CLINICAL THERAPEUTICS 5: INFECTIOUS DISEASES

PHA-3HK1

Time allowed: 2 hours

Part ONE

Answer ALL questions. For each question, there is ONE correct answer. Use the answer grid provided for ALL your answers.

Part TWO

Answer THREE of the FOUR questions.

Use a SEPARATE answer book for EACH question in Part TWO.

Each question has the same value.
The marks distribution is shown as a percentage for each section of the question. Answer ALL parts of each of the individual questions you select.

The mark allocation for the paper is:
- Part ONE carries 50% of the total mark.
- Part TWO carries 50% of the total mark.

You are advised to spend approximately 1 hour on Part ONE and 1 hour on Part TWO.

The following is provided: Multiple choice answer grid.

This paper consists of 11 pages in total.

Dictionaries are not permitted in this examination.

Notes are not permitted in this examination.

Do not take this question paper out of the examinations room.

Do not turn over until you are told to do so by the Invigilator.

(PHA-3HK1) Module Contact: Dr Chris Hamilton, PHA
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PART ONE
SECTION A – TYPE 1 MCQ

Answer ALL questions. For each question there is ONE correct answer. Use the answer grid provided for ALL your answers.

1. Which ONE of the following would NOT contribute to the development of HIV drug resistance?
   (A) Transmission of drug resistant virus
   (B) Patient adherence
   (C) Drug-drug interactions
   (D) Patient’s CD4 count
   (E) Choice of antiretroviral therapy

2. Samuel is three years old. He is suffering from a blocked nose and is generally quite miserable. Which one of the following recommendations is the most appropriate treatment?
   (A) Saline nose drops
   (B) Steam inhalation
   (C) Ibuprofen liquid
   (D) Oxymetazoline nose drops
   (E) Psuedoephedrine tablets

3. Which ONE of the following statements regarding the use of zinc for the common cold is TRUE?
   (A) Large doses may cause blurred vision
   (B) The increased ionisation of zinc in the presence of citric acid reduces zinc absorption
   (C) A nasal spray is available which is claimed to prevent a cold from developing
   (D) The majority of randomised controlled trial have used zinc in the lozenge formulation
   (E) Its proposed mechanism of action is enhancing function of neutrophils and T-lymphocytes

4. Which ONE of the following statements about Chlamydia trachomatis is FALSE?
   (A) In men it can cause urethritis and epididymitis
   (B) In women it can cause urethritis, conjunctivitis and cervicitis
   (C) It can lead to ectopic pregnancies in women
   (D) In neonates it can sometimes cause interstitial pneumonia
   (E) Reiter’s syndrome is a common symptom in neonates
5. Which **ONE** of the following statements about a *Salmonella* infection is **FALSE**?

(A) *Salmonella* enters the body via ingestion
(B) *Salmonella* infections usually do not lead to abdominal cramps, vomiting or fever
(C) *Salmonella* bacteria migrate to the lamina propria layer of the ileocecal region after infection
(D) *Salmonella* infection leads to watery diarrhoea
(E) The inflammatory response towards the infection in the gut leads to an increase of cAMP

6. Which **ONE** of the following statements about bacterial neonatal meningitis is **FALSE**?

(A) Pre-term delivery and prolonged labour are risk factors for meningitis onset soon after birth
(B) Meningitis onset soon after birth is fatal in 60% of cases
(C) The late onset of the disease is often due to poor hygiene in nurseries
(D) The lack of maternal antibodies is often a cause for both the early and late onset of the disease
(E) The late onset disease manifests itself predominantly as a generalised infection, including meningitis, bacteremia and pneumonia

7. Which **ONE** of the following statements about *Candida albicans* is **FALSE**?

(A) *Candida albicans* primarily colonise the GI tract from mouth to rectum
(B) 25-50% of healthy subjects carry *Candida albicans* as part of their normal flora in the mouth
(C) Up to 39% of hospital patients who suffer from a *Candida albicans* bloodstream infection will not survive
(D) Infections are commonly seen in persons with localised or general immune-suppression
(E) *Candida albicans* can cause allergic reactions in the nasal cavity

8. Which **ONE** of the following statements about the polio virus is **TRUE**?

(A) Polio causes an asymptomatic illness in 90% of all infections
(B) The polio virus is classified as a sexually transmitted disease
(C) The polio virus is latent in monocytes and T-lymphocytes
(D) The polio virus is re-activated from latency by stress or immune-suppression
(E) The polio virus is a retrovirus
9. Which **ONE** of the following statements about Herpes viruses is **FALSE**?

(A) The Kaposi sarcoma-related virus targets lymphocytes and is spread by close contact
(B) The Cytomegalovirus can cause severe disease in immunosuppressed patients
(C) The Epstein-Barr virus is spread by saliva
(D) The Herpes simplex virus avoids antibodies by cell to cell spread
(E) The Varizella Zoster virus often causes benign parotitis

10. With respect to how HIV can escape from the immune system, which **ONE** of the following statements is **TRUE**?

(A) It leads to a latent infection in neurons and can become reactivated at any timepoint
(B) The virus destroys the CD8+ cells
(C) Mutations in the p24 envelope protein make it difficult for antibodies to target the virus
(D) Heavy glycosylation of gp120 makes it difficult for antibodies to bind to the protein
(E) The virus infects B-cells and prevents antibody production

11. Which **ONE** of the following statements would **NOT** be appropriate advice for a patient using benzoyl peroxide cream 2.5% w/v for acne?

(A) Start by applying a small amount to an affected area once a day
(B) If the skin dries out and peels increase the frequency of using the cream for a few days
(C) Benzoyl peroxide can bleach bedding and towels, so use old ones where possible
(D) The patient should wait at least six weeks before judging effects of treatment
(E) The patient should use a hot flannel or steam bath as an alternative to picking spots

12. Mrs Jones comes in to your pharmacy with an itchy head. Her son has got several head lice in his hair and Mrs Jones would like some treatment for the whole family. Which **ONE** of the following is the most appropriate to suggest?

(A) Treat the whole family with dimethicone lotion overnight and repeat in 7 days
(B) Treat the whole family with dimethicone lotion overnight and repeat in 14 days
(C) Treat her son with dimethicone and repeat in 7 days, inspect everyone else in the household regularly and only treat when live lice are seen in the hair
(D) Treat all those with an itchy head with dimethicone lotion overnight and repeat in 7 days
(E) Treat her son with dimethicone and repeat in 14 days, inspect everyone else in the household regularly and only treat when live lice are seen in the hair
13. Mrs Hughes presents at the pharmacy with a red eye and complaining of pain in her eye. When she looks at lights she can see halos round them. On inspection you can see that her pupil is an abnormal shape. Which ONE of the following conditions is she most likely to be suffering from?

(A) Bacterial conjunctivitis  
(B) Iritis  
(C) Episcleritis  
(D) Glaucoma  
(E) Corneal ulceration

14. Master Jason Jones is 5 years old. He has had a dry cough for a few days and a raised temperature. It occurs mainly during the day. Which ONE of the following is it most likely to be?

(A) Tuberculosis  
(B) Acute bronchitis  
(C) Asthma  
(D) Bronchiectasis  
(E) Pneumonia

15. Mrs Ethel White, an 85 year old non-smoker, presents with a cough which is producing a pink frothy sputum. She describes herself as having to sleep sitting up to make it better. Which ONE of the following is it most likely to be?

(A) Acute bronchitis  
(B) Lung cancer  
(C) Heart failure  
(D) Chronic obstructive pulmonary disease  
(E) Pneumonia

16. Which ONE of the following statements is TRUE?

(A) A Gram-positive bacterium has both a cell membrane and a cell wall  
(B) A bacterial cell is eukaryotic whereas an animal cell is prokaryotic  
(C) A bacterial cell has a cell wall, but no cell membrane  
(D) A bacterial cell has a cell membrane, but no cell wall  
(E) A Gram-negative bacterium has two cell walls and one cell membrane
17. Cephaloridine is a cephalosporin antibiotic which has a pyridinium ring in place of the acetyl group found in cephalothin. Which **ONE** of the following statements is **TRUE**?

(A) Cephaloridine is a potent inhibitor of RNA biosynthesis  
(B) Cephaloridine has a shorter duration of action than cephalothin  
(C) The pyridinium ring acts as a good leaving group in the inhibition mechanism of cephalothin  
(D) The pyridinium ring is more easily metabolised than the acetyl group of cephalothin  
(E) The pyridinium ring is structurally very similar to an hydroxyl group

18. Which **ONE** of the following statements about AZT is **TRUE**?

(A) It is a nucleoside analogue where the 3’-hydroxyl group of the ribose ring is replaced with an azide  
(B) It is a prodrug, which must first be converted to AZT diphosphate, before it can inhibit HIV reverse transcriptase  
(C) It is an ATP analogue, which inhibits viral protein kinases  
(D) It is an ADP analogue, which inhibits viral protein phosphatases  
(E) It is a NADH analogue, which inhibits HIV reverse transcriptase

19. Which **ONE** of the following statements about the mechanism of action of penicillins is **TRUE**?

(A) A proline residue in the active site of the transpeptidase enzyme reacts with the beta-lactam ring of penicillin to form an ester  
(B) A serine residue in the active site of the transpeptidase enzyme reacts with the carboxylate group of penicillin to form an ester  
(C) A lysine residue in the active site of the transpeptidase enzyme reacts with the carboxylate group of penicillin to form an ester  
(D) An arginine residue in the active site of the transpeptidase enzyme reacts with the beta-lactam ring of penicillin to form an ester  
(E) A serine residue in the active site of the transpeptidase enzyme reacts with the beta-lactam ring of penicillin to form an ester

20. Which **ONE** of the following tactics is successfully used to increase the stability of penicillins to acid hydrolysis, whilst retaining antibacterial activity?

(A) Expanding the beta-lactam ring to increase ring strain  
(B) Adding an electron-withdrawing group to the acyl side chain  
(C) Adding an electron-withdrawing group to the beta-lactam ring  
(D) Contracting the size of the beta-lactam ring to increase ring strain  
(E) Expanding the beta-lactam ring to relieve ring strain
SECTION B – TYPE 2 MCQ

Decide which of the responses to the following questions is/are correct and then choose:

(A) If (i), (ii) and (iii) are correct
(B) If (i) and (ii) only are correct
(C) If (ii) and (iii) only are correct
(D) If (i) only is correct
(E) If (iii) only is correct

21. Which of the following statement(s) about Brucellosis is/are TRUE?
   (i) The disease is caused by Gram-negative coccobacilli
   (ii) A vaccine will give humans protection against Brucellosis
   (iii) The infection always leads to clinical symptoms

22. A parent brings their 3 year old child into the pharmacy. Their child has been under the weather for a few days and then a rash has appeared on their face and trunk. The spots are fluid filled vesicles and some are starting to itch. Which of the following could it possibly be?
   (i) Chicken Pox
   (ii) Fifth disease
   (iii) German measles

23. You decide to sell a cough medicine for a chesty cough. Which of the following ingredients would be appropriate?
   (i) Guaifenesin
   (ii) Codeine
   (iii) Dextromethorphan

24. A parent enters your pharmacy to tell you about her 9 year old child who is at home. They have had a raised temperature and catarrh for the last few days. Yesterday a non-itchy rash appeared on the face and then today is on their trunk. Which of the following could it possibly be?
   (i) German measles
   (ii) Chicken Pox
   (iii) Mumps
SECTION C – TYPE 3 MCQ

The questions consist of a statement in the left-hand column followed by a second statement in the right-hand column.

Decide whether the first statement is TRUE or FALSE.

Decide whether the second statement is TRUE or FALSE.

Then choose:

A  If both statements are TRUE and the second statement is a correct explanation of the first statement.

B  If both statements are TRUE but the second statement is NOT a correct explanation of the first statement.

C  If the first statement is TRUE but the second statement is FALSE.

D  If the first statement is FALSE but the second statement is TRUE.

E  If both statements are FALSE.

Directions Summarised

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25. **FIRST STATEMENT**

Efavirenz should be avoided in HIV patients with a psychiatric history.

**SECOND STATEMENT**

Efavirenz is associated with mood disturbances and suicidal tendencies.

26. **FIRST STATEMENT**

Clavulanic acid is not an effective antibiotic when administered on its own.

**SECOND STATEMENT**

Clavulanic acid inhibits the beta-lactamase catalysed inactivation of cycloserine.
Directions Summarised

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27. **FIRST STATEMENT**

Second generation anti-histamines such as cetirizine are appropriate for the management of nasal symptoms caused by the common cold.

**SECOND STATEMENT**

Second generation anti-histamines cause peripheral vasoconstriction.

28. **FIRST STATEMENT**

A patient describing a rash which does not blanch when a glass is pressed against it should be referred immediately.

**SECOND STATEMENT**

A non-blanching rash is unlikely to be a self-limiting viral condition.

29. **FIRST STATEMENT**

Antihistamines are useful for the treatment of chesty coughs.

**SECOND STATEMENT**

Promethazine is non-sedating.

30. **FIRST STATEMENT**

Demulcents can be safely recommended in pregnancy for the treatment of dry coughs.

**SECOND STATEMENT**

Demulcents contain no active Ingredients.

END OF PART ONE
PART TWO

Answer THREE of the FOUR questions in this section. Use a SEPARATE answer book for EACH question.

31. Answer BOTH parts.

Mr Patel is 70 years old and wants advice about influenza. He has been vaccinated against influenza in previous years, but he wonders why he has to come back for a vaccination each year.

(a) Explain the reasons why influenza vaccination will not provide you with a lifelong immunity against the disease. [50%]

Unlike for influenza, vaccinations against Hepatitis B will give you an immunity against the disease for a long time.

(b) Describe the pathogenesis of the Hepatitis B virus and discuss the possible outcomes of an infection. [50%]

32. Answer ALL parts (a) to (c).

Mr Marple has recently been diagnosed HIV-positive during a sexual health screen.

(a) Describe the monitoring parameters associated with HIV infection and antiretroviral therapy. [10%]

(b) Summarise the different classes of antiretroviral therapy and explain their mechanism of action. [50%]

(c) Discuss the drug and patient factors considered when initiating anti-retroviral therapy. [40%]

33. Answer ALL parts (a) to (c).

Malarone is a combination therapy used in both the treatment and prevention of Malaria.

(a) Briefly describe the mode of action of the two components of Malarone. [30%]

(b) Explain why Malarone is such an effective combination therapy. [20%]

(c) Mr Arnold returns from travelling to South America and is diagnosed as having a roundworm infection. Describe the life cycle of the roundworm. [50%]
34. Answer **ALL** parts (a) to (e).

The 3'-hydroxyl group of kanamycin-A is essential for its anti-bacterial activity. Kanamycin-A can be inactivated through phosphorylation of this functional group, catalysed by the bacterial aminoglycoside phosphotransferase enzyme (AHP-3') as shown below.

(a) How does kanamycin-A exert its biological activity as an antibiotic? [10%]

(b) What are the names of substrate A and product B? [10%]

(c) Name two other metabolic modifications that bacteria can use to inactivate aminoglycoside antibiotics. [15%]

(d) With the aid of diagrams, describe how kanamycin-A can be chemically modified so it can retain its antibacterial activity in bacteria which produce AHP-3’ [50%]

(e) Briefly describe the mechanism of action of the antibiotic cycloserine. [15%]

**END OF PAPER**