Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Introduction to Physical Science	**SCI101**	**FINAL EXAM**
Semester:	First Semester -- Term 181	
Date:	Wednesday, December 26, 2018	
Time Allowed:	180 minutes	

STUDENT DETAILS:

Student Name:			
Student ID Number:			
Section:	Circle section#:	556 557	558 559
Instructor's Name:	Circle name:	Dr. Hazem Abu-Farsakh	Dr. Muaffaq Nofal

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**	**Part 2 – Q3**	**Part 2 – Q4**	**Total**
Mark						
Full Mark	24	5	4	4	3	40

Part 1 (24 marks): 24 multiple choice questions, 1 mark each
Indicate the answer choice that best completes the statement or answers the question

Q1. Which of the following is Newton's first law of motion?
a) For every action there is an equal opposite reaction
b) Every object continues in a state of rest or uniform speed in a straight line unless acted upon by a nonzero net force.
c) The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass.
d) The total work done on an object is equal to the change in its kinetic energy

Q2. A car and a truck are both moving on a highway with the same kinetic energy. If the mass of the truck is four times the mass of the car then the car is moving
a) with the same speed as the truck
b) four times faster than the truck
c) two times faster than the truck
d) sixteen times faster than the truck

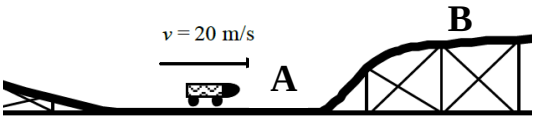
Q3. Which of the following quantities has units of J/s?
a) work b) power c) specific heat capacity d) thermal energy

Q4. A 0.2 kg baseball is moving at 60 m/s. After being batted it bounces back at 60 m/s. How much impulse is given to the baseball?
a) zero b) 24 N.s c) 120 N.s d) 12 N.s

Q5. An 8 kg firearm fires a 20 g bullet at 320 m/s. The speed at which the firearm recoils is:
a) 0.8 m/s b) 80 m/s c) 160 m/s d) 0.4 m/s

Q6. A 2000 kg car moving at 5 m/s collides with another 3000 kg car initially at rest. It the two cars stick together after the collision what is their final speed?
a) 3 m/s b) 1 m/s c) 5 m/s d) 2 m/s

Q7. A 50 kg roller coaster is moving at 20 m/s in the lowest point of its track (point A). As it climbs up to point B its speed becomes 10 m/s. Neglecting friction, what is the height at point B?



a) 20 m b) 5 m c) 10 m d) 15 m

Q8. The gravitational attractive force between two objects is 800 N when the distance between their centers is 120 km. How much is the attractive force if the distance becomes 60 km?
a) 3200 N b) 1600 N c) 200 N d) 400 N

Q9. The height of Mercury in a barometer reads 85 cm. Given the density of mercury is 13.6 g/cm^3, what is the pressure in kPa?
a) 115.6 kPa b) 1600 kPa c) 160 kPa d) 11.56 kPa

Q10. The amount of heat necessary to change the temperature of 1 kg of an object by 1°C is
a) 1 calorie b) its specific heat c) its latent heat d) 1 J

Q11. Which heat transfer method happens in vacuum?
a) conduction b) convection c) radiation d) all of these

Q12. Given the specific heat capacity of aluminum = 900 J/(kg.°C), if we add 180 J of heat to 10 g of aluminum, by how much will its temperature increase

a) 5 °C b) 20 °C c) 10 °C d) 18 °C

Q13. A temperature of 50° F is equal to:

a) 122 °C
b) 223 K
c) 18 K
d) 10 °C

Q14. What is the amount of heat released when 200 g of water at 0 °C is transformed to ice at -5 °C, given the specific heat capacity of ice = 2100 J/(kg.°C), specific heat capacity of water = 4180 J/(kg.°C), and the latent heat of fusion of ice = 334000 J/kg.

a) 64.7 kJ
b) 65.536 kJ
c) 68.9 kJ
d) 69.736 kJ

Q15. Consider a metallic rod and a wooden rod both at 15 °C. Why the metallic rod feels cooler when touched?

a) because metal has a higher specific heat capacity
b) because wood has a higher specific heat capacity
c) because metal is a better conductor of heat
d) because wood is a better conductor of heat

Q16. Which of the following has the shortest wavelength?

a) Red light
b) Yellow light
c) Blue light
d) Violet light

Q17. Dispersion is

a) the process in which a wave bounces off when encountering a surface
b) the enforcement of two waves when they meet together
c) the cancellation of two waves when they meet together
d) the separation of light into colors arranged by their frequency

Q18. Refracted light that bends away from the normal is light that

a) slows down
b) speeds up
c) is reflected
d) is absorbed

Q19. The image of an object in a convex mirror (which curves outward) is

a) smaller and closer to the mirror than the object
b) larger and closer to the mirror than the object
c) larger and farther away than the object
d) smaller and farther away than the object

Q20. A nucleus with an atomic number of 48 and a mass number of 112 must have
a) 48 neutrons
b) 112 neutrons
c) 64 neutrons
d) 160 neutrons

Q21. An atom with an atomic number of 8 has
a) 8 valence electrons
b) 6 valence electrons
c) 2 valence electrons
d) no valence electrons

Q22. The electron dot structure of $^{24}_{12}\mathrm{Mg}$ is:

a)  b)  c)  d) 

Q23. What is the net charge of an atom that has an atomic number of 13 and has lost 3 electrons?
a) $+3$
b) -3
c) $+10$
d) -10

Q24. Elements within the same group in the periodic table have
a) the same number of protons
b) the same number of electrons
c) the same electron dot structure
d) all of the above

Part 2 (16 marks):
Solve the following four problems in the provided space and show your detailed solution.

Q1. (5 marks) A 12 kg object falling initially at a speed of 3 m/s downwards is affected by an upward air resistance force of 30 N. Assuming the air resistance force remains constant, calculate:

a) The net force acting on the object

b) The acceleration of the object

c) The final speed of the object as it falls for 2 seconds

d) The work done on the object by air resistance during its fall for 21 meters

e) The total work done on the object during its fall for 21 meters.

Q2. (4 marks) A 150 grams piece of pure Silver of density 10.5 g/cm^3 is placed in water of density 1 g/cm^3. Calculate:

a) The volume of displaced water

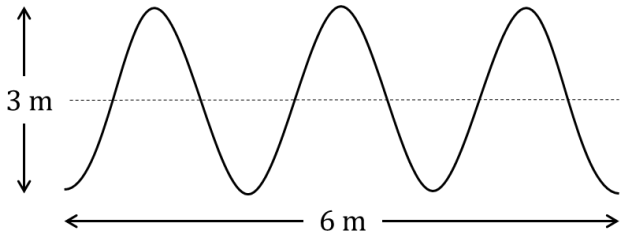
b) The weight of displaced water

c) The actual weight of the piece (outside water)

d) The weight of the piece inside water

Q3. (4 marks) The wave shown in the figure vibrates up and down 4 times each second. Determine

a) Its wavelength



b) Its amplitude

c) Its period

d) Its speed

Q4. (3 marks) A 15 g piece of metal at 120 °C is placed in 200 g of water at 25 °C in an isolated container. The final temperature of the water and the metallic piece is 35 °C. Given the specific heat capacity of water is 4180 J/(kg.°C), calculate the specific heat capacity of the metallic piece.

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