المستوى الثالث - فيزياء حيوية - فرع ٣ ك ١ فيزياء حيوية صحية

Mansoura University
Faculty of Science
Physics Department

Course code: Biophys 321

Second semester 2013-2014
Date: 21-5-2014

3rd level Biophysics Students
Full Mark: 80
Allowed time: 2 hours
Course title: Health Biophysics

Answer the following questions: Marks

1- a- Define the following:- 12.5

I. Absorber half thickness II. Delta ray

III. Rontgen IV. Exposure unit

V. Resolving time

b- How Long will it take to collect all the positive ions in a GM counter with argon at a pressure of 100 mmHg if the operating voltages is 1000 V and the cathode and anode have radii of 1 cm and 0.01 cm respectively? Knowing that the mobility of postive ions is 1040 (cm/S)/(V/cm). 7.5

2- a- Write short notes on structure of proportional counter and show how the disadvantages of ionization chambers are avoided by it. 12

b- What must be the minimum thickness of a shield of Plexiglas and aluminum for Strontium-90 knowing that, the density of Plexiglas is 1.18 g/cm^3, the density of aluminum is 2.7 g/cm^3 and Strontium-90 emits a beta particle whose maximum energy is 2.27 MeV. Which is better choice as a radiation shield Plexiglas or aluminum for Strontium-90? 8

3- a- Write in details on the mechanism of indirect effect of radiation 12

b- Prove that 1 X unit equals 34 Gray (in air) 8

4- a- What is the relative (to air) mass stopping power of graphite, density=2.25 g/cm^3 for a 0.1 MeV beta particle. Knowing that:- mean ionization and excitation potential of absorbing atoms (I)=1.35x10^{-5}Z , Z is atomic number =6, speed of ionizing particle/ speed of light β =0.3010, Avogadro's number=6.02x10^{23} atom/mole and energy equivalent of electron mass =0.51 MeV. 12

b- Write short notes on Zero threshold –dose response curve 8

Best wishes:

Dr Hany Kamal

المستوى الثالث - فيزياء حيوية للجهاز العصبي ٢٠١٤

Mansoura University
Faculty of Science
Zoology Department
Date: 4th June 2014
Time: 2 hr

Program: Z321
Biophysics
Subject: Nervous system
Full Mark: 80 Marks

Answer All of the Following Questions

I.A. Choose the correct answer for (10) questions only : **[20 Marks]**

1- Pia matter is the:
1-first membrane **2-inner membrane** **3- middle membrane**

2-Cereprospinal fluid acts to keep constant:
1-intracranial pressure **2-blood volume** **3-fluid volume**

3-Cranial nerves III & IV arise from :
1-midbrain **2- thalamus** **3-cerebrum**

4-Food intake is controlled by :
1-thalamus **2- hypothalamus** **3-cerebrum**

5-In human, spinal cord is divided into:
1- 31 segments **2- 30 segments** **3- 23 segments**

6-Spinal cord is responsible for:
1-immediate reflexes **2-motor reflexes** **3- brain reflexes**

7-Cardiac centers are important for controlling :
1-blood pressure **2-heart contraction** **3-respiration**

8-Occipital lobes receives signals from :
1-auditory nerves **2-optic nerves** **3-facial nerves**

9-Deeper parts of cerebral hemispheres consist of :
1-myelinated fibers **2- grey matter** **3- glial cells**

10-Initiation of voluntary movement is controlled by :
1-optic lobe **2-sensory lobe** **3-frontal lobe**

11- Cerebral cortex is highly convoluted & this increases:
1-surface area of brain **2-nerve fibers** **3- motor neurons**

I.B. Compelete (5) only of the following: **[10 Marks]**

1-Cerebrum is divided into 2 hemispheres connected by .....to permit .....

2-In the spinal cord , the grey matter consists of inter-neurons,....., ..., while white matter consists of..... ....

3-Midbrain consists mainly of ....., which is important for connecting thalamic region with .....

4-Brain contains ..... interconnected cavities called.....

5-Spinal cord is the main pathway connecting brain &.....

6-Meninges consist of.....,.....,.....

II.A. Put (√) or (X) on (5)only of the following statments & give the correct answer for the wrong ones: **[10Marks]**

1-Cervical region of spinal cord consists of 8 segments, while lumber region of 5 segments ( ).

2-Cerebellum is important for initiating voluntary movement &for controlling posture & balance.

3-Cerebrum is the largest portion of the brain associated with higher mental functions ( ).

4-Vital centers of the medulla are cardiac, respiratory & gastric centers ( ).

5-Extracellular fluid circulates in brain ventricles & central canal of the spinal cord ( ).

6-Cerebrospinal fluid (CSF) is secreted by brain vessels ( ).

II.B. Answer the following questions **[20 Marks]**

1) What conclusions can you draw from the following observation? An axon was stimulated with 0.075 volts and there was no response. Later it was stimulated with 0.15 volts and there was a response.

2) Discuss the role of potassium ions during the action potential using a labeled diagram.

III. Define all of the following terms: **[20 Marks]**

a) All or Nothing' Law	**b) excitable cell membrane**	**c) Action potential**
d) Afferent neuron	**e) Nerve impulses**	**f) the absolute refractory period**
g) Depolarization	**h) Saltatory conduction**	**i) Signal summation**
j) Reflex arch		

Best Whishes

Prof. Dr. Azza El-Wakf **Prof. Dr. Amr El-Missiry**

المستوى الثالث - فيزياء حيوى - الفيزياء الرياضية لغير الفيزيائيين ف ٢٠١٤

Mansoura University
Faculty of Science
Physics Department

Second semester
Date:8-6-2014

3rd level Biophysics students
Full Mark: 80
Allowed time: 2 hours
Course title: Mathematical Physics for non physicists
Course code: Phys 330

Answer the following questions: Marks

1-	a-	Draw and write the branched function of:- $$f(t)=\begin{cases}2 & 0\le t\prec 3\\ -4 & 3\le t\prec 4\\ 1 & 4\le t\end{cases}$$	15
	b-	Find the Fourier series expansion of :- $$f(t)=\begin{cases}0 & -1\le t\prec 0\\ t & 0\le t\prec 1\end{cases}$$	15
2-	a-	Find Laplace transform of the following functions:- $$x^{-1/2}\quad ,x^{1/2},\quad \int_0^x f(x)dx,\quad f(x)=\begin{cases}0 & 0\le x\prec \pi\\ -\sin x & \pi\le x\prec 2\pi\\ 0 & 2\pi\le x\end{cases}$$	15
	b-	Solve the integral equation:- $$y(x)=x^3+\int_0^x \sin(x-t)y(t)dt$$	15
3-	a-	Solve the initial value problems:- I. $y_{n+2}+4y_{n+1}+4y_n=0$ $\quad y_0=0\ ,\ y_1=1$ II. $y_{n+2}+2y_{n+1}+4y_n=0$ $\quad y_0=1\ ,\ y_1=0$	20

Best Wishes

Prof Attalla Elhanbaly

Mansoura University **Faculty of Science** **Chemistry Department** **Code: Chem.341** **Subject : Electrochemistry**	كلية العلوم جامعة المنصورة	**Third Level - Second Term** **Program : Biophysics ;** **Chem./Botany; Chem./Zoology** **Date : June 2014** **Time Allowed : 2 hours** **Full Mark : 60 Marks**

Answer All Questions الأسئلة على الوجهين

First Question: **(20 Mark)**

[A] Write on Nernst theory of the origin of electrode potential and Nernst equation relating electrode potential and concentration. **(8 Mark)**

[B] Taking E^o $Zn^{2+}/Zn = -0.76$ V and E^o $Mg^{2+}/Mg = -2.37$ V , construct a cell of both electrodes.

Write electrode and cell reactions and calculate : E^o cell , ΔG^o and equilibrium constant K . **(6 Mark)**

[C] Write on cadmium-Weston standard cell. **(6 Mark)**

Second Question: **(20 Mark)**

[A] Discuss in detail activation overpotential for polarized electrode and the Tafel equation. Illustrate how,using this equation, the exchange current i_o can be calculated. **(8 Mark)**

[B] If the Tafel constants, a and b, have the values 1.54 v and 0.119 v respectively for the reduction of hydrogen ions at a lead cathode, calculate the values of transfer coefficient α and the exchange current density i_o .

(6 Mark)

[C] Write on cathodic evolution of hydrogen. **(6Mark)**

Third Question: **(20 Mark)**

[A] The following values of emf of the cell: Ag/ AgBr/ KBr (a=1) / Hg_2Br_2/Hg

at various temperatures are given as follows:

t^oC	20	25	30
E (V)	0.06630	0.06834	0.07048

Write the electrode reactions, cell reaction and calculate the enthalpy change of the cell reaction ΔH, free energy change ΔG , entropy change ΔS and equilibrium constant K at 25°C.

(8 Mark)

[B] Complete : **(6 Mark)**

(1) $Sb/Sb_2O_3/OH^-$ is called..... and can be used for measuring .....

(2) In chemical cell emf is due to ....., while in concentration cell it is due to.....

(3) Concentration overpotential is due to .....

(4) The potential of gas electrode depends on..... and.....

(5) Ohmic overpotential is due to .....

(6) The transport number of the anion or cation is .....

[C] Tick (√) for the correct answer : **(6 Mark)**

(1) Overpotential η is given by :

(i) $\eta = E_{irreversible} + E_{reversible}$ ( ) (ii) $\eta = E_{irreversible} - E_{reversible}$ ( ) (iii) $\eta = E_{reversible} - E_{irreversible}$ ( )

(2) For an electrode at equilibrium :

(i) Rate of oxidation = rate of reduction ( ) (ii) Rate of oxidation > rate of reduction ( )

(iii) Rate of oxidation < rate of reduction ( )

(3) For non spontaneous cell reaction :

(i) E has a +ve value while ΔG has a –ve value ( )

(ii) E has a -ve value while ΔG has a +ve value ( )

(iii) Both E and ΔG have zero value ( )

(4) Theoretically , liquid junction potential (E_j) equal zero when:

(i) $t_+ = t_-$ ( ) (ii) $t_+ > t_-$ ( ) (iii) $t_+ < t_-$ ( ) (iv) $t_+ + t_- = 0$ ( )

(5) The cell : $Pt, H_{2(g)} (P_1 \text{ atm}) \mid HCl (a) \mid (P_2 \text{ atm}) H_{2(g)}, Pt$

is an example of :

(i) Electrolyte concentration cell without transference ( )

(ii) Electrolyte concentration cell with transference ( )

(iii) Chemical cell without transference ( )

(iv) Electrode concentration cell without transference ( )

(6) Irreversible processes are characterized with:

(i) Very high i_o ( ) (ii) Very low i_o ( )

Good Luck

المستوى الثالث فيزياء حيوى: فيزياء المفاعلات والنيوترونات (ف ٣١٢)

Mansoura University Faculty of Science Physics Department	Year: 3th Level Specialization: Biophysics Program	Second Semester , 2013-2014 June ,2014 Time : 2 Hours

Course Title: Physics of Reactors and Neutrons

Course Code: Phys312 / Program: Biophysics

Sunday 15/6/2014 9 – 11 AM Total Full Mark: 80 Marks

Answer the following questions

		Marks
1a	Write on the different types of slow neutron reactions with short notes about each one.	10
1b	Define the following: 1. Epithermal neutrons 2. Flux density 3. Macroscopic cross section 4. Mean free path 5. Breeding reactions	15
1c	Calculate η for natural uranium. (ν= 2.47)	5
2a	The absorption cross section of Cd^{113} for certain neutrons is 20800 barns. Taking the density of this material to be 8.67 grams/cm^3. Calculate: 1.The volume density of this material 2. The macroscopic absorption cross section. 3. The thickness of Cd^{113} required to reduce the intensity of the neutron beam to 1 % of its original value.	15
2b	Plot and discuss thermal neutron fission yield of U^{233} and Pu^{239}.	10
3a	Calculate the energy released when 1 kg of U^{235} fissions, taking the disintegration energy per event to be Q = 208 MeV.	10
3b	Write on nuclear fission and liquid drop model. Calculate E_f and E_b and derive the condition for stability.	15

With our Best wishes

Examiners: Prof. Dr. Ali H. El-Farrash Dr. Ahmed Abu El-Ela*

*Corresponding Examiner

المستوى الثالث فيزياء حيوي - التحليل الكهربي - طرق فصل الكروماتوجرافيا ٢٠١٦

Mansoura University Faculty of Science Chemistry Department Subject Code: Chem. 316 Subject: Analytical chemistry	كلية العلوم جامعة المنصورة	Second Term Examination 3rd Level Students Program: Biophysics Date: 1/6/2014 Time Allowed: 2 hours Full Mark: 80 Marks

Answer the following questions:

Section (A) Electroanalytical chemistry **(40 marks)**

Q1. A. Write an account about the coulometric titration for the determination of AsO_3^{3-} ion in insecticide, with drawing the electrolysis cell, mechanism of reaction and the calculation of the percentage As_2O_3 in insecticide sample. (At. Wt.: As=79.4) **(10 marks)**

B. Calculate the solubility product constant (K_{AgI}), the solubility (X) in molar and in ppm for the sparingly soluble AgI salt present in the cathode chamber of the following cell:

$$(+)Pt/H_{2(g)}(0.575\ atm)/H^+_{(aq)}(0.01M)\ //\ KI_{(aq)}(0.02M)/AgI_{(s)}/Ag^o(-)$$

(Knowing that: E_{Cell}=0.1135 volt, $E^o_{Ag+/Ago}$=0.8 volt and $E^o_{2H+/H2}$=0.0 volt) (At.Wt.: Ag=108, I=127) **(10 marks)**

Q2. A. Write the equation for the liquid junction potential (Ej, volt) with reference to the different parameters in the equation, the electrochemical cell in which an ion selective membrane for the determination of pH and pF is incorporated and the standard calibration curves used for the determination of H^+ and F^- ions in unknown water samples. **(10 marks)**

B. The organic phenol is easily brominated by the following equation:

$$C_6H_5OH+3Br_2 \rightarrow C_6H_2Br_3OH+3HBr$$

This equation forms the basis for a coulometric titration with the electrogenerated bromine. A 150 ml sample of polluted H_2O by phenol is acidified and 5 g of KBr is added. The coulometric titration requires 7.054 min at 0.0375 A to reach the end point. Calculate the phenol content in the sample as ppm (µg/ml). Show whether the water sample is polluted by phenol or not (polluted water contains more than 0.15 µg/ml phenol). (At.Wt.: C=12, O=16 and H=1.008) **(10 marks)**

Section (B) Chromatography **(40 marks)**

Q3. 1. Write on each of the following: **(15 marks)**

a. Applications of ion-exchange chromatography.
b. Advantages of gel chromatography.
c. Differences between GC and HPLC.

2. For a column of height equal 10 cm and cross sectional area equal 2 cm^2. If the void volume equal 50 % of column volume, find V_{max} knowing that K_P=30. **(5 marks)**

Q4. 1. Explain each of the following: **(12 marks)**

a. General procedures for paper chromatography (PC).
b. Identifying spots in planner chromatography.

2. If 100 ml of a pollutant with concentration of 1×10^{-7}M was extracted with 100 ml of organic solvent and the remaining concentration was 2×10^{-8}M. What is the number of extractions should be performed to get 99.2% extraction. **(8 marks)**

Good Luck: Prof. Medhat Hafez and Dr. Hany Moustafa

المستوى الثالث - فيزياء حيوى - كيمياء حيوية اكلينيكية (كع ٣٧٨)

Mansoura University
Faculty of Science
Chemistry Department
Subject: Biochem. 378
Course(s): Clinical Biochemistry

Second Term
Final Exam
Third Level (Biophysics)
Date: 1st June 2014
Time Allowed: Two hours
Full Mark: 80 Marks

Answer ALL the Following Questions

[1] A- **Explain the factors to be considered in each of the following cases:**
i- At the time of collecting the blood specimen. **[10] Marks**
ii- Establishing reference values and interpreting results of analyses carried out on specimens collected form individual patients. **[14] Marks**

B- Classify briefly the main uses of the data contained in clinical chemistry reports. **[5] Marks**

[2] A- Discuss the reasons that make the detection of gastrointestinal blood loss in faeces not simple, as it depends on the pseudoperoxidase activity of haem. **[5] Marks**

B- Enumerate the causes of water depletion. Give examples for each cause. **[7]Marks**

C- Differentiate between hyperkalaemia and hypokalaemia. **[10] Marks**

[3] A-Mention the factors known to cause a shift of HbO_2 dissociation curve to the right (increased P_{50}). **[4] Marks**

B- What are the tests that may be helpful in reaching a diagnosis for patients with renal stones? **[10] Marks**

C- A 70-year-old man was admitted to hospital as an emergency. He gave a history of dyspepsia and epigastric pain extending over many years. He had never sought medical attention for this. One week prior to admission, he had started to vomit, and since vomited frequently, being unable to keep down any food. He was clinically dehydrated, and had marked epigastric tenderness, but no sign of abdominal rigidity. Analysis of an arterial blood specimen gave the following results:

	Plasma analyses (mmol/L)	Reference range (mmol/L)
[Urea]	17.3	2.5-6.6
[Na^+]	117	132-144
[K^+]	2.2	3.3-4.7
[Creatinine]	250	55-120

P.T.O.

	Blood gas analyses	Reference range
$[H^+]$ (nmol/L)	26	36-44
P_{CO_2} (kPa)	6.2	4.4-6.1
[Bicarbonate] (mmol/L)	44	21.0-27.5
P_{O_2} (kPa)	9.5	12-15

How would you describe this patient's acid-base status? What might have caused the various abnormalities revealed by these results? Why is the plasma $[K^+]$ so low?

[15] Marks

Examiner: Dr. Ahmed EL-Sokkary

-Good Luck-