

- 一、選擇題(每題 2 分) ※ 注意：請於試卷內之「選擇題作答區」依序作答。
- 以下食品中常見之污染物，何者會和 DNA 產生鍵結而導致基因突變的可能性？(1) 苯并芘 (安息香比林, benzopyrene) (2) 塑化劑 (3) 三聚氰胺 (4) 黃麴毒素。  
(A) 1, 4  
(B) 2, 3  
(C) 1, 2  
(D) 1, 3, 4
  - 以下敘述何者敘述錯誤？  
(A) Saxitoxin 屬於麻痺性貝毒(paralytic shellfish poison)  
(B) 麻痺性貝毒的中毒機轉在於阻斷神經與肌肉細胞之間的鈉離子通道  
(C) 軟骨藻酸(domoic acid)屬於失憶性貝毒  
(D) 河豚毒(tetrodotoxin)的中毒機轉在於阻斷神經與肌肉細胞之間的鉀離子通道
  - 下列哪些屬於目前已知的內分泌干擾物？(1) 雙酚 A (Bisphenol A, BPA), (2) 鄰苯二甲酸酯 (Phthalates), (3) 萊克多巴胺(Ractopamine), (4) 多氯聯苯 (Polychlorinated Biphenyls, PCBs)。  
(A) 1, 2, 4  
(B) 1, 2  
(C) 1, 3, 4  
(D) 2, 3, 4
  - 在毒理學研究中，NOAEL (無可觀察不良影響劑量) 和 ADI (每日可容忍攝入量) 是評估食品中化合物安全性的重要參數。下列關於 NOAEL 和 ADI 的敘述，何者正確？  
(A) ADI 的計算通常基於 NOAEL，並引入安全係數 100 以考慮種間差異(10 倍)和個體敏感性差異(10 倍)  
(B) NOAEL 是指在動物實驗中沒有檢測到任何生理變化的劑量，與毒理學效應無關  
(C) NOAEL 和 ADI 的值會因不同物種的代謝機制相同而保持一致，不需要跨物種修正  
(D) 以上皆是
  - 下列關於有害金屬對人類的危害何者有誤？  
(A) 鎘會造成痛痛病 (Itai-Itai disease)  
(B) 無機汞會造成水俣病 (Minamata disease)  
(C) 銅會造成威爾森病 (Wilson disease)  
(D) 砷可能會造成烏腳病 (black foot disease)
  - 由半致死劑量(lethal dose 50) 推測以下何種化合物的急毒性最強？  
(A) 毒物 A 的 LD 50 為 1.5 ppm  
(B) 毒物 B 的 LD 50 為 15 ppb  
(C) 毒物 C 的 LD 50 為 100 ppb  
(D) 毒物 D 的 LD 50 為 20 ppm
  - 下列哪一種測試可用於檢測 DNA 修復能力？  
(A) Sister chromatid exchange (SCE) assay  
(B) Comet assay  
(C) Ames test  
(D) MTT assay
  - 以下哪種機制不是 DNA 修復的主要方式？  
(A) 鹼基切除修復 (Base excision repair, BER)  
(B) 核苷酸切除修復 (Nucleotide excision repair, NER)  
(C) 非同源末端接合 (Non-homologous end joining, NHEJ)  
(D) RNA 干擾 (RNA interference)
  - 下列何者屬於直接致癌物 (Direct-acting Carcinogens)？  
(A) 環氧乙烷 (Ethylene oxide)  
(B) 芳香族胺 (Aromatic amines)  
(C) 多環芳香烴 (Polycyclic aromatic hydrocarbons, PAHs)  
(D) 亞硝胺 (Nitrosamines)

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- 10、下列哪一種化學物質屬於前致癌物質 (Procarcinogens)?
- (A) 苯並芘 (Benzo[a]pyrene)
  - (B) 多氯聯苯 (PCBs)
  - (C) 鉻化合物 (Chromium compounds)
  - (D) 戊二醛 (Glutaraldehyde)
- 11、下列何者為致癌過程中最可能產生永久性基因突變的階段?
- (A) Initiation
  - (B) Promotion
  - (C) Progression
  - (D) Regression
- 12、下列何種突變在細胞中發生機率最高?
- (A) oxidized DNA
  - (B) single-strand break
  - (C) depurination
  - (D) double-strand breaks
- 13、放射性輻射對 DNA 造成的主要損傷類型是?
- (A) Pyrimidine dimers
  - (B) Single-strand breaks
  - (C) Double-strand breaks
  - (D) Depurination
- 14、下列何種輻射劑量評估單位可用於描述人體內吸收的輻射能量?
- (A) 西弗 (Sievert, Sv)
  - (B) 格雷 (Gray, Gy)
  - (C) 貝克 (Becquerel, Bq)
  - (D) 雷得 (Rad)
- 15、以下哪一種是衡量輻射劑量對人體生物效應的單位?
- (A) 格雷 (Gray, Gy)
  - (B) 西弗 (Sievert, Sv)
  - (C) 居里 (Curie, Ci)
  - (D) 貝克 (Becquerel, Bq)
- 16、Which of the following statements best describes the role of insulin in fuel metabolism?
- (A) It inhibits glucose uptake in peripheral tissues.
  - (B) It promotes catabolic processes such as lipolysis.
  - (C) It facilitates glycogen synthesis in the liver and muscle.
  - (D) It triggers the release of stored triglycerides from adipocytes
- 17、Which of the following best explains the "set-point" theory regarding energy balance?
- (A) The body stores excess energy as glycogen to maintain a constant weight.
  - (B) Energy intake and expenditure are regulated to preserve a consistent level of energy reserves.
  - (C) The basal metabolic rate remains constant regardless of energy consumption.
  - (D) Weight fluctuations are primarily influenced by genetic factors rather than homeostatic mechanisms.
- 18、Which of the following best illustrates the concept of "the dose makes the poison"?
- (A) Botulinum toxin is toxic at nanogram levels, while sodium chloride requires gram-level exposure to cause harm.
  - (B) Chemicals with low LD50 values are always more dangerous than those with higher values.
  - (C) Toxicity of a chemical depends solely on its physical state and reactivity.
  - (D) Acute exposure always produces immediate toxic effects, regardless of dose.
- 19、What distinguishes a chemical toxin from a toxicant?
- (A) Toxins are naturally produced by biological systems, while toxicants are often synthetic.
  - (B) Toxicants include venoms released by animals, whereas toxins do not.
  - (C) Toxins are limited to organic chemicals, while toxicants include inorganic substances.
  - (D) Toxicants cause immediate toxicity, while toxins result in delayed effects.

- 20、 Which property enhances the distribution of a toxicant to its target site?  
(A) High ionization at physiological pH.  
(B) Accumulation in non-target tissues like adipose tissue.  
(C) Presence of specialized transport processes.  
(D) Low molecular weight below 30 kDa.
- 21、 Which organ is most likely affected by a toxicant undergoing significant first-pass metabolism?  
(A) Heart  
(B) Lungs  
(C) Kidneys  
(D) Liver
- 22、 What typically happens when a lipophilic toxicant accumulates in adipose tissue?  
(A) It immediately causes systemic toxicity.  
(B) It becomes more toxic due to interactions with fatty acids.  
(C) It is safely stored and released slowly, reducing toxicity.  
(D) It enhances the bioavailability of other xenobiotics.
- 23、 What is the role of glutathione in detoxification?  
(A) Enhancing toxicant absorption in the gastrointestinal tract.  
(B) Conjugating electrophiles to form less harmful compounds.  
(C) Blocking reactive oxygen species formation at mitochondria.  
(D) Activating xenobiotics to their toxic metabolites.
- 24、 Which of the following statements best describes the main advancement in risk assessment methodology since the 1970s?  
(A) Risk assessment has shifted from a single-chemical, single-exposure approach to evaluating multiple chemicals and exposure pathways across various endpoints.  
(B) The use of high-dose animal bioassays has become the sole method for carcinogenicity testing.  
(C) Risk management now exclusively relies on quantitative data, eliminating the need for qualitative analysis.  
(D) Advances in risk assessment methodologies have resulted in complete replacement of animal testing with in vitro assays.
- 25、 What are the four key steps in the risk assessment process as outlined in the National Research Council's framework?  
(A) Risk reduction, exposure analysis, hazard identification, and stakeholder involvement  
(B) Hazard identification, dose-response assessment, exposure assessment, and risk characterization  
(C) Problem formulation, chemical analysis, dose assessment, and stakeholder communication  
(D) Exposure analysis, policy formulation, risk communication, and hazard characterization
- 26、 What is the primary objective of using biomarkers in risk assessment?  
(A) To eliminate the need for dose-response assessments  
(B) To establish direct evidence of a chemical's market value  
(C) To link chemical exposure to potential health effects and disease prediction  
(D) To replace animal studies with computational models
- 27、 Why is "problem formulation and scoping" important in risk assessment?  
(A) It determines the economic viability of risk management strategies.  
(B) It defines the context and goals for the risk assessment process.  
(C) It ensures all testing methods are non-animal based.  
(D) It prioritizes regulatory action over stakeholder involvement.
- 28、 Which of the following describes a limitation of high-dose animal bioassays for carcinogenicity testing?  
(A) They are unable to detect rare tumor types.  
(B) They cannot assess cancer risk in humans under any circumstances.  
(C) Animal bioassays only evaluate single-exposure risks.  
(D) High doses may trigger different biological responses than low doses.

二、問答題 ※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

- 1、 在肝臟細胞中的細胞色素 p450 (cytochrome p450) 具有什麼特性及扮演何種功能? (5 分)
- 2、 請解釋 PM2.5 在空氣污染中的定義及其如何對人類健康發生不良影響 (2 分)，此外它與其他粒徑的懸浮微粒(如 PM10) 對人類暴露的路徑有何不同 (2 分)。

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題號： 149

國立臺灣大學 114 學年度碩士班招生考試試題

科目： 毒理學概論

題號：149

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- 3、丙烯醯胺 (acrylamide) 被 IARC (International Agency for Research on Cancer) 歸類為 2A 化合物，IARC 的分類標準為何？丙烯醯胺是藉由何種已知的毒理機轉而被歸類為 2A? (4 分)
- 4、Ames Test 如何使用沙門氏菌株篩檢潛在致癌劑或致突變劑？請描述其基本原理及如何解釋結果。(4 分)
- 5、多環芳香烴 (PAHs) 是一類常見的環境污染物，請描述其代謝活化機制及其如何導致 DNA 突變或癌症發生。(3 分)
- 6、近期社會上發生喪屍煙彈毒駕事件，請說明：
  - (1)其主要成分之化學名(2 分)
  - (2)其為幾級毒品(2 分)
  - (3)若警方現場逮捕犯人後，可採集那些檢體說明近期內的使用？請寫出兩種(4 分)
  - (4)請說明法規上以何種儀器做毒品確認檢驗及其流程(6 分)。
- 7、請說明新聞常出現的假酒事件中，其主要成分為甲醇，請說明：
  - (1)其如何造成神經傷害?(5 分)
  - (2)以乙醇做為治療方法，請說明原理?(5 分)

試題隨卷繳回