

國立成功大學
110學年度碩士班招生考試試題

編 號：313

系 所：醫學檢驗生物技術學系

科 目：檢驗醫學

日 期：0203

節 次：第 1 節

備 註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Please describe the reason in brief for causing “Dark Brown Plasma or Urine” and your suggestions for dealing with those samples in hospital diagnostic laboratories (10%)

2. Please describe the currently available detection methodology for SARS-CoV-2 infection. (10%)

3. Please read this abstract and answer the following questions:
“Zoonotic introduction of novel coronaviruses may encounter preexisting immunity in humans. Using diverse assays for antibodies recognizing SARS-CoV-2 proteins, we detected preexisting humoral immunity. SARS-CoV-2 spike glycoprotein (S)-reactive antibodies were detectable using a flow cytometry-based method in SARS-CoV-2-uninfected individuals and were particularly prevalent in children and adolescents. They were predominantly of the immunoglobulin G (IgG) class and targeted the S2 subunit. By contrast, SARS-CoV-2 infection induced higher titers of SARS-CoV-2 S-reactive IgG antibodies targeting both the S1 and S2 subunits, and concomitant IgM and IgA antibodies, lasting throughout the observation period. SARS-CoV-2-uninfected donor sera exhibited specific neutralizing activity against SARS-CoV-2 and SARS-CoV-2 S pseudotypes. Distinguishing preexisting and de novo immunity will be critical for our understanding of susceptibility to and the natural course of SARS-CoV-2 infection.” (*Science* 370:1339, 2020)

(A) Can the preexisting antibodies be protective? Please design experiment(s) for testing the protective efficacy of preexisting antibodies recognizing SARS-CoV-2 proteins. (8%)
(B) Coronaviruses are RNA viruses that usually have high mutation rates. Please describe your strategy for the development of effective vaccines against SARS-CoV-2 mutant strains. (12%)

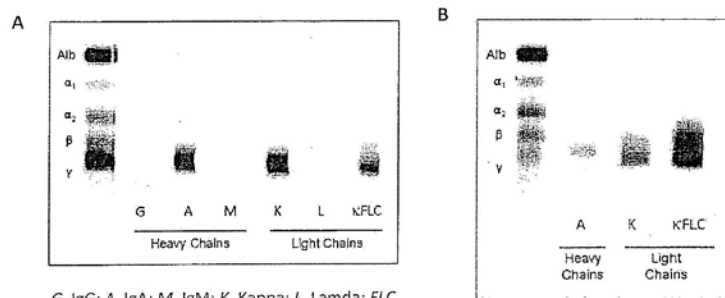
4. Routine biochemistry investigations for a patient with acute myeloid leukemia treated by bone marrow transplantations were as follows. This patient was diagnosed with graft-versus-host disease and liver impairment.

Test (reference interval)	Result
Sodium-indirect ISE* (133-143 mmol/L)	123
Sodium-direct ISE*	143
Total CO ₂ (22-26 mmol/L)	16
Total bilirubin (< 0.6 mg/dL)	10.2
Direct bilirubin (< 0.6 mg/dL)	9.9
Alkaline phosphatase (250-800 U/L)	2470
γ -glutamyltransferase (< 37 U/L)	1056
Aspartate aminotransferase (10-45 U/L)	172
Total protein (60-80 g/L)	56
Total cholesterol (< 200 mg/dL)	2317
Triglycerides (nonfasting) (< 150 mg/dL)	212

*ISE: ion-selective electrode

- (A) What is the possible reason for the discrepancy in plasma sodium measured by these two methods? (5%)
- (B) Which sodium result is more correct? (2%)
- (C) In addition to sodium level, which test shown above could also be affected? (2%)
- (D) According to the liver function test results, what is the possible liver impairment do you think and why. (5%)

5. An 80-year-old male with multiple myeloma visited clinic after one year of chemotherapy. His serum immunofixation (IF) results at diagnosis (Fig. A) and one year after therapy (Fig. B) are shown.



G, IgG; A, IgA; M, IgM; K, Kappa; L, Lamda; FLC, free light chains.

Table 1. Quantitative results

	At diagnosis	At one year
IgA-κ and β-globulin	~ 7.1 g/dL	~ 1.1 g/dL
Serum κFLC by IF densitometry	Detected	2000 mg/L
Serum κFLC by immunoassay	16 mg/L	24 mg/L

- (A) As shown in Fig. A, what is your interpretation for the result at diagnosis? (2 %)
- (B) Following one year of chemotherapy, what did the IF result demonstrate? (2 %)
- (C) The medical technologist found the discordance between the high serum κFLC concentration observed using IF (2000 mg/L) with the much lower κFLC concentration measured by immunoassay (24 mg/L). Please explain the possible effect occurred in the immunoassay. (5%)
- (D) What should be the adjustment for the immunoassay to obtain reasonable result? (3%)

6. Please describe the abnormality of the test results. (4%)

Test	Value
Potassium, mmol/L (3.7-5.5)	8.4
Calcium, mg/dL (8.8-10.4)	3.6
Magnesium, mg/dL (1.7-2.4)	0.5
Alkaline phosphatase, U/L (30-110)	10
Albumin, g/dL (3.5-5.0)	3.6
Total protein, g/dL (6.4-8.3)	6.7

7. 請簡述 2020 年諾貝爾化學獎得主美國學者夏彭提耶(Emmanuelle Charpentier)與道納(Jennifer A. Doudna)自細菌中所發現的免疫系統做為現今基因組的編輯工具。(3%) 並請簡述其臨床檢測可能的應用。(3%)
8. 隨時代演進，臨床細菌鑑定方法也日新月異。請以血液培養為例，簡述流程、傳統鑑定方法及時效性 (6%)，並舉出三種可加速鑑定時效的新穎方法學。(9%)。
9. 近年來許多報導指出腸道微生物菌相與人類健康息息相關，請問腸道菌項檢測的基本原理，並請舉出一實例腸道菌相與疾病之相關性，並設計實驗說明之。(9%)