Prince Sultan University

Department of Mathematics & Physics

SCI 101- General Sciences

Final Exam

First Semester, Term 161

Sunday 22/1/2017

Examination Time : 180 minutes

Name (Please Print). . . . . .

Student I.D. . . . . .

Circle your Section

533	534	535	744
10 – 10:50	11 – 11:50	1:10 - 2	1:10 - 2
Dr. Muaffaq Nofal	Dr. Muaffaq Nofal	Dr. Muaffaq Nofal	Dr. Asif Zaidi

Important Instructions:

1. You can use a scientific calculator that does not have programming or graphing capabilities.

*2. You may **NOT** borrow a **calculator** from anyone.*

*3. Do not use **RED pen**.*

*4. This is a closed books and notes exam. Do **NOT** use notes or textbooks.*

*5. There should be **NO** talking during the examination.*

*6. Your will be **expelled** immediately from the exam if your mobile phone is seen or heard.*

*7. Any signs of **cheating** may cause you being expelled from the exam.*

*8. This examination has **3 parts**. **Part 1** has **12 multiple choice questions**, each question worth **1 point**. **Part 2** has **6 multiple choice questions**, each question worth **2 point. Part 3** has **4 workout problems** each problem worth **4 points**.*

Make sure your paper has all the questions and problems.

Part 1: 12 Multiple Choice Questions (1 mark each)

1) What is the acceleration of a car that increases its velocity from 10 m/s to 70 m/s in 12 s?

a) 5 m/s^2 b) 6 m/s^2 c) 10 m/s^2 d) 720 m/s^2

2) A ball is thrown from ground directly upward with an initial speed of 35 m/s. How long time does the ball need to reach the top point of its path?

a) 6125 s b) 3.5 s c) 7 s d) 1.75 s

3) The process of thermal energy transfer in which a cooler (more dense) fluid sinks through a warmer (less dense) fluid is called

a) Conduction. b) Convection. c) Radiation. d) Isolation.

4) The boiling point of Mercury is 671 ^oF. What is its boiling point in kelvin?

a) 663 K b) 1311 K c) 355 K d) 628 K

5) If you triple the frequency of a certain wave, what happens to its period?

a) The period triples.

b) The period stays the same.

c) The period is cut into one third.

d) Not enough information is given to answer this question.

6) Two waves combine to make a wave with reduced amplitude in a process called

a) Refraction b) Reflection

c) Constructive interference. d) Destructive interference.

7) Refraction is the bending of light caused by the change in speed when light passes from one medium to another. Which of these would not exist if light didn't change speed in transparent materials?

a) Rainbows.

b) Mirages.

c) Dispersion in a prism.

d) All wouldn't exist.

8) Which of the following is true about valence electrons?
a) Valence electrons are electrons in the innermost shell of the atom.
b) Valence electrons exist only in gases.
c) Valence electrons are the ones that can participate in chemical bonding.
d) All electrons of metals are valence electrons.

9) Which of the following is NOT true about elements in the same group in the periodic table?

a) They have similar chemical properties.

b) They have similar atomic number.

c) They have similar electron dot structure.

d) They have similar electron configuration.

10) Which is the electron dot structure for Phosphorus (atomic number = 15)?

11) What is the chemical formula for Aluminum Chloride which is a compound made of Aluminum ions, Al^{3+}, and Chlorine ions, Cl^{1-}?

a)$AlCl_3$ b) Al_3Cl c) AlCl d) $ClAl_3$.

12) How many covalent bonds would Nitrogen atom (N) usually form?

(Atomic number of Nitrogen = 7)

a) 1 b) 2 c) 3 d) 4

Part 2: 6 Multiple Choice Questions (2 mark each)

1) Two automobiles are 275 kilometers apart and traveling toward each other along a straight line. One automobile is moving at constant velocity of 70 km/h and the other is moving at constant velocity of 40 km/h. In how many hours will they meet?

a) 1.5 h b) 2 h c) 2.5 h d) 1.75 h

2) A 300 kg cart is pulled by two horses. The force exerted by each horse is 1500 N. The opposing force of friction acting on the cart is 400 N and the opposing air resistance is 200 N. What is the resulting acceleration of the cart?

a) 8 m/s^2 b) 10 m/s^2 c) 12 m/s^2 d) 2 m/s^2

3) A 6 kg ball rolling horizontally at a speed of 3 m/s hits a wall recoils from it at a speed of 2.5 m/s. The change in the momentum of the ball is:

a) 33 N.s b) 3 N·s c) 18 N·s d) 15 N·s

4) How much power is required to lift a 45 kg object at constant speed a vertical distance of 7 m in a time of 5 seconds?

a) 63 watt b) 630 watt c) 315 watt d) 321 watt

5) What is the gravitational attractive force between a ship of mass 95000 kg and a boat of mass 5600 kg when their centers are 120 m apart?

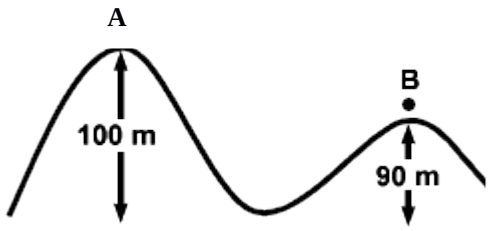
a) 9.63×10^{-6} N b) 0.035 N c) 2.95×10^{-6} N d) 2.46×10^{-6} N

6) A hydraulic jack has a small piston of area 25 cm^2. It is required to obtain a force of 280 N at the large piston when a force of 40 N is exerted at the small piston. What should be the area of the larger piston?

a) 3.57 cm^2 b) 6 cm^2 c) 175 cm^2 d) 82 cm^2

Part 3: Solve the following four problems in the space provided in between showing all your steps (4 marks each)

Problem 1: A 70 kg skier starts to move from rest from point A down a frictionless hill of height 100 meters. Then he ascends another hill of height 90 meters, as shown in the figure below.



a) Calculate the potential energy of the skier at the highest point of this path.

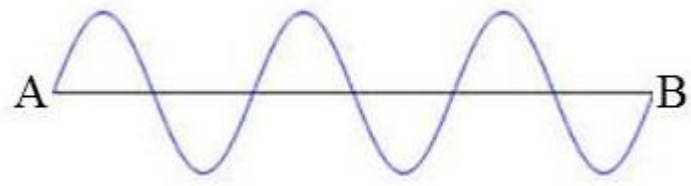
b) What is the speed of the skier when he reaches the top of the second hill?

Problem 2: In an experiment to measure the specific heat of copper, a piece of copper of mass 190 g is heated to a temperature of 150 °C then placed into 750 g of water at 20 °C. The measured final equilibrium temperature was 23 °C. Given that the specific heat of water is 4200 J/(kg.°C), calculate the specific heat of copper.

Problem 3: Calculate the amount of thermal energy needed to convert a 300 g of ice at -20 °C to water at 15 °C.

Given that: The specific heat capacity of ice is 2100 J/(kg.°C)
The specific heat capacity of water is 4200 J/(kg.°C)
The latent heat of fusion of ice is 334000 J/kg

Problem 4: The following diagram represents a 0.2 Hz wave that is moving at a speed of 120 m/s. find



a) The period of this wave.

b) The wavelength of this wave.

c) The distance between points A and B on the diagram of this wave.

d) The time needed for this wave to travel from point A to point B on the diagram.