Clinical Medicine and Public Health: Second-round Sample Tasks for the Open Doors Master's and Doctoral Track

This sample test comprises 40 tasks, including 24 entry-level tasks with a single correct answer (each correct answer is assigned 2 points), 12 intermediate-level tasks with multiple correct answers (the correct answer is assigned 3-4 points), 4 advanced-level tasks requiring a detailed answer (the answer is assigned 9 points depending on its correctness and completeness).
For advanced-level tasks requiring a detailed answer, assessment criteria and a standard answer are provided.

Field of Science 1. Anatomy and Morphology

Task 1
Entry level (1 point)

On which part of the humerus is the groove for the ulnar nerve located?

a) in front of the medial epicondyle
b) in front of the lateral epicondyle
c) behind the medial epicondyle
d) behind the lateral epicondyle
Answer: c

Task 2
Entry level (1 point)

Which region does the pectoralis major originate from?
a) Head
b) Clavicular
c) Cervical
d) Scapula
Answer: b

Task 3
Entry level (1 point)

Where is the pineal gland located?
a) In the metathalamus region of the diencephalon
b) Near the crossing of the optic nerves
c) In the groove between the upper tubercles of the midbrain
d) In the epithalamus of the diencephalon
Answer: c

Task 4
Intermediate level (3 points)

Which cranial nerves are responsible for gustatory sensitivity?
Select all correct answers.
a) Trigeminal nerve (V)
b) Facial nerve (VII)
c) Glossopharyngeal nerve (IX)
d) Vagus nerve (X)

Answer: Facial nerve (VII), Glossopharyngeal nerve (IX), Vagus nerve (X).

Field of Science 2. Physiology

Task 1
Entry level (1 point)

Which of the following is NOT included in biological motivation?
a) Professional ambitions
b) Hunger
c) Fear
d) Thirst
Answer: a

Task 2
Entry level (1 point)

Hypercapnia primarily affects respiration by stimulating which of the following?
a) Carotid and aortic bodies receptors
b) Central (medullary) chemoreceptors
c) Arterial baroreceptors
d) Hypoglossal nerve
Answer: b

Task 3
Entry level (1 point)

Which of the following is a mediator in a synaptic contact between a somatic nerve and a skeletal muscle?
a) Noradrenaline
b) Acetylcholine
c) Serotonin
d) Glycine
Answer: b

Task 4
Intermediate level (3 points)

Which of the following are caused by norepinephrine's interaction with alpha1-adrenergic receptors? Select all correct answers.
a) Vasoconstriction
b) Pupil dilation
c) Bronchial dilation
d) Pupil narrowing
Answer: a, d

Field of Science 3. Pathology

Task 1
Entry level (1 point)

Which of the following is caused by cell swelling?

a) Increased inflow of Na+
b) Increased inflow of K+
c) Accumulation of lactic acid
d) Accumulation of albumin

Answer: a

Task 2
Entry level (1 point)

Which of the following is NOT a characteristic pathological feature of apoptosis?

a) Nuclear chromatin condensation
b) Nuclear fragmentation
c) Cytoplasmic budding
d) Swelling of organelles

Answer: d

Task 3
Intermediate level (3 points)

Which of the following are secondary pyrogens?
Select all correct answers.

a) Interleukin-1
b) Thromboxane a2
c) Lipopolysaccharide
d) Interleukin-6

Answer: a, d

Task 4
Intermediate level (3 points)

Which of the following are found in a tuberculous granuloma?
Select all correct answers.

a) Plasma cells
b) Focus of caseous necrosis
c) Epithelioid cells
d) Langhans giant cells

Answer: b, c, d

Field of Science 4. Pharmacology

Task 1
Entry level (1 point)

Which of the following is a non-opioid analgesic that has analgesic and antipyretic effects but no anti-inflammatory properties?

a) Ketamine
b) Paracetamol
c) Amitriptyline
d) Carbamazepine

Answer: b

Task 2
Entry level (1 point)

Which of the following statements is correct?

a) M-cholinoblockers cause arterial hypertension.
b) M-anticholinergics reduce the secretion of exocrine glands by blocking parasympathetic influences on the glands.
c) M-cholinoblockers cause relaxation of the radial muscle of the iris.
d) M-anticholinergics increase intraocular pressure by increasing the production of intraocular fluid.

Answer: b

Task 3
Intermediate level (3 points)

Which of the following does the concept of pharmacokinetics include?
Select all correct answers.

a) Mechanisms of drug action
b) Distribution of drugs in the body
c) Pharmacological effects
d) Drug metabolism

Answer: b, d

Task 4
Intermediate level (3 points)

Which of the following are contraindications for the use of cardiac glycosides?
Select all correct answers.

a) Heart failure
b) Tachyarrhythmic forms of atrial fibrillation
c) Atrioventricular block
d) Bradycardia

Answer: c, d

Field of Science 5. General and Internal Medicine

Task 1
Entry level (1 point)

Which of the following is a manifestation of pneumonia in elderly and senile patients?

a) Unexplained falls
b) Hectic fever
c) An acute beginning
d) Abundant purulent sputum

Answer: a

Task 2
Entry level (1 point)

In the NYHA classification, which distance covered in a 6-minute walk corresponds to Class II chronic heart failure?

a) 301–425 meters
b) 151–300 meters
c) Less than 150 meters
d) 426–550 meters

Answer: a

Task 3
Entry level (1 point)

Which of the following characterizes chronic hepatitis C?

a) Predominance of ALT over AST
b) Predominance of AST over ALT
c) Isolated increase in ALT
d) Isolated increase in AST

Answer: b

Task 4
Intermediate level (4 points)

Which of the following are recommended for the prevention of bleeding from varicose veins? Select all that apply.

a) Prescription of non-selective beta-blockers
b) Endoscopic ligation of varicose veins esophagus
c) Prescription of super-selective beta-blockers
d) Ligation of hemorrhoidal veins

Answer: a, b

Task 5
Advanced level (9 points)

A 20-year-old patient reported weakness, reduced physical and mental performance, unpleasant sensations in the muscles, and episodic pain in both small and large joints during movement.

Past medical history: the patient reported being ill for two weeks, with the first symptoms appearing after work-related stress. The symptoms have been progressively worsening. Despite taking multivitamins to alleviate the symptoms, there was no improvement, which led her to seek medical help.

Life history: the patient is single and lives in an apartment. She works in an office, has an "irregular work schedule" and describes her work as "stressful." The patient does not smoke, drink alcohol, or use substances. She occasionally takes multivitamins. Two months ago, she underwent a medical examination that included visits to a general practitioner, gynecologist, neurologist, and otorhinolaryngologist, as well as fluorography, general blood and urine tests, and biochemical blood tests. No pathology was detected. The patient is physically active and exercises regularly. There is no history of hereditary or chronic illnesses, and no epidemiological history of diseases. She has been vaccinated according to the recommended schedule for her age.

Examination: The patient's condition is relatively satisfactory. She has an asthenic physique, with a height of 178 cm and a weight of 62 kg. The skin and mucous membranes are of normal color. The joints are normal, and there are no pathologies in the respiratory or circulatory systems. The abdomen is of normal size, soft to palpation, and painless throughout. The liver and spleen are not enlarged, and there is no dysuria.

Laboratory examination:
A general blood test showed an increase in ESR up to 30 mm / h;
HBsAg, HCV Ab, and HIV 1 and 2 antibodies, as well as the HIV 1 and 2 antigen (HIV Ag/Ab Combo), are negative.
Biochemical blood test: ALT was within the upper limit of normal (ULN); AST-15 ULN; total and direct bilirubin levels were normal; ALP-1.5 ULN; GGT: 2 ULN; INR-1.30 (norm 0.8-1.2); total protein-88 g / l (the norm up to 83); albumin-30 g/l (the norm of 35–52); alpha 1 and 2 levels, beta globulins were normal; gamma globulin level was 22 g/l (ULN is 15.2); M-gradient was not detected on electrophoresis when assessing immunoglobulin levels; a slight increase in IgA, IgM levels and an increase in IgG levels up to 2 ULN were noted.

Questions and Tasks

1. What is the most likely diagnosis? Provide a rationale for your conclusion.
2. Propose a plan for further diagnostic evaluation. Justify your selection of additional tests or procedures.
3. Outline a treatment strategy for this patient, including health regimen, medication, dietary recommendations, and other therapeutic measures.

Answer
1. Highly active autoimmune hepatitis. The diagnosis is based on the detected cytolysis syndrome, with ALT and AST levels considerably above the ULN and moderately elevated ALP and GGT levels. The lack of markers for hepatotropic infections in the blood, no history of alcohol abuse or hepatotoxic drug use, no family history of liver diseases, combined with severe hypergammaglobulinemia and polyclonal gammopathy with a predominant increase in IgG levels, and the absence of physical and laboratory signs of cirrhosis, suggest an autoimmune nature of hepatitis. An increase in ALT and AST levels exceeding ten times the upper limit of the norm is characteristic of acute hepatitis.
2. Considering the previous examinations, an ultrasound of the abdominal organs is necessary to exclude focal liver pathology, bile duct and gallbladder diseases, portal hypertension, and abdominal cavity lymphadenopathy. The patient has a clinical and biochemical picture of acute hepatitis. The tests performed are insufficient to completely rule out the viral nature of hepatitis. To exclude acute hepatitis C, HCV RNA should be tested in the blood; for acute hepatitis A and E, anti-HAV IgM and anti-HEV IgM should be tested; and for infectious mononucleosis, EBV DNA and antibodies to the early EBV antigen should be determined. There is no need to exclude acute hepatitis B, since the patient has been vaccinated against HBV. The level of immunity should be assessed by a quantitative anti-HBs test. To confirm the diagnosis of autoimmune hepatitis, it is necessary to determine a-nuclear antibodies (ANA), smooth muscle antibodies (SMA), and antibodies to liver and kidney microsomes type 1 (anti-LKM-1), liver nocturnal cytosolic protein (anti-LC-1), soluble hepatic antigen (anti-SLA), and hepatic-pancreatic antigen (anti-LP). It is also crucial to conduct screening for Wilson's disease by testing serum ceruloplasmin and hemochromatosis-ferritin.
3. No special health regimen is required. The diet should be rich in protein (a high-protein diet) Recommended medications include glucocorticosteroids (prednisolone, methylprednisolone, budesonide) and immunosuppressants (azathioprine, 6-mercaptopurine, cyclophosphamide)

Assessment criteria
Question 1
The diagnosis is correct, comprehensive, and supported by clear and logical justification – 3 points.
The diagnosis is correct, but either lacks completeness or sufficient justification – 2 points.
Question 2
The proposed examination plan is accurate, thorough, and well-reasoned – 3 points.

The examination plan is appropriate but either incomplete or insufficiently substantiated – 2 points.

Question 3

The treatment plan is accurate, comprehensive, and includes a clear rationale for the proposed regimen, diet, and medications – 3 points.

The treatment plan is generally correct but lacks either completeness or adequate justification – 2 points.

Field of Science 6. Surgery

Task 1
Entry level (1 point)

Which method of hernioplasty involves the use of a polypropylene mesh prosthesis?

a) Lichtenstein
b) Shouldice
c) Bossini
d) Marcy

Answer: a

Task 2
Entry level (1 point)

Which of the following is Murphy's ultrasound symptom in acute cholecystitis?

a) Pain on probe pressure in the right subcostal region
b) Thickening of the gallbladder wall
c) Increase in the size of the gallbladder
d) Sludge in the gallbladder lumen

Answer: a

Task 3
Entry level (1 point)

What type of abdominal effusion is most commonly associated with colon perforation?

a) Fecal
b) Hemorrhagic
c) Fibrinous
d) Chylous

Answer: a

Task 4
Intermediate level (4 points)

Which of the following is acute cholecystitis characterized by?
Select all that apply.

a) Nausea and vomiting
b) Pain in the RUQ
c) Leukocytosis
d) Irradiation of pain to the perineum

Answer: a, b, c

Task 5
Advanced level (9 points)

A 38-year-old woman was brought to the emergency department with recurrent episodes of severe, sharp abdominal pain in the right upper quadrant with repeated nausea and vomiting. The patient's height was 170 cm, weight 72 kg, and BMI 24.9 kg/m2. Her temperature was 38.0 °C (100.4 °F), pulse 99 beats per minute, blood pressure 120/80 mmHg, and respiratory rate 22/min. On palpation, the abdomen was moderately tense in the right subcostal region. Peristalsis was audible. ECG registered sinus tachycardia. Abdominal ultrasound revealed no abnormalities in the pancreas and liver. The common bile duct was 6 mm in diameter. The gallbladder was enlarged, contained multiple calculi, and had a layered wall measuring up to 8 mm in thickness. Perivesical fluid with gas bubbles was also noted.

Questions and tasks
1. List the clinical syndromes observed in the patient.
2. Determine the most probable diagnosis based on the clinical and diagnostic findings.
3. Develop an appropriate treatment plan, including justification for the chosen approach.

Answer
1. Abdominal pain syndrome. Systemic inflammatory response syndrome (tachycardia, tachypnoea, fever). Dyspepsia.
2. The diagnosis is acute cholecystitis.
3. Surgical treatment is indicated. Cholecystectomy is recommended due to signs of destructive cholecystitis, including marked gallbladder wall thickening (up to 8 mm) and the presence of perivesical fluid with gas inclusions.

Assessment criteria
Question 1
Syndromes are correctly and comprehensively identified – 3 points.
Syndromes are correctly but incompletely identified – 2 points**.**
Question 2
A correct and substantiated diagnosis is provided – 3 points.
Question 3
A correct and detailed treatment algorithm, including all necessary therapeutic measures – 3 points.
A correct but incomplete treatment plan – 2 points.

Field of Science 7. Dentistry and Oral Surgery

Task 1
Entry level (1 point)

Which of the following is an oral manifestation of chronic poisoning by heavy metals?
a) Black line along the gingival margin
b) Periodontal pockets
c) Overgrowth of the gingival papilla
d) Oral candidiasis

Answer: a

Task 2
Entry level (1 point)

In chronic odontogenic sinusitis, which wall of the maxillary sinus is primarily affected?

a) Medial
b) Lower
c) Back
d) Top

Answer: b

Task 3
Intermediate level (4 points)

Which of the following are pathological processes in oral leukoplakia?
Select all that apply.

a) Hyperkeratosis
b) Acantosis
c) Acantholysis
d) Necrosis

Answer: a, b

Task 4
Intermediate level (4 points)

Which of the following are facial lymph nodes?
Select all that apply.

a) Buccal
b) Molar
c) Submandibular
d) Mastoid

Answer: a, b

Field of Science 8. Infectious Diseases

Task 1
Entry level (1 point)

Which of the following is the ability of a population to resist the damaging effects of a disease pathogen?

a) Heard immunity
b) Incidence
c) Susceptibility
d) Contagiousness

Answer: a

Task 2
Entry level (1 point)

Which of the following describes the advantage of live vaccines over inactivated vaccines?

a) More robust immunity

b) Fewer adverse effects
c) Do not require maintaining the cold chain
d) Do not cause allergic reactions

Answer: a

Task 3
Entry level (1 point)

Which diseases are characterized by seasonal increases in morbidity?

a) The majority of infectious diseases
b) Some noncommunicable diseases
c) All noncommunicable diseases
d) All diseases, regardless of their origin

Answer: a

Task 4
Intermediate level (3 points)

Which natural factors influence the intensity of an epidemic process?
Select all that apply.

a) Living and working conditions
b) Migration
c) Climate
d) Virulence of the pathogen

Answer: c, d

Task 5
Advanced level (9 points)

During a continuous descriptive epidemiological study conducted in the European part of Russia—in two cities, A and B, with city A having a larger population—researchers analyzed long-term patterns in the incidence of influenza and acute respiratory viral infections (ARVI). Over the past five years, the incidence rates of influenza and ARVI in city A have consistently exceeded those in city B. Furthermore, city A demonstrates an upward trend in incidence, while city B shows relatively stable incidence rates over the same period.

Questions

1. Which epidemiological indicators are most appropriate for comparing the incidence of disease between the two populations?
2. Which social (socio-demographic and socio-economic) factors might account for the observed differences in the epidemic patterns between the two cities? Give examples.
   Which natural (environmental and climatic) factors might contribute to the differences in the epidemic process observed in the two cities? Give examples.

Answer

1. To compare incidence in populations with differing sizes, it is essential to calculate intensive indicators such as incidence and prevalence. Comparing absolute numbers alone is inadequate because it does not account for differences in population size.
2. Social factors influencing the intensity for anthroponoses of epidemic processes with an aerosol transmission mechanism may include: economic factors, sanitary and communal

amenities, urbanization and overcrowding, national and religious characteristics, periods of social instability, quality of medical care, vaccination coverage, and public awareness of the disease and preventive measures. In addition, the incidence rate may depend on the quality of disease registration and diagnosis.

3. Natural factors influencing the intensity of anthroponoses of epidemic processes with an aerosol transmission mechanism are as follows: climatic conditions (temperature, humidity, etc.), characteristics of circulating microbial strains (virulence, contagiousness).

Assessment criteria

Question 1

The relevant epidemiological indicators (e.g., incidence rate, prevalence rate) are correctly identified, and their application is appropriately justified in the context of comparing populations of different sizes - 3 points.

The indicators may not be listed entirely accurately, but their conceptual meaning is explained, and their relevance to the task is logically justified - 2 points.

Question 2

Social factors influencing the epidemic process are correctly identified. The answer includes a discussion of how these factors affect the characteristics of disease transmission, with specific examples provided - 3 points.

Social factors are correctly listed, but either the examples or the connection to disease features and transmission mechanisms are insufficient or missing - 2 points.

Question 3

Natural (environmental or climatic) factors affecting the epidemic process are accurately identified. The explanation addresses their influence on disease transmission and epidemiological characteristics, and specific examples are included – 3 points.

Natural factors are correctly mentioned, but either the illustrative examples or the discussion of their influence on disease features or transmission is incomplete – 2 points.

Field of Science 9. Public Health

Task 1
Entry level (1 point)

Which of the following is a criterion of tertiary prevention effectiveness?

a) Number of deaths in patients
b) Incidence
c) Index of health
d) Percentage of people older 50 years in the population

Answer: a

Task 2
Entry level (1 point)

Which of the following is an integral medico-demographic rate?

a) Infant mortality rate
b) Death rate
c) Population size
d) Immigration level

Answer: a

Task 3
Entry level (1 point)

Which statistical test is appropriate for comparing numerical variables across three or more independent groups when the data are not normally distributed?

a) Kruskal–Wallis H-test
b) Pearson's χ^2-test
c) Variation coefficient
d) Unpaired Student's t-test

Answer: a

Task 4
Intermediate level (3 points)

Which of the following are key characteristics of individual preventive strategies? Select all that apply.

a) Implemented at the level of healthcare institutions
b) Focused on identifying specific risk factors in each individual
c) Yield results no earlier than 5–10 years
d) Target the reduction of risk factors in high-risk population groups

Answer: a; b

Task 5
Advanced level (9 points)

A study was conducted to assess the self-reported quality of life and associated social factors among residents of city K with the view to developing social programs for health protection.
Questions and tasks:
1. What are the objectives of the research?
2. What are the research program elements (observation unit, characteristics studied and their types specified).

3. Develop a structured research plan that includes the following components: object of research, setting (location), study design by period (temporal classification), and type of study design by scope

Answer
1. Research objectives:
- to study the social environment of city K;
- to analyze the self-reported quality of life of residents;
- to develop social programs for health protection.

2. Research program elements. The unit of observation is an adult resident of K. Characteristics analyzed: gender (nominal), age (continuous), living conditions (nominal), social class (ordinal), self-assessed quality of life (continuous).
3. Research plan elements. The research plan involves a cross-sectional, selective study conducted in city K, with residents of city K serving as the object of research.

Assessment criteria
Question 1
The research objectives are clearly and correctly formulated, include relevant details, and logically reflect the sequence of essential research steps - 3 points.

The research objectives are broadly outlined and logically reflect the sequence of essential research steps - 2 points.

Question 2

The unit of observation is correctly defined, accompanied by examples of the studied characteristics with their types specified - 3 points.

The unit of observation is correctly defined, and examples of the studied characteristics are provided, but their types are not specified - 2 points.

Question 3

All elements of the research plan are correctly indicated, including the object of study, place of research, type of study by period, and type of study by scope – 3 points.

Two or three elements of the research plan are correctly indicated – 2 points.