Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Introduction to Physical Science	**SCI101**	**MAJOR EXAM II**
Semester:	First Semester -- Term 181	
Date:	Sunday November 25, 2018	
Time Allowed:	60 minutes	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work when required and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.
- **Assume $g = 10$ m/s^2**
- **The universal gravitational constant $G = 6.67 \times 10^{-11}$N.m^2/kg^2**

GRADING:

	Part 1	**Part 2 - Q1**	**Part 2 - Q2**	**Total**
Mark				
Full Mark	12	4	4	20

Part 1 (12 marks): Indicate the answer choice that best completes the statement or answers the question

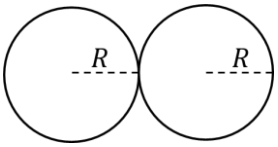
Q1. The work-energy theorem states that the total work done on an object is equal to:
a) its mechanical energy
b) the change in its mechanical energy
c) the change in its kinetic energy
d) the change in its potential energy

Q2. Car A has twice the mass and half the speed of car B. The kinetic energy of car A is
a) equal to the kinetic energy of car B
b) half the kinetic energy of car B
c) twice the kinetic energy of car B
d) four times the kinetic energy of car B

Q3. How much work is done by you when you carry a 15 kg box a horizontal distance of 25 m at constant velocity?
a) 150 J b) zero c) 375 J d) 3750 J

Q4. The weight of an object on Earth is equal to 80 N. What would be the weight of the object on a planet that has twice the radius and twice the mass of Erath?
a) 40 N b) 80 N c) 160 N d) 320 N

Q5. Two identical spheres each of mass $m = 5$ kg and radius $R = 15$ cm are placed in contact with each other as shown. How much is the gravitational attractive force between the two spheres?



a) 5.56×10^{-9} N b) 7.4×10^{-8} N c) 1.85×10^{-8} N d) zero

Q6. Which of the following is the boiling temperature of water at sea level?
a) 100 °F b) 100 K c) 212 °F d) 273 K

Q7. When a 5 kg object is completely submerged in a liquid it displaces 2 kg of the liquid. How much buoyant force acts on the object?
a) 70 N b) 50 N c) 30 N d) 20 N

Q8. Given the density of mercury is 13.6 g/cm^3, what is the height of mercury in the barometer when the pressure is 120 kPa?
a) 88.2 cm b) 882 cm c) 0.882 cm d) 16.32 cm

Q9. In a hydraulic jack the force on the small piston creates a pressure of 20 kPa. What will be the force on the large piston which has a surface area of 250 cm^2?
a) 40 N b) 80 N c) 500 N d) 250 N

Q10. Which of the following can be explained using Bernoulli's principle?

a) the lift force on airplane wings
b) the buoyant force on a floating ship
c) the increased output force in hydraulic jack
d) land heats faster than water

Q11. Which of the following statements is correct:

a) Land cools faster than water because land has a higher specific heat capacity
b) There is no lower limit for temperature
c) Heat flows from a higher specific heat substance to a lower specific heat substance
d) Atmospheric pressure is greater at the bottom of a mountain than at its top

Q12. An 8 kg object requires 12000 J of thermal energy to increase its temperature from 10 °C to 15 °C. What is its specific heat capacity?

a) 1500 J/kg.K b) 300 J/kg.K c) 150 K/kg.K d) 100 J/kg.K

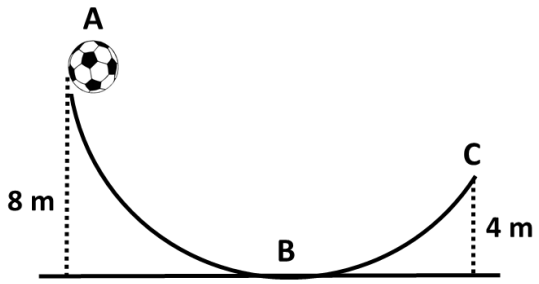
End of part 1

Proceed to part 2 next page

Part 2 (8 marks): Solve the following TWO questions in the provided space and show your solution.

Q1. In the figure, a 0.5 kg ball is released from rest from point A. Assuming no frictional forces, determine:

a) The mechanical energy of the ball at point A



b) The kinetic energy of the ball at point B

c) The potential energy of the ball at point C.

d) The speed of the ball as it leaves at point C

Q2. An object of 500 cm^3 volume floats in oil of density $\rho = 0.8$ g/cm^3 such that 100 cm^3 of its volume is above oil. Determine:

a) The mass of the displaced oil

b) The weight of the displaced oil

c) The density of the object

d) The buoyant force acting on the object

Scratch Paper
Do not remove