

一、單選題 (每題 2 分) 請於試卷內之「選擇題作答區」依序作答。

- Which medications are patients taking at an increased risk for hyperkalemia?
  - Angiotensin-converting enzyme inhibitor (ACEi) only
  - Angiotensin receptor blocker (ARB) only
  - ACEi and ARB only
  - ACEi, ARB, and spironolactone only
  - ACEi, ARB, spironolactone, sodium-glucose cotransporter 2 (SGLT2) inhibitors
- Based on data from the Copenhagen Prospective Studies on Asthma in Childhood (COPSAC) birth cohort, which of the following neonatal factors is the strongest predictor of asthma at age 7?
  - Airway obstruction
  - Allergic sensitization
  - Blood eosinophil level
  - Bronchial hyper-responsiveness
- Mr. Lee is a 25-year-old man who presents with asthma since childhood and comorbid atopic dermatitis and who has had several attacks in the past 4 months. His medications include budesonide/formoterol 160/4.5, 2 puffs twice daily, montelukast 10 mg at bedtime, and fluticasone nasal spray as needed. Laboratory tests show a total serum immunoglobulin E (IgE) of 172 IU/L, a blood eosinophil count of 350 cells/ $\mu$ L, and a fractional exhaled nitric oxide (FeNO) count of 34 ppb while on therapy. You confirm that Mr. Lee has adhered to his medications and that his inhaler technique is adequate. Which type of biologic therapy would be most appropriate to prescribe for Mark to optimize his asthma treatment?
  - Anti-interleukin (IL)-4R biologic
  - Anti-IL-5/IL-5R biologic
  - Anti-IgE biologic
  - Anti-TSLP biologic
- A 65-year-old woman presents with a 3-cm invasive ductal carcinoma in her right breast that is estrogen receptor (ER)-positive/HER2-negative, grade 2, with a Ki-67 index of 15%. Sentinel lymph node (SLN) biopsy shows 0 of 3 nodes positive, and there is no lymphovascular invasion. Following the American Society of Clinical Oncology (ASCO®) and National Comprehensive Cancer Network (NCCN) guidelines, what test is most appropriate to determine the potential benefit from chemotherapy in this patient?
  - Magnetic resonance imaging (MRI)
  - Gene expression assay
  - Ki-67 scoring
  - Chest computed tomography (CT) scan
- Ms. Yang is a 57-year-old woman who was diagnosed with atopic dermatitis 2 years ago. She has been using topical agents for the past 2 years, but recently, her pruritus has become much worse. She cannot sleep at night and is missing work days. She has a recent history of herpes zoster infection. What aspects of her disease make her a candidate for biologic therapy but not upadacitinib therapy?
  - Failure of topical therapy
  - Her age
  - History of herpes zoster
  - Worsening pruritus
- What initial pharmacologic therapy does the American Thoracic Society (ATS) currently recommend for patients with chronic obstructive pulmonary disease (COPD) and dyspnea or exercise intolerance?
  - Long-acting  $\beta$ -agonist (LABA)
  - LABA or long-acting muscarinic antagonist (LAMA)
  - LABA plus inhaled corticosteroid (ICS)
  - LABA plus LAMA
- Mr. Chang is a 28-year-old man who recently got married. He is relatively healthy and has had no other health conditions except for occasional symptoms of PSVT for the past 3 years. Whenever he experiences palpitations or shortness of breath, he makes an excuse and steps away. He is embarrassed to tell his wife. This time, he sees his primary care physician for vague chest pain. Frustrated, he asks his doctor how his PSVT can be treated.
  - Do not do anything if the symptoms are only occasional
  - Ask the physician associate to explain how to perform the vagal maneuver

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- C. Recommend that Mr. Chang go to the emergency room for intravenous (IV) adenosine treatment  
D. Prescribe a daily oral beta-blocker
8. According to the Control of Anticoagulation Subcommittee of the International Society on Thrombosis and Haemostasis (ISTH), which of the following is a defining criterion for major bleeding in non-surgical patients receiving anti-coagulants?  
A. Bleeding causing a fall in hemoglobin level of  $\geq 30$  g/L (3g/dL)  
B. Bleeding causing a fall in hemoglobin level of  $\geq 20$ g/L (2g/dL)  
C. Bleeding requiring a transfusion of  $\geq 3$  units of whole blood  
D. Bleeding requiring a transfusion of  $\geq 3$  units of red cells
9. An 84-year-old female who has been taking an anti-factor Xa presents to the emergency department with an intracranial hemorrhage. Her Glasgow Coma Scale (GCS) is 14. Which of the following reversal agents would be preferred, according to the American College of Cardiology and pan-European multidisciplinary Task Force for Advanced Bleeding Care in Trauma guidelines on managing major bleeding?  
A. Idarucizumab  
B. Andexanet alfa  
C. Prothrombin complex concentrates (PCC)  
D. Activated PCC
10. A 58-year-old man with a history of deep vein thrombosis presents to the emergency department with hematemesis and dark stool. He has taken his dabigatran 150 mg 4 hours previously. His blood pressure is 88/54, and his heart rate is 102. His blood urea nitrogen (BUN) is elevated at 46. His stool is melanotic and hemoccult positive. Which type of agent is the preferred treatment for reducing bleeding in this patient?  
A. Recombinant human factor Xa (eg, andexanet alfa)  
B. Vitamin K  
C. Four-factor prothrombin complex concentrate (4F-PCC)  
D. Monoclonal antibody fragment (eg, idarucizumab)
11. Which of the following is accurate regarding an interchangeability designation for biosimilars?  
A. Biosimilar can be substituted for the reference product with prior approval from the provider  
B. Requires studies that include at least 3 switches from the reference product to the biosimilar  
C. Requires studies that include at least 2 switches from the reference product to the biosimilar  
D. Requires studies that include at least 1 switch from the reference product to the biosimilar
12. Ms. Chen is a 65-year-old woman with a history of type 2 diabetes, dyslipidemia, mild CKD, and prior MI 1 year ago. She recently transferred to the cardiology clinic at NTUH after moving to Taipei. As part of your evaluation, you measure her LDL-C and hsCRP levels. Results show an LDL-C level of 55 mg/dL and a hs-CRP level of 4 mg/L. What does this hsCRP level indicate?  
A. High systemic inflammation, given past medical history  
B. Low systemic inflammation, given past medical history  
C. Transient infectious process  
D. Undertreated dyslipidemia  
E. Undiagnosed rheumatoid arthritis

二、簡答題（6分）請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

George is a 58-year-old man who presented to the emergency department 2 years ago with chest pain and was found to be experiencing non-ST-elevation myocardial infarction (NSTEMI). Cardiac catheterization demonstrated a 90% right coronary artery lesion, which was successfully stented. A nonculprit 40% left anterior descending artery lesion was not intervened upon. George's atorvastatin dose was increased from 20 to 80 mg upon discharge, along with 100 mg of aspirin and prasugrel. Prior home medication of lisinopril/hydrochlorothiazide (HCTZ) 20/25 mg were continued.

He returns to the cardiology clinic today for his yearly follow-up with his wife. His blood pressure is 120/80 mm Hg, low-density lipoprotein-cholesterol (LDL-C) is 62 mg/dL, fasting blood glucose is 112 mg/dL, glycated hemoglobin (HbA1c) is 6.2% (up from 6% last year), and body mass index (BMI) is 30.5 kg/m<sup>2</sup>. He says that he feels great, although often tired. His wife comments that he needs something to stop him from snoring.

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George's medical history and results of his physical exam and laboratory tests are shown in Table 1.

Table 1. George's Medical Record

Findings/Results	
<b>HISTORY</b>	
<b>Medical</b>	ASCVD, previous NSTEMI 2 years ago. HTN x 15 years, dyslipidemia x 15 years, prediabetes, sleep apnea
<b>Current medications</b>	Atorvastatin 80 mg/d, lisinopril/HCTZ 20/25 mg/d, aspirin 100 mg/d
<b>Social/occupational</b>	Married, lives with wife and dog; nondrinker; nonsmoker; has 2 adult sons in college.
<b>PHYSICAL EXAM</b>	
<b>Vital signs</b>	BP: 120/80 mm Hg; HR: 78 bpm
<b>Body measurements</b>	BMI: 30.5 kg/m <sup>2</sup>
<b>Extremities</b>	No edema
<b>Neck</b>	No distended neck veins
<b>Heart</b>	Echo: LVEF 70%, BNP 90 pg/ml.
<b>Lungs</b>	No rales
<b>Abdomen</b>	Soft, nontender
<b>CBC</b>	
	Normal
<b>METABOLIC PANEL</b>	
<b>HbA1c</b>	6.2%
<b>Lipid panel</b>	LDL-C: 62 mg/dL; HDL-C: 39 mg/dL, TG: 160 mg/dL
<b>SrCr</b>	1 mg/dL
<b>eGFR</b>	90 mL/min/m <sup>2</sup>
<b>Serum potassium</b>	4.1 mmol/L

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ASCVD, atherosclerotic cardiovascular disease; BNP, B-type natriuretic peptide; BP, blood pressure; CBC, complete blood count; echo, echocardiogram; eGFR, estimated glomerular filtration rate; HDL, high-density lipoprotein-cholesterol; HR, heart rate; HTN, hypertension; LVEF, left ventricular ejection fraction; SrCr, serum creatinine; TG, triglyceride.

1. How would you classify George in terms of his weight?
2. You tell George that a medication in the glucagon-like peptide-1 receptor agonist (GLP-1 RA) class, semaglutide, can reduce his risk of having another heart attack. George is interested in learning more and asks how the medicine works. How would you explain to George the mechanisms of action of GLP-1 RAs in reducing weight?
3. George wants to know whether there are any adverse effects he should be worried about if he starts a GLP-1 RA. What is the most appropriate next step in educating George when initiating a GLP-1 RA to reduce the risk of the most common adverse effects?

※ 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。

三、問答題：閱讀以下文章摘要並回答問題（24 points）

### Medication Therapy Management Services: Definition and Program Criteria

Medication Therapy Management is a distinct service or group of services that optimize therapeutic outcomes for individual patients. ① Medication Therapy Management services are independent of, but can occur in conjunction with, the provision of a medication product. Medication Therapy Management encompasses a broad range of professional activities and responsibilities within the licensed pharmacist's, or other qualified health care provider's, scope of practice.

A program that provides coverage for Medication Therapy Management services shall include:

- a. Patient-specific and individualized services or sets of services provided directly by a pharmacist to the patient. ② These services are distinct from formulary development and use, generalized patient education and information activities, and other population-focused quality assurance measures for medication use.
- b. Face-to-face interaction between the patient and the pharmacist as the preferred method of delivery. ③ When patient-specific barriers to face-to-face communication exist, patients shall have equal access to appropriate alternative delivery methods. Medication Therapy Management programs shall include structures supporting the establishment and maintenance of the patient-pharmacist relationship.
- c. Opportunities for pharmacists and other qualified health care providers to identify patients who should receive Medication Therapy Management services.
- d. ④ Payment for Medication Therapy Management services consistent with contemporary provider payment rates that are based on the time, clinical intensity, and resources required to provide services.
- e. Processes to improve continuity of care, outcomes, and outcome measures.

Bluml BM. J Am Pharm Assoc (2003). 2005;45(5):566-72.

1. Describe the definition and goal of Medication Therapy Management in Chinese. (3 points)
2. Translate the underlined sentences (marked with 01 to 04 ahead of the sentences) in Chinese. (12 points)
3. Provide two specific pharmaceutical services within the scope of Medication Therapy Management that have been carried out in Taiwan. (3 points)
4. Explain the reasons why the mentioned services fall within the scope of Medication Therapy Management, as outlined in your responses to Question #3. (6 points)

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四、綜合題組：(11 points)

A 67-year-old female patient with colorectal cancer is undergoing systemic chemotherapy with FOLFIRI. Following the physician's assessment, she is admitted for the second cycle of this chemotherapy treatment.

Day 1: Irinotecan 180mg/m<sup>2</sup> IV over 30–90 minutes with:

Day 1: Leucovorin 400mg/m<sup>2</sup> IV infusion to match duration of irinotecan infusion, followed by:

Days 1–2: Fluorouracil 400mg/m<sup>2</sup> IV push day 1, then 1,200mg/m<sup>2</sup>/day × 2 days (total 2,400mg/m<sup>2</sup> over 46–48 hours) IV continuous infusion.

Repeat cycle every 2 weeks.

The following table outlines the emetic risk associated with commonly prescribed chemotherapy agents administered through intravenous injection.

Table 1. Emetogenic Levels of Intravenously Administered Antineoplastic Agents.\*

Level 1 (minimal risk, <10%)	Level 2 (low risk, 10–30%)	Level 3 (moderate risk, 31–90%)	Level 4 (high risk, >90%)
Bevacizumab	Bortezomib	Carboplatin	Carmustine
Bleomycin	Cetuximab	Cyclophosphamide	Cisplatin
Busulfan	Cytarabine (≤100 mg/m <sup>2</sup> of body-surface area)	(≤1.5 g/m <sup>2</sup> )	Cyclophosphamide
Cladribine	Docetaxel	Cytarabine (>1 g/m <sup>2</sup> )	(>1.5 g/m <sup>2</sup> )
Fludarabine	Etoposide	Daunorubicin	Dacarbazine
Vinblastine	Fluorouracil	Doxorubicin	Mechlorethamine
Vincristine	Gemcitabine	Epirubicin	Streptozocin
Vinorelbine	Ixabepilone	Idarubicin	
	Lapatinib	Ifosfamide	
	Methotrexate	Irinotecan	
	Mitomycin	Oxaliplatin	
	Mitoxantrone		
	Paclitaxel		
	Pemetrexed		
	Temsirolimus		
	Topotecan		
	Trastuzumab		

\* Percentages indicate the risk of vomiting with intravenously administered antineoplastic agents in the absence of antiemetic prophylaxis.

Reference: Hesketh PJ. N Engl J Med 2008; 358(23):2482-94.

(1) \_\_\_\_\_ Based on the information above, what is the potential emetic risk level associated with the current chemotherapy regimen the patient is undergoing? (1 point)

- (A) Minimal risk    (B) low risk    (C) moderate risk    (D) high risk

The chemotherapy pharmacy currently stocks the following medications: ① Aprepitant , ② Dexamethasone , ③ Diphenhydramine , ④ Haloperidol , ⑤ Lorazepam , ⑥ Metoclopramide , ⑦ Ondansetron , ⑧ Olanzapine .

(2) \_\_\_\_\_ Considering the current inventory in the pharmacy, which medication(s) would you recommend the physician prescribe to the patient to mitigate the potential discomfort of acute nausea and vomiting during the chemotherapy process? (1 point)

(2-1) What is/are the pharmacological mechanism(s) of the medication(s) you selected? (2 points)

(3) \_\_\_\_\_ Considering the current pharmacy inventory, which medication(s) would you advise the physician to prescribe for the patient to prevent potential discomfort from delayed nausea and vomiting following the chemotherapy process? (1 point)

(3-1) What is/are the pharmacological mechanism(s) of the medication(s) you selected? (2 points)

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(4) \_\_\_\_\_ Given the patient's previous unpleasant experience of nausea and vomiting during past FOLFIRI treatments, and considering the current pharmacy inventory, which medication(s) would you suggest the physician prescribe for the patient to use the night before chemotherapy to prevent discomfort from anticipatory nausea and vomiting during the treatment? (1 point)

(4-1) What is/are the pharmacological mechanism(s) of the medication(s) you selected? (2 points)

(5) \_\_\_\_\_ Severe diarrhea is a common side effect experienced by patients undergoing treatment with irinotecan and fluorouracil. Loperamide is among the preferred medications for alleviating gastrointestinal discomfort. What is the recommended maximum daily dose of loperamide for severe chemotherapy-induced diarrhea? (1 point)

(A) 4 mg (B) 8 mg (C) 16 mg (D) 24 mg (E) 40 mg

### 五、Answer the following 3 questions (25 points)

#### Metformin Plus Insulin for Preexisting Diabetes or Gestational Diabetes in Early Pregnancy

#### The MOMPOD Randomized Clinical Trial

Boggess KA, et al.

JAMA. 2023;330(22):2182-2190. DOI:10.1001/JAMA.2023.22949.

#### IMPORTANCE

Insulin is recommended for pregnant persons with preexisting type 2 diabetes or diabetes diagnosed early in pregnancy. The addition of metformin to insulin may improve neonatal outcomes.

#### OBJECTIVE

- ① To estimate the effect of metformin added to insulin for preexisting type 2 or diabetes diagnosed early in pregnancy on a composite adverse neonatal outcome.

#### DESIGN, SETTING, AND PARTICIPANTS

This randomized clinical trial in 17 US centers enrolled pregnant adults aged 18 to 45 years with preexisting type 2 diabetes or diabetes diagnosed prior to 23 weeks' gestation between April 2019 and November 2021. Each participant was treated with insulin and was assigned to add either metformin or placebo. Follow-up was completed in May 2022.

#### INTERVENTION

Metformin 1000 mg or placebo orally twice per day from enrollment (11 weeks <23 weeks) through delivery.

#### MAIN OUTCOME AND MEASURES

- ② The primary outcome was a composite of neonatal complications including perinatal death, preterm birth, large or small for gestational age, and hyperbilirubinemia requiring phototherapy. Prespecified secondary outcomes included maternal hypoglycemia and neonatal fat mass at birth, and prespecified subgroup analyses by maternal body mass index less than 30 vs 30 or greater and those with preexisting vs diabetes early in pregnancy.

#### RESULTS

- ④ Of the 831 participants randomized, 794 took at least 1 dose of the study agent and were included in the primary analysis (397 in the placebo group and 397 in the metformin group). Participants' mean (SD) age was 32.9 (5.6) years; 234 (29%) were Black, and 412 (52%) were Hispanic. The composite adverse neonatal outcome occurred in 280 (71%) of the metformin group and in 292 (74%) of the placebo group (adjusted odds ratio, 0.86 [95%CI 0.63-1.19]). The most commonly occurring events in the primary outcome in both groups were preterm birth, neonatal hypoglycemia, and delivery of a large-for-gestational-age infant. The study was halted at 75% accrual for futility in detecting a significant difference in the primary outcome. Prespecified secondary outcomes and subgroup analyses were similar between groups. Of individual components of the composite adverse neonatal outcome, metformin-exposed neonates had lower odds to be large for gestational age (adjusted odds ratio, 0.63 [95%CI, 0.46-0.86]) when compared with the placebo group.

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**CONCLUSIONS AND RELEVANCE**

Using metformin plus insulin to treat preexisting type 2 or gestational diabetes diagnosed early in pregnancy did not reduce a composite neonatal adverse outcome. The effect of reduction in odds of a large-for-gestational-age infant observed after adding metformin to insulin warrants further investigation.

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- (1) Translate the underlined sentences (marked with ①②③④⑤ in front of the sentences) into Mandarin word by word. (15 points)
- (2) What are the treatment goals of gestational diabetes? (5 points)
- (3) How do pharmacists apply the study result to their daily practice? (5 points)

六、 Answer the following 2 questions regarding Mr. Lee's prescription ( 10 points )

- (1) Which information is lacking in this prescription for a pharmacist to verify the appropriateness of medications? (5 points)
- (2) List the principle to treatment community-acquired pneumonia for Mr. Lee. (5 points)

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<p>2024/01/10 15:45 臺大醫院門診調劑單</p>	
<p>病患姓名 李 XX 先生</p> <p>年齡 073 性別 M 80 Kg 身份 N01</p> <p>科別 MED 醫師 周 XX</p> <p>診斷 Diabetes Gout</p> <p>Heart failure Chronic kidney disease</p> <p>Pneumonia</p> <p>調劑藥師 陳 XX 複核藥師 朱 XX</p>	<p>領藥窗口 09</p> <p>領藥號碼 L-8173</p> <p>病患姓名 李 XX</p> <p>處方日期 2024/01/10</p> <p>病歷號碼 225xxxx</p> <p>結帳號碼 530xxxx</p> <p>第 次領藥</p>
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<p>Y 01 Loditon 500 MG (METFORMIN TABLETS)</p> <p>Y 02 LASIX 40 MG (FUROSEMIDE TABLETS)</p> <p>Y 03 Glucobay 50 MG (ACARBOS TABLETS)</p> <p>Y 04 Colchicine 0.5 MG (COLCHICINE TABLETS)</p> <p>Y 05 Cravit Film-coated 500 MG (LEVOFLOXACIN TABLETS)</p>	<p>PO 1 TAB BID 56 TAB 28 天</p> <p>PO 0.5 TAB BIDPC 28 TAB 28 天</p> <p>PO 1 TAB TIDPC 84 TAB 28 天</p> <p>PO 1 TAB QD 84 TAB 28 天</p> <p>PO 0.5 TAB QD 14 TAB 28 天</p>

試題隨卷繳回