	13:00 - 13:50	SCI- 216	10
Yacoub Anini	S, M	13:00 - 13:50	SCI- 215	9
Nidal Haddad	M, W	8:00 - 8:50	SCI- 214	12
	M, W	13:00 - 13:50	SCI- 213	15
Ghassan Andoni	M, W	14:00 - 14:50	SCI- 114	5
Wafaa Khater	S, W	9:00 - 9:50	SCI- 215	3
Tayseer Arouri	S, W	12:00 - 12:50	SCI- 215	4
	S, W	14:00 - 14:50	SCI- 216	11
	S, W	8:00 - 8:50	SCI- 113	13

16/20

BIRZEIT UNIVERSITY

Second Hour Exam

Physics 141 | Fall, 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 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	Classes Time		Sec	✓	Instructor	Classes Time	
1	☐	اسماعيل بدران	M, W	11:00 - 11:50	10	☐	إدوارد صادر	M, W	13:00 - 13:50
2	☐	غسان أنضوني	M, W	12:00 - 12:50	11	☐	تيسير عاروري	S, W	14:00 - 14:50
3	☐	تيسير عاروري	S, W	09:00 - 09:50	12	☒	لميس نداف	M, W	08:00 - 08:50
4	☐	هبة فطافطة	S, W	12:00 - 12:50	13	☐	وفاء خاطر	S, W	08:00 - 08:50
5	☐	أريج عبد الرحمن	M, W	14:00 - 14:50	14	☐	غسان أنضوني	M, W	09:00 - 09:50
6	☐	غسان عباس	M, W	14:00 - 14:50	15	☐	غسان عباس	M, W	13:00 - 13:50
7	☐	عزيز شوابكة	M, W	13:00 - 13:50	16	☐	لميس نداف	M, W	14:00 - 14:50
8	☐	غسان أنضوني	M, W	13:00 - 13:50	17	☐	هبة فطافطة	M, W	08:00 - 08:50
9	☐	هبة فطافطة	S, M	13:00 - 13:50	18	☐	نضال حداد	S, W	09:00 - 09:50

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

	a	b	c	d	e
1		/			
2		/			
3			/		
4		(scribbled)			/
5		/			(scribbled)
6					/
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16		/			
17					/
18		/			
19				/	
20			/		

USEFUL FORMULA and CONSTANTS

$G = 6.67 \times 10^{-11}\ N \cdot m^2/kg^2$.
$M_E = 5.97 \times 10^{24}$ kg
$R_E = 6370$ km

$g = 10\ m/s^2$

Work and Kinetic Energy

1. $W = \vec{F} \cdot \vec{d}$ *(constant force)*
2. $W = \int_a^b f(x)dx,$ *(variable force)*
3. $\bar{P} = \frac{W}{\Delta t}$, *(average power)*
4. $P = \vec{F} \cdot \vec{v}$ *(instantaneous power)*
5. $W = \Delta K$ *(work-kinetic energy theorem)*

Gravity

6. $F = \frac{GMm}{r^2}$
7. $U(r) = -\frac{GMm}{r}$
8. $T^2 = \frac{4\pi^2}{GM} r^3$
9. $v_{esc} = \sqrt{\frac{2GM}{r}}$

Conservation of Energy

10. $K = \frac{1}{2} m v^2$
11. $U = mgh,$ *(gravitational)*
12. $U = \frac{1}{2} k x^2$ *(elastic)*
13. $E = K + U$
14. $\Delta U = -\int_a^b f(x)dx$
15. $\Delta E = W_{non\_conservative}$

System of Particles

16. $\vec{P} = m\vec{v}$
17. $\vec{J} = \int_{t_i}^{t_f} \vec{f}(t)dt$
18. $x_{com} = \sum_i m_i x_i / \sum_i m_i$
19. $x_{com} = \int x\, dm / \int dm$

Vocabulary:

Venus	كوكب الزهرة	launched	أطلق
constrained	مقيد	Mars	المريخ
wagon	عربة	suspended	معلق
generated	نتجت	rearward	إلى الخلف
pump	مضخة	intersection	تقاطع
deliver	يبذل	rough	خشن
well	بئر	rebounds	يرتد
canoe	قارب نهري	forbidden	ممنوع

1. A certain planet has an escape speed V. If another planet has twice the mass and half the radius, its escape speed will be

(a) V/2
(b) $\sqrt{2}$ V
(c) 2V
(d) V/$\sqrt{2}$
(e) V

2. A force on a particle depends on position such that $F(x) = 3x^2 + 6x$, for a particle constrained to move along the x-axis. What work is done by this force on a particle that moves from x = 0.0 m to x = 2.0 m?

(a) 4.0 J
(b) 20.0 J
(c) -48.0 J
(d) 10.0 J
(e) 54.0 J

3. What is the angle between the vector $\vec{A} = 4\hat{i} + 2\hat{j} - 4\hat{k}$ and the +y-axis?

(a) 90°
(b) 48°
(c) 70°
(d) 132°
(e) 37°

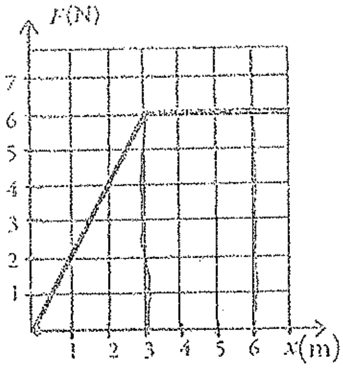
4. If the distance from Venus to the sun is 0.723 the distance from the earth to sun, how many earth days is the Venus year?

(a) 124 Earth days
(b) 48 Earth days
(c) 365 Earth days
(d) 422 Earth days
(e) 224 Earth days

5. A child pulls on a wagon with a horizontal force of 73 N. If the wagon moves horizontally a total of 42 m in 3.0 min, what is the average power generated by the child?

(a) 24 W
(b) 17 W
(c) 22 W
(d) 26 W
(e) 10 W

6. A graph of the force on an object of mass 1 kg as a function of its position is shown in the figure. If the object starts motion at x= 0, find its speed at x = 6.0 m.



(a) 5.0 m/s
(b) 6.5 m/s
(c) 2.5 m/s
(d) 3.4 m/s
(e) 7.3 m/s

7. At what maximum rate can a 300 W pump deliver water to a tank 60 m above the water level in the well? Give your answer in liter/min? (density of water = 1 kg/liter)

(a) 30 liter/min
(b) 40 liter/min
(c) 15 liter/min
(d) 10 liter/min
(e) 60 liter/min

8. The work done on an object by a non-conservative force

(a) Depends only on the initial and final points of motion
(b) Depends on the path taken by the object.
(c) Is always negative
(d) Can be stored as a potential energy
(e) None of the above

9. A man sits in the back of a canoe in still water. He then moves to the front of the canoe and sits there. Assume no friction between the canoe and water, Afterwards the canoe is:

(a) forward of its original position and moving forward
(b) forward of its original position and moving backward
(c) rearward of its original position and moving forward
(d) rearward of its original position and moving backward
(e) rearward of its original position and stay still in water

10. Consider the motion of a 1.00 kg particle that moves with potential energy given by $U(x) = -2.00/x + 4.00/x^2$. Suppose the particle is moving with a speed of 3.00 m/s when it is located at x = 1.00 m. What is the speed of the particle when it is located at x = 4.00 m?

(a) 4.68 m/s
(b) 3.00 m/s
(c) 3.67 m/s
(d) 2.13 m/s
(e) 5.20 m/s

11. A 1.2 kg object moving with a speed of 8.0 m/s collides perpendicularly with a wall and rebounds with a speed of 6.0 m/s in the opposite direction. If the object is in contact with the wall for 2.0 ms, what is the magnitude of the average force on the object by the wall?

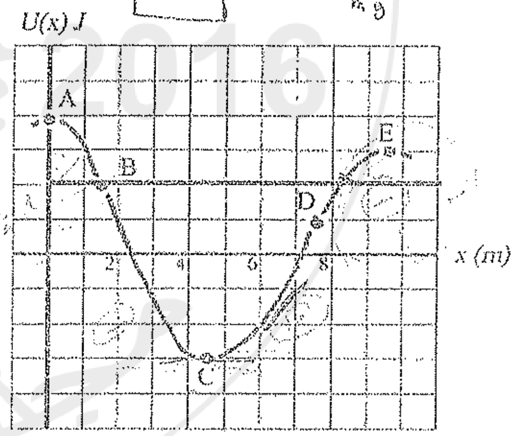
(a) 9.8 kN
(b) 7.7 kN
(c) 8.4 kN
(d) 9.1 kN
(e) 1.2 kN

12. What is the period of a satellite circling Mars 100 km above the planet's surface? The mass of Mars is 6.42×10^{23} kg, its radius is 3.40×10^{6} m.

(a) 1.45 h
(b) 1.00 h
(c) 1.15 h
(d) 1.75 h
(e) 1.25 h

13. A 2.0 kg object suspended from the ceiling by a string that has a length of 1.0 m is released from rest with the string 30° below the horizontal position. What is the tension in the string at the instant when the object passes through its lowest position?

(a) 10 N
(b) 25 N
(c) 40 N
(d) 20 N
(e) 30 N



14. A 1 kg particle has a potential curve shown. Given that E= 2 J for the particle, which statement is not true

(a) x= 1.5 m is a turning point
(b) x= 4.5 m is an equilibrium point
(c) x > 8.25 m is a forbidden region
(d) The force at x= 6 m is negative
(e) Maximum speed occurs at x= 7.5 m.

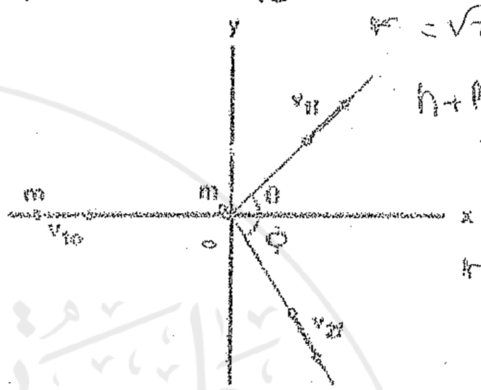
15. A car heading north collides at an intersection with a small truck of the same mass as the truck heading east. If they lock together and travel at 28 m/s at 45° north of east just after the collision, how fast was the car initially traveling?

(a) 20 m/s
(b) 40 m/s
(c) 30 m/s
(d) 80 m/s
(e) 50 m/s

16. The radius of the earth is R. At what distance above the earth's surface will the acceleration of gravity be half the acceleration at the surface of the earth?

(a) 1.4 R
(b) 0.41 R
(c) 2.0 R
(d) 0.5 R
(e) 1.0 R

17. In an elastic collision between two bodies of equal mass, with body 2 initially at rest, body 1 moves off at angle θ relative to the direction of its initial velocity and body 2 at angle φ. The sum of the angles θ and φ is equal to



(a) 0.0 degrees
(b) 30.0 degrees
(c) 45.0 degrees
(d) 60.0 degrees
(e) 90.0 degrees

18. Two blocks of mass m1 and m2 such that (m1<m2) are pressed together on a horizontal frictionless surface with a compressed spring between them. They are not attached to the spring. After they are released and have both moved free of the spring

(a) Both blocks will have the same amount of kinetic energy
(b) Block m_2 will have more kinetic energy than block m_1
(c) Block m_2 will have more momentum than block m_1
(d) Block m_1 will have more kinetic energy than block m_2
(e) Both blocks will have equal speed

19. A 10-kg block on a rough horizontal surface is attached to a spring of k= 1.4 kN/m. The block is pulled 8.0 cm to the right from its equilibrium position and released from rest. The frictional force between the block and surface has a magnitude of 30 N. What is the kinetic energy of the block as it passes through its equilibrium position (x=0)?

(a) 4.5 J
(b) 6.6 J
(c) 6.9 J
(d) 2.1 J
(e) 4.9 J

20. A thin rod of length L has a linear density $\lambda(x) = Ax^2$, where A is a constant and x is the distance from the left end of the rod. Find the center of mass of the rod from the left end

(a) L/2
(b) 2L/3
(c) 3L/4
(d) L/3
(e) L/4

BIRZEIT UNIVERSITY

Physics 141

Summer, 2015

Time: 90 minutes

Second Hour Exam

Instructor: Dr. Aziz Shawabka

Student Name: ____________________ *Student No.:* __________

Please read these instructions and remarks before starting the exam:

- Write your name and student number in the above box.
- 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.

Answer Sheet

	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	✓				

Some useful formulae and constants:

1. $D = \frac{1}{2} C\rho A v^2$
2. $F = -kx$
3. $W = \vec{F} \cdot \vec{d}$ (constant force)
4. $W = \int_a^b f(x)dx$, (variable force)
5. $\bar{P} = \frac{W}{\Delta t}$, (Average power)
6. $P = \vec{F} \cdot \vec{v}$,(Instantaneous power)
7. $W = \Delta K$ (work-Kinetic energy theorem)
8. $K = \frac{1}{2} m v^2$
9. $g = 10.0\ m/s^2$
10. $U = mgh, (gravitational)$
11. $U = \frac{1}{2} kx^2\ (elastic)$
12. $E = K + U$
13. $\Delta U = -\int_a^b f(x)dx$
14. $\Delta E_{tot} = \Delta E + \Delta E_{th} = 0,$
15. $\vec{J} = \int_{t_i}^{t_f} \vec{f}(t)dt$
16. $x_{com} = \sum_i m_i x_i / \sum_i m_i$

(1) A particle moves along the x-axis under the influence of a force given by $F = 3x^2 - 1$, where F is in Newton and x is in meters. If $x = 0$ is taken to be the zero of potential energy, then the potential energy of the particle in joules at $x = 2$ m is equal to :

(a) 1 J
(b) -1 J
(c) 6 J
(d) -6 J
(e) 0 J

(2) The work done by an applied force $\vec{F} = 2\hat{\imath} + 3\hat{\jmath}$ N in moving an object from the origion to $\vec{r} = 4\hat{\imath} - \hat{\jmath}$ is equal to

(a) 0 Joule
(b) +5 Joule
(c) -6 Joule
(d) -12 Joule
(e) +11 Joule

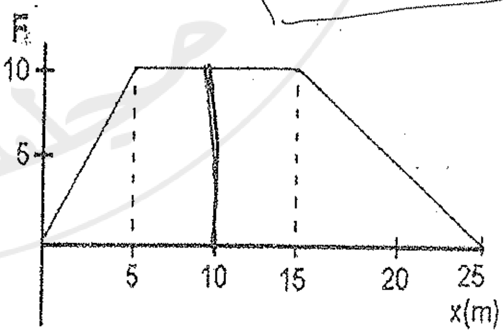
(3) A 2 kg block is compressed 0.1 m on a frictional surface with $\mu_k = 0.25$, against a horizontal spring with spring constant k=2000 N/m. When released, The block will come to rest in a distance of approximately

(a) 0.2 m
(b) 0.5 m
(c) 2.0 m
(d) 4.0 m
(e) 5.0 m

(4) A water pump is moving water from a lake to a storage tank at 12 meters above ground. If the pump moves 5 m^3 of water (density = 10^3 kg/m^3) in 10 minutes, the pump must have at least a power of approximately

(a) 4 kW
(b) 2 kW
(c) 5 kW
(d) 1 kW
(e) 3 kW

(5) The diagram represents the force acting on a 6 kg mass along the x-axis. If the mass is at rest at the origin, find the velocity of the mass at x=10 m.



(a) 1.0 m/s
(b) 2.5 m/s
(c) 3.5 m/s
(d) 5.0 m/s
(e) 10.0 m/s

(6) Body A with velocity v_0 collides elastically along a straight line with body B of equal mass. Which statement is TRUE

(a) The two bodies exchange momentum
(b) Body A will bounce back with the same initial speed
(c) Both bodies will move forward with velocity v_0
(d) Both bodies will move forward with velocity $v_0/2$
(e) The kinetic energy of the system is not conserved

(7) The impulse given to a body by the force $f(t) = 2t - 3$, with f(t) in Newtons, during the first 4 seconds of action is

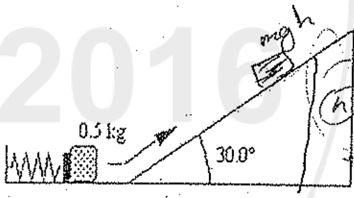
(a) 16 kg m/s
(b) 8 kg m/s
(c) 10 kg m/s
(d) 12 kg m/s
(e) 4 kg m/s

(8) The center of mass of the moon-earth system is

(a) Between earth and moon and closer to moon.
(b) Between earth and moon and closer to earth.
(c) Between earth and moon and halfway between them.
(d) At the center of the earth
(e) At the center of the moon

(9) A spring of constant k = 200 N/m compressed a distance of 0.5 m, is used to launch a 0.5 kg up a frictionless slope at an angle 30° as shown. Find the maximum distance along the slope that the mass moves after leaving the spring.

(a) 2.0 m
(b) 4.0 m
(c) 5.0 m
(d) 8.0 m
(e) 10.0 m



(10) A 0.50-kg mass attached to the end of a string swings in a vertical circle (radius = 2.0 m). When the string is horizontal, the speed of the mass is 8.0 m/s. What is the tension in the string at this position?

(a) 16 N
(b) 18 N
(c) 21 N
(d) 32 N
(e) 25 N

(11) A 2.0 kg mass is projected vertically upward from ground level with an initial speed of 30 m/s. The mass rises to a maximum height of 35 m above ground level. How much work is done on the mass by air resistance between the point of projection and the point of maximum height?

(a) - 0.50 kJ
(b) +0.50 kJ
(c) - 0.40 kJ
(d) +0.30 kJ
(e) -0.20 kJ

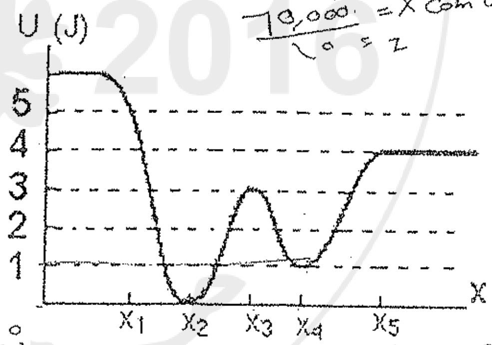
(12) A 6.0 kg object moving 5.0 m/s collides with and sticks to a 2.0 kg object. After the collision the composite object is moving 2.0 m/s in a direction opposite to the initial direction of motion of the 6.0 kg object. Determine the speed of the 2.0 kg object before the collision.

(a) 15 m/s
(b) 7.0 m/s
(c) 8.0 m/s
(d) 23 m/s
(e) 11 m/s

(13) A 2000 kg car is traveling at constant speed of 110 km/hr. A heavy truck of mass 5000 kg is traveling in the opposite direction at a constant speed of 30 km/hr. When passing each other, their center of mass is moving at

(a) 0 km/hr
(b) 53 km/hr
(c) 70 km/hr
(d) 10 km/hr
(e) 20 km/hr

(14) The potential energy curve U(x) of a 2 kg object moving along the x-axis is shown in the figure. The speed of the object at x_2 equals 2 m/s. The speed of the object at x_4 is



(a) 1.0 m/s
(b) 1.4 m/s
(c) 1.7 m/s
(d) 2.0 m/s
(e) 2.4 m/s

(15) The angle between the vector $\vec{A} = 3\hat{\imath} + 3\hat{\jmath} - \sqrt{7}\hat{k}$ and the y-axis is

(a) 30°
(b) 45°
(c) 60°
(d) 53°
(e) 37°

(16) Two masses A and B have equal linear momentum, If $M_B = 3\ M_A$, then the ratio(نسبة) of the kinetic energy of A to B is

(a) 1:3
(b) 3:1
(c) 1:1
(d) 1:9
(e) 9:1

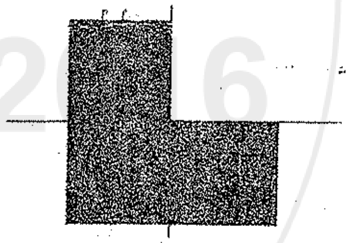
(17) The work done in stretching a relaxed spring with k=100 N/m 10 cm is.

(a) +0.5 J
(b) +2.0 J
(c) +0.0 J
(d) -0.5 J
(e) -0.2 J

(18) A 4 kg object is at rest at the origin when it explodes into three pieces. The first, with mass 1 kg, moves along the x-axis at 15 m/s. The second, with mass 2 kg, moves along the y-axis at 10 m/s. Find the speed of the third piece.

(a) 10 m/s
(b) 15 m/s
(c) 20 m/s
(d) 25 m/s
(e) 30 m/s

(19) One fourth of a square metal sheet of length L is cut from the corner as shown in the figure. Consider the origion to be at the cenetr of the origional plate, then the center of mass of the remaining part is located at



(a) -L/2, -L/3
(b) -L/12, -L/12
(c) -L/4, +L/3
(d) +L/12, -L/6
(e) +L/6, +L/6

(20) A 60 kg boy is standing at one end of a 20 kg slab that is initially at rest on a frictionless floor. The slab is 8.0 m long. The boy walks to the other end of the slab. How far did slab move with respect to the floor?

(a) 6.0 m
(b) 8.0 m
(c) 4.0 m
(d) 1.0 m
(e) 2.0 m