Answer the following questions: (Each question 15 marks)

1.a) Define: i) Deformation force ii) Poission's ratio iii) Bulk modulus vi) Breaking force
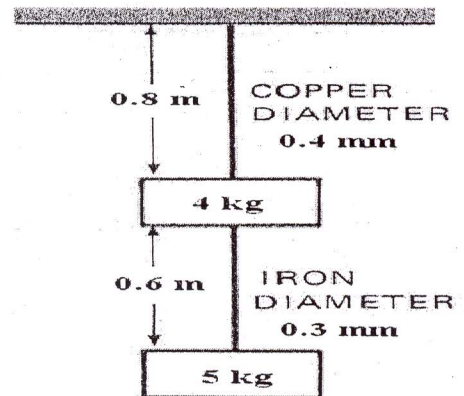
1.b) Two masses are suspended on a copper and on iron wire (as in Fig.). What is the stress (σ) in each wire? What is the elongation (ΔL) for each wire? What is the potential energy (PE) in each wire? ($E_{Cu}= 12 \times 10^{10}$ N/m^2 and $E_{Ir}= 19 \times 10^{10}$ N/m^2).

2.a) In the torsion formula of a circular bar, deduce the maximum shear stress, τ_{max} and the polar moment of inertia I_p for circular and hollow tubes.

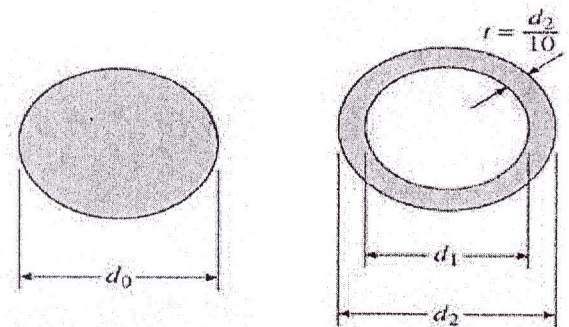2.b) A steel shaft of either solid bar or circular tube, (as in Fig.). If $\tau_{all} = 50$ MPa, $T = 1500$ N.m, $G = 80$ GPa and $\theta_{all} = 65°$. Determined:

i) d_0 of the solid bar.

ii) for the hollow shaft, $t = d_2/10$ determined d_2

iii) determined d_2/d_0 and W_{hollow}/W_{solid}.

2.c) A prismatic bar AB is loaded by a distributed torque of constant intensity t per unit distance, if $L = 15$ ft, $t = 550$ lb.in, $G = 12$GPa and $I_p = 19.5$ in^4, determined the strain energy, U.
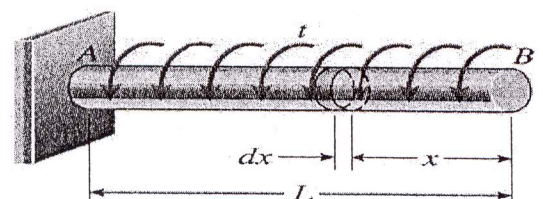
3.a) Define: i) Fracture ii) Fatigue limit iii) Creep

3.b) Compare between the brittle and ductile materials fracture.

3.c) Clarify how the ductile-to-brittle transition.

4.a) Explain crack initiation and propagation of fatigue.

4.b) Clarify: i) the stages of creep ii) parameters of creep behavior iii) mechanisms of creep.

مع كل الأمنيات الطيبة بالتوفيق،،،

أ.د/خالد العجيلى ا.د/محمود أبو زيد

Mansoura University
Faculty of Science
Department of Physics

Allowed Time: 2 hours
Date: 21 / 1 / 2014

First Term Exam 2013-2014
Electricity in Biological systems (BioPhys 210)

Answer the following questions:

Question 1:

1. A) Write short note about Bioelectricity in bone.   (*8 marks*)

1. B) Suppose a membrane has capacitance of 3×10^{-7} F/m with resting potential = -70 mV.

    i. Calculate the number of Na^+ ions entering the axon during the action potential (30 mV) per meter of nonmyelinated axon length.

    ii. Estimate the minimum energy required to propagate the impulse along the axon.

Where the charge of $Na^+ = 1.6 \times 10^{-19}$ coulomb.   (*12 marks*)

Question 2:

2. A) Derive Nernest-Planck equation for Cl^- ion.   (*10 marks*)

2. B) Discuss briefly the following topics;   (*10 marks*)

    i. Effects of electric current on the human body tissues,

    ii. Propagation mechanism of action potential in neuron.

Question 3:

3. A) Discuss briefly the differences between the functions of channels and pumps.   (5 marks)

3. B) Derive the parallel conductance model.   (*15 marks*)

Question 4:

The following steady-state concentrations and permeabilities are given for a membrane.

Ion	Cytoplasm (mM)	Extracellular Fluid (mM)	Ratio of Permeabilities
K^+	136	15	1.0
Na^+	19	155	0.019
Cl^-	78	122	0.381
Ca^{2+}	0.001	1.5	-------

    i. Find the Nernst potential for each ion.

    ii. What is the resting membrane potential predicted by the Goldman equation?

    iii. Explain why the resting membrane potential does not equal the Nernst potential of any of the ions.

Where, F = 96,487 Coulombs/mole, R = 8.314 Joules/$^\circ$K.mole and temperature is 27°C.

(*20 marks*)

Best wishes
Dr. Reda Felfel

Mansoura University		2nd Level students
Faculty of Science		Biophysics-Physics-Microbiology-
Physics Department		Chemistry-Biochemistry-Chemistry
Course code: Bio-Phys 211		Botany - Chemistry Zoology and
Course title: General biophysics	First term 2013-2014	Environmental Science
	Date: 14-1-2013	Full Mark: 80
		Allowed time: 2 hours

Answer all the following questions:

1-	A-	**Write true (√) or False (χ)** [each item = 1.5 Mark]
		i. A graded potential is a minor perturbations in membrane potential due to spontaneous ion leakage through cell membrane.
		ii. Any change in membrane potential from -70 mV to -80 mV is called hyperpolarization.
		iii. The dose equivalent measured in Sv and equals the absorbed dose in rad multiplied by quality factor.
		iv. Glaucoma disease is characterized by a clouding of eye's natural lens.
		v. The graded potentials last from 5 msec to several minutes.
		vi. The electrical signals of the brain can be measured using electroencephalogram EEG.
		vii. Hypermetropia caused by irregularity shaped cornea results in light focusing behind of retina
		viii. X-rays can be deflected by electric field or magnetic field.
		ix. The cornea of the eye contains the photoreceptors which are rods and cones.
		x. The ear canal behaves like pipe that are open from both ends.
	B-	Potential biological effects depend on how much and how fast a radiation dose is received. Differentiate between the acute and chronic radiation doses, explain your answer by different syndromes. [10 Marks]
	C-	Calculate the velocity of blood through the capillaries inside the lung if you know the radius of aorta is 8 mm, the velocity of blood in aorta is 33 cm/sec and the total cross sectional area of capillaries is 2800 cm². (**Comment on your answer**) [5 Marks]
2-	A-	**Complete the following sentences:** [each item = 2 Marks]
		• The heart can be described as an ......(1)......dipole whose magnitude and direction varies in a ......(2)...... manner, repeating for each heart cycle.

Please follow the rest of questions on the other side of this paper

		• The beta waves of EEG have frequency range ......(3)...... Hz in ....(4).........state.
		• X-rays are produced when rapidly moving ......(5)....... that have been accelerated through a potential difference of order 1 kV to 1 MV strikes a ......(6)....... .
	B-	Magnetic resonance imaging (MRI) is an imaging technique used primarily in medical settings to produce a high quality images of the inside of the human body. Discuss the physical principle of the magnetic resonance imaging (MRI) technique. [10 Marks]
	C-	Find an expression given for minimum wavelength and maximum frequency for X-ray tube operates at an accelerating voltage V. [8 Marks]
3-	A-	**Choose the correct answer :** [each item = 1 Mark]
		i. (Absorbed dose- Dose equivalent- Quality factor- Radiation flux) is a measure of energy deposition in any medium by any type of ionizing radiation.
		ii. The human eye is organ design to receive visible light having wavelengths between [(360 and 760 nm) – (380 and 670 nm) –(380 and 760 nm) –(390 and 660 nm)].
		iii. The X-rays emitted from the target is usually consisting of continuous radiation up on which (parallel-superimposed-straight-under) a line spectrum containing a relatively few lines.
		iv. About (64% -54%-44%-34%) of cone cells are red sensitive.
		v. The unit of the absorbed dose is called the (Gray-Sv-Rem-joule)
		vi. (Hypermetropia-Myopia-Astigmatism-Presbyopia) caused by irregularity shaped cornea results in light focusing in front of retina.
		vii. Myopia is corrected by (converging-diverging lens-cylindrical-flat) lens.
		viii. (Absorbed dose- Dose equivalent- Quality factor- Radiation flux) is number of particles or photons crossing an area of 1 square meter in one second.
	B-	Calculate the resistance per unit length of the fluids inside an axon of unmyleinated nerve and the resistance per unit area of the membrane, if the resistivity of the fluids inside the axon is 0.5 ohm-m, resistivity of membrane is 1.6×10^7 ohm-m , the axon radius is 5μm and the axon thickness is 6 nm. [6 Marks]
	C-	Each of three people talking, when speaking individually produce an unknown sound level L_1, but when they talk together, the sound level is 70 dB. Calculate the sound level L_1. [6 Marks]

Best wishes:

Dr Hany Kamal

Mansoura University Faculty of Science Physics Department Final Exam – 1st Term (11 Jan. 2014)	2013-2014	Second Level Students (BioPhysics) Course: Modern Physics (Phy220) Time allowed: 2 hours

Full Mark: 80 (Every question: 20 Mark)

Answer the following questions

Q1: Choose the best answer:

1. Newtonian mechanical laws are ………………… under Galilean transformations

a) variant   b) invariant   c) changeable   d) none

2. Michelson-Morley experiment approved ……………… results for the hypothesis of the ether existence

a) neutral   b) positive   c) negative   d) none

3. Taking the limit of Lorentz transformation as …………… gives Galilean transformation.

a) velocity $v \to 0$ b) velocity $v \to \infty$ c) velocity $v \to C$ d) velocity $v = 0$

4. An ellipse ($a = 2.55m$, $b = 2.20m$) in a craft viewed at the earth as a circle, so the craft's speed is

a) $v = 0.186C$ b) $v = 0.251C$ c) $v = 0.506C$ d) none

5. At what speed will the electron mass become triple of its rest mass?
a) $0.866C$ b) $0.886C$ c) $0.934C$ d) $0.943C$

6. A particle has a kinetic energy equal to half of its rest-mass energy $(K = 0.5m_0C^2)$, so its momentum equal

a) $p = 1.118m_0C$ b) $p = 0.18m_0C$ c) $p = 0.5m_0C$ d) none

7. The binding energy corresponds to the ………….. the bounded masses and their individual masses.
a) sum of   b) difference between   c) same as   d) all

8. Light of $\lambda = 590nm$ incident on **K**-surface, and the stopping potential is 0.35 volts, what is threshold frequency?

a) $v_0 = 4.03 \times 10^{12} Hz$ b) $v_0 = 9.15 \times 10^{13} Hz$ c) $v_0 = 42.38 \times 10^{13} Hz$ d) $v_0 = 4.33 \times 10^{14} Hz$

9. The maximum frequency that can be obtained from an X-ray tube operated at 9000 volts, is
a) $v_{max} = 2.18 \times 10^{18} Hz$ b) $v_{max} = 2.15 \times 10^{15} Hz$ c) $v_{max} = 3.14 \times 10^{14} Hz$ d) $v_{max} = 1.16 \times 10^{16} Hz$

10. The wavelength difference $\Delta\lambda$ in Compton scattering for scattering angle $60°$ is

a) $1.21 A°$ b) $0.121 A°$ c) $0.0121 A°$ d) $0.0242 A°$

Q2:

A) By knowing the Lorentz transformations, deduce the corresponding velocity transformations.

B) Write the basic two postulates stated by Einstein for his special theory of relativity.

Q3:

A) A spaceship is traveling at the speed of $9 \times 10^7 m/s$ with respect to the ground. An astronaut flashes a light signal to the ground control station every second. What is the time interval between the signals according to the person watching in the ground control station?

B) Show in details how Plank explained the blackbody radiation, and then calculated his constant h.

Q4: A) Explain deBroglie hypothesis for the wave-particle duality, and calculate the deBroglie wavelength for an electron of speed 5000 m/s.

B) Write short notes on the following:

1- Difference between the line X-ray spectrum and the continuous X-ray spectrum.

2- Twin paradox.

With my best regards,,,   **Dr. M. Sallah**

$C = 3 \times 10^8 m/s, h = 6.625 \times 10^{-34} J.s, e = 1.6 \times 10^{-19} c, m_{e0} = 9.1 \times 10^{-31} kg$

Mansoura University Faculty of Science Physics Department	Final Exam. 2 nd level Biophysics Vibration & Waves	Time : 2 hours Jan/ 2013 Full Mark: 80
Answer the following questions		

1- a)	A cylinder has a diameter of 1 m. floats at a water surface of density 1 gm/m^3. with its axis vertical. The periodic time of its oscillation when it pushed down and left is 2 seconds. Find the mass of the cylinder. (Use acceleration due to gravity = 1 m/sec^2).	10 marks
b)	Find the displacements of Cl_2 molecule when its atoms connected by three equal force strength spring and comment on the result.	10marks
c)	Find the condition to obtain a straight line with negative slope from the superposition of two perpendicular waves.	10 marks
2- a)	Prove that the propagation of sound wave in air obeys the adiabatic changes law.	10 marks
b)	Two trains move towards each other with speed 60 and 45 Km/hour. What is the apparent frequency to be detected in the second train when the frequency of the first train whistled is 512 Hz.	10 marks
3- a)	Define the reflectance coefficient for two connected wires and prove that it depends on the mass per unit length of the two parts of the wire. Solve the differential equation of damping oscillation. Find the normal mode of oscillation and the frequency	15 marks
b)	of a wave propagate in string.	15 marks

Best Wishes   Prof. M.S. Meikhail

Mansoura University Faculty of Science Physics Department		First Term Exam, 2014 Second level Date:28-12- 2013 Time allowed : **2 hours** Full Mark: **80 Mark**
Subject: **Physics**		Course: **Physical Optics 221** ف

Answer the Following Questions

[1] a -Demonstrate an explanatory diagram of the optical arrangement of Newton's rings. Discuss the forming of dark spot in the center of these rings. Derive the necessary formula of these ringes.

[15 Marks]

b - The disturbances produced at a given point by two coherent sources separately are given by;

$$y_1 = a \sin \omega t$$

and $\quad y_2 = b \sin (\omega t - \delta)$.

Deduce an expression for the intensity at a given point when both the sources act simultaneously.

Show a plot of this intensity as a function of δ for the case where (a=b).

[12 Marks]

[2] a- Using Fresnel's biprism give an experiment to determine the refractive index of the thin sheet of a transparent material having thickness t. Derive the necessary formula. Explain why a white light is used in this experiment.

[15 Marks]

b- A grating with 6000 ruling /cm is illuminated with white light at normal incidence. Describe the diffraction pattern for zero and first order assuming that the wavelength of light extends from (4000 A$^\circ$) to (7000 A$^\circ$).

[12 Marks]

[3] a- Discuss Fraunhofer diffraction pattern when using a rectangular slit. Derive an expression for the intensity distribution of the observed diffraction pattern . Show a plot of this intensity.

[18 Marks]

b- Drive the Malus law of the intensity of polarized light transmitted through the analyzer.

[8 Marks]

Good Luck

Examiners: Prof. Dr. Taha Sakkar & Prof. Dr. Karemal El -Farhaty

Prof. Dr. Eman Seisa & Prof. Dr. Mohamed Kabeel

Mansoura University
Faculty of Science
Zoology Department
Subject: Zoology
Course :Cytogenetics(Z-221)

2ⁿᵈ level- Biophysics
1ˢᵗ term- Academic year:2013-2014
Date: 23/12/2013
Time: 2 hours
Full Mark: 60

Answer the following questions:-
Question 1
(20 Marks)

Answer only two of the following:
1- Describe the structure of the plasma membrane of Eukaryotic cell and illustrate by a labeled diagram.
2- Report on Golgi apparatus structure and function and illustrate by a labeled diagram.
3- Write on the structure and function of the nucleus and illustrate by a labeled diagram.

Question2
Match A with B appropriately: (20 Marks)

A	B
a Nucleoplasm	**1-** are the site of protein synthesis.
b. Turner syndrome	**2-** leads the affected individual to have only 45 chromosomes.
c. Ribosomes	**3-** The transfer of a part of one chromosome to a nonhomologous chromosome.
d. Smooth Endoplasmic reticulum	**4-** function in formation of glycogen.
e. Lysosome	**5-** are known as the powerhouse of the cell.
f. Cytosol	**6-** are made up of cells that contain nucleoid.
g. Translocation	**7-** during the S phase of cell cycle.
h. Mitochondria	**8-** is the fluid portion of the nucleus.
i. Bacteria	**9-** contains digestive enzymes.
j. DNA replicates	**10-** is the fluid portion of the cytoplasm

Question 3
(20 Marks)

A-Complete the following sentences:
1-In prophase stage of mitosis, the ...., ... disappear and the spindle is formed.
2- .... is a type of cell division that occurs in Bacteria.
3- Lysosomes are organelles that function in.......
4-............ is a type of cell division by which gametes are formed.
5- Cri-du-chat is a genetic disorder resulted from........
6- In meiosis division the stage by which the cell end up with 4 daughter cells, is called...........
7- The process by which the water molecules pass through a membrane down a concentration gradient is called ....
8-Large-sized solid particles are taken in by the cell by a process called...........
9-Facilitated diffusion is a passive transport that needs .... and does not need..... to transport molecules across cell membranes.
10- A .... is a thread-like structure of DNA and protein found in the nucleus of cells.

B- Define the following terms:
Karyotype - Pinocytosis - Prokaryotes – Centromere.

Best of luck   *Prof.Dr. Nariman K. Badr El-Din*