PAST - QUESTIONS

BABCOCK UNIVERSITY, ILISHAN-REMO, OGUN STATE
DEPARTMENT OF BASIC SCIENCES – PHYSICS/ELECTRONICS UNIT

2016/17 SESSION FIRST SEMESTER EXAMINATIONS 16th December 2016

PHYS 101: GENERAL PHYSICS I CREDIT: **3** Units **TIME:** 1½ Hours

Name:..... ....
Surname First Name Middle Name

Department:..... Course of Study:.....

Matriculation Number:..... Signature:..... Date:.....

INSTRUCTIONS: Section A: Answer **ALL** questions by **PICKING** the correct option. **Section B:** Answer any **three (3)** questions out of **four (4)** questions.

USEFUL CONSTANTS: *Atmospheric pressure,* $1\ atm = 1.013 \times 10^5 Pa$*; Acceleration due to gravity,* $g = 9.8\ ms^{-2}$*; density* $\rho = 1000\ Kgm^{-3}$

SECTION A: MULTIPLE CHOICE QUESTIONS

1. A radio wave travels at a frequency of 900 kHz. If the speed of electromagnetic wave is $3x10^8$ m/s, calculate the wavelength of the wave.
   (a) 333.33 m (b) 33.33 m (c) 300 m (d) 30 m
2. A wave that requires a material medium for its propagation is called
   (a) Mechanical (b) Transverse (c) Electromagnetic (d) All of the above
3. A wave traveling in the positive x-direction is represented by the equation $y = 0.45 \sin(8\pi x + bt)$. The wave has a frequency of 3 Hz, determine the values of b.
   (a) -8π rad/s (b) 8π rad/s (c) -6π rad/s (d) 6π rad/s
4. From question 3 above, what is the amplitude of the wave?
   (a) 4.5 m (b) 0.45 m (c) 0.045 m (d) 0.54 m
5. Which of the following represents a stationary wave
   (a) $y = 2A \sin(kx + \omega t)$ (b) $y = 2A \cos kx \sin \omega t$ (c) $y = 2A \cos \omega t \sin kx$
   (d) $y = 2A \cos(kx + \omega t)$
6. A 250-kg load is hung on a wire having a length of 5.00 m, cross-sectional area $0.250 \times 10^{-4}\ m^2$, and Young's modulus $8.00 \times 10^{10}\ N/m^2$. What is its increase in length?
   (a) 6.13×10^{-3} m (b) 6.25×10^{-3} m (c) 6.0×10^{-2} m (d) 4.16×10^{-3} m
7. Which of the following is NOT used in measuring pressure?
   (a) Manometer (b) Sphygmomanometer (c) Barometer (d) Pressurometer
8. A body weighs 0.76N in air and 0.40N when immersed in a liquid. What is the upthrust exerted on the object by the liquid?
   (a) 0.27 N (b) 0.36 N (c) 1.16 N (d) 0.10 N
9. Which of the following is **incorrect** about factors affecting the viscosity of a fluid?
   (a) increases as the surface area of the fluid in contact decreases (b) vary directly with pressure
   (c) depends on the concentration of the fluid (d) vary directly with temperature
10. Which of the following is **wrong** about Laminar or Turbulent flow?
    (a) Laminar and Turbulent flow occurs at low and high Reynolds number respectively
    (b) In laminar flow the path traced out by the particle is streamlined
    (c) Turbulent flow occurs at sufficiently high velocity
    (d) In turbulent flows every particle of the fluid passing a paticular point have their velocities in same directions.

11. One of the following is **not** a property of an ideal fluid.
    (a) It is non-viscous (b) It is incompressible (c)) Its flow is steady (d) Its flow is rotational
12. Which of the following is **not** an effect of surface tension?
    (a) Formation of drops occurs when a mass of liquid is stretched.
    (b) Beading of rain water on a waxy surface, such as a leaf.
    (c) Floating of objects whose weight is less than upthrust
    (d) Flotation of objects denser than water when its weight is small enough
13. A capillary tube of 0.50 mm diameter is inserted vertically in a liquid of relative density 0.78 and surface tension 6.0×10^{-2} N/m. If the angle of contact is 30°, calculate how high in the stem the liquid rises. (a) 7.38 cm (b) 5.44 cm (c) 0.544 cm (d) 0.738 cm
14. Calculate the absolute pressure at an ocean depth of 1250 m. Assume the density of seawater is 1024 kg/m^3 and that the air above exerts a pressure of 101.3 KPa.
    (a) 12,645.3 KPa (b) 10,136.5 KPa (c) 1,024 KPa (d) 1,125.3 KPa
15. Water flows through a fire hose of diameter 7.2 cm at a rate of 0.0150 m^3/s. The fire hose ends in a nozzle of inner diameter 2.0 cm. What is the speed with which the water exits the nozzle?
    (a) 0.100 m^3/s (b) 0.1944 m^3/s (c) 0.054 m^3/s (d) 0.216 m^3/s
16. A particle is projected with a velocity of 25 ms^{-1}, what is the maximum range for the particle?
    (a) 63.8 m (b) 68.3 m (c) 83.6 m (d) 6.38 m
17. A body of mass 60 Kg moving with a speed of 25 ms^{-1} makes a head on collision with another body of mass 6 Kg moving in the same direction with a speed of 20 ms^{-1}. If the collision is completely elastic, find their common velocity.
    (a) 45.25 ms^{-1} (b) 25.45 ms^{-1} (c)24.55 ms^{-1} (d) 44.25 ms^{-1}
18. A man's brain is approximately 0.33 m above his heart. If the density of human blood is $1.05 \times 10^3 kgm^{-3}$, determine the pressure required to circulate blood between the heart and the brain.
    (a) 340 Nm^{-2} (b) 34.0 Nm^{-2} (c) 3400 Nm^{-2} (d) 3.4 Nm^{-2}
19. The highest officially recorded temperature in continental United State is 134°F in death valley, California. What is this temperature on the Celsius scale?
    (a) 56.7°C (b) 57.6°C (c) 66.6°C (d) 67.6°C
20. An ideal gas occupies a volume of 1 litre at 1 atms. and −50°C. What is the volume occupied when it is compressed to 3 atms at a temperature of 30°C?
    (a) 0.045 litres (b) 0.0045 litres (c) 0.54 litres (d) 0.45 litres
21. In a Tug-of-war competition, group A and B exert forces 800 N and 815 N respectively on one another. What is the magnitude of the net force and in what direction?
    (a) 15 N, towards A (b) 15 N, towards B (c) 0 N, at the middle (d) 51 N, towards B.
22. A reversible process is one in which
    (a) the system returns to its original state (b) the system is always in equilibrium state
    (c) the system receives no heat energy (d) the system interacts with the surrounding
23. When work is done by the system the internal energy of the system increases. **True** or **False**
24. Calculate the thermal efficiency of carnot engine operating between two temperature reservoirs maintained at $200°C$ and $40°C$.
    (a) 0.000338 (b) 0.00338 (c) 0.0338 (d) 0.338
25. In a system where mass and energy cannot enter or leave is called
    (a) Isolated system (b) Single system (c) Open system (d) Closed system
26. $P + \frac{1}{2}\rho v^2 + \rho g z$ = constant is called
    (a) Poiseuille's equation (b) Bernoulli's equation (c) Stoke's equation (d) Archimede's equation

27. Calculate the stiffness of a piece of elastic material where length is increased by 1 m when a force of 2 N was applied across its ends.
(a) 4 Nm^{-1} (b) 3 Nm^{-1} (c) 2 Nm^{-1} (d) 1 Nm^{-1}

28. Mechanical Advantage of hydraulic press is expressed as: assuming a and A maintains their usual meanings
(a) $\frac{a}{A}$ (b) $\frac{a^2}{A^2}$ (c) $\frac{A^2}{a^2}$ (d) $\frac{A}{a}$

29. The temperature of -93^{0}C correspond to an absolute temperature of
(a) 366K (b) 293K (c) 273K (d) 180K

30. What is the maximum efficiency of an engine which operates between two reservoirs at temperature of 25^{0}C and 40^{0}C?
(a) 0.95% (b) 1.95% (c) 20.11% (d) 4.79%

SECTION B: THEORY

1. An object of mass 4kg moves round a circle of radius 6m with a constant speed of 12ms^{-1}. Calculate:
(a) the angular velocity (5 Marks)

(b) the force towards the centre (5 Marks)

2. (a) State Pascal's Principle (2 Marks)

(b) Write out the Bernoulli's equation (2 Marks)

(c) Horizontal pipe of varying cross-section delivers water into a reservoir. At a point in the pipe the pressure is 2 x 10^5 Pa and water flows past this point at 1 m/s. calculate the pressure at another point in the pipe where the velocity of water is 10 m/s.

3. (a) State the temperature range of the following thermometers:

S/N	Types of Thermometer	Temperature Range
i.	Mercury Thermometer	
ii.	Thermocouple Thermometer	
iii.	Resistance Thermometer	

(1 Mark each)

(b) On thermodynamic temperature scale carried out in Physics Laboratory, one fixed point is the triple point with a given value of 273.16 K, and the other fixed point is 0 K. Using the relation: $V/V_{tr} = \theta/273.16$ for measuring θ with a constant pressure gas thermometer, calculate the temperature in Kelvin when the volume at unknown temperature is

i. 800 cm^3 (1 Mark)

ii. 560 cm^3 (1 Mark)

(c) A cup of mass 500 g and initially at 20°C is made of copper of Specific heat capacity 390 $J\,kg^{-1}K^{-1}$ when 8.78 $\times 10^3$ J of heat is supplied to the cup. Calculate:

i. the heat capacity of the cup (2 Marks)

ii. the temperature to which the cup is raised (3 Marks)

4. (a) Define the term *longitudinal wave* with two examples. (2 Marks)

Chitor

BABCOCK UNIVERSITY, ILISHAN-REMO, OGUN STATE
DEPARTMENT OF BASIC SCIENCES – PHYSICS UNIT

100 LEVEL — **B.Sc. EXAMINATIONS** — 11th December 2015
2015/16 SESSION — **PHYS 101:** GENERAL PHYSICS I — CREDIT: **3** Units
INSTRUCTION: Attempt **ALL** questions by **FILLING/PICKING** the correct option. **TIME:** 1½ Hours
Show **ALLWORKINGS** where necessary in any space provided.

USEFUL CONSTANTS: *Atmospheric pressure, 1 atm = $1.013 \times 10^5 Pa$; Mass of the earth, $M_e = 6.0 \times 10^{24} k$; Radius of the earth, $r_e = 6400$ km; Gravitational constant, $G = 6.67 \times 10^{-11} Nm^{-2}kg^{-2}$; Acceleration due to gravity, $g = 9.8\ ms^{-2}$; Stefan-Boltzmann's constant $\sigma = 5.67 \times 10^{-8} Wm^{-2}K^{-4}$;*

Name:..... ....
Surname First Name Middle Name

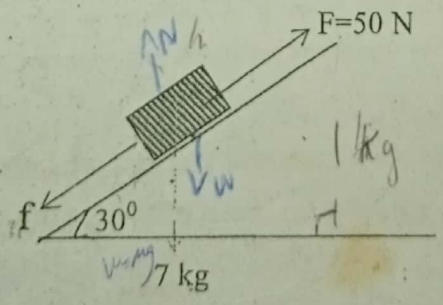
Department:..... Course of Study:.....

Matriculation Number:..... Signature:..... Date:.....

1. Given two vectors $\bar{a} = 3\hat{\imath} + 2\hat{\jmath}$, $\bar{b} = -\hat{\imath} + 7\hat{\jmath}$. *Find a vector $\bar{c}$ such that $\bar{a} + \bar{b} + \bar{c} = 0$*
   a. $+2\hat{\imath} - 9\hat{\jmath}$ b. $-2\hat{\imath} - 9\hat{\jmath}$ c. $-2\hat{\imath} + 9\hat{\jmath}$ d. $+2\hat{\imath} + 9\hat{\jmath}$
2. A man throws a ball vertically upward with an initial speed of 120 m/s. What is the maximum height reached by the ball and how long does it takes to return to the point it was thrown?
   a. $6.12\ m, 12.24\ s$ b. 7.12 m, 11.42 s c. 6.5 m, 7.24 s d. 11.54 m, 12.8 s
3. A flight from Lagos to Frankfurt which is a distance of 4750km takes 6hrs 15min. What is the plane's average velocity?
   a. 111.1 m/s b. 121.1 m/s c. 112.1 m/s d. 211.1 m/s
4. What minimum initial speed must a projectile have at the earth's surface if it is to escape from the earth? Ignore effects caused by atmospheric friction and the earth's rotation
   a. $2.6 \times 10^4\ ms^{-1}$ b. $1.22 \times 10^4\ ms^{-1}$ c. $1.32 \times 10^4\ ms^{-1}$ d. $1.12 \times 10^4\ ms^{-1}$
5. A 12kg load is dragged along surface by a force of 35 N. What is the acceleration of the load if the coefficient of friction between the load and the surface is 0.22?
   a. $0.76\ m/s^2$ b. $7.60\ m/s^2$ c. $0.67\ m/s^2$ d. $0.66\ m/s^2$
6. A load of mass $M_1 = 2.3$ kg is attached to a mass $M_2 = 4.25$ kg with a light inextensible string hanging over a frictionless pulley. It the two loads hang freely in air, what is the acceleration of M_1 upwards?
   a. $24.5\ m/s^2$ b. $2.54\ m/s^2$ c. $25.4\ m/s^2$ d. $5.24\ m/s^2$

Use the information below to answer the questions 7 to 10

A body of mass 7 kg is dragged up an inclined plane of angle 30^0 with force F = 50 N. The coefficient of Kinetic friction μ between the body and the plane is 0.22. (See the diagram below)



7. Calculate the kinetic friction f experienced by the body?
   a. 12.07 N b. 11.07 N c. 13.07 N d. 10.07 N
8. What value is the component of the gravitational force down the plane?
   a. 34.3 N b. 24.3 N c. 44.3 N d. 14.3 N

9. Calculate the net force on the body up the plane
   a. 6.23 N b. 3.26 N c. 3.36 N d. 2.63 N
10. What is the value of the acceleration with which the body ascends the plane?
   a. 0.38 m/s^2 b. 3.8 m/s^2 c. 0.83 m/s^2 d. 8.3 m/s^2
11. A swimmer whose body's surface area is approximately 1.6 m^2 lies at a depth of 3 m below the water surface. How much force is exerted on his body due to water pressure?
   a. 4.7×10^4 N/m^2 b. 7.7×10^4 N/m^2 c. 7.4×10^4 N/m^2 d. 2.4×10^4 N/m^2
12. Which of the following machines is an application of pascal principle
   a. Inclined plane b. Pulleys c. Hydraulic press d. Screw jack
13. A 2.54 cm pipe A, is welded to another pipe B of diameter 0.6 cm. a liquid flows in the pipes laid horizontally. If the velocity of the liquid in pipe A is 0.16 m/s, calculate the velocity in pipe B.
   a. 2.47 m/s b. 2.57 m/s c. 2.67 m/s d. 2.87 m/s
14. Which of the following is the carrier of heat transfer by radiation?
   a. Air b. Water c. Holes d. Electromagnetic waves
15. A blackbody of surface area 2.5×10^{-2} m^2 and at temperature 2000°C is placed in a room where the temperature is 30°C. Calculate the net rate of heat radiation in the body. {Hint: emissivity of a black body = 1}
   a. 7.38×10^4 W b. 3.78×10^4 W c. 8.73×10^4 W d. 2.38×10^4 W.
16. $P + \frac{1}{2}\rho v^2 + \rho g z =$ constant is called .....
   a. Poiseuilli's equation b. Bernoulli's equation c. Stokes equation d. Archimedes' equation
17. b. A carnot engine operates under the double cyclic _____ processes?
   a. Adiabatic and Isothermal b. Adiabatic and Isochoric
   c. Adiabatic and Isobaric d. Isochoric and Isobaric
18. c. A horizontal pipe of varying cross-section delivers water into a reservoir. At a point in the pipe the pressure is 2×10^5 Pa and water flows past this point at 1 m/s. calculate the pressure at another point in the pipe where the velocity of water is 10 m/s.
   a. 1.61×10^5 Pa. b. 2.51×10^5 Pa. c. 3.51×10^5 Pa. d. 1.51×10^5 Pa.
19. d. A simple pendulum of length 1m goes through a curved distance 10cm. what angle does it turn through to achieve this?
   a. 0.1rad b. 10 rad c. 0.01 rad d. π rad
20. e. If the simple pendulum spends 25 s to complete 20 oscillations, what is the period of its oscillation?
   a. 2 s b. 1.25 s c. 2.5 s d. 0.8 s
21. f. The correct unit for surface tension is ---------- ?
   a. N/m b. N/m^2 c. N/m^3 d. N^2/m
22. g. A body of mass 1.5 kg is whirled in a circle by a string of length 0.5 m. If the period of revolution is π sec. Calculate the force on the body by the string.
   a. 5 N b. 3 N c. 2 N d. 4 N

23. The position of an object in space is described with respect to a pre-defined
   (a) coordinate point (b) reference point (c) arbitrary space (d) inertial frame
24. The dimension of Heat capacity is .....
25. When the unit of measured quantity is small, prefixes are used to denote the factor, is known as (a) Sub-Multiples (b) Multiples (c) Factors (d) None of the above
26. What is $4\hat{j} \times 5\hat{i}$? .....

27. The position vector of a particle in 3-D is $\vec{r} = x\,\hat{\imath} + y\,\hat{\jmath} + z\,\hat{k}$, state the instantaneous velocity expression

(a) $\vec{v} = a_x\hat{\imath} + a_y\hat{\jmath} + a_x\hat{k}$ (b) $\vec{v} = r_x\hat{\imath} + r_y\hat{\jmath} + r_x\hat{k}$ (c) $\vec{v} = v_x\hat{\imath} + v_y\hat{\jmath} + v_x\hat{k}$ (d) $\vec{r} = v_x\hat{\imath} + v_y\hat{\jmath} + v_x\hat{k}$

28. A particle is launched to the air with an initial velocity $\vec{v} = 12.5\,\hat{\imath} + 20.0\,\hat{\jmath}$ in ms^{-1}. Calculate the horizontal distance attained by the particle. (a) $131.3\,m$ (b) $113.3\,m$ (c) $131.1\,m$ (d) $133.1\,m$

29. A cylinder resting on its curved surface is said to be in ..... equilibrium.

30. The coefficient of dynamic friction is far less in value than that of its limiting friction. **True** or **False**

31. Calculate the work done by a water pump in raising 500 kg of water from 12 m deep well on to a reservoir 5 m above the ground. (a) $83.385\,KJ$ (b) $83.835\,KJ$ (c) $83.335\,KJ$ (d) $83.375\,KJ$

32. ..... is the tendency of a force to cause an object to rotate about its axis.

33. The phenomenon that describes the magnitude of the velocity of uniform circular motion constant but its direction changes as the particle moves in a circular path is called .....

34. The period of an oscillating pendulum whose angular frequency is $\frac{4\pi}{5}$ rad/s is .....

35. The expression for gravitational potential energy with all symbols having their usual meanings is (a) $\frac{GMm}{2R}$ (b) $-\frac{GMm}{2R}$ (c) $\frac{GMm}{R}$ (d) $-\frac{GMm}{R}$

36. The effect exerted by the molecules of a confined fluid which interact and in contact with the wall of the container is known as .....

37. In laminar flow, the velocity of the fluid layers at the wall is maximum compared with the one at the centre of the pipe that is zero. **True** or **False**

38. The point where elastic deformation of a stretching material is still effective is called .....

39. The velocity ratio of a hydraulic lift as a class of machine is expressed as .....

40. The random movement of molecules in fluids brings about its increase in average speed thereby giving its temperature rise. **True** or **False**

41. What is the unit of latent heat of a substance? .....

42. The process by which molecules escaped from the surface of a fluid in form of vapour phase is termed .....

43. Heat transmitted through Solid's molecules movement is known as .....

44. When work is done on the system, its internal energy increases. **True** or **False**

45. The average separation between molecules in the gas is large compared with individual dimensions. **True** or **False**

ACOCK UNIVERSITY, ILISHAN-REMO. BASICS SCIENCES DEPT – PHYSICS UNIT

14/15 **PHYS 101** Test Date: 17th Nov. 2014 **TIME: 40** Mins **INSTRUCTION:** Attempt **ALL** questions.

(3)

Surname ..... First Name ..... Middle Name ..... Matric. No ..... Course of Study .....

1. When a body is completely or partially immersed in a fluid it experiences two forces namely its ..... and ..... Archimedes' Upthrust
2. In laminar flow, the velocity of the fluid layers at the centre of the pipe is maximum compared with the one at the wall that is zero. **True** or **False** .....
3. The region where the stretching material undergo a permanent change in shape is called ..... Elastic deformation
4. The hydraulic Lift is a class of machine called ..... Hydraulic Press
5. A steel rod increases its length by 5 mm when the temperature increases by 10 °C. What is initial length of the rod if the coefficient of linear expansion for steel is 1.1×10^{-5} *per* °C?
6. The melting point of gold is 1064 °C and the boiling point is 2660 °C. Express the temperatures in (a) Kelvin for the steam point and (b) Fahrenheit for the ice point.
7. The heat absorbed or released during a phase change at a fixed temperature is called ..... latent heat
8. ..... is the means through which heat can be transmitted without actual physical contact.
9. When work is done on the internal energy of the system increases, **True** or **False** .....
10. The molecules of gases in the kinetic theory model assumption make elastic collisions with the walls of the container, **True** or **False** .....

BABCOCK UNIVERSITY, ILISHAN-REMO, OGUN STATE

DEPARTMENT OF BASIC SCIENCES

100 LEVEL
2015/16 SUMMER

B.Sc. EXAMINATIONS

PHYS 101: GENERAL PHYSICS I

30th June 2016
CREDIT: **3** Units
TIME: 1½ Hours

INSTRUCTION: Attempt **ALL** questions by **CIRCLING** the correct option.
Show **ALL WORKINGS** where necessary in any space provided.

USEFUL CONSTANTS: *Atomic mass unit (a.m.u) = 1.66 x 10^{-27}kg; Boltzmann's constant k = 1.38 x 10^{-23}JK^{-1}; Universal Gas constant R = 8.314 Jmol^{-1}K^{-1}; Mass of the earth= 6 x 10^{24}kg; Radius of the earth = 6400 km; Gravitational constant G = 6.67 x 10^{-11}Nm^{2}kg^{-2}; Acceleration due to gravity g = 9.8 ms^{-2}*

Name: ....
Surname First Name Middle Name

Department:..... Course of Study:.....

Matriculation Number:..... Signature:..... Date:.....

1. Which of the following is defined as the tendency of liquids to rise (or fall) in narrow capillary tubes? (a) Surface tension (b) Cohesion (c) Adhesion (d) Capillarity

2. The mass of a certain small car is 1000 kg and its interior volume 4.0 m^3. What fraction of the car is immersed in water when it floats. Buoyancy of steel and other material may be neglected.
$(a)\ \frac{1}{2}\quad (b)\ \frac{1}{4}\quad (c)\ \frac{2}{3}\quad (d)\ \frac{2}{5}$

3. A block of brass mass 1.5 kg and density of 4.0x10^3 kg/m^3 was suspended from a string. Find the tension in the string if the block is completely immersed in water. Density of water = 1000 kg/m^3
(a) 12.40 N (b) 13.02 N (c) 11.03 N (d) 15.11 N

4. Water enters a pipe of 4.0 cm inlet diameter at a velocity of 5 m/s and pressure 2.5x10^5 N/m^2. The outlet of the pipe 2 cm in diameter is 6m above the inlet. Find the pressure at the outlet.
(a) 3.75 x 10^6 N/m^2 (b) 4.26 x 10^6 N/m^2 (c) 5.62 x 10^6 N/m^2 (d) 6.75 x 10^6 N/m^2

5. A circular hole 4cm in diameter is cut in the side of a large cylinder filled with water 10m below the water level. Find the volume discharged per unit time.
(a) 0.0126 m^3/s (b) 0.0241 m^3/s (c) 0.0176 m^3/s (d) 0.0521 m^3/s

6. Methanol at 20°C flows with a speed of 40 cm/s through a horizontal pipe of uniform radius 1.5 mm. What is the Reynolds number and the nature of flow? If viscosity of methanol at that temperature is 0.584 x 10^{-3} Ns/m^2 and its density is 806 kg/m^3
(a) 1342.12, laminar (b) 2501.10, turbulent (c) 1469.22, laminar (d) 1469.22, laminar

7. Water at 20°C flows through a horizontal pipe of radius 1.0 cm. If the flow velocity at the center is 0.2m/s, find the pressure drop along the a 4m section of the pipe due to viscosity 1.00 x 10^{-3} Nsm^{-2}
(a) 3,200 Nm^{-2} (b) 6,400 Nm^{-2} (c) 5,500 Nm^{-2} (d) 7,200 Nm^{-2}

8. Calculate the flow rate of water in question 7 above
(a) 4.5 x 10^{-6} m^{3}s^{-1} (b) 3.1 x 10^{-6} m^{3}s^{-1} (c) 5.2 x 10^{-6} m^{3}s^{-1} (d) 2.7 x 10^{-6} m^{3}s^{-1}.

9. An astronaut is being tested in a centrifuge. The centrifuge has a radius of 10m and, in starting, rotates according to $\theta = 0.30t^2$, where t is in seconds and θ is in radians. When t = 5.0s, what are the magnitude of the astronaut's angular velocity and linear velocity.
(a) 30 rad/s, 3.0 m/s (b) 3.0 rad/s, 30 m/s (c) 0.3 rad/s, 3.0 m/s (d) 3.0 rad/s, 0.3 m/s

10. The pressure on a ball was increased by $2.0 \times 10^3\ Nm^{-2}$ and the volume reduced to ⅔ of the original volume. Calculate the compressibility, if the original volume is $1.5 \times 10^{-3}\ m^3$
(a) $1.20 \times 10^{-4}\ N^{-1}m^2$ (b) $1.65 \times 10^{-4}\ N^{-1}m^2$ (c) $1.31 \times 10^{-4}\ N^{-1}m^2$ (d) $3.33 \times 10^{-4}.N^{-1}m^2$

11. A wire with cross-sectional area $0.02\ m^2$ was stretched by a 2.5 N force. Calculate the Young modulus if the wire increased in length to ½ of its original length.
(a) $400\ Nm^{-2}$ (b) $250\ Nm^{-2}$ (c) $100\ Nm^{-2}$ (d) $300\ Nm^{-2}$

12. Which of the following is correct. In fluids, pressure
(a) decreases with height, increases with depth and independent of area
(b) increases with height, increases with depth and depend on area
(c) decreases with height, decreases with depth and depend on area
(d) increases with height, decreases with depth and independent of area

13. Two reliable devices routinely employed to measure the pressure of a confined fluid are
(a) Hydrometer and manometer (b) Thermometer and Mercury-barometer
(c) Manometer and Mercury-barometer (d) Barometer and Spectrometer

14. Calculate the rotational inertial of a wheel that has a kinetic energy of 24,400 J when rotating at 602 rev/min (a) $24.56\ kgm^2$ (b) $6.14\ kgm^2$ (c) $3.07\ kgm^2$ (d) $12.3\ kgm^2$

15. When a piece of wire is stretched by a weight attached to it, the stress experience is
(a) Tensile stress (b) Shear stress (c) Bulk stress (d) None

16. A diver makes 5 revolutions on the way from a 12 m high platform to the water. Assuming zero initial vertical velocity, find the diver's average angular velocity during the dive.
(a) 5 rev/s (b) 2.12 rev/s (c) 4.15 rev/s (d) 3.19 rev/s

17. When a body slides over the surface of another body, a resisting force acts _____ to the direction of motion of the sliding body. (a) opposite (b) same (c) normal (d) parallel

18. Find the centripetal acceleration of an object at the equator due to the rotation of the earth.
(a) $3.39 \times 10^{-1}\ ms^{-2}$ (b) $3.39 \times 10^{-4}\ ms^{-2}$ (c) $3.39 \times 10^{-3}\ ms^{-2}$ (d) $3.39 \times 10^{-2}\ ms^{-2}$

19. The phenomenon that describes the magnitude of the velocity of uniform circular motion constant but its direction changes as the particle moves in a circular path is called _____.
(a) radial acceleration (b) tangential acceleration (c) angular acceleration (d) linear acceleration

20. For a particle P under forces F_1, F_2 and F_3 to be in equilibrium
(a) $F_1 + F_2 + F_3 = F$ (b) $F_1 + F_2 + F_3 = 1$ (c) $F_1 + F_2 + F_3 = 0$ (d) $F_1 + F_2 + F_3 = 3$

21. If two bodies in motion collides and stick together after the collision and move with a common velocity is known as _____. (a) Elastic (b) Inelastic (c) Co-elastic (d) None

22. Compute the angular speed and angular acceleration of an automobile wheel *356 mm* in radius when the car is moving at *72 km/h* in *11s*.
(a) 5.62 rad/s, 52.6 rad/s² (b)56.2 rad/s, 5.11 rad/s²
(c) 5.11 rad/s, 56.2 rad/s² (d) 51.1 rad/s, 5.11 rad/s²

23. A 0.5 kg boy performs simple harmonic motion with a frequency of 2 Hz and amplitude of 8 mm. Find the maximum velocity of the body. (a) 10^{-3} m/s (b) 10^{-4} m/s (c) 10^{-1} m/s (d) 10^{-2} m/s

24. A boy runs from a point A $(2\hat{\imath} + 3\hat{\jmath} + 4\hat{k})$ to a point B $(5\hat{\imath} + 6\hat{\jmath} + 7\hat{k})$ in a time of $3s$. Find the boy's velocity. (a) $\hat{\imath} + \hat{\jmath} + \hat{k}$ (b) $3\hat{\imath} + 3\hat{\jmath} + 3\hat{k}$ (c) $7\hat{\imath} + 9\hat{\jmath} + 11\hat{k}$ (d) $10\hat{\imath} + 12\hat{\jmath} + 14\hat{k}$

25. In the simple pendulum, when the pendulum is at the equilibrium position, which of the following is true? (a) $K.E. = 0; P.E. = max$ (b) $K.E = P.E.$ (c) $K.E. = max; P.E. = 0$ (d) $K.E. = 0; P.E. = 0$
(K.E. is kinetic energy and P.E. is potential energy)

26. The shape of the orbits followed by planets, according to Kepler, around the sun is
(a) a cirle (b) a square (c) a triangle (d) an ellipse

27. A body of mass $50kg$ weighs $49.5kg$ when immersed in a certain fluid. What is the upthrust of the fluid on the body?(Assume $g = 10\,m/s^2$). (a) $5\,N$ (b) $0.5\,N$ (c) $0.05\,N$ (d) $0.005\,N$

28. A rotating body has its centre of mass $1m$ away from the axis of rotation. If the mass of the body is $20kg$, calculate its moment of inerta. (a) $20\,Nm$ (b) $20\,Nm^2$ (c) $20\,Nm^2$ (d) $200\,Nm^2$

29. A gun of mass $10kg$ is used to fire a bullet of mass $0.01kg$ at a speed of $5\,m/s$. What is the recoil speed of the gun? (a) $0.5\ m/s$ (b) $0.05\ m/s$ (c) $0.005\ m/s$ (d) $0.0005\ m/s$

30. Determine the maximum height of an object projected at an initial velocity of $100\,m/s$ at 27^0 above the horzontal. (a) $105.2\,m$ (b) $102.5\,m$ (c) $150.2\,m$ (d) $120.5\,m$

31. A ballot box with mass $m = 6.0kg$ slides with speed $v = 4.0\,m/s$ across a frictionless floor along the x-axis. The box explodes into two pieces. One piece with mass $m_1 = 2.0kg$ moves with $v_1 = 8.0\,m/s$ along the positive x-axis. What is the velocity v_2 of the second piece?
(a) $2m/s$ (b) $2.5\,m/s$ (c) $3\,m/s$ (d) $4\,m/s$

2. A force $\vec{F} = (2.0N)\hat{\imath} + (-6.0N)\hat{\jmath}$ pushes a load through a displacement $\vec{D} = (-3.0m)\hat{\imath}$. How much work does this force do on the load? (a) $6\,J$ (b) $12\,J$ (c) $18\,J$ (d) $9\,J$

3. Two bowling balls each of mass $7.3kg$ are placed with their centres at distance $r = 50cm$ apart. What gravitational force does the balls exert on each other?
(a) $1.49 \times 10^8 N$ (b) $1.47 \times 10^8 N$ (c) $1.45 \times 10^8 N$ (d) $1.42 \times 10^8 N$

34. Which of the following is true about these two vectors; $\vec{A} = 9\hat{\imath} + \hat{\jmath} - \hat{k}$, $\vec{B} = 3\hat{\imath} - 7\hat{\jmath} + 5\hat{k}$?
(a) Vectors $\vec{A}$ and $\vec{B}$ are parallel (b) Vectors $\vec{A}$ and $\vec{B}$ are mutually perpendicular
(c) $\vec{A}$ and $\vec{B}$ are antiparallel (d) $\vec{A}$ and $\vec{B}$ are anticommutative

35. The unit of latent heat is
(a) J/kg (b) J/K (c) $J/(kgK)$ (d) Jkg/K

36. The first law of Thermodynamics is expressed as ΔE=Q – W. What does ΔE represents?
(a) Change in external energy (b) Change of heat
(c) Change in work (d) Change in internal energy

3[illegible]. The amount of energy per unit mass that must be transferred as heat when a sample completely undergoes a phase change is called ..... latent heat .....

3[illegible]. Compute the rate of heat loss in a draught of a calorimeter of mass 50 kg, specific heat capacity of 25 $KCal\,kg^{-1}°C^{-1}$ for a change of temperature of 50°C in 20 $seconds$. .....
(a) $2500\ KCal/s$ (b) $3125\ KCal/s$ (c) $6250\ KCal/s$ (d) $2520\ KCal/s$ $Q = mC(\theta_2 - \theta_1)$ $Q = mC\Delta\theta$

3[illegible]. A patient's temperature is measured and recorded as 40°C. The temperature in Kelvin is
(a) 233 K (b) 263 K (c) 253 K (d) 313 K $273 + 40$

[illegible]. According to Graham's law, the rate of diffusion of a gas depends

(a) directly as the density (b) inversely as the density
(c) directly as the volume (d) inversely as the temperature

1. What is the unit of heat capacity of a substance? ..... JK^{-1} .....

2. The process by which molecules escaped from the surface of a fluid in form of vapour phase is termed (a) Radiation (b) Convection (c) Conduction (d) Evaporation

3. Heat transmitted through fluid's molecules movement is known as .....
(a) Radiation (b) Convection (c) Conduction (d) Evaporation

4. When work is done by the system, its internal energy increases. **True** or **False**

5. The average separation between molecules in the gas is large compared with individual dimensions. **True** or **False**

BABACOCK UNIVERSITY, ILISHAN-REMO, OGUN STATE

100 LEVEL
2014/15 Session

DEPARTMENT OF BASICS SCIENCES
MAKE-UP MID-SEMESTER EXAMINATIONS 21st Nov. 2014
PHYS 101: General Physics I (3 Units)

TIME: 40 Mins
INSTRUCTION: Attempt **ALL** questions.

Surname ..... First Name ..... Middle Name ..... Matric. Number .....

1. The S.I. unit of Resistance is .....
2. When the unit of measured quantity is large, prefixes are used to denote the factor, is known as .....
3. The error size that is roughly constant and its measurements obtained are always greater or less than the actual value is called .....
4. What is the unit vector of $3\hat{\imath} - 5\hat{\jmath}$? .....
5. The instantaneous position of a moving particle is $x = pt^2 - qt^3$, where x is in m and t in s, and p and q are respectively 1.5 and 0.5. At what time is the particle at rest other than t = 0. .....
6. The acceleration of the particle at that instant in question 5 is .....
7. A body moves velocity with a velocity of $\vec{v} = 5\hat{\imath} + 2\hat{\jmath} - 3\hat{k}$ under the influence of a constant force $\vec{F} = 4\hat{\imath} + 3\hat{\jmath} - 2\hat{k}$. Determine the instantaneous power.
8. The coefficient of dynamic friction is far less in value than that of its limiting friction. **True** or **False**
9. In an elastic collision what quantity is conserved? .....
10. An object of mass 25g is projected at 30^0 angle to the horizontal with an initial speed of 120m/s. Calculate the time taken to reach maximum height. (Take g = 9.81 ms^{-2})
11. The angular frequency of an oscillating pendulum whose period is 2.5 s is .....
12. A Simple harmonic motion is described by the equation; $x = 3.5m\cos\left(\frac{1}{2}t \pm \pi\right)$.The amplitude and period of the motion is ..... and .....
13. Write the expression for gravitational potential energy? (all symbols maintain their usual meanings).
14. A wedge of angle θ, acting as a machine, has a force ratio .....
15. ..... is the tendency of a force to cause an object to rotate about its axis.

Course Lecturer: Dr. E. O. EHINLAFA

BABACOCK UNIVERSITY, ILISHAN-REMO, OGUN STATE
DEPARTMENT OF CHEMICAL & ENVIRONMENTAL SCIENCES
100 LEVEL B.Sc. MID-SEMESTER EXAMINATIONS 28th OCTOBER 2010
2010/11 SESSION **PHYS 101:** GENERAL PHYSICS I CREDIT: 3 Units
INSTRUCTION: Attempt **ALL** questions by **CIRCLING** the correct option. **TIME: 30** Mins
Show **ALL WORKINGS** where necessary in the space behind.
USEFUL CONSTANTS: Atomic mass unit (a.m.u) = 1.66×10^{-27}kg; Acceleration due to gravity g = $9.8ms^{-2}$

Name:..... ....
Surname First Name Middle Name
School:..... Department:.....
Matriculation Number:..... Signature:..... Date:.....
Course Lecturer:..... Programme:.....

1. Identify the correct dimensions of density and pressure from the following?
(a) ML^{-3}, $ML^{-1}T^{-2}$ (b) $ML^{-1}T^{-2}$, ML^{-3} (c) ML^{-2}, $ML^{-1}T^{-2}$ (d) ML^{3}, $ML^{-1}T^{2}$
2. In a stretched string, the velocity v, of the wave set up by plucking depends on the tension F, in the string, its length L, and its mass m, and is given by $v = kF^xL^ym^z$, where x, y, z are unknown numbers and k is a constant. Find the values of x, y, and z.
(a) ½, -½, ½ (b) -½, ½, ½ (c) -½, ½, -½ (d) ½, ½, -½
3. The resultant of two vectors $\vec{A}$ and $\vec{B}$ is $\vec{C}$, which is given by $\vec{C} = 2.2\hat{i} + 3.4\hat{j}$. If vector $\vec{A}$ is $1.5\hat{i} - 2.0\hat{j}$, find the magnitude of $\vec{B}$ and the angle it makes with the positive x-axis.
(a) 29.70 Unit, 82.6^0 (b) 29.70 Unit, 7.4^0 (c) 2.45 Unit, 82.6^0 (d) 5.45 Unit, 82.6^0
4. The position of a particle moving along x-axis is given $x = 5.0 - 6.0t + 2.0t^3$, where x is in metres and t is in seconds. Find the velocity of the particle at t = 2.0s. Is the velocity constant or changing with time? (a) 18.0 ms^{-1}, changing (b) 6.0 ms^{-1}, changing (c) 18.0 ms^{-1}, constant (d) 6.0 ms^{-1}, constant
5. An object of mass 25g is projected at 30^0 to the horizontal with an initial speed of 120 m/s. Calculate the horizontal range and the time taken to reach maximum height.
(a) 734.7m, 10.6s (b) 1272.5m, 12.24s (c) 734.7m, 21.21s (d) 1272.5m, 6.12s
6. A man throws a ball vertically upward with an initial speed of 20.0m/s. What is the maximum height reached by the ball and how long does it take to return to the point it was thrown?
(a) 4.04m, 2.0s (b) 20.4m, 4.0s (c) 4.04m, 4.0s (d) 20.4m, 2.0s
7. If two bodies in motion collides and stick together after the collision and move with a common velocity is known as (a) Elastic (b) Inelastic (c) Co-elastic (d) None of the above
8. Three forces F_1, F_2, and F_3 are acting on a block of mass 2.0kg. The forces are given in magnitude and the angles the direction make with positive x-axis: F_1 = 4N, 30^0; F_2 = 5N, 90^0 and F_3 = 3N, 0^0. Find the resultant force in unit vector notation.
(a) $6.5\hat{i} + 7.0\hat{j}$ (b) $0.5\hat{i} + 3.0\hat{j}$ (c) $7.0\hat{i} + 6.5\hat{j}$ (d) $3.0\hat{i} + 0.5\hat{j}$
9. All these are true of friction except
(a) friction is zero when applied force is zero (b) friction and applied force are equal in magnitude when acceleration is zero (c) coefficient of static friction μ_s is less than coefficient of kinetic friction μ_k (d) limiting friction is proportional to normal reaction
10. A 15kg block is pulled by a donkey with a uniform speed along a rough horizontal surface with a force inclined at 45^0 to the horizontal. The coefficient of friction between the surfaces is 0.30. If it covers 15m in 5minutes, calculate the work done by the applied force and the power generated. (a) 147.9 J, 1.7 W (b) 508.8 J, 1.3 W (c) 147.9 J, 1.3 W (d) 508.8 J, 1.7 W