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PHY101 Physics Final 2009 Paper Solved by Farhan and Ali (s1)

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FINALTERM EXAMINATION

Fall 2009

PHY101- Physics (Session - 1)

Solved by Farhan & Ali

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Time: 120 min

M a r k s: 70

PHY101 - Physics - Question No: 1 (M a r k s: 1)

As a 2.0-kg block travels around a 0.50-m radius circle it has an angular speed of

12 rad/s. The circle is parallel to the xy plane and is centered on the z axis, a

distance of 0.75m from the origin. The z component of the angular momentum

around the origin is:

► **6.0kg · m2/s**

► 9.0kg · m2/s

► 11 kg · m2/s

► 14 kg · m2/s

PHY101 - Physics - Question No: 2 (M a r k s: 1)

A net torque applied to a rigid object always tends to produce:

► linear acceleration

► rotational equilibrium

► **angular acceleration**

► rotational inertia

PHY101 - Physics - Question No: 3 (M a r k s: 1)

An object attached to one end of a spring makes 20 vibrations in 10 s. Its angular

frequency is:

► 1.57 rad/s

► **2.0 rad/s**

► 6.3 rad/s

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PHY101 - Physics - Question No: 4 (M a r k s: 1)

In simple harmonic motion, the restoring force must be proportional to the:

► amplitude

► frequency

► velocity

► displacement

PHY101 - Physics - Question No: 5 (M a r k s: 1)

Mercury is a convenient liquid to use in a barometer because:

► it is a metal

► it has a high boiling point

► it expands little with temperature

► it has a high density

PHY101 - Physics - Question No: 6 (M a r k s: 1)

The units of the electric field are:

► J/m

► J/(C·m)

► J/C

► J·C

PHY101 - Physics - Question No: 7 (M a r k s: 1)

A farad is the same as a

► **J/V**

► V/J

► C/V

► V/C

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PHY101 - Physics - Question No: 8 (M a r k s: 1)

We desire to make an LC circuit that oscillates at 100 Hz using an inductance of

2.5H. We also need a capacitance of:

► 1 F

► 1mF

► 1 µF

► **100 µF**

PHY101 - Physics - Question No: 9 (M a r k s: 1) vuzs

The wavelength of red light is 700 nm. Its frequency is _____.

► 4.30 * 10_4 Hertz

► 4.30 * 10_3 Hertz

► **4.30 * 10_5 Hertz**

► 4.30 * 10_2 Hertz

PHY101 - Physics - Question No: 10 (M a r k s: 1)

Which of the following statements is **NOT TRUE** about electromagnetic waves?

► Electromagnetic waves satisfy the Maswell's Equation.

► Electromagnetic waves can not travel through space.

► The receptions of electromagnetic waves require an antenna.

► **The electromagnetic radiation from a burning candle is unpolarized.**

PHY101 - Physics - Question No: 11 (M a r k s: 1)

Radio waves and light waves are _____.

► Longitudinal waves

► Transverse waves

► **Electromagnetic and transverse both**

► Electromagnetic and longitudinal both

PHY101 - Physics - Question No: 12 (M a r k s: 1)

Wien's Law states that, λ_{max} = _____ K.

► 2.90 * 10^{-3} Hertz

► 2.90 * 10^{-3} s

► 2.90 * 10^{-3} kg

► 2.90 * 10^{-3} m

PHY101 - Physics - Question No: 13 (M a r k s: 1)

Interference of light is evidence that:

► the speed of light is very large

► light is a transverse wave

► light is a wave phenomenon

► light is electromagnetic in character

PHY101 - Physics - Question No: 14 (M a r k s: 1)

Fahrenheit and Kelvin scales agree numerically at a reading of:

► -40

► 0

► 273

► 574

PHY101 - Physics - Question No: 15 (M a r k s: 1)

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According to the theory of relativity:

► **moving clocks run fast**

► energy is not conserved in high speed collisions

► the speed of light must be measured relative to the ether

► none of the above are true

PHY101 - Physics - Question No: 16 (M a r k s: 1)

Light from a stationary spaceship is observed, and then the spaceship moves

directly away from the observer at high speed while still emitting the light. As

a result, the light seen by the observer has:

► higher frequency and a longer wavelength than before

► **lower frequency and a shorter wavelength than before**

► higher frequency and a shorter wavelength than before

► lower frequency and a longer wavelength than before

PHY101 - Physics - Question No: 17 (M a r k s: 1)

How fast should you move away from a 6.0×10^{14} Hz light source to observe

waves with a frequency of 4.0×10^{14} Hz?

► 20c

► **38c**

► 45c

► 51c

PHY101 - Physics - Question No: 18 (M a r k s: 1)

The quantum number n is most closely associated with what property of the electron in a hydrogen atom?

► **Energy**

► Orbital angular momentum

► Spin angular momentum

► Magnetic moment

PHY101 - Physics - Question No: 19 (M a r k s: 1)

The quantum number m_s is most closely associated with what property of the electron in an atom?

► Magnitude of the orbital angular momentum

► **Energy**

► z component of the spin angular momentum

► z component of the orbital angular momentum

PHY101 - Physics - Question No: 20 (M a r k s: 1)

As the wavelength of a wave in a uniform medium increases, its speed will _____.

► Decrease

► Increase

► Remain the same

► None of these

PHY101 - Physics - Question No: 21 (M a r k s: 3)

Two people are carrying a uniform wooden board that is 3.00 m long and

weighs 160 N. If one person applies an upward force equal to 60 N at one end,

at what point does the other person lift? Begin with a free-body diagram of the

board.

Forces in x direction = 0

Forces in Y = F1 + F2 - W

Given:

L = 3.00 m F1 = 60 N

W = 160 N F2 = ? and x2 = ?

Sum of forces and torques = 0

Sum Force = F1 + F2 - W = 0

60N + F2 - 160 N = 0

F2 = 100 N

My pivot point is at F2.

Sum of torques = 0

Torque F1 = F1(L - x2)

Torque F2 = 0 b/c at pivot point

Torque W = W(L/2 - x2)

F1L - F1x2 + (WL)/2 - Wx2 = 0

(60)(3) - 60x2 + (160 * 3)/2 - 160x2 = 0

180-60x2 + 240-160x2 = 0

420-220x2 = 0

x2 = 1.9m

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PHY101 - Physics - Question No: 22 (M a r k s: 3)

If a charged particle moves in a straight line through some region of space, can

you say that the magnetic field in that region is zero?

PHY101 - Physics - Question No: 23 (M a r k s: 3)

You want to explore the shape of a cel1ain molecule by scattering electrons of

momentum p from a gas of the molecules and studying the deflection of the

electrons. You will be able to see finer details in the molecules by (a)

increasing p; (b) decreasing p: (c) not worrying what p is.

PHY101 - Physics - Question No: 24 (M a r k s: 3)

A vessel is filled with gas at some equilibrium pressure and temperature. Can all gas molecules in the vessel have the same speed?

PHY101 - Physics - Question No: 25 (M a r k s: 3)

What are the properties of wave function?

Wave functions contain all the measurable information about the particles

Wave functions are continuous.

They allow energy calculations via schrodinger equation.

They establish the probability distribution in three dimensions.

They permit calculation of most probable values of given variables.

PHY101 - Physics - Question No: 26 (M a r k s: 5)

A bike accelerates uniformly from rest to a speed of 7.10 m/s over a distance of

35.4 m. Determine the acceleration of the bike.

$2as = vf_2 – vi_2$

$2a(35.4) = (7.10)_2 – (0)_2$

$2a(35.4) = 50.41$

$A = .71\ m/s_2$

PHY101 - Physics - Question No: 27 (M a r k s: 5)

A flat loop of wire consisting of a single turn of cross-sectional area 8.00 cm^2 is

perpendicular to a magnetic field that increases uniformly in magnitude from

0.500 T to 2.50 T in 1.00 s. What is the resulting induced current if the loop

has a resistance of 2.00 W?

$E=(Bf-Bi)*A/t=(2.5-0.5)*8*10^{-4}/1=1.6*10^{-3}$ V

I=E/R=1.23 mA

PHY101 - Physics - Question No: 28 (M a r k s: 5)

An ideal gas is contained in a vessel at 300 K. If the temperature is increased to

900 K, by what factor does each one of the following change?

(a) The average kinetic energy of the molecules.

(b) The rms molecular speed.

(c) The average momentum change of one molecule in a collision with a wall.

(d) The rate of collisions of molecules with walls.

(e) The pressure of the gas.

PHY101 - Physics - Question No: 29 (M a r k s: 5)

Who discover the nucleus? Write the experimental setup that he follows.

Ans:

Lord Rutherford discovered the nucleus. He carried out his famous experiment that showed the existence of a small but very heavy core of the atom. He arranged for a beam of alpha particles to strike gold atoms in a thin foil of gold. If the positive and negative charges in the atom were randomly distributed, all ' would go through without any deflection. But a lot of backscattering was seen, and some alphas were even deflected back in the direction of the incident beam. This was possible only if they were colliding with a very heavy object inside the atom.

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PHY101 - Physics - Question No: 30 (M a r k s: 5)

In

an analogy between electric current and automobile traffic flow, what would correspond to charge? What would correspond to current?

PHY101 - Physics - Question No: 31 (M a r k s: 10)

(a)When can you expect a body to emit blackbody radiation?

(b) Which law is obeyed by Sun and other stars, briefly explain it.

(a) When can you expect a body to emit blackbody radiation?

Ans:

Waves are emitted when charges accelerate. Blackbody radiation occurs for

exactly this reason as well. If a body is heated up, the electrons, atoms, and molecules which it contains undergo violent random motion. Light may emit by electrons in one atom and absorbed in another. Even an empty box will be filled with blackbody radiation because the sides of the box are made up of material that has charged constituents that radiate energy when they undergo acceleration during their random motion. A blackbody is both an ideal absorber and an ideal radiator. At high temperature, a body emits radiation of shorter wavelength. Temperature is inversely proportional to wavelength.

(b) Which law is obeyed by Sun and other stars, briefly explain it.

Ans:

The Sun and other stars obey Wien's Law since the gases they are composed of emit radiation that is in equilibrium with the other materials. Wien's law allows astronomers to determine the temperature of a star because the wavelength at which a star is brightest is related to its temperature.

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