

國立交通大學 103 學年度碩士班考試入學試題

科目：微生物學(4546) (4523) 4科6分

考試日期：103年2月15日 第2節

系所班別：分子醫學與生物工程研究所

組別：分醫所·生科乙組 第 1 頁, 共 11 頁

【不可使用計算機】*作答前請先核對試題、答案卷(試卷)與准考證之所組別與考科是否相符!!

Part I: 單選題：請選出最適當的答案，每題一分。請使用答案卡作答

- Which of the following is (are) not true about cephalosporins?**
 - They, like penicillin, inhibit bacterial cell wall synthesis.
 - There are four generations of cephalosporins.
 - They can be given to patients with penicillin allergies.
 - They are produced by the soil bacteria *Streptomyces*
- The binomial system assigns each organism a scientific name consisting of**
 - family and genus
 - genus and species
 - class and order.
 - order and family
- Which of the antibiotics inhibits protein synthesis?**
 - Tetracycline
 - Vancomycin
 - Quinolone
 - Rifampin
- Which of the following is true of the bacterial components?**
 - The floor-like S layer is composed of an organized protein or glycoprotein.
 - Lipopolysaccharide (LPS) is also known as an enterotoxin.
 - Fimbriae composed of polysaccharides help bacteria escape phagocytosis.
 - Porin is a highly selective transporter.
- The factors that influence the emerging infectious diseases include**
 - Rapid transportation systems and the mobility of the population
 - Ecological disruption such as the destruction of rain forests
 - Increased drug usage and sexual promiscuity
 - all of the choices
- Which is not true for microscopy study?**
 - Gram staining or acid-fast staining is a differential staining method.
 - Transmission electron microscope forms an image by passing an electron beam through a specimen.
 - Acridine orange is commonly used to stain cell wall
 - A confocal microscope illuminates the specimens with laser beam.
- Helicobacter pylori* is responsible for**
 - dysentery
 - meningitis
 - pneumonia
 - peptic ulcer
- Which is not a property of *Methanogens*?**
 - can be stained either gram positive or gram negative
 - are obligate anaerobes that produce methane as a clean-burning fuel
 - may significantly promote global warming by methane production
 - are also called halobacteria
- Which of the following bacteria could be excellent fuel cells?**
 - Bacillus*
 - Shewanella*
 - Clostridium*
 - Burkholderia*

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科目：微生物學(4546) (4523) 4/2/09

考試日期：103年2月15日 第2節

系所班別：分子醫學與生物工程研究所

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10. **Bacterial flagella**

- (A) Enables to glide on solid surfaces
- (B) Plays a major role in specific adhesion
- (C) Is a major determinant of chemotaxis activity
- (D) helps regulating cell-to-cell communication

11. **Which is not true of the bacterial genetic system?**

- (A) Conjugative transposon mobilizes DNA via specialized transduction.
- (B) Plasmids are the major vehicles for horizontal gene transfer among bacteria.
- (C) F plasmid is a fertility factor for bacterial conjugation.
- (D) Transposition by transposable elements may cause mutation of nearby gene

12. **Which of the following is not true of quorum sensing?**

- (A) An important regulatory mechanism for bacterial virulence
- (B) A behavior of bacterial cell to cell communication
- (C) Is initiated by a small molecule named siderophore
- (D) Is important in regulating bacterial biofilm formation

13. **The photosynthetic *Cyanobacteria***

- (A) carry out only anoxygenic photosynthesis
- (B) use differentiated heterocyst to fix nitrogen
- (C) carry out phototaxis by flagella to position in optimal illumination in water
- (D) use gliding motility when cells are in dark environments

14. **Which of the following is not true?**

- (A) Z-ring formation is required for bacterial cytokinesis
- (B) The process of forming a cross-wall between two daughter cells is called septation
- (C) FtsZ is an actin-like protein involved in determining the rod shape of *E. coli*
- (D) Most bacterial and archaeal cells divide by binary fission

15. **Bacterial type IV secretion system (T4SS)**

- (A) Is used to secrete proteins as well as DNA
- (B) Is also called autotransporter
- (C) Is found only in the gram positive bacteria
- (D) Is evolutionarily related to ABC transporter

16. **The first case in an epidemic is called the**

- (A) Prime case
- (B) Break case
- (C) Index case
- (D) Alpha case

17. **Which of the following is not true of *Mycoplasma*?**

- (A) They are classified to gram positives but lack peptidoglycan cell wall structure.
- (B) They are resistant to beta-lactam drugs.
- (C) They contain sterols in their plasma membrane.
- (D) They glide on semi-solid surface using flagella.

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科目：微生物學(4546)

(4523) 4 科 6 分

考試日期：103 年 2 月 15 日 第 2 節

系所班別：分子醫學與生物工程研究所

組別：分醫所、生科組 第 3 頁，共 11 頁

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18. Which is **not true** of two-component signal transduction systems?
- (A) Are found only in the bacterial domain
 - (B) Are often composed of a sensor kinase and response regulator
 - (C) Mainly work via phosphorelay from sensor kinase to response regulator
 - (D) Are important in regulating *Bacillus* sporulation
19. Which is **not true** of genomics study?
- (A) Sequencing of the human microbiome is a metagenomics project
 - (B) Pan-genome is the collection of genes in all strains of a species
 - (C) Metabolomics, also called metagenomics, is to study environmental genomics.
 - (D) Functional genomics is the analyses of genome transcripts and the proteins
20. Which is **not true** of probiotic microorganisms?
- (A) They are host specific
 - (B) They are prepared as inactivated powder
 - (C) They are able to compete with pathogens for nutrients and adhesion
 - (D) They may provide anticarcinogenic activity
21. The organism that uses light for energy, an inorganic electron source and CO₂ as its carbon source is
- (A) photoorganoautotroph
 - (B) photoorganoheterotroph
 - (C) photolithoautotroph
 - (D) photolithoheterotroph
22. Which is **not** the reason for bacterial cells entering stationary phase?
- (A) depletion of an essential nutrient
 - (B) activate cell division
 - (C) accumulation of toxic waste products
 - (D) lack of available oxygen
23. The microorganisms grow well at 0°C and have optimum growth temperatures of 15°C or lower are
- (A) frigidiphiles
 - (B) mesophiles
 - (C) psychrophiles
 - (D) thermophiles
24. The standard or housekeeping sigma factor used most often by *E. coli* RNA polymerase under normal growth conditions is called
- (A) RpoD
 - (B) RpoS
 - (C) RpoH
 - (D) RpoE
25. Thermophilic bacteria are stabilized by phospholipids with fatty acids
- (A) that have lower molecular weights
 - (B) that tend to be more saturated
 - (C) that have more hydrogen bonds
 - (D) all of the choices
26. The bacteria *Rhizobium*
- (A) Grows symbiotically within root nodules of legumes
 - (B) Is important nitrifying bacteria that convert nitrite to nitrate
 - (C) Infects broad-leaved plants and causes crown gall disease
 - (D) Is capable of introducing DNA into bacteria, fungi, and plant cells

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(4523) 生科所

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組別：分醫所-生科組 第4頁,共11頁

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27. The first epidemiologist is

- (A) Edward Jenner (B) Louis Pasteur (C) John Snow (D) Robert Koch

28. Spirochete is the causative agent of

- (A) Leprosy (B) Lyme disease (C) Plague (D) Whooping cough

29. Which is not true of the *archaea*?

- (A) Many are solfatara, acidophiles and extremely thermophilic.
(B) They carry eukaryotic type RNA polymerase.
(C) They carry selenocysteine and pyrrolysine.
(D) They reproduce via binary fission, budding, or mitosis.

30. Which of the following statements is not true?

- (A) *Lactobacillus* grows optimally at extremely acidic pH.
(B) *Streptomyces* is usually found in soil habitats
(C) *Rickettsia* is the cause of Rocky Mountain spotted fever.
(D) The cause of Legionnaire's disease may be originated from shower stalls.

31. Which of the following statements is not true?

- (A) High efficiency particulate air (HEPA) filter can remove particles of 1 μm or larger
(B) Tyndallization is a heating process to destroy bacterial endospore
(C) Autoclaving is to sterilize objects using steam under pressure
(D) Pasteurization is the process of heating milk and other liquids

32. *Agrobacterium tumefaciens*

- (A) is capable of nitrogen fixation. (B) grows anaerobically as photoautotrophs.
(C) carries a tumor inducing (Ti) plasmid as a tool for horizontal gene transfer.
(D) grows symbiotically within insects.

33. In quorum sensing, acylhomoserine lactones regulate their own synthesis by a(n)

- (A) antisense repression (B) autoinduction
(C) riboswitch control (D) catabolite repression

34. Specialized transduction can be carried out by

- (A) any bacteriophage (B) only temperate bacteriophage
(C) only those temperate bacteriophages that integrate into the host chromosome.
(D) only virulent bacteriophage

35. Mineralization refers to

- (A) Incorporation of inorganic material into organic materials.
(B) Release of various minerals from ores.
(C) Utilization of minerals as energy sources
(D) Breakdown of organic materials to inorganic materials

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科目：微生物學(4546)

(4523) 生科 59

考試日期：103年2月15日 第2節

系所班別：分子醫學與生物工程研究所

組別：分醫所(生科)組 第5頁,共11頁

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36. *Bacteroides* are the major human gut microbes which benefit us by degrading
(A) cellulose (B) bile salts (C) proteins (D) all of the choices
37. Twin arginine transportation (TAT) system translocates ___ through cytoplasmic membrane of bacteria or archaea
(A) any protein (B) unfolded protein (C) folded protein (D) lipid
38. Cholera is a(n)
(A) Airborne infection (B) Foodborne infection
(C) Insect-borne infection (D) Sexual transmitted infection
39. Biofilm is
(A) a community composed of single species of microbes
(B) able to protect microbes from UV light and antibiotics.
(C) a non-organized microbial community
(D) surrounded by a layer of viable but not culturable cells
40. Which of the followings is true?
(A) Pathogenicity islands are typically associated with genes encoding rRNA.
(B) Endotoxins include diphtheria toxin and tetanus toxin.
(C) Exotoxin production is most generally associated with gram-negative bacteria
(D) Hemolysin is a pore forming toxin.
41. The pioneer colonizer of the human intestinal tract is
(A) *Lactococcus lactis* (B) *Escherichia coli*
(C) *Bifidobacterium bifidus* (D) *Salmonella enterica*
42. Pneumococcal vaccine component is
(A) toxoid (B) polysaccharide (C) DNA (D) antibody
43. *Escherichia coli* is
(A) a good indicator of fecal contamination of water supplies
(B) a major cause of urinary tract infection (C) a mixed acid fermenter
(D) all of the choices
44. Which of the following statements is not true?
(A) *Staphylococcus* species are normally associated with mucous membranes
(B) *Pseudomonas aeruginosa* can be a problem with cystic fibrosis patients
(C) *Bacillus subtilis* is used in the biocontrol of a variety of types of insects
(D) *Salmonella* species are common causes of gastroenteritis
45. The phylum _____ is thought to represent the oldest branch of the bacteria.
(A) *Thermotogae* (B) *Aquificae*
(C) *Cyanobacteria* (D) *Deinococcus*

國立交通大學 103 學年度碩士班考試入學試題

科目：微生物學(4546)

(4523) 生科64

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系所班別：分子醫學與生物工程研究所

組別：分醫所、生科64 第6頁，共11頁

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46. A miniaturized commercial rapid bacterial identification system is the
(A) Kirby-Bauer test (B) Quellung test (C) Widal test (D) API 20E system
47. The organisms that cause toxic shock syndrome is
(A) *Staphylococcus epidermidis*. (B) *Staphylococcus aureus*.
(C) *Lactococcus lactis*. (D) *Streptococcus pneumoniae*.
48. A(n) _____ disease is increased in occurrence within a large population over a very wide region (usually the world).
(A) endemic (B) sporadic (C) pandemic (D) epidemic
49. The Lancefield grouping system for *Streptococci* is based on
(A) antibiotic susceptibility (B) hemolysin activity
(C) superantigen typing (D) polysaccharide and teichoic acid antigens
50. *Burkholderia cepacia* may cause a particular problem with
(A) tuberculosis patients (B) hemophilia patients.
(C) cystic fibrosis patients. (D) diabetes patients

PART II Please Choose the Best Answer. 1 Point each.

單選題。答對每題得一分；答錯不倒扣。

51. Which of the following is most likely to happen when bacteriophages are removed from a seawater environment and left everything else behind? The bacterial population most likely will
(A) increase dramatically. (B) increase slowly.
(C) stop growing (D) remain the same.
(E) fluctuate.
52. Which of the following is the best to describe the size of viruses?
(A) Larger than Mitochondria. (B) Similar to ribosomes.
(C) Smaller than prions. (D) Larger than bacteria.
(E) Smaller than an amino acid.
53. The genome of a virus is usually contained within the capsid. Capsid is made of
(A) proteins. (B) lipids.
(C) nucleic acids. (D) carbohydrates.
(E) glycolipids.
54. Which of the following is correct?
(A) All bacteria have RNA genomes. (B) All viruses have DNA genomes.
(C) All fungi have DNA genomes. (D) Some protists have RNA genomes.
(E) Some fungi have RNA genomes.

國立交通大學 103 學年度碩士班考試入學試題

科目：微生物學(4546)

(4523) 4/2/69

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55. Which of the following is LESS likely to be correct?
- (A) An enveloped virus may use receptor-mediated endocytosis to enter host cells.
 - (B) A naked virus may use receptor-mediated endocytosis to enter host cells.
 - (C) An enveloped virus may use membrane fusion to enter host cells.
 - (D) A naked virus may use membrane fusion to enter host cells.
 - (E) A naked virus may use clathrin-coated vesicle to infect host cells.
56. Which of the following set are heterotrophs?
- (A) Yeast and *Escherichia coli*.
 - (B) Fungi and plants.
 - (C) Rabies virus and plants.
 - (D) Algae and SARS virus.
 - (E) Protists and Algae.
57. Which of the following organism contains genome located inside nucleus?
- (A) Mushrooms.
 - (B) *Escherichia coli*.
 - (C) SARS virus.
 - (D) The pathogen of Mad Cow Disease.
 - (E) All of the above.
58. Which of the following set does NOT have meiosis?
- (A) *Saccharomyces cerevisiae* and Arabidopsis.
 - (B) *Escherichia coli* and SARS virus.
 - (C) *Saccharomyces cerevisiae* and mushroom.
 - (D) *Schizosaccharomyces pombe* and *Aspergillus*.
 - (E) *Penicillium* and *Aspergillus*.
59. Which of the following can be used for detection of microbial infection?
- (A) Detection of microbial antigens.
 - (B) Culture from tissue.
 - (C) Polymerase Chain Reaction.
 - (D) All of the above.
 - (E) None of the above.
60. Which of the following is most likely to be resistant to UV and can still propagate after the treatment?
- (A) SARS virus.
 - (B) Prions.
 - (C) pBluescript II.
 - (D) Viroids.
 - (E) *Escherichia coli* DH5.
61. Which of the following can be used for sterilization of microbes containing nucleus?
- (A) Autoclave.
 - (B) UV.
 - (C) Filter.
 - (D) All of the above.
 - (E) None of the above.

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(4523) 4546

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組別：分醫所-生技組 第8頁,共11頁

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62. Which of the following is correct?
- (A) Fungi are diploid, multi-cellular organisms.
 - (B) Bacteria are diploid, unicellular organisms.
 - (C) Some yeasts are diploid, uni-cellular organisms.
 - (D) Viruses are haploid, uni-cellular organisms.
 - (E) Fungi are haploid, uni-cellular organisms.
63. Which of the following can be viral receptors on host cells?
- (A) Proteins.
 - (B) Enzymes.
 - (C) Carbohydrates.
 - (D) Glycolipid.
 - (E) All of the above.
64. Which of the following is LESS likely to be a viral genome?
- (A) Double-stranded Circular RNA.
 - (B) Double-stranded Circular DNA.
 - (C) Single-stranded Linear RNA.
 - (D) Single-stranded Linear DNA.
 - (E) Single-stranded Circular DNA.
65. Which of the following has been eradicated?
- (A) Dengue.
 - (B) Smallpox.
 - (C) Yellow Fever.
 - (D) Hepatitis.
 - (E) Poliomyelitis.
66. A host cell will not be infected by an envelope virus such as Yellow Fever Virus if the host cell is pre-treated with
- (A) antibiotics.
 - (B) nucleases.
 - (C) the same virus.
 - (D) bacteria.
 - (E) other viruses.
67. The shape of a virion can be described as
- (A) Helical symmetry.
 - (B) Cylinder shape.
 - (C) Icosahedral symmetry.
 - (D) Sphere shape.
 - (E) All of the above.
68. Which of the following will require a helper virus for propagation?
- (A) HBV.
 - (B) SARS virus.
 - (C) HDV.
 - (D) Influenza virus.
 - (E) HCV.
69. Which of the following is LEAST likely to be infected by a virus?
- (A) *Schizosaccharomyces pombe*.
 - (B) *Escherichia coli* DH5
 - (C) Mushroom.
 - (D) The pathogen of Mad Cow Diseases.
 - (E) *Aspergillus fumigates*.

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科目：微生物學(4546)

(4523) 4 科 6 4

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70. Cyclosporine is an immunosuppressant originally from microbes. Which of the following is the most likely source?

- (A) Bacteria.
- (B) Fungi.
- (C) Protists.
- (D) Algae.
- (E) Archaeobacteria.

71. Which of the following set share the most similar chemical components?

- (A) The cell wall of *Saccharomyces cerevisiae* and the exoskeleton of fruit fly.
- (B) The cell wall of *Escherichia coli* and *Saccharomyces cerevisiae*.
- (C) The exoskeleton of fruit fly and the cell wall of a pine tree.
- (D) The cell wall of algae and *Escherichia coli*.
- (E) The cell wall of a pine tree and *Saccharomyces cerevisiae*.

72. Fungi can cause which type of illness in human?

- (A) Intoxication.
- (B) Respiratory allergies.
- (C) Superficial infection.
- (D) Systemic infection.
- (E) All of the above.

73. Which of the following mechanisms can result in genetic recombination in viruses?

- (A) Copy Choice.
- (B) Genome re-assortment.
- (C) Double cross-over.
- (D) Single cross-over.
- (E) All of the above.

74. Which of the following is most likely to possess ribozyme activities?

- (A) Potato Spindle Tuber Viroids.
- (B) *Saccharomyces cerevisiae*.
- (C) *Escherichia coli*.
- (D) Hepatitis B Virus.
- (E) *Schizosaccharomyces pombe*.

75. The most likely way of exiting a host cell of a mammalian virus is via

- (A) Lysis.
- (B) Budding.
- (C) Endocytosis.
- (D) Fission.
- (E) Fusion.

76. Which of the following set does NOT have mitochondria in both organisms?

- (A) Bacteria and Plants.
- (B) Fungi and Bacteria.
- (C) Fungi and Mammals.
- (D) Influenza Virus and Archaeobacteria.
- (E) Algae and Fungi.

77. Which of the following may propagate in nature without a live host?

- (A) Yeasts.
- (B) Rickettsia.
- (C) Prions.
- (D) SARS virus.
- (E) All of the above.

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科目：微生物學(4546)

(4123) 生科所

考試日期：103 年 2 月 15 日 第 2 節

系所班別：分子醫學與生物工程研究所

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78. Which of the following is NOT known to have proof-reading activity in vivo?
- (A) DNA-dependent RNA polymerases. (B) DNA-dependent DNA polymerases.
(C) RNA-dependent DNA polymerases. (D) Klenow fragment.
(E) Tag polymerase.
79. Which of the following set do NOT have flagella?
- (A) Diatoms and *Escherichia coli*. (B) *Saccharomyces* and Dinoflagellates.
(C) Basidiomycetes and *Saccharomyces*. (D) Golden Algae and *Escherichia coli*.
(E) Red Algae and Euglenids.
80. Which of the following pathogens was the LAST one to be discovered?
- (A) Fungi. (B) Bacteria.
(C) Viruses. (D) Protists.
(E) Prions.

PART III. Please Choose the Best Answer. 2 Point each.

單選題。答對每題得二分；答錯不倒扣。

81. For safety issue, a laboratory can be classified according to Biosafety Level (BSL). How many levels are there in Taiwan?
- (A) 3. (B) 4.
(C) 5. (D) 7.
(E) 2.
82. Which of the following shall NOT be found in a BSL2 laboratory?
- (A) Micro-centrifuge. (B) Gloves and lab coat.
(C) *Saccharomyces cerevisiae*. (D) Lunch and coffee.
(E) *Escherichia coli*.
83. Which of the following is most likely to be the correct order of viral replication?
- A) Attachment, Entry, Assembly, Maturation, Packaging.
B) Entry, Assembly, Packaging, Exit, Maturation.
C) Attachment, Assembly, Maturation, Packaging, Exit.
D) Synthesis of protein, Maturation, Assembly, Packaging, Exit.
E) Attachment, Entry, Packaging, Maturation, Assembly.
84. Which of the following is associated with sexual reproduction?
- (A) Formation of basidiospore. (B) Budding of yeasts.
(C) Fission of bacteria. (D) Viral envelope fusion.
(E) None of the above.

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(4523) 4523

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85. Which of the following is a LESS likely method used to introduce genetic material into *Saccharomyces cerevisiae*?
- (A) Chemical Transformation. (B) Electroporation.
(C) Transduction. (D) Gene Gun.
(E) Cell fusion.
86. If a medium contains peptones, yeast extract, and serum, then it is most likely used to enrich which type of organism?
- (A) Fungi. (B) Bacteria.
(C) Protists. (D) Viruses.
(E) Rickettsia.
87. Which of the following is LESS likely to be used for detecting pathogens' genetic materials?
- (A) PCR and Gene array.
(B) Dot blot and Nucleic acid hybridization.
(C) Northern blot and Southern blot.
(D) Western blot and Hemagglutination assay.
(E) RT-PCR and Gene array.
88. Which of the following organisms' genetic information may appear in host genomes? 1. Fungal pathogen; 2. Bacteriophage; 3. Retrovirus.
- (A) 1, 2, and 3. (B) Only 1 and 2.
(C) Only 2 and 3. (D) Only 1 and 3.
(E) None.
89. The extinction of which organisms is most likely to endanger the survival of plants?
- (A) Bacteria. (B) Prions.
(C) Viruses. (D) Protists.
(E) Fungi.
90. For *Neurospora crassa* (Ascomycete), which of the following stages are haploid?
1. Zygote; 2. Ascospore; 3. Conidia; 4. Ascus.
- (A) 1 and 2. (B) 2 and 3.
(C) 3 and 4. (D) 1 and 3.
(E) Only 2.