

元培科技大學

96 學年度日間部研究所碩士班入學考試

應用數學試題

准考證號碼

注意事項 請先在試題卷首准考證號碼之方格內填上自己的准考證號碼，考完後將「答案卡」、「試題」一併繳回。

(1) 請用高斯消去法，化簡以下矩陣。(10%)

$$\begin{pmatrix} 1 & -1 & 3 \\ 2 & 0 & 4 \\ 5 & 3 & 3 \end{pmatrix}$$

(2) 試求下列矩陣的特徵多項式(10%)、特徵值 (10%)，及特徵向量。(10%)

$$\begin{pmatrix} -3 & 1 & 0 \\ 1 & -3 & 0 \\ 0 & 0 & 3 \end{pmatrix}$$

(3) 請解釋以下名詞

- (a) 方陣的對角化 (5%)
- (b) 正交矩陣 (5%)
- (c) 兩個集合的交集 (5%)
- (d) 數學歸納法 (5%)

(4) 試證明或反證以下命題

- (a) 如果一個三階方陣的每個元素都不為零，則它的行列式值也不為零。(10%)
- (b) A 和 B 是兩個 n 階方陣， $\text{tr}(AB)=\text{tr}(BA)$ 。(10%)
- (c) 對於所有自然數 n， $n^3 - n$ 都是 3 的倍數。(10%)
- (d) n 是一個自然數，如果 n^3 是偶數則 n 是偶數。(10%)

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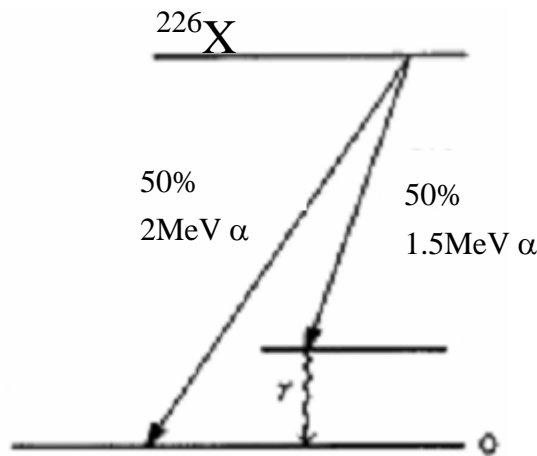
96 學年度日間部研究所碩士班入學考試

放射物理試題

准考證號碼

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1. 請說明 KMM 鄂惹電子(Auger electron)如何產生。並請解釋 KML 鄂惹電子(Auger electron)是否有可能產生?(10%)
2. 若有一電子其速度為 1.08×10^8 m/sec，請問這個電子的動能為多少 MeV? 總能量為多少 MeV?(10%)
3. 某一核種 ${}^A_Z X_N$ 原子核質量為 M_X amu，求此核種每個核子的束縛能 (電子質量為 M_e amu、質子質量為 M_p amu、中子質量為 M_n amu)。(5%)
4. 1 分鐘的計數顯示 70 個計數的總活性。若背景為 45 分鐘得 30cpm 計數率，為了使真活性在 96% 之置信度水平的 10% 以內，樣品必須被計數多久?(10%)
5. 請說明閃爍偵檢器(scintillation detector)偵測輻射作用的基本原理。(10%)
6. 何謂 LET? 它與質量阻止本領的差別在何處?(5%)
7. 假設有 2.26ng 的 X 核種均勻的分布在 1.6 公斤的組織中，如果此核種完全蛻變，假設 α 能量完全被組織吸收， γ 能量完全不被吸收，求此塊組織的吸收劑量為多少 Gy? (${}^{226}\text{X}$ 的 $T_{1/2}=1$ 天) (10%)



8. 解釋名詞(40%)
 - A. ionization
 - B. characteristic γ -ray
 - C. internal conversion yield
 - D. annihilation
 - E. average life
 - F. secular equilibrium
 - G. oxygen enhancement ratio (OER)
 - H. exposure rate constant (Γ)
 - I. quenching
 - J. photodisintegration

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生理學試題

准考證號碼

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I. True (T) or False (F) (60%)

1. Arterial blood pH is indirectly proportional to the partial carbon dioxide pressure of arterial blood.
2. Increasing arterial blood pH increases the affinity of hemoglobin for oxygen.
3. Myoglobin has a greater affinity for oxygen than hemoglobin.
4. Dilation of the afferent arteriole would increase glomerular pressure.
5. Elevated blood pressure stimulates an increased glomerular filtration rate.
6. Increased blood volume results in increased anti-diuretic hormone secretion.
7. Sympathetic stimulation increases the activity of the pacemakers of the intestinal muscularis.
8. Bile is derived from cholesterol.
9. A lack of circulating Ca^{2+} inhibits blood clotting.
10. Closure of the semilunar valves occurs at the end of systole.
11. Cardiac output increases as heart rate decreases.
12. Stroke volume is increased as systemic blood pressure increases.
13. The T wave of the ECG represents atrial repolarization.
14. The Frank-Starling law of the heart describes an intrinsic regulation of stroke volume.
15. During exercise, blood flow to the heart increases.
16. Increased mean arterial pressure induces decreased atrial natriuretic factor secretion.
17. Pulse pressure is the difference between systolic and diastolic blood pressures.
18. Inhibition of G-proteins would cause an increase in hormone-induced intracellular Ca^{2+} concentrations.
19. Fats and fat-soluble molecules readily move into and out of cells.
20. Inhibition of follicle stimulating hormone secretion would inhibit testosterone synthesis.
21. Progesterone is secreted primarily from the corpus luteum.
22. Ca^{2+} must bind to troponin to allow myosin binding sites on actin interact with myosin.
23. During skeletal muscle contraction the A band decreases in size.
24. When skeletal muscle cells contract, they increase in length.
25. Inhibin specifically inhibits the secretion of LH but not FSH from the anterior pituitary.
26. The only hormone required for lactation is prolactin.
27. The granular (rough) endoplasmic reticulum is characterized by a lack of ribosomes.
28. Anticodons found in mRNA allow for base pairing with the codons in tRNA.
29. The genetic code is found within DNA.
30. Oncogenes are mutated forms of proto-oncogenes.

II. 問答題: (40%)

1. 何謂 Na^{+} - K^{+} Pump (就離子運送過程及功能說明)
2. 細胞膜為何帶負電
3. 動作電位分期及其離子進出原因 (請劃出膜電位及時間及標示橫軸及縱軸的單位)
4. 描述突觸的化學傳遞過程 (突觸前神經元如何傳至突觸後神經元)