ASSALAM O ALAIKUM all fellows
ALL IN ONE
PHY101 Final Term PAPERS, MCQz & Subjective
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FINALTERM EXAMINATION
Spring 2009
PHY101- Physics (Session - 2)

Question No: 1 (Marks: 1) - Please choose one

The number of significant figures in 0.00150 is:

► 5
► 4
► 3
► 2

Question No: 2 (Marks: 1) - Please choose one

One revolution is the same as:

2π rad

- ► 1 rad
- ► 57 rad

- ► $\pi/2$ rad
- ► π rad
- ► 2π rad

Question No: 3 (Marks: 1) - Please choose one

For a body to be in equilibrium under the combined action of several forces:

- ► All the forces must be applied at the same point

- ► all of the forces form pairs of equal and opposite forces

- ► any two of these forces must be balanced by a third force

- ► the sum of the torques about any point must equal zero

Question No: 4 (Marks: 1) - Please choose one

A bucket of water is pushed from left to right with increasing speed across a horizontal surface.
Consider the pressure at two points at the same level in the water.

► It is the same

► It is higher at the point on the left

► It is higher at the point on the right

► At first it is higher at the point on the left but as the bucket speeds up it is lower there

Question No: 5 (Marks: 1) - Please choose one

An organ pipe with both ends open is 0.85m long. Assuming that the speed of sound is 340m/s, the frequency of the third harmonic of this pipe is:

► A. 200 Hz

► B. 300 Hz

► C. 400 Hz

► D. 600 Hz

Question No: 6 (Marks: 1) - Please choose one

Capacitors C1 and C2 are connected in series. The equivalent capacitance is given by

► $C_1C_2/(C_1 + C_2)$

► $(C_1 + C_2)/C_1C_2$

► $1/(C_1 + C_2)$

► C_1/C_2

Question No: 7 (Marks: 1) - Please choose one

If the potential difference across a resistor is doubled:

► only the current is doubled
► only the current is halved
► only the resistance is doubled
► only the resistance is halved

Question No: 8 (Marks: 1) - Please choose one

By using only two resistors, R1 and R2, a student is able to obtain resistances of 3 Ω, 4Ω, 12Ω, and 16 Ω. The values of R1 and R2 (in ohms) are:

► 3, 4
► 2, 12
► 3, 16
► 4, 12

Question No: 9 (Marks: 1) - Please choose one

Faraday's law states that an induced emf is proportional to:

- ► the rate of change of the electric field
- ► the rate of change of the magnetic flux
- ► the rate of change of the electric flux
- ► the rate of change of the magnetic field

Question No: 10 (Marks: 1) - Please choose one

A generator supplies 100V to the primary coil of a transformer. The primary has 50 turns and the secondary has 500 turns. The secondary voltage is:

- ► 1000V
- ► 500V
- ► 250V
- ► 100V

Question No: 11 (Marks: 1) - Please choose one

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

Question No: 12 (Marks: 1) - Please choose one

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Question No: 13 (Marks: 1) - Please choose one

A laser in a compact disc player generates light that has a wavelength of 780 nm in air. The light then enters into the plastic of a CD. If the index of refraction of plastic is 1.55, the speed of this light once enter the plastic is _____.

- ► $3.00 * 10^8$ m/s
- ► $1.94 * 10^8$ m/s
- ► $4.29 * 10^8$ km/h
- ► $3.00 * 10^8$ km/h

Question No: 14 (Marks: 1) - Please choose one

Which of the following electromagnetic radiations has photons with the greatest energy?

- ► blue light
- ► yellow light
- ► x rays
- ► radio waves

Question No: 15 (Marks: 1) - Please choose one

A virtual image is one:

- ► toward which light rays converge but do not pass through
- ► from which light rays diverge as they pass through
- ► toward which light rays converge and pass through
- ► from which light rays diverge but do not pass through

Question No: 16 (Marks: 1) - Please choose one

What is the unit of magnification factor?

- ► meter.Kelvin
- ► radian.Kelvin
- ► degree.Kelvin
- ► no units

Question No: 17 (Marks: 1) - Please choose one

During an adiabatic process an object does 100 J of work and its temperature decreases by 5K. During another process it does 25 J of work and its temperature decreases by 5 K. Its heat capacity for the second process is.

- ► 20 J/K
- ► 100 J/K

► 15 J/K
► 5 J/K

Question No: 18 (Marks: 1) - Please choose one

An ideal gas expands into a vacuum in a rigid vessel. As a result there is:

► a change in entropy
► a decrease of internal energy
► an increase of pressure
► a change in temperature

Question No: 19 (Marks: 1) - Please choose one

The Stern-Gerlach experiment makes use of:
► a strong uniform magnetic field
► a strong non-uniform magnetic field
► a strong uniform electric field
► a strong non-uniform electric field

Question No: 20 (Marks: 1) - Please choose one

A large collection of nuclei are undergoing alpha decay. The rate of decay at any instant is proportional to:
► the number of undecayed nuclei present at that instant
► the time since the decays started
► the time remaining before all have decayed
► the half-life of the decay

Question No: 21 (Marks: 1)

Which weigh more, a liter of ice or a liter of water?
Answer:

The water will weigh more,
since a liter is measurement of volume, and water expands when it is frozen, then the liter of liquid water will actually have more water than the ice.

Question No: 22 (Marks: 1)

Will the current in a light bulb connected to a 220-V source be greater or less than when the same bulb is connected to 110-V source?
Answer:
Greater. Current is directly proportional to Voltage. $I \propto V/R$
Well, it does not even depend on the bulb, everything that roughly follows Ohm's law will have higher current at higher voltage:
I = U/R
So current and voltage are proportional.
Btw. your bulb will end up in a nice flash, if it was DESIGNED to operate at 110V and gets connected to 220V, the current at 220V will blow the filament.

Question No: 23 (Marks: 1)

How is the wavelength of light related to its frequency?
Answer:

Electromagnetic waves always travel at the same speed (299,792 km per second). This is one of their defining characteristics. In the electromagnetic spectrum there are many different types of waves with

varying frequencies and wavelengths. They are all related by one important equation: Any electromagnetic wave's frequency multiplied by its wavelength equals the speed of light.

FREQUENCY OF OSCILLATION x WAVELENGTH = SPEED OF LIGHT

Question No: 24 (Marks: 1)

We don't notice the de Broglie wavelength for a pitched baseball. Is this because
the wavelength is very large or because it is very small?

The diameter of the baseball is about
0.10 m, whereas the de Broglie wavelength
is 10–34 m; the baseball is about
1033 times larger than the wavelength

Question No: 25 (Marks: 2)

Does every magnet necessarily have a north and south pole? Explain
Answer:
Yes.
A magnet, any magnet, **always** consists of both a north pole and a south pole.
The North and South poles are the northernmost and southernmost points on the earth, respectively. When following a compass, consistently going north will lead you to the North Pole, a point in which it is impossible to venture any further North. If following South, then the same result becomes the same. Each pole is where the theoretical lines of longitude converge (meet).

Question No: 26 (Marks: 2)

In a cool room, a metal or marble table top feels much colder to the touch than does a wood surface even though they are at the same temperature. Why?

Ans:

Metals have higher heat conductivities than wood, so heat flows more quickly through metals than through wood.

Question No: 27 (Marks: 3)

If a water wave oscillates up and down three times each second and the distance between wave crests is 2 m, what is its frequency? What is its wavelength? What is its wave speed?

Question No: 28 (Marks: 3)

A transformer has N_1 = 350 turns and N_2 = 2 000 turns. If the input voltage is
V (t) = (170 V) cos t, what rms voltage is developed across the secondary coil?

V1rms= 170/√2=120.208 V approx

$$\frac{V_{2RMs}}{V_{1Rms}} = \frac{N_2}{N_1}$$

V2rms= (2000/350) (120.208) = 686.904 V apprx

Question No: 29 (Marks: 3)

Why do astronomers looking at distant galaxies talk about looking backward in time?

Answer"

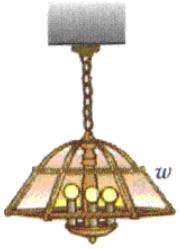
Astronomers are technically looking back in time because light travels at a finite speed in space. It takes a while for light to get to us from, say, a distant galaxy. If an object is 100 light years away we are looking at it, as it was, 100 years in the past because the light it is now emitting still hasn't reached us.

Question No: 30 (Marks: 3)

Some distant astronomical objects, called quasars, are receding from us at half the speed of light (or greater). What is the speed of the light we receive from these quasars?

Question No: 31 (Marks: 5)

Consider a lamp hanging from a chain. What is the tension in the chain?



The tension in the chain is equal to the weight of the lamp.
Weight is calculates as
Weight = Mass * acceleration due to gravity
Weight = 9.81*mass in kg
The tension is expressed in N .

Question No: 32 (Marks: 5)

A proton travels with a speed of 3.00 * 10^6 m/s at an angle of 37.0° with the direction of a magnetic field of 0.300 T in the + y direction. What are (a) the magnitude of the magnetic force on the proton and (b) its acceleration?

Question No: 33 (Marks: 5)

1. Light from the Sun takes approximately 8.3 min to reach the Earth. During this time interval the Earth has continued to rotate on its axis. How far is the actual direction of the Sun from its image in the sky?
2. Do all current-carrying conductors emit electromagnetic waves? Explain

2. Yes all current carrying conductors emit electromagnetic waves, and these are at the right angle of the current passes thorough as right hand rule of Fleming's explains it.

Question No: 34 (Marks: 5)

Explain solar convection zone. What is its other name?

The convection zone is the outer-most layer of the interior. It extends from a depth of 200,000 km up to the visible surface of the Sun. Energy is transported by convectionin this region. The surface of the

convection zone is where light (photons) is created. This top layer is called the *photo*sphere.

Question No: 35 (Marks: 10)

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a) Explain why you can't just open your refrigerator to cool your kitchen on a hot day. Why is it that turning on a room air conditioner will cool down the room but opening a refrigerator door will not?

b) On a humid day, water vapor condenses on a cold surface. During condensation, the entropy of the water(a) in-creases, (b) remains constant, (c) decreases, (d) may decreases or remain unchanged. Give its reason.

FINALTERM EXAMINATION
Fall 2009
PHY101- Physics (Session - 1)

Ref No: 1316760
Time: 120 min
Marks: 70

Student Info	
StudentID:	BC080402259
Center:	OPKST
ExamDate:	3/9/2010 12:00:00 AM

For Teacher's Use Only									
Q No.	1	2	3	4	5	6	7	8	Total
Marks									
Q No.	9	10	11	12	13	14	15	16	
Marks									
Q No.	17	18	19	20	21	22	23	24	
Marks									
Q No.	25	26	27	28	29	30	31		
Marks									

Question No: 1 (Marks: 1) - Please choose one

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

Question No: 2 (Marks: 1) - Please choose one

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

► linear acceleration

► rotational equilibrium

► angular acceleration

► rotational inertia

Question No: 3 (Marks: 1) - Please choose one

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

Question No: 4 (Marks: 1) - Please choose one

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

► amplitude

► frequency

► velocity

► displacement

Question No: 5 (Marks: 1) - Please choose one

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**

Question No: 6 (Marks: 1) - Please choose one

The units of the electric field are:

► **J/m**
► J/(C·m)
► J/C
► J·C

Question No: 7 (Marks: 1) - Please choose one

A farad is the same as a

► **J/V**
► V/J
► C/V
► V/C

Question No: 8 (Marks: 1) - Please choose one

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**

Question No: 9 (Marks: 1) - Please choose one

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

Question No: 10 (Marks: 1) - Please choose one

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.**

Question No: 11 (Marks: 1) - Please choose one

Radio waves and light waves are _____.

► Longitudinal waves
► Transverse waves
► **Electromagnetic and transverse both**
► Electromagnetic and longitudinal both

Question No: 12 (Marks: 1) - Please choose one

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**

Question No: 13 (Marks: 1) - Please choose one

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

Question No: 14 (Marks: 1) - Please choose one

Fahrenheit and Kelvin scales agree numerically at a reading of:

► **-40**
► 0
► 273
► 574

Question No: 15 (Marks: 1) - Please choose one

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

Question No: 16 (Marks: 1) - Please choose one

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

Question No: 17 (Marks: 1) - Please choose one

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

Question No: 18 (Marks: 1) - Please choose one

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

Question No: 19 (Marks: 1) - Please choose one

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

Question No: 20 (Marks: 1) - Please choose one

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

► Decrease

► Increase

► Remain the same

► None of these

Question No: 21 (Marks: 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

Question No: 22 (Marks: 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?

Ans:
NO
when a charged particle enters a magnetic field its deflection in the magnetic field will be given by the cross product of both Electric field and magnetic field
the cross product of two vectors is maximum when they are perpendicular to each other and zero when they are parallel to each other.
hence there is no deflection leads to two probabilities.
1) no magnetic field
2) the existing field is parallel to the direction of the path of the charged particle.
hence we cannot say that when a charged particle moves in a straight line through some region of space, there is no external magnetic field in that region

Question No: 23 (Marks: 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.

Question No: 24 (Marks: 3)

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

Question No: 25 (Marks: 3)

What are the properties of wave function?
Wave functions contain all the measurable information about the particles

1. Wave functions are continuous.
2. They allow energy calculations via Schrodinger equation.
3. They establish the probability distribution in three dimensions.
4. They permit calculation of most probable values of given variables.

Question No: 26 (Marks: 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.

$2as = vf^2 - vi^2$
$2a(35.4) = (7.10)^2 - (0)^2$
$2a(35.4) = 50.41$
$A = .71\ m/s^2$

Question No: 27 (Marks: 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

Question No: 28 (Marks: 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.

Question No: 29 (Marks: 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.

Question No: 30 (Marks: 5)

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

Question No: 31 (Marks: 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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