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University Examinations 2023/2024

THIRD YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY AND BACHELOR OF SCIENCE IN MEDICAL LABORATORY

HMM 3325/HML 3226: DIAGNOSTIC MEDICAL VIROLOGY

DATE: APRIL 2024 **TIME: 2 HOURS**

INSTRUCTIONS: Answer all questions in Section A and B, and any other two questions

SECTION A

1. Identify the most commonly used diagnostic technique in the virus laboratory

    A. Virus isolation in cell culture
    B. Next generation sequencing (NGS)
    C. Immuno-serology
    D. Reverse-transcriptase PCR (RT-PCR)

2. Which of the following samples is used for diagnosis of hepatitis B infections?

    A. Liver biopsy
    B. Blood
    C. Faecal samples
    D. Throat swabs

3. Which of the following two reasons justify laboratory diagnosis of viral infections?

A. To satisfy patient demand
B. For teaching of clinicians and doctors
C. To determine if a virus is sensitive to a new antiviral agents.
D. To quantify virus load for chemotherapy.

4. What is the most common cause of aseptic meningitis of viral etiology?

A. Enteroviruses
B. Herpesviruses
C. Arboviruses
D. Retroviruses
E. Orthomyxoviruses

5. Protection against influenza A virus in a nonimmune individual can be achieved through the administration of a drug that interferes with

A. viral endonuclease activity
B. binding of host messenger RNA (mRNA) caps by the viral P1 protein
C. synthesis of viral progeny RNA
D. uncoating of nucleic acid
E. viral adsorption and penetration

6. Which one of the following infection routes are most often involved in the neonatal transmission of hepatitis B virus (HBV)?

A. Blood transfusion
B. Fetal contact with infected blood during childbirth
C. Ingestion of the virus via maternal breast milk
D. Transmission of the virus from hospital personnel during childbirth
E. Transplacental transmission of the virus

7. The finding of large, multinucleated, clumps of cells in the bronchial secretions of a 2-year-old girl with acute bronchopneumonia suggests that this infection is caused by

A. Bordetella pertusis
B. Epstein-Barr virus
C. Mycoplasma hominis
D. Rhinovirus

E. Respiratory syncytial virus (RSV)

8. All of the following picornaviruses are resistant to the acidity of the stomach except:
    A. Coxsackievirus A
    B. Coxsackievirus B
    C. Echovirus
    D. Poliovirus
    E. Rhinovirus
9. In a chronic carrier of hepatitis B virus (HBV), which positive test is most indicative of high infectivity?
    A. Hepatitis B Surface Antigen (HbsAg)
    B. Hepatitis B Core Antigen (HbcAg)
    C. Hepatitis B e Antigen (HbeAg)
    D. Anti-HBsAg
    E. Anti-HBeAg
10. A sexually active 22-year-old college student presents to the local clinic with a localized vesicular eruption on the shaft of his penis. A scraping of the base of one of the vesicles is positive for Tzanck cells. The patient mentions that he had a similar eruption in the same area 2 months earlier. The reappearance of this eruption may be explained by:
    A. Cell-mediated immunity (CMI) deficiency in the patient
    B. A prolonged period of viremia following the initial infection
    C. A second infection with a similar virus with a different serotype
    D. failure of the patient to comply with therapy prescribed at the initial episode
    E. reactivation of a latent infection.
11. The complement fixation test (CFT) has largely been replaced by improved assays for evidence of infection. Select the organism for which CFT remains a useful laboratory diagnostic test of infection.
    A. Coxiella burnetii

B. Cytomegalovirus
C. Herpes simplex virus
D. Neisseria gonorrhoeae
E. Parainfluenza type 3

12. All of the following association are true EXCEPT ONE:

A. EBV can cause nasopharyngeal carcinoma
B. CMV causes heterophil-negative mononucleosis
C. Mumps virus can cause meningitis
D. Poliovirus can cause paralytic disease
E. Astrovirus causes gastroenteritis only in adults

13. Each of the following diseases is associated with infection by picornaviruses EXCEPT:

A. Myocarditis
B. Hepatitis
C. Meningitis
D. Mononucleosis
E. Herpangina

14. Many antiviral drugs act by inhibition of a viral DNA polymerase enzyme. To which of the following viruses would this class of drugs would be effective.

A. Cytomegalovirus
B. Influenza
C. Measles
D. Mumps
E. Rabies

15. A 1-day old baby was visited by his 5-year-old sister who developed chickenpox the following day. The baby had been born at 30 weeks' gestation and weighed 990g. The mother had not had any obvious illness during the pregnancy. The maternal antenatal blood taken at 13 weeks was retrieved for laboratory investigations which was positive for Varicella zoster virus IgG. What is the most appropriate intervention

for the baby?

A. Commence intravenous acyclovir
B. Commence oral valganciclovir
C. Give intramuscular human normal immune globulin
D. Give intramuscular varicella zoster immune globulin
E. No action required

16. Which one of the following statements concerning mumps is CORRECT?

A. The testes, ovaries and pancreas can be involved
B. There is no vaccine against mumps
C. Passive immunization is the only means of preventing the disease
D. The diagnosis is made only on clinical grounds, since the virus cannot be grown in cell culture and serologic tests are inaccurate
E. Second episodes of mumps can occur, since there are 2 serotypes

17. The following methods maybe used for serological diagnosis of viral infections;

A. Complement fixation test (CFT)
B. Polymerase chain reaction (PCR)
C. Single radial haemolysis (SRH)
D. CMV DEAFF test
E. Western blot

18. The following is INCORRECT regarding haemagglutination Inhibition assay (HAI)

A. Not a quantitative test
B. Treatment of patient serum is necessary to remove non-specific inhibitors
C. Animal blood is necessary
D. Usually more specific than complement fixation tests (CFT)
E. May be used for the diagnosis of rubella infection

19. The following is TRUE about cell cultures

A. Viruses can only be cultured using cell lines
B. The presence of cytopathic effect is the only way to detect a virus

C. The neutralization test is the mainstay of identification of a poliovirus isolate
D. The haemagglutination inhibition test is the mainstay of identification of a respiratory syncytial virus (RSV) isolate
E. Whole blood is the specimen of choice for many common viruses

20. A serological diagnosis of a primary viral infection may be made by

A. Detection of viral-specific IgA
B. Detection of viral-specific IgD
C. Detection of viral-specific IgE
D. Detection of viral-specific IgM
E. Seroconvertion

SECTION B - ANSWER ALL QUESTIONS

1. Describe how tissue biopsies and stools are decontaminated and/or disposed of in the virology laboratory. (8 Marks)
2. Describe the diagnostic assays which can detect viral antigens directly in the clinical specimen. (8 Marks)
3. Discuss the principals involved in the direct and indirect immunoflourescence assays. (8 Marks)
4. Critically discuss the clinical aspects, epidemiology and laboratory identification of adenoviruses. (8 Marks)
5. a) Abby is a 45-year-old female renal transplant patient. She was seropositive for CMV pre-transplant and was matched with a seropositive donor. Highlight the tests that would be conducted for routine screening. (4 Marks)

b) Describe methods that can be used to evaluate multiplication of a virus in a virus-infected cell. (4 Marks)

SECTION C - ANSWER TWO QUESTIONS

Question ONE

Discuss and illustrate the principles involved in the direct, indirect, competitive and μ-capture ELISA assays. Give examples of such assays which are used in diagnostic virology. (20 Marks)

Question TWO

Discuss hepatitis viruses A – E in terms of their diagnostic markers and diagnostic tests available. (20 Marks)

Question THREE

Discuss ways in which contaminations could be introduced into cell cultures and enumerate the common contaminants. Then, outline the precautions taken and aseptic techniques used to prevent contamination of the cell cultures. (20 Marks)