الفيزياء ف ١٠

Mansoura University Faculty of Science Physics Department Jan. 2016	Second Level (Physics) Themodynamics (Ph210) Time (2hrs) Full marks, 80

1. a) If T is a function of P and V, Find dT in terms of the coefficient of volume expansion β and isothermal compressibility K. 25

b) For an ideal gas of one atom molecule with constant heat capacities, find the entropy as a function of temperature and pressure and calculate the change in entropy if the gas is heated from 27 °c to 327 °c while pressure drops from 300 to 150 N/m^2 (R=8.3 Joule/mole K).

2. An ideal gas c_p=29.6 Joule/mole K, temperature 277 °c and pressure $5x10^6$ N/m^2 the gas expands adiabatically to pressure 10^6 N/m^2 and then heated at constant volume to temperature 277 °c and finally the gas compressed isothermally back to its initial condition. 30

a) Find the cycle on (P-V) and on (T-S) diagrams.

b) Find the quantity of heat for each process of the cycle and calculate the efficiency of the cycle.

c) Calculate the work and the change of entropy of the gas for each of the three processes.

3. a) Using the fact that Gibbs function remains constant during a reversible process taking place at constant temperature and pressure, deduce the Clausis-Clapeyron equation. 25

b) Deduce the first and the second TdS equation and then find the energy equation.

c) Find $(\partial u/\partial v)_T$ for a Van der waals gas and find the internal energy in this case.

With my best wishes
Dr. Anwar Megahed

الفرقة : المستوى الثاني المادة : جبر خطى وهندسة كود المادة : (ر203) البرنامج: فيزياء	كلية العلوم – قسم الرياضيات	دور: يناير 2016 الزمن : ساعتان التاريخ :2016/ 1/3

أجب عن الأسئلة الآتية: **الدرجة الكلية :** 80

1-أ) باستخدام طريقة جاوس – جوردان حل مجموعة المعادلات :

$$x_1 - 2x_2 - x_3 - 2x_4 = 0\ ,\ 2x_1 - 5x_2 - 2x_3 - 5x_4 = -1$$

$$3x_1 - 5x_2 - 2x_3 - 3x_4 = 1\ ,\ -x_1 + 4x_2 + 4x_3 + 11x_4 = 2$$

ب) اذا كانت $p_1(1,-1,12)\ ,\ p_2(0,1,-1)\ ,\ p_3(3,-4,1)$. اوجد معادلة المستوى الذى يمر بالنقطة p_2 ويكون عموديا على $\overrightarrow{p_1p_3}$ *(20 درجة)*

2- أ) عرف كل من : الاستقلال الخطى – الأساس و البعد للفراغ الاتجاهى

ب) حدد ما إذا كانت الفئة $S=\{V_1,V_2,V_3\}$ تكون أساسا للفضاء R^3 أم لا؟ حيث

$$V_1=(1,2,3)\ ,\ V_2=(0,1,2)\ ,V_3=(-2,0,1)$$

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ج) بفرض أن A مصفوفة مربعة وقابلة للانعكاس اثبت ان : $i)\ \det(A^{-1})=\dfrac{1}{\det(A)}$

واذاكانت A تحقق $A^2-3A+I=0$ فان ii) $A^{-1}=3I-A$

(20 درجة)

3- أ) اوجد المعكوس للمصفوفة

$$A=\begin{bmatrix}2&3&1\\3&3&1\\2&4&1\end{bmatrix}$$

ثم اوجد حل نظام المعادلات:

$$2x+3y+z=0\ ,\ 3x+3y+z=0\ ,\ 2x+4y+z=0$$

ب) اوجد طول و معادلة العمود النازل من النقطة (1 - , 2 , 1 -) على المستوى

$2x+y-2z+3=0$ *(20 درجة)*

4- أ) اثبت أن المستقيمين $\dfrac{x-1}{2}=\dfrac{y-2}{3}=\dfrac{z-3}{4}$, $\dfrac{x-2}{3}=\dfrac{y-3}{4}=\dfrac{z-4}{5}$

يتقاطعان واوجد نقطة التقاطع والزاوية بينهما و معادلة المستوى الذي يحتويهما .

ب) عرف الفراغ الخطى الجزئى من فراغ اتجاهى. ثم بين ما اذا كانت الفئة W فراغ جزئى من R^3 ام لا ؟ حيث $W=\{(a,b,0)\ ,a,b\in R\}$ *(20 درجة)*

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Mansoura University Faculty of Science Physics Department Subject: Physics		2nd Level , 1st Term Credit Hour Students: Physics Date : 13 January 2016 Time allowed : 2 hours
Course: Physics 212, Meteorology & Astronomy		Full Mark : 80 Mark

Answer the 1st question, then any other two questions

[1] a- Derive the orbital potential energy equation for the orbit of a body moves under the effect of a central force , when $r \neq r(\theta)$ [10] Marks

b- A body moves under the effect of central force in an orbit of radius is given by $r = 2a \cos \theta$, determine:

i- The potential energy V(r), [10] Marks

ii- The force F(r). [5] Marks

c- Calculate the mass of Sun using the facts that the distance between earth and the Sun is 150×10^6 Km and earth revolution time is 365 days. [5] Marks

[$G = 6.67 \times 10^{-11}$ N m^2 Kgm^{-2}]

[2] a- State Kepler's 1st law. [3] Marks

b- Define the Eccentricity. [7] Marks

c- Using the definition of the Eccentricity derive Kepler's 1st law. [7] Marks

d- Define each of the following: [8] Marks

i- Dynamic meteorology. ii- Synoptic meteorology.

iii- Agricultural meteorology. iv- Climatology.

[3] a- For El-Mansoura of latitude 31°N, on 13 of January, Calculate: [12] Marks

i-The declination angle. ii-The zenith angle, at 10:00 LAT.

iii-The time of sunrise iv-The day length.

b-The density of the atmosphere depends on the temperature and on the altitude. Discuss this phrase with deriving the corresponding equations. [13] Marks

[4] a- Mercury has no atmosphere. Discuss this phrase. [9] Marks

b- The weather is affected by atmospheric parameters. Discuss this phrase giving the names of at least 5 instruments are used for measuring these parameters. [8] Marks

c- Calculate the distance between the earth and the sun at "13" of January and 1st of October if the AU=150×10^6 Km. [8] Marks

Good Luck

Examiners: 1- Prof. Dr. Magdy Tadros Yacoub* 2- Dr. Hamed Ibrahim

Mansoura University Faculty of Science Physics Departement Subject: Introduction to Biophysics Course code: biophys221		First Term, Final Exam 2nd Students Time Allowed :2 h . Date :20/1/2016 Full Mark :80 Mark

Answer all the following questions

I-Write short notes about each of the followings:

a) Cobalt 60 and linear accelerator

c) Classification of light atom interaction

b) Ion distribution in cell membrane

e) Acoustic impedance

f) Transducer

g) Equivalent Circuit Model for the Plasma Membrane

h) Treatment planning software

d) Compton Effect

II-Choose the correct answer from the followings:

1) The process in which α and β rays pass close to atoms and knocks the electrons out is called:

a) Ionization b) Ionisation

b) Decay d) None of above

2)The sound that emanates from a piezoelectric transducer originates:

a) From a point on the active surface

b) From most of the active surface

c) From a small area in the center of the active surface

d) From the edges of the active surface

3) Period is determined by:

a) Sound source b) Medium

c) Both

4) The time it takes a wave to vibrate a single cycle, or time from the start of a cycle to the start of the next cycle :

a) Period

b) Frequency

c) Wavelength

d) Speed

e) Power

5) Which of the following ions are involved in neuronal action potentials؟

a) Na^+

b) K^+

c) Cl^-

d) A and B only

e) A, B, and C

6) At what membrane voltage do neuronal voltage-gated Na^+ channels become activated`

a) −70 mV

b) −55 mV

c) 0 mV

d) +55 mV

7) At what membrane voltage do neuronal voltage-gated K+ channels become activated?

a) −70 mV

b) −55 mV

c) 0 mV

d) −90 mV

8) The hyperpolarization phase of the action potential:

a) Is due to the opening of voltage-gated Cl− channels

b) Is due to the prolonged opening of voltage-gated K+ channels

c) Is due to the closure of resting Na+ channels

d) None of the above

9) What is a major health concern wth MRI?

a) Reaction to applied drug

b) extrerme cold؟

c) Radiation dose

d) localized burns due to metallic implants?

10) Uses high doses of radiation to kill cancer cells and shrink tumors, delivered precisely to avoid damaging healthy brain tissue.

a) Radiation therapy

b) Ionizing radiation

c) X-ray

d) Radiosurgery

11) Which of the following is NOT true about the neuronal action potential؟

a) Action potentials are all-or-nothing .

b) Action potentials travel along axons in a non-decremental fashion .

c) Repolarization and hyperpolarization are due to the activity of K+ channels .

d) All of the above are true about action potentials.

12) Which of the following is NOT a source of background radiation?

a) Radiation from Naturally occurring unstable isotopes.

b) Radiation from a Source being measured.

c) Radiation from Space.

d) Radiation from Human Activity.

13) Which of the following types of radiation can enter living cells and cause ionization, thus damaging or destroying the cell?

a) Gamma. b) Alpha and Beta.

c) Beta and Gamma. d) Alpha, Beta and Gamma.

14) Where does radiation come from?

a) An electron b) An atom.

c) A stable nucleus d) An unstable nucleus which decays.

15) Which type of radiation would be stopped by a few millimetres of aluminium, but not by paper?

a) Gamma. b) Infra-red.

c) Alpha d) Beta.

III-Write the scientific expression:

a) The component of the ultrasound imaging equipment that is placed in direct contact with the patient's body( ).

b) Conversion of electrical energy to mechanical energy and vice versa ( ).

c) Nerves that communicate messages between the central nervous system and the rest of the body nerves that communicate messages between the central nervous system and the rest of the body( ).

d) Places radioactive material into tumor or surrounding tissue( ).

e) The action potential goes past -70 mV because the potassium channels stay open a bit too long( ).

f) A pair of reflecting surface of which one is a perfect reflector and the other is a partial reflector( ).

مع تمنياتي بالتوفيق

د/أمل الشهاوي

Mansoura University
Faculty of Science
Physics Department

Elastic Physics (PHYS215)
Time: 2 hours
Physics+BioPhysics(2nd level)

Final Term Exam, (2015-2016) **Marks: 80**

Answer the following questions

Q1- a) Define: Shear stress, modulus of rigidity, Ductile and brittle fracture, Intergranular and transgranular fracture, Compressibility, Poisson's ratio.

Q1- b) What types of imperfections in solids and how do defects affect material properties, are defects undesirable or not?

Q1- c) A 30 cm long glass fiber of diameter 0.05 mm is broken when exposed to atmosphere for 6 hours. The breaking load is estimated to be 0.16 N. Given $Y = 7 \times 10^{10}$ N.m^{-2} and $\gamma = 0.6$ J.m^{-2}. Calculate the following: a) Fracture stress, b) Crack depth, c) Stress at the tip of the crack assuming tip radius to be 1.5 Å just prior to fracture.

Q2- a) Distinguish between Frenkel defect and Shottky defect?

Q2 - b) A sheet of copper 0.750 m long, 1.00 m high, and 0.500 cm thick is acted on by a tangential force of 50,000 N. The value of S for copper is 4.20×10^{10} N/m^2. Find (a) the shearing stress, (b) the shearing strain, and (c) the linear displacement Δx.

Q2- c) During the manufacturing process should avoid sharp corners, why?

Q3- a) ***Explain***;

i- Cracks with sharp tips propagate easier than cracks having blunt tips.

ii- Ductile-to- brittle transition temperature.

Q3 - b) Define: Fatigue, high cycle fatigue, fatigue limit, fatigue strength, and fatigue life.

Q3- c) Find the number of vacancy concentration in 1 cm^3 of Cu at 1000 °C.
Given; ρ=8.4 g/cm^3, A_{Cu}=63.5 g/mol., Q_v=0.9 eV/atom , N_A=6.02 x 10^{23} atoms/mol, K = 8.62 x 10^{-5} eV/atom.

Q4- a) Clarify; stages of fatigue failure, creep, stages of creep, mechanisms of creep

Q4- b) What are the factors that affect fatigue life and how to solve?

Q4- c) Discuss and draw the relation between *stress amplitude* and *number of cycles to failure* (S-N curves) for Fe and Al.

With my best wishes
Prof. Dr. Rizk Mostafa Ibrahim

Mansoura University Faculty of Science Physics Department	Vibrations and waves Level (2) code F211 Physics and Biophysics	Jan 2016 Time 2 hours

Section 1: Physics (Answer 3 questions only)

1- Find reflectance coefficient of wave in two connected wires with different density of unit length
2- Prove that the velocity of wave in gas makes an adiabatic change.
3- Find the condition to obtain a circle as a result of the superposition of to normal waves.
4- A) Prove that the amplitude of damping oscillator depends on time.

4- b) Prove that the total energy of simple harmonic motion is constant.

Section 2: Biophysics (Answer 3 questions only)

1- a) Find the wavelength and the velocity of two dimensions wave given by $\phi = 10 \sin (2x-2y-3t)$

b) A spring is hanged vertically from its upper end. Its lower end is connected by a mass of 9 Kg. Then it is pulled down a distance of 2 cm from its steady state position. If the spring constant = 1000 N/m , study its motion.

2- a) Prove that the total energy of light damped simple harmonic motion decreases exponentially.

b) Define the following: i) The periodic time ii) the frequency iii) the wave number iv) the wavelength v) the amplitude of the wave.

3- a) Study the coupled oscillations in case of mono atoms system.

b) Study the energy of free simple harmonic oscillation in an electric system.

4- a) Study the superposition of two perpendicular vibrations having the same frequency but differ in the amplitude and phase.

b) Study the oscillation of stationary wave.