Prince Sultan University
Department of Mathematics & Physics
SCI 101- General Sciences
Final Exam
First Semester, Term 141
Wednesday 7/1/2015
Examination Time : 120 minutes

Name (Please Print). . . . .

Student I.D. . . . .

Section No. . . . .

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 **2 parts**. **Part 1** has **20 multiple choice questions**, each question worth **1 point**. **Part 2** has **five workout problems** each problem worth **5 points**.*

> *Make sure your paper has all the questions and problems.*

Part 1: 20 Multiple Choice Questions (1 mark each)

1) A 4.2 kg book is placed on a table, and then you put your notebook that weights 20 N above the book. What is the normal force acting on the book from the table?

a) 62 N   b) 24.2 N   c) 6.2 N   d) 242 N

2) When an object is in dynamic equilibrium then

a) The object is at rest.

b) The object is moving with constant speed.

c) The object is moving with constant velocity.

d) The object is moving with constant non-zero acceleration.

3) A horse is running at a speed of 18 km/h west while a train is moving at 84 km/h west. Assuming that the horse and the train are moving along the same straight line, what is the speed of the train with respect to the horse?

a) 102 km/h   b) 66 km/h   c) 84 km/h   d) 18 km/h

4) A 45 kg box is dropped from the top of a high building. What is the value of air resistance faced by the box at the moment when its acceleration is 7 m/s^2?

a) 270 N   b) 450 N   c) zero   d) 135 N

5) Which of the following is **NOT** true about action-reaction forces?
a) action-reaction forces cancel to zero for a single object.
b) action-reaction forces are equal in magnitude.
c) action-reaction forces act on two different objects.
d) action-reaction forces are opposite in direction.

6) A 30 N object is released from a height of 3.2 m. What is its kinetic energy just before it hits the ground?

a) 8 J   b) 64 J   c) 96 J   d) 9.6 J

7) Ice floats on the top of liquid water because:
a) Ice is colder than water.   b) Ice has a lower density than water.
c) Ice has a higher density than water.   d) Ice is a solid.

8) What is the buoyant force acting on a 6.7 kg object floating at the surface of sea water?

a) Depends on the density of seawater.

b) Less than 67 N

c) 6.7 N

d) 67 N

9) A completely submerged object always displaces its own

a) Weight of fluid.   b) Density of fluid.

c) Mass of fluid.   d) Volume of fluid.

10) An object that has kinetic energy must be
a) At ground.   b) At a high location.   c) At rest.   d) Moving.

11) The boiling point of Mercury is 628°K. What is its boiling point in Fahrenheit?
a) 671   b) 1654   c) 607   d) 179

12) Which of the following is **NOT** true about thermal energy?
a) Thermal energy can move things.
b) Thermal energy flows from a substance with more thermal energy into one with less thermal energy.
c) Thermal energy flows from high temperature to low temperature.
d) Thermal energy is measured in Joule or Calorie.

13) How many calories are there in 209 joules?

 a) 209   b) 874   c) 50   d) zero

14) How does thermal energy reach the Earth from the Sun?

a) By conduction.   b) By convection.   c) By insulation.   d) By radiation.

15) The unit used to measure the latent heat of fusion is:

a) J/kg   b)   J/(kg.°C)   c) kg/J   d) kg/(J.°C)

16) What is the name given to the lowest point of a wave?

a) Crest   b) Trough   c) Amplitude   d) Wavelength

17) Two waves combine to make a wave with larger amplitude in a process called

a) Standing waves   b) Reflection

c) Constructive interference.   d) Destructive interference.

18) Consider the following diagram. If the distance from point A to point B in the diagram is 36 cm, then the wavelength is:
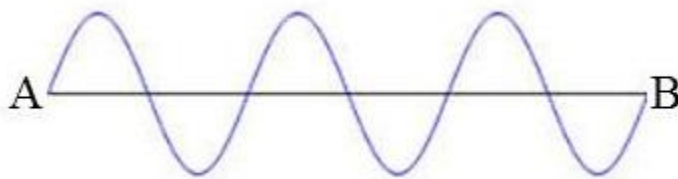
a) 36 cm   b) 18 cm   c) 108 cm   d) 12 cm

19) A fire truck siren at rest has a frequency of 780 Hz. If you are standing still and observe the frequency to be 765 Hz, then you can conclude that

a) The sound from the fire truck has echoed.

b) The fire truck is at rest.

c) The fire truck is moving toward you.

d) The fire truck is moving away from you.

20) The speed of a wave does not depend on
a) The medium through which the wave moves.

b) The frequency of the wave.

c) The wavelength of the wave.

d) The amplitude of the wave.

Problem 1: If you lift a 16 kg box to the top of a 65 m high building at a constant speed in 3 minutes,

a) What is the work done by you in lifting the box?

b) What is your power in lifting the box?

Problem 2: A certain wave travels at a speed of 54 km/h. When the period of the wave is 2 minutes, what is its wavelength?

Problem 3: If you take a 2.6 kg block of pure gold (Au) and lower it into a container of sea water, what will be the weight of the gold block inside the sea water? (given that the density of sea water = 1.1 g/cm^3 and density of gold = 19.6 g/cm^3)

Problem 4: Determine the final temperature when a 2 kg block of Lead at 60 °C is placed in contact with an 8 kg block of Aluminum at 10 °C. Given that the specific heat capacity of Lead is 150 J/(kg.°C) and the specific heat capacity of Aluminum is 900 J/(kg.°C).

Problem 5: Calculate the amount of thermal energy needed to convert a 4 kg of ice at -80 °C to water at 50 °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