LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY, OGBOMOSO
DEPARTMENT OF PURE AND APPLIED PHYSICS
B. TECH. (PHYSICS) DEGREE EXAMINATION – HARMATTAN SEMESTER 2011/2012 SESSION
PHY 101 - GENERAL PHYSICS I (4 UNIT)

DATE: Monday 21st May, 2012 TIME ALLOWED: 45 minutes
INSTRUCTION: Answer ALL questions by SHADING the correct option; otherwise you place yourself at a grave disadvantage.

Name: ..... Matric No: ..... Department: .....

1. A block of ice floats on water inside a container. If the block of ice gets completely melted, the level of water in the container will
A. increase B. remain the same C. decrease D. first decrease and then increase

2. A bridge made of steel is 0.6 km long. What is the daily variation in its length if the night-time and day-time temperatures are 10 °C and 35 °C respectively? The linear expansion of steel is 0.000012 °C^{-1}.
A. 0.18 cm B. 0.18 m C. 600.18 cm D. 600.18 m

3. A lift is moving down with an acceleration of 3 ms^{-2}. A ball is released 1.7 m above the lift floor. Assuming g = 9.8 ms^{-2}, how long will the ball take to hit the floor?
A. 0.14 s B. 0.90 s C. 0.70 s D. 0.80 s

4. A particle moving in a plane has its motion described by $x=3t^2+18$ and $y=36t+5$ where distances are in meters and time in seconds. Find the magnitude and direction of its velocity at the instant when t =2 s.
A. 37.95m/s, 71.57° to y-axis B. 37.95m/s^2, 71.57° to x-axis
C. 37.95m/s, 71.57° to x-axis D. 37.95m/s, 71.57° to xy-axes

5. The motion of a particle is defined by the relation $x = t^2 - (t-3)^3$ where x and t are expressed in meter and seconds, respectively. Determine when the acceleration is zero.
A. 3.33 m/s^2 B. 3.33 m/s C. 3.33 m D. 3.33 s

6. A hose ejects water at a speed of 20 cms^{-1} through a hole of area 100 cm^2. If the water strikes a wall normally, calculate the force on the wall, assuming the velocity of the water normal to the wall is zero after collision.
A. 0.80 N B. 0.40 N C. 0.16 N D. 0.20 N

7. A force of 6 N acts horizontally on a stationary mass of 2 kg for 4 s. The K.E. gained by the mass in Joule is
A. 72 B. 144 C. 24 D. 12

8. A train traveling at 30 m/s overcomes a frictional resistance of 100 N while moving. What is the power of the engine? (1 h.p. = ¾ kW).
A. 4.0 h.p. B. 0.4 h.p. C. 4.4 h.p. D. 2.5 h.p.

9. An automobile driver moving at 30 m/s suddenly saw a policeman standing 70 m straight ahead. If his reaction time is 1.0 s and the maximum deceleration is 4 m/s^2, the distance traveled by the automobile after he saw the policeman is
A. 71.25 m B. 102.50 m C. 142.50 m D. 162.50 m

10. A ball of mass 100 g falls from a height of 5 m on to a floor and rebounds to a height of 3 m. What energy is lost by the ball as a result of the impact on the floor?
A. 20 J B. 2 J C. 10 J D. 200 J

11. A small mass of 0.2 kg is whirled round in a horizontal circle at the end of a string of length 0.5 m at a constant angular speed of 4 rad s^{-1}. The tension (force) in the string in N is
A. 1.6 B. 0.8 C. 0.4 D. 0.6

12. A tugboat is travelling from Asaba to Onitsha across the river Niger with a resultant velocity of 20 knots. If the river flows at 12 knots, the direction of motion of the boat relative to the direction of water flow is
A. 36.87° B. 53.13° C. 90° D. 136.87°

13. A balloon inflated with helium gas at ground level is released. As it rises through a constant temperature atmosphere,
A. its pressure reduces and volume remains constant B. the product of pressure and volume remains constant
C. its pressure remains constant but volume decreases D. both pressure and volume increase

14. Which of the following statements is NOT true? Thermostats are used to control the temperature of
A. pressure cookers B. heated apartments C. laundry irons D. aquaria for tropical fish

15. Which of the following properties makes metals ideal for cooking utensils?
A. High coefficient of expansion B. Good conduction of heat
C. Low specific heat capacity D. Poor radiation of heat

16. A piece of wood floats inside water at room temperature with a fraction of it above the liquid surface. As the temperature of the water is raised, the part of the wood above the liquid will
A. decrease because the density of water decreases with temperature
B. increase because the density of water decreases with temperature
C. decrease because the density of water increases with temperature
D. increase because the density of water increases with temperature

Which of the following phenomena explains the fact that a house whose roof is coated with white paint will be cooler in the hot season than one coated with black paint?

A. Conduction B. Convection C. Reflection D. Refraction

A 170 kg mass suspended from a wire of length 25 cm and diameter 4.6 mm caused an extension of 1.2 cm. If the Poisson's ratio is 0.4, what is the Young's modulus and the change in diameter under this stress?

A. 2.088×10^{9} Nm^{-2}, 8.832×10^{-6} m B. 8.600×10^{8} Nm^{-2}, 6.524×10^{-6} m

C. 8.600×10^{8} Nm^{-2}, 4.416×10^{-6} m D. 8.600×10^{8} Nm^{-2}, 3.312×10^{-5} m

What is the increase in pressure that is required to decrease the volume 3 m^3 of water by 10^{-6} m^3 if the bulk modulus of water is 3×10^{10} Nm^{-2}?

A. 2×10^{5} Pa B. 3×10^{4} Pa C. 3×10^{3} Pa D. 1×10^{4} Pa

A glass fibre of diameter 60 nm is found to break under a load of 1.3 g. What is the breaking stress?

A. 4.505×10^{12} Nm^{-2} B. 1.040×10^{10} Nm^{-2} C. 3.827×10^{13} Nm^{-2} D. 1.27×10^{5} Nm^{-2}

Which of the following is true?

A. Crystals have definite shape and definite melting point B. All true solids are not crystalline

C. Amorphous have definite shape and definite melting point D. Crystals are usually insoluble

Crystal structures are distinguished and measured by

A. Gamma spectrometer B. Geiger Muller counter C. Infrared ray D. None of the above

Two moles of an ideal gas are compressed slowly and thermally from a volume 100 m^3 to 25 m^3 at a temperature of 27 ^{0}C. How much work is done?

A. 6520 J B. -6918 J C. -5431 J D. 6918 J

A ball of mass 0.4 kg moving at 10 ms^{-1} collides with another ball of equal mass at rest, Calculate their common velocity if the two balls move off together after the impact.

A. 2.5 ms^{-1} B. 5.0 ms^{-1} C. 20.0 ms^{-1} D. 10.0 ms^{-1}

What is the dimension of Young's modulus of elasticity?

A. $[M]^{-1}[L]^{-1}[T]^{-2}$ B. $[M]^{1}[L]^{-1}[T]^{-2}$ C. $[M]\,[L]\,[T]^{-2}$ D. $[M]\,[L]^{-1}[T]^{-1}$

A ship floating in clear water of density 1000 kgm^{-3} moves to sea-water of density 1050 kgm^{-3} where it floats again. The upthrust on the ship then

A. increases B. decreases C. stays constant D. increases by 0.05 times

A hot-air balloon moving upwards has a total weight of 200 N and a volume of 20 m^3. Assuming the air density is 1.2 kgm^{-3}, the net upward force on the balloon in N is

A. 36 B. 40 C. 240 D. 176

A hygrometer floats in water with 6.0 cm of its stem above the water level, and in oil of density 0.8 gm^{-3} with 4.0 cm of the stem above the oil level. What is the length of the stem above the water level when the hygrometer is placed in a liquid of density 0.9 gm^{-3}?

A. 2.57 cm B. 1.57 cm C. 7.15 cm D. 5.17 cm

The mass of gas emitted from the rear of a toy rocket is initially 0.1 kgs^{-1}. If the speed of the gas relative to the rocket is 50 ms^{-1}, and the rocket is 2 kg, what is the initial acceleration of the rocket?

A. 3.5 ms^{-2} B. 2.5 ms^{-2} C. 5.2 ms^{-2} D. 3.2 ms^{-2}

A hose directs a horizontal jet of water moving with a velocity of 20 ms^{-1} on to a vertical wall. The cross-sectional area of the jet is 5×10^{-4} m^2. If the density of water is 1000 kgm^{-3}, calculate the force on the wall assuming the water is brought to rest there.

A. 400 N B. 100 N C. 200 N D. 205 N

If U is upthrust and V is viscous force, when terminal speed is reached by a falling body we have

A. $V=\frac{mg}{U}$ B. V=mg+U C. V=mg-U D. U+V=2mg

A car of mass 80 kg moves in a circular track of radius 100 m. If the velocity of the car is 20 ms^{-1}, calculate the centripetal force acting on the car.

A. 420 N B. 320 N C. 300 N D. 250 N

A bomber is flying at a constant horizontal velocity 2000m/s at an elevation of 20km toward a point directly above its target. At what time would the bomb reach the target? (Take g = 10m/s^2, neglect air resistance).

A. 63.25 s B. 70.72 s C. 83.25 s D. 90.72 s

A tap supplies water at 30°C while another supplies water at 66°C. If a LAUTECH student wishes to bathe with water at 54°C, what is the ratio of the mass of hot water to that of cold water?

A. 1:2 B. 2:1 C. 1:3 D. 3:1

A car starting from rest, accelerates uniformly so that it attains a speed of 60 km/h in 2mins. It travels at this speed for 6 mins and is then brought to rest with uniform retardation after 2mins. The distance traveled by the car is equal to …

A. 5, 501.1 m B. 6, 501.1 m C. 7, 860.6 m D. 8001.6 m

I agree that this examination script will be rejected and nullified if I fail to write my Name, Matric Number and Department LEGIBLY in the space provided.

Student's Signature: ---------- **Date:** ----------

LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY, OGBOMOSO
DEPARTMENT OF PURE AND APPLIED PHYSICS
B. TECH. (PHYSICS) DEGREE EXAMINATION – 2ND SEMESTER 2010/2011 SESSION
PHY 102 - GENERAL PHYSICS II (4 UNIT)

DATE: Tuesday 15th November, 2011 TIME ALLOWED: 45 minutes

INSTRUCTION: Answer ALL questions by SHADING the correct option; otherwise you place yourself at a grave disadvantage.

Name: ..... Matric No: ..... Department: .....

1. ---------- waves are of concern to the health physicist.
(A) Water (B) Rope (C) String (D) Electromagnetic

2. Some equations in Physics are true under all conditions while others are true only under certain conditions. Which of the following is/are true under all conditions?
i. Equation for force: F = ma ii. Gravitation: $F = GMm/r^2$ iii. Wave motion: $v = f\lambda$
(A) i (B) ii (C) iii (D) i, iii

3. The unit of electric field intensity is
(A) Nm (B) JC^{-1} (C) Nm^{-1} (D) Vm^{-1}

4. A sodium surface is illuminated with a light of wavelength 0.3μm. The work function for sodium is 2.40eV. What is the maximum K.E of the ejected electrons and the cut-off wavelength for sodium?
(A) 2.76×10^{-19}J, 0.52μm (B) 5.96×10^{-19}J, 0.52μm (C) 0.56×10^{-19}J, 0.05μm (D) 1.06×10^{15}, 0.52μm

5. Which of the following properties is not associated with sound waves?
(A) Diffraction (B) Interference (C) Polarization (D) Refraction

6. Which of the following substance is not a magnetic material?
(A) iron (B) steel (C) copper (D) nickel

7. A transformer connected to a 220V a.c power supply has 400 turns in its primary coil and 100 turns in its secondary coil. The secondary is connected to a 100Ω light bulb. How much current is drawn from the 220V power supply?
(A) 0.075A (B) 0.050A (C) 1.375A (D) 0.375A

8. Which of the following equations gives the correct relationship between the peak value I_o and root-mean-square value I_{rms} of an alternating current?
(A) $I_o = \sqrt{2}I_{rms}$ (B) $I_o = \frac{I_{rms}}{\sqrt{2}}$ (C) $I_o = \sqrt{2I_{rms}}$ (D) $I_o = \frac{1}{\sqrt{2I_{rms}}}$

9. The apparent increase or decrease in frequency when a source of sound moves towards or away from a stationary observer is known as
(A) beats (B) resonance (C) Doppler effect (D) interference

10. An object is placed 30cm from a converging lens. If the real image formed is 90cm from the object. The power of the lens is
(A) 1.67 dioptres (B) 0.0167 dioptres (C) 2.67 dioptres (D) 0.167 dioptres

11. Calculate the energy stored in a 20μF capacitor if the p.d between the plates is 40V.
(A) 3.2×10^{-2}J (B) 1.2×10^{-2}J (C) 8.0×10^{-4}J (D) 4.0×10^{-4}J

12. Determine the half-life of Thorium-234 if a sample of 5 grams is reduced to 4 grams in one week.
(A) 22 minutes (B) 22 hours (C) 22 days (D) 22 weeks

13. The activity of a radioactive sample is 1450 dis/min. If the half-life is 25 mins, the activity of the sample 1 hour earlier is
(A) 7656 dis/sec (B) 7656 mins (C) 7656 dis/min (D) 7656 secs

14. The nuclear equation for the disintegration of lead, $^{214}_{82}Pb$, into bismuth, $^{214}_{83}Bi$ is
(A) $^{214}_{82}\text{Pb} \leftarrow {}^{214}_{83}Bi + {}^{0}_{-1}\text{e}$ (B) $^{214}_{82}\text{Pb} \leftrightarrow {}^{214}_{83}Bi + {}^{0}_{-1}\text{e}$
(C) $^{214}_{82}\text{Pb} \rightarrow {}^{214}_{83}Bi + {}^{0}_{+1}\text{e}$ (D) $^{214}_{82}\text{Pb} \rightarrow {}^{214}_{83}Bi + {}^{0}_{-1}\text{e}$

15. The results of decay measurements on a sample are shown below.

Decay measurements

Time/days	0	1	3	6	9	12	15	18
Corrected counts/minute	3613	3376	3136	2637	2353	1980	1768	1510

Estimate the half-life of the sample.
(A) 14.3 seconds (B) 14.3 minutes (C) 14.3 hours (D) 14.3 days

16. A plane progressive wave is represented by the equation $y = 4\sin(2000\pi t - 0.5x)$. Calculate the frequency.
(A) 0.1 Hz (B) 0.1 MHz (C) 0.1 kHz (D) 0.1 GHz

17. Two thin converging lenses A and B, each having a focal length of 6 cm, are placed 10 cm apart. If an object is placed 10 cm to the left of lens A, the final image is
(A) $\frac{30}{11}$ cm to the left of lens B (B) $\frac{30}{10}$ cm to the left of lens B
(C) $\frac{30}{11}$ cm to the right of lens B (D) $\frac{30}{10}$ cm to the right of lens B

18. Which of the following waves is an electromagnetic wave?
(A) sound waves (B) water waves (C) x-rays (D) heart beats

19. The ability of a wave to spread around corners is called
(A) polarization (B) dispersion (C) diffraction (D) reflection

20. Select the false statement
(A) electric charges at rest produces electrostatic field
(B) electric charges in motion produces magnetic field
(C) the product of area of loop and the current is called dipole moment
(D) none of these

21. Wind, tides and the sun as sources of energy are
(A) nuclear in nature (B) non-renewable (C) renewable (D) thermal in nature

22. In a solar cell, the correct energy transformation is
(A) chemical → electromagnetic (B) electrical → chemical
(C) electromagnetic → chemical (D) chemical → electrical

23. What is the electrostatic force between two electrons separated by a distance 10^{-9}m?
(A) 2.88×10^{-10}N attractive (B) 2.30×10^{-10}N repulsive
(C) 1.44×10^{-10}N repulsive (D) 5.45×10^{-10}N attractive

24. A charge of +Q Coulombs is placed on the x-axis at x = -1 m and a charge of -2Q Coulombs is placed at x = +1 m. At what position on the x-axis will a test charge of +q Coulombs experience zero net force?
(A) 0 m (B) $\pm\frac{1}{3}$ m (C) $-\left(3+\sqrt{8}\right)$m (D) $\left(3+\sqrt{8}\right)$m

25. The image of an object on the retina of a human eye is
(A) erect and magnified (B) inverted and virtual (C) inverted and real (D) virtual and diminished

26. A diverging mirror is used as a driving mirror because it
(A) produces a real image (B) has only one focus
(C) reflects more than other types of mirror (D) has a wider field of view

27. A voltmeter of resistance 1 kΩ is connected across a resistor and the combination is connected in series with an ammeter. When 5 V is applied, the voltmeter reads 40 V and the ammeter reads 0.05 A. What is the resistance of the resistor?
(A) 0.4 Ω (B) 4 Ω (C) 0.4 kΩ (D) 4 kΩ

28. Ohm's law relates the current density J with field intensity E as
(A) $\vec{J} = \sigma^2\vec{E}$ (B) $\vec{J} = \frac{\vec{E}}{\sigma}$ (C) $\vec{J} = \frac{E^2}{\sigma}$ (D) $\vec{J} = \sigma\vec{E}$

29. An AC generator consists of 10 turns of wire of area A = 0.08 m^2 with a total resistance of 16.0 Ω. The loop rotates in a magnetic field of 0.600 T at a constant frequency of 50.0 Hz. What is the maximum induced current?
(A) 9.4 mA (B) 9.4 μA (C) 94 A (D) 9.4 A

30. A transformer connected to a 120 V AC power line has 200 turns in its primary winding and 50 turns in its secondary winding. The secondary is connected to a 100 Ω light bulb. How much current is drawn from the 120 V power line?
(A) 75 kA (B) 75 A (C) 75 mA (D) 7.5 mA

31. A LED is constructed based on a GaAsP semiconductor p-n junction whose energy gap is 2.4 eV. The wavelength of the emitted light is ----------
(A) 517 nm (B) 560 nm (C) 226 nm (D) 258 nm

32. The maximum wavelength of the light that will excite an electron in the valence band of diamond to the conduction band when the energy gap is 6.6 eV is ----------
(A) 188 nm (B) 376 nm (C) 226 nm (D) 230 nm

33. A pure semiconductor is called ----------
(A) extrinsic (B) hole mobility (C) electron mobility (D) none of the options

34. In an extrinsic semiconductor, the holes and electrons concentration are
(A) pure (B) equal (C) not equal (D) neutral

35. If the p region of a junction diode is connected to the negative terminal of a battery and n region to the positive terminal, it is called ----------
(A) forward bias (B) exponential increase (C) potential barrier (D) reverse bias

I agree that this examination script will be rejected and nullified if I fail to write my Name, Matric Number and Department LEGIBLY and Sign in the space provided.

Student's Signature & Date: ---------- Invigilator's Signature & Date: ----------

LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY, OGBOMOSO
DEPARTMENT OF PURE AND APPLIED PHYSICS
2009/2010 PHY 102 RAIN SEMESTER EXAMINATION

INSTRUCTION: Answer ALL questions by **SHADING** the correct option. **TIME**: 45 minutes

Matric No: ..... **Department**: .....

1. A wave is transporting energy from left to right. The particles of the medium are moving back and forth in a leftward and rightward direction. This type of wave is known as a ..... wave.
   (A) Electromagnetic (B) Mechanical (C) Longitudinal (D) Transverse
2. A transverse wave is transporting energy from East to West. The particles of the medium will move .....
   (A) North to South only (B) both Northward and Southward (C) East to West only (D) both Eastward and Westward
3. A lamp is suspended from a high ceiling with a cord 12 ft long. Find its period of oscillation. ($g = 32\ ft/s^2$).
   (A) 6.95 seconds (B) 6.95 minutes (C) 3.85 seconds (D) 3.85 minutes
4. If the peak of a wave measures 300 cm above the still water mark in the harbor, the amplitude of the wave is
   (A) 1.50 m (B) 3.00 cm (C) 3.00 m (D) 6.00 m
5. A 100 level LAUTECH student found out from a simple pendulum experiment that 18 oscillations were completed in 36 seconds. What is the period of oscillation of the pendulum?
   (A) 200 Hz (B) 200 seconds (C) 2 Hz (D) 2 seconds
6. The equation of a wave is $y = 0.4\sin[\pi(0.5x - 200t)]$ where x and y are in metres and t is in seconds. Find the velocity of the wave.
   (A) 0.4 cm/s (B) 0.4 mm/s (C) 0.4 m/s (D) 0.4 km/s
7. Consider a simple harmonic motion, say as described by a mass-spring system. The velocity of the mass will be minimum when the:
   (A) displacement of the mass is maximum (B) displacement of the mass is minimum
   (C) P.E. is minimum (D) K.E. is maximum
8. Which of the following is NOT the property of the image formed by a concave lens?
   (A) Erect image (B) Virtual image (C) Real image (D) Diminished image
9. A magnifying glass of focal length 6.0cm is used to view an object by a person whose near point is 25cm. If he holds the glass close to the eye, determine the best position of the object and the linear magnification produced by the lens.
   (A) 4.84 cm, 5.2 (B) 2.42 cm, 2.6 (C) 8.40 cm, 5.2 (D) 6.12 cm, 5.2
10. A 70° prism is made of glass whose refractive index for a certain light is 1.50. At what angle of incidence will minimum deviation occur?
    (A) 35° (B) 59° (C) 48° (D) 45°
11. The unit of illumination is
    (A) lumen (B) lux (C) candela per meter square (D) candela
12. Two positive point charges of 12 and 8 μC respectively are 10 cm apart. Find the work done in bringing them 4 cm closer so they are 6 cm apart. (Assume $\frac{1}{4\pi\varepsilon_o} = 9\times10^9\ mF^{-1}$).
    (A) 8.5 J (B) 5.8 J (C) 4.5 J (D) 3.5 J
13. If any surface of conductors appear in an electric field, the lines of must always be drawn to meet them at
    (A) 60° (B) 90° (C) 180° (D) 0°
14. A potential difference of 3.6V is maintained between two plates which are 30cm apart. Calculate the electric field intensity between the plates.
    (A) 1.8 Vm^{-1} (B) 12.0 Vm^{-1} (C) 18.0 Vm^{-1} (D) 4.0 Vm^{-1}
15. A lamp bulb is rated 60 W for a 240 V supply, what is the resistance of the lamp?
    (A) 0.25 Ω (B) 4.00 Ω (C) 15.00 Ω (D) 960.00 Ω
16. The unit of magnetic induction is
    (A) Farad (B) Tesla (C) Henry (D) Ampere

17. Two 240 Ω light bulbs are connected in series with a 120 V power source. The current in each bulb is
(A) 0.025 A (B) 0.250 A (C) 2.500 A (D) 25.000 A

18. If 2charged plates are maintained at a pd of 3kV, the workdone in taking a charge of 600μC across the field is
(A) 0.8 J (B) 1.0 J (C) 1.8 J (D) 2.0 J

19. A 240V A.C. supply is supplied to operate electric kettle that has a resistance of 30 Ohms. Calculate the maximum instantaneous current passing through the electric kettle.
(A) 8.00 A (B) 11.31 A (C) 0.80 A (D) 1.13 A

20. Calculate the inductance of a solenoid containing 250 turns if the length of the solenoid is 20cm and its cross-sectional area is $4.0\times10^{-4}m^2$.
(A) 0.75 mH (B) 0.57 mH (C) 0.1 mH (D) 0.157 mH

21. The 4 main types of radiation which must be dealt with in health physics are x-/gamma rays, alpha particles, neutrons and ----------
(A) laser radiation (B) sound waves (C) beta particles (D) hydrogen

22. It is known that a neutron exists in a light atomic nucleus, which of the following also exits in the nucleus?
(A) an electron (B) an x-ray (C) a proton (D) an atom

23. If a sample of a radioactive substance weighed 10 N 20 days ago, what would be its mass now?
(Take $t_{½}$ = 10 days, g = 10m/s^2)
(A) 2.00 kg (B) 2.00 g (C) 0.25 kg (D) 0.25g

24. Calculate the binding energy of $^{20}_{10}Ne$ if its atomic mass is 19.9924 a.m.u.
(Mass of proton = 1.007826 a.m.u, mass of neutron = 1.008665 a.m.u, 1 a.m.u = 931 MeV).
(A) 160.6 a.m.u. (B) 160.6 J (C) 160.6 meV (D) 160.6 MeV

25. Find the activity of a sample at 4:18pm when its activity was 10^3 disintegrations/min at 10:18am (λ=0.2/day)
(A) 951 dis/sec (B) 951 dis/min (C) 951 dis/hour (D) 951 dis/day

26. 1 g of the radioactive radium-226 decays with a half-life of 1942 years. Calculate the mean-life.
(A) 1942 years (B) 2802 years (C) 1942 year^{-1} (D) 2802 year^{-1}

27. Which of the following is a pair of isotopes?
(A) $^{33}_{18}Ar$, $^{33}_{16}S$ (B) $^{35}_{17}Cl$, $^{37}_{17}Cl$ (C) $^{13}_{6}C$, $^{14}_{7}N$ (D) $^{14}_{7}C$, $^{14}_{7}N$

28. An atom is excited to an energy level E_1 from its ground state energy level E_0. The wavelength of the radiation is
(A) $\frac{E_1 - E_0}{hc}$ (B) $\frac{hc}{E_1 - E_0}$ (C) $\frac{E_0 - E_1}{hc}$ (D) $\frac{hc}{E_0 - E_1}$

29. Light of wavelength 450 nm is shone on to the surface of a metal of work function 3×10^{-19} J. The maximum energy of the emitted electrons in 10^{-19} J is
(A) 1.2 (B) 2.8 (C) 2.4 (D) 3.2

30. A sodium surface is illuminated with a light of wavelength 0.30μm. The work function for sodium is 2.40eV What is the maximum K.E. of the ejected electrons and the cut-off wavelength for sodium?
(A) 2.76×10^{-19}J, 0.52μm (B) 5.96×10^{-19}J, 0.52μm (C) 0.56×10^{-19}J, 0.05μm (D) 1.06×10^{-19}J, 0.52μm

31. The concentration of hole-electron pairs in the intrinsic germanium specimen is 6.40×10^{13} cm^{-3}. If the holes and electron mobilities are respectively 1700 cm^2/V/s and 3600 cm^2/V/s in the specimen, the conductivity is
(A) 2.650 $(\Omega m)^{-1}$ (B) 0.026 $(\Omega m)^{-1}$ (C) 0.027 $(\Omega m)^{-1}$ (D) 4.030 $(\Omega m)^{-1}$

32. A light emitting diode is constructed based on a Ga-As-P semiconductor p-n junction whose energy gap is 2.95 eV. The wavelength of the emitted light is ----------
(A) 421 nm (B) 560 nm (C) 280 nm (D) 260 nm

33. Doping of semiconductor ----------
(A) increases the carrier concentrations (B) decreases the doping concentrations
(C) makes the semiconductor to be at equilibrium (D) damages the semiconductor

34. In an intrinsic semiconductor, the holes and electrons concentration are ----------
(A) pure (B) equal (C) not equal (D) zero

35. Which of the following is a typical application of semiconductor diode?
(A) D.C. restorer (B) Connectors (C) Limiter (D) Relay

THIS MATERIAL IS FREE OF CHARGE (NOT FOR SALE) 09/09/09

PICK INTEREST in what you're being taught in **P.D.S.**

30 PRACTICE QUESTIONS (NOT TO BE SUBMITTED)

(THESE 30 QUESTIONS ARE TO TEST WHETHER YOU UNDERSTAND THE 48 SOLUTIONS ABOVE)

WAVE CHARACTERISTICS

1. A **nurse** counts 78 **heartbeats** in 1 minute. What are the period and frequency of the heart's oscillations?
2. The time required for 1 complete **back and forth** vibration (wave cycle) is called the _____ and is measured in units of seconds
3. Frequency and period of oscillation are _____ proportional to each other.
4. **(a)** Frequency is the number of wave cycles per _____ (Hz). **(b)** The frequency is inversely related to the _____ (T).
   (c) The number of cycles made per second is called _____ (2006/07 LAUTECH PHY 001 EXAM QUESTION 22)
5. Amplitude (A) is the displacement of vibrating material from the _____ position.
6. As the **frequency** of sound is increased, does the **wavelength** increase or decrease?
7. New York's 300-m high Citicorp Tower oscillates in the wind with a period of 6.8s. Calculate its frequency of vibration.
8. A backyard swing sways **back and forth** 55 times every 1.00 minute.
   (a) What is the period of the swing? (b) What is the frequency of the swing? (c) What is the length of the swing?
9. A **bird** beats its wings **up and down** with a frequency of 80Hz. Determine the period of the **wing's beats**.
10. A tall, thin **tree** swings **back and forth** in the breeze with a period of 0.45 sec. Determine the frequency of the **back and forth** motion.
11. A **hypnotist** swings a **watch** on a chain so as to make a pendulum that is 20cm long. Find the period of the **watch** pendulum.
12. A **spider** swings on a silk thread at a period of 0.60 sec. Determine the length of the silk thread.
13. A wrecking **ball** swing from a 10.0 m cable. Determine the period of the swing.
14. A Physics teacher jumps on a bathroom scale whose spring constant is 222 N/m. The jump causes a needle to vibrate **back and forth**. If the Physics teacher's mass is 48kg, find the period of vibration.
15. A progressive wave is represented by the equation $y = 3\sin(66t - x)$. Find the frequency (PHY001 2006/07 NO 21 TEST
16. What happens to the FREQUENCY if the length of a simple pendulum is INCREASED by a factor of NINE?
    (A) it decreases by a factor of 3 (B) it increases by a factor of 3 (C) it remains constant (i.e. does not change)
    (D) it increases by a factor of 9 (E) it decreases by a factor of 9

WAVE TYPES

17. ***Electromagnetic*** waves require no _____ in which to propagate (transfer energy).
18. **Mechanical** waves require a medium in which to propagate (e.g. _____ is a mechanical wave).
19. Does the **medium** in which a wave travels move along with the wave itself? Defend your answer.
20. (i) How do **electromagnetic** and **mechanical** waves differ? (ii) Why can light travel in a vacuum while sound cannot?

WAVE FORMS

21. In **Longitudinal** waves, medium is displaced _____ to the direction of wave propagation.
22. In **Transverse** waves, medium is displaced _____ to the direction of wave propagation.
23. Distinguish between a **Transverse** wave and a **Longitudinal** wave.

WAVE SPEED

24. (i) The speed of a **Mechanical** wave depends upon the type of _____ through which the wave pulse propagates
    (ii)Sound travels faster in **solids** than in **liquids** and faster in liquids than in **gases** (sound won't travel at all in a __)
27. If the speed of sound in air is 340 ms^{-1}, the period of vibration of sound waves of wavelength 1.7m is
    (A) 0.005 s (B) 0.02 s (C) 0.05 s (D) 200 s (LAUTECH PDS 2009 ENTRANCE EXAM QUESTION 136)
25. The 2nd harmonic of a string 1.5m long and fixed at both ends is 80Hz. Find the speed of the transverse wave(PHY001 2001
26. A metal string of mass 0.95g and length 60cm is under tension of 120N. Determine the speed of transverse wave in the string. Determine also the frequency of its fundamental note, first overtone and second overtone.

ENERGY

28. (i) When does the moving mass have the **maximum** kinetic energy? (ii) When is the kinetic energy **minimum** (0.0 Joule)?
29. (i)When is the elastic potential energy at a **maximum** value? (ii)When is the elastic potential energy a **minimum**(0.0 Joule)?

30. Consider a simple harmonic motion, say as described by a mass-spring system. The **ACCELERATION** of the mass will be **MAXIMUM** when the:
    (A) **displacement** of the mass is **MAXIMUM** (B) **velocity** of the mass is **MAXIMUM**
    (C) **displacement** of the mass is **MINIMUM** (D) **P.E.** is **MINIMUM** (E) **K.E.** is **MAXIMUM**

I'll be very much interested in real-life situations you apply this chapter to. It's more than just passing exam.

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BIODUN AMUDA

LADOKE AKINTOLA UNIVERSITY OF TECHNOLOGY OGBOMOSO.
DEPARTMENT OF PURE AND APPLIED PHYSICS.
PHY001 2006/2007 MID-PROGRAMME TEST FOR PDSP.

Instructions: Answer all questions by shading the correct alphabets on the answer sheet provided.
Time allowed: **1hour**

Q1. The speed c of ocean waves is proportional to the acceleration due to gravity g, wavelength λ, and density ρ of the wave such that $c = kg^x\lambda^y\rho^z$, where k is a dimensionless constant. The correct equation for the speed of the ocean wave is……

A. $c = k\sqrt{g\lambda}$ B. $c = \sqrt{kg\lambda\rho}$ C. $c = k\sqrt{g\lambda\rho}$ D. $c = kg^2\lambda^2\rho^2$

Q2. The vector product of $\mathbf{A} = 7\mathbf{i} - 4\mathbf{j} + 10\mathbf{k}$ and $\mathbf{B} = 2\mathbf{i} - 7\mathbf{j} - 3\mathbf{k}$ is equal to ……

A. $58\mathbf{i} - 41\mathbf{j} + 57\mathbf{k}$. B. $82\mathbf{i} + 41\mathbf{j} - 41\mathbf{k}$. C. $82\mathbf{i} - 41\mathbf{j} + 41\mathbf{k}$. D. $23\mathbf{i} + 34\mathbf{j} + 10\mathbf{k}$

Q3. If the distance of the earth to the moon is about 60 earth radii, then the gravitational field at the moon in Nkg^{-1} due to the earth is about……

A. 6.0. B. 0.16. C. 0.0028. D. 0.032.

Q4. Which of the following statements is true when a bullet strikes a block and becomes embedded?

A. The mechanical energy is conserved. B. There is no interchange of energy.
C. The kinetic energy of the bullet is converted into potential energy of the block.
D. The kinetic energy of the bullet is converted into thermal energy of the block and bullet.

Q5. A metal rod of Young's modulus $2 \times 10^{10}Nm^{-2}$ undergoes an elastic strain of 0.06%. The energy per unit volume stored in Jm^{-3} is……

A. 2600. B. 3600. C. 7200. D. 10800.

Q6. Calculate the radius of a capillary tube if water rises to a height of 12.5cm within it; assuming the angle of contact between the water and glass is zero; and surface tension for water is 0.0727. (Take g = $10ms^{-2}$)

A. 11mm. B. 1.10mm. C. 0.11mm. D. 0.01mm.

Q7. A constant volume gas thermometer indicates a pressure of 250mmHg at the ice point and 750mmHg at the steam point. What temperature will be read on this thermometer when it indicates a pressure of 500mmHg?

A. 40°C. B. 45°C. C. 50°C. D. 60°C.

Q8. A tyre is pumped to a pressure of $30Nm^{-2}$ at 54°C. Calculate the new pressure when it heats up to 108°C, assuming no change in volume.

A. $26.91Nm^{-2}$ B. $30.61Nm^{-2}$ C. $32.71Nm^{-2}$ D. $34.95Nm^{-2}$

Q9. A system absorbs 1500J of heat energy from its surroundings. If the surrounding performs 2200J of work on the system, the change in the internal energy of the system is……

A. 3700J. B. 2200J. C. 1500J. D. 700J.

Q10. The distance between a node and the nearest antinode of a stationary wave of wavelength λ is ……

A. λ/8. B. λ/4. C. λ/2. D. λ

Q11. The phenomenon where the forcing frequency of an oscillating body is equal to its natural frequency is called……

A. resonance. B. interference. C. oscillation. D. diffraction.

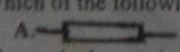
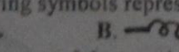
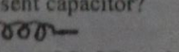
Q12. The force of attraction between two charged particles $q_1 = -6\mu C$ and $q_2 = 2\mu C$ separated by a distance of 20cm is equal to …… (Take $\varepsilon = 8.9 \times 10^{-12}Fm^{-1}$)

A. 2.7N. B. 3.7N. C. 4.7N. D. 5.7N.

Q13. Which of the following statement is **NOT** true?

A. Electric field intensity is a vector quantity. B. Electric potential is a vector quantity.
C. The unit of electric charge is Coulumb. D. Dielectric material is a poor conductor.

Q14. Which of the following symbols represent capacitor?

A.  B.  C.  D. 

Q15. The equivalent resistance of three resistors 2Ω, 3Ω, and 5Ω arranged in parallel is equal to……

A. 0.17Ω. B. 0.69Ω. C. 0.97Ω. D. 1.0Ω.

Q16. The angle between $\mathbf{A} = 2\mathbf{i} - \mathbf{j} - \mathbf{k}$ and $\mathbf{B} = \mathbf{i} - \mathbf{j} + \mathbf{k}$ is equal to ……

A. 90°. B. 75°. C. 62°. D. 45°.