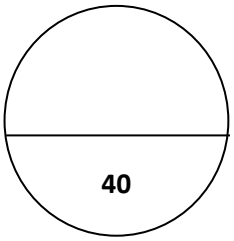
King Saud University
College of Science
Department of Physics and Astronomy



First semester 1436-1437*	Physics 103	Final exam
Tuesday 11/3/1437	22nd Dec 2015	1:00 – 4:00 PM

Submit all pages to the Examiner/ Invigilator

Name	
University number	
Section/ Dr Name	

Write choice of the correct answers in CAPITAL LETTERS in the table given

Q. 1	Q. 2	Q. 3	Q. 4	Q. 5
C	E	B	C	B
Q. 6	Q. 7	Q. 8	Q. 9	Q. 10
B	C	B	A	C
Q. 11	Q. 12	Q. 13	Q. 14	Q. 15
E	C	A	A	E
Q. 16	Q. 17	Q. 18	Q. 19	Q. 20
A	D,E	B	C	B
Q. 21	Q. 22	Q. 23	Q. 24	Q. 25
A	C	B	C	B
Q. 26	Q. 27			
C	C			

Take g= 9.8 m/s² in problems wherever needed

1 The velocity of a particle moving along the *x* axis varies in time according to the expression $V_x = (100 - 5t^2)$ *m/s*, where t is in seconds. Find the average acceleration in the time interval t = 2.0 s to t = 5.0 s.

a. 10 m/s²	b. 18 m/s²	c. -35 m/s²	d. -31 m/s²	e. 40 m/s²

2 A ball is thrown upward. While the ball is in free fall, does its acceleration

a. increase	b. decrease	c. increase and then decrease	d. decrease and then increase	e. remain constant

3 If two vectors, **A**=4**i** -5**j** and **B**=5**i**+*y***j** are perpendicular to each other. The value of *y* is:

a. - 4	b. 4	c. 2	d. -6	e. 3

4 Which of the following correctly describes the centripetal acceleration vector for a particle moving with constant speed in the circular path?

a. Constant and always perpendicular to the velocity vector of the particle
b. Constant and always parallel to the velocity vector for the particle
c. Of constant magnitude and always perpendicular to the velocity vector for the particle
d. Of constant magnitude and always parallel to the velocity vector for the particle
e. All of the above

5 A projectile is fired in such a way that its horizontal range is equal to three times its maximum height. The angle of projection is equal to: (Hint: sin2A=2sinAcosA)

a) 45° b) 53.1° . c) 63.4° d) 25° e) 15°

6 A particle initially located at the origin has an acceleration of $\boldsymbol{a}$ =3**j** m/s² and an initial velocity $\boldsymbol{v_i} = 8\,\boldsymbol{i}\ m/s$; the speed of the particle at $t = 2\ s$ is

a) $12\,m/s$ b) $10\,m/s$ c) $13\,m/s$ d) $20\,m/s$ e) *zero*

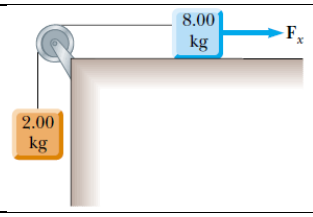
7 If a fly collides with the windshield of a fast moving car, which object experiences an impact force with a larger magnitude?

a. the fly	b. the car	c. both experience the same force	d. depends on the direction of the velocity of car	e. not enough information

8 You are standing on a weight measuring scale in an elevator that is accelerating downward at a constant rate of 1.0m/s². Your mass is 100 kg. You look at the scale to determine your weight, it reads

a. 101 N b. 880 N c. 780 N d. 1080 N e. 1180 N

9 In the system shown in the figure, a horizontal force $\mathbf{F}_x$ acts on the 8.00-kg object. The horizontal surface and pulley are frictionless. For what value of $\mathbf{F}_x$ does the tension in the cord = 19.6 N?



a. 19.6N b. 71.6 N c. 46.6N d. 58.8N e. 39.2N

10 An object experiences a net force and exhibits acceleration in response. Which of the following is *always* true?

a. The object moves in the direction of force.
b. The acceleration is in the same direction as the velocity.
c. The acceleration is in the same direction as the net force.
d. The velocity of the object increases.
e. None of the above

11 If a car is sliding down on an incline road of 30° above the horizontal with a constant speed,

the coefficient of kinetic friction of the road is:

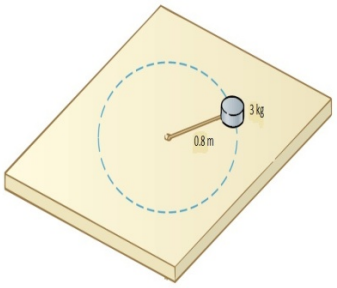
a. 0.88 b. 0.21 c. 0.43 d. 0.65 e. 0.58

12 An airplane pilot performs a looping maneuver (see figure) as he follows a vertical circular track at constant speed. The forces acting on the pilot are normal force **n** and weight **mg**: At the top (where airplane is upside-down), the direction of **n** and **mg is:**

a) **n** and **mg** are directed upward
b) **n** is upward and **mg** is downward
c) **n** and **mg** are directed downward
d) **n** is downward and **mg** is upward
e) none of the previous choices

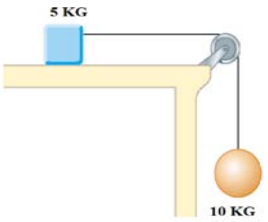
13 A light string can support a stationary hanging load of 25.0 kg before breaking. A 3.00-kg object attached to the string rotates on a horizontal, frictionless table in a circle of radius 0.800 m, while the other end of the string is held fixed. The maximum speed of the object before the string breaks is

a) 8.1 m/s	b) 9.7 m/s	c) 11.4 m/s	d) 13.2 m/s	e) 6.2 m/s



14 The system of objects in the figure starts from rest. What is the speed of the 10.00-kg ball when it has fallen to 2 m? The coefficient of kinetic friction between the 5.00-kg block and the surface is 0.5.

a) 4.43 m/s	b) 2.42 m/s	c) 5.20 m/s	d) 10.20 m/s	e) None of these



15 An old model car of mass *m* accelerates from rest to a speed v in 10 seconds. A new sports car of mass *m* accelerates from rest to a speed 2v in the same time period. The ratio of the power of new car to that of the old car ($P_{new\ car}$ / $P_{old\ car}$) is:

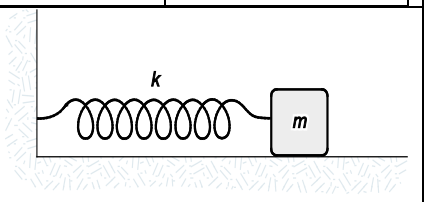
a) 0.25	b) 0.5	c) 1.0	d) 2	e) 4

16 A force $\mathbf{F} = (6\hat{\mathbf{i}} - 2\hat{\mathbf{j}})$ N acts on a particle that undergoes a displacement $\Delta\mathbf{r} = (3\hat{\mathbf{i}} + \hat{\mathbf{j}})$ m.

The work done by the force on the particle is

a) 16 J	b) 20 J	c) zero	d) 10 J	e) 18 J

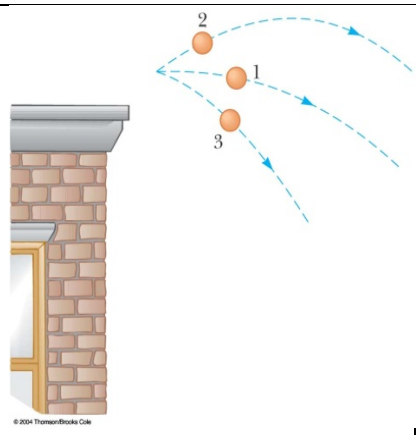
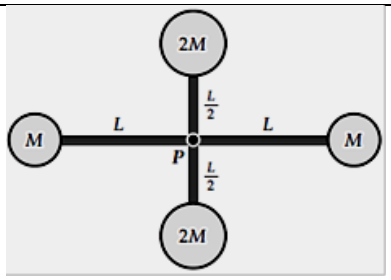
17 The block shown is released from rest when the spring is stretched a distance *d*. If *k* = 50 N/m, *m* = 0.50 kg, *d* = 10 cm, and there is no friction between the block and the horizontal surface. The speed of the block when it passes through the position of un-stretched spring is.

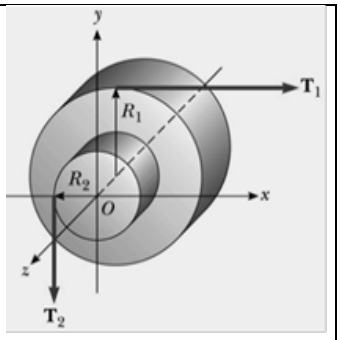


a) 0.5 m/s	b) 1.5 m/s	c) 2.0 m/s	d) 1.0 m/s	e) 1.0 m/s

18 A 2.0-kg mass swings at the end of a light string (length = 3.0 m). Its speed at the lowest point on its circular path is 6.0 m/s. What is its kinetic energy at an instant when the string makes an angle of 50° with the vertical?

a) 19 J **b)** 15 J **c)** 28 J **d)** 36 J **e)** 23 J

19	Three identical balls are thrown from the top of a building, all with the same initial speed as shown in the figure. The following statement regarding the speed of balls at the instant each hits the ground. a. $V_1<V_2<V_3$ b. $V_1>V_2>V_3$ c. $V_1=V_2=V_3$ d. $V_1>V_2<V_3$ e. None of the above	
20	A 4.0-kg particle is moving horizontally with a speed of 5.0 m/s when it strikes a vertical wall. The particle rebounds with a speed of 3.0 m/s. What is the magnitude of the impulse delivered to the particle? a) 24 N · s b) 32 N · s c) 40 N · s d) 36 N · s e) 8.0 N · s	
21	A 10g bullet is fired into a stationary block of wood (m=5kg) which gets stuck in it. The speed of the bullet-plus-wood combination immediately after the collision is 0.600 m/s. The initial speed of the bullet is a. **300.6 m/s** b. 30.6 m/s c. 306 m/s d. 250.5 m/s e. 350.7 m/s	
22	A car and a large truck travelling at the same speed make a head on collision and stick together. Which vehicle experiences the larger change in the magnitude of momentum? a) The car b) The truck c) The change in the magnitude of momentum is the same for both d) Impossible to determine e) More information is required	
23	A disk (radius = 8 cm) that rotates about a fixed axis starts from rest and accelerates at a constant rate to an angular velocity of 4 rad/s in 2 s. What is the magnitude of the tangential acceleration of a point on the rim of the disk? **a)** 24 cm/s^2 **b)** 16 cm/s^2 **c)** 12 cm/s^2 **d)** 18 cm/s^2 **e)** 30 cm/s^2	
24	The rigid object shown is rotated about an axis perpendicular to the paper and through point P. The rotational kinetic energy of the object as it rotates is equal to 1.4 J. If M = 1.3 kg and L = 0.5 m, what is the angular velocity of the object? (Neglect the mass of the connecting rods and treat the mass of rigid objects as point particles).	
	a) 2.3 rad/s **b)** 1.5 rad/s **c)** 1.7 rad/s **d)** 1.2 rad/s **e)** 2.87 rad/s	

25	The cylinder is free to rotate around the central axis as shown in the figure. A rope wrapped around the drum of radius R_1=1m, exerts a tension force T_1=5N to the right. Another rope wrapped around the core of radius R_2=0.5m exerts a tension force T_2=6N downward on the cylinder, the net torque acting on the cylinder about the rotation axis is	
	a) 2 N.m **b)** -2 N.m **c)** 1N.m **d)** -1N **e)** 11 N	
26	Ali and Omar are riding on merry-go-round (لعبة دوامة الخيل). Ali rides a horse at the outer rim of the circular platform (منصة دائرية) twice as far from the center of the circular platform as Omar, who rides on the inner circle. If merry-go-round is rotating with constant angular speed, Ali's angular speed is:	
	a) twice as Omar's **b)** half of Omar's **c)** the same as Omar's **d)** four times of Omar's **e)** none of those	
27	A rigid object is rotating in a counterclockwise direction about a fixed axis. Each of the following pairs of quantities represents an initial angular position and a final angular position of the rigid object. Which of the sets can only occur if the rigid object rotates through more than 180°? **a)** 3 rad, 6 rad **b)** -1 rad, 1 rad **c)** 1 rad, 5 rad **d)** 1 rad, 2 rad **e)** -1 rad, 2 rad	

The End