

INI CET Microbiology

Sample Paper – 4

Duration: 14 Minutes

Maximum Marks: 15

Instructions

- This paper contains **15** Multiple Choice Questions (Single Best Response), modelled on the Microbiology content of **INI CET** (Institutes of National Importance Combined Entrance Test) conducted by AIIMS New Delhi.
- The **15-question** length matches the number of Microbiology items you actually meet in the real 200-question paper.
- Each correct answer carries **+1 mark**. There is **negative marking of one-third (0.33) mark** for every incorrect answer; unattempted questions carry no penalty.
- Every question has **exactly one best answer**. Choose the single most appropriate option.
- Attempt this practice paper in one timed sitting of about **14 minutes**, the pace the real computer-based test demands.

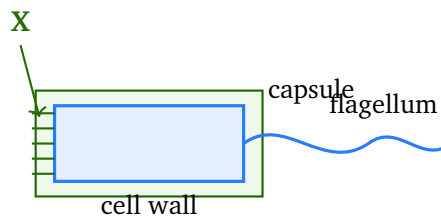
General Microbiology and Sterilization

- Q1.** Which staining method, using malachite green applied with heat followed by a safranin counterstain, is used to demonstrate bacterial endospores?
- (A) Albert stain
(B) Schaeffer-Fulton stain
(C) Ziehl-Neelsen stain
(D) Giemsa stain
- Q2.** Which agent is best suited for sterilising heat-sensitive items such as plastic tubing, endoscopes and prosthetic implants?



- (A) Autoclaving at 121 °C
- (B) Dry heat in a hot-air oven
- (C) Ethylene oxide gas
- (D) Red-heat flaming

Q3. In the diagram of a bacterial cell below, the numerous short hair-like appendages marked X, which mediate adhesion and attachment to host surfaces, are the:



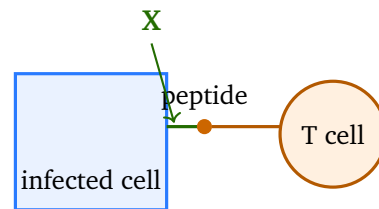
- (A) Flagellum
- (B) Pili (fimbriae)
- (C) Capsule
- (D) Cell wall

Immunology

Q4. Administering preformed anti-tetanus immunoglobulin to a wounded patient provides immediate but short-lived protection. This is an example of:

- (A) Passive immunity
- (B) Active natural immunity
- (C) Active artificial immunity
- (D) Innate immunity

Q5. In the schematic below, an infected cell presents a peptide on its MHC class I molecule marked X to a T lymphocyte. Which T-cell subset recognises antigen presented on MHC class I?

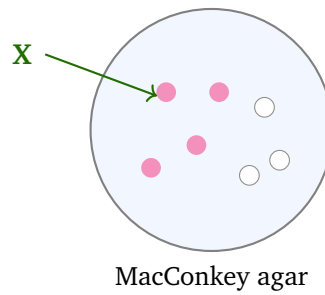


- (A) CD4 helper T cell
- (B) CD8 cytotoxic T cell
- (C) Regulatory T cell
- (D) Natural killer cell

Systematic Bacteriology

- Q6.** A gram-negative intracellular diplococcus grows on chocolate agar and is the cause of epidemic meningococcal meningitis. The organism is:
- (A) *Streptococcus pneumoniae*
 - (B) *Haemophilus influenzae*
 - (C) *Listeria monocytogenes*
 - (D) *Neisseria meningitidis*
- Q7.** A non-lactose-fermenting, oxidase-positive gram-negative rod produces a blue-green pigment and a fruity, grape-like odour in culture. The most likely organism is:
- (A) *Klebsiella pneumoniae*
 - (B) *Escherichia coli*
 - (C) *Proteus mirabilis*
 - (D) *Pseudomonas aeruginosa*
- Q8.** On the MacConkey agar plate below, the deep-pink colonies of *Escherichia coli* marked X, in contrast to the pale colourless colonies, indicate that the organism is a:





- (A) Non-lactose fermenter
- (B) Lactose fermenter
- (C) Urease producer
- (D) Spore former

Virology

Q9. During HIV entry into a host cell, which viral envelope glycoprotein binds the CD4 receptor before engaging a chemokine co-receptor such as CCR5?

- (A) gp120
- (B) p24
- (C) Reverse transcriptase
- (D) Integrase

Q10. Which virus, an enterovirus of the family Picornaviridae spread by the faecal-oral route, causes acute flaccid paralysis and is prevented by OPV and IPV?

- (A) Poliovirus
- (B) Rabies virus
- (C) Measles virus
- (D) Rotavirus

Mycology and Parasitology



- Q11.** Lung tissue from a neutropenic patient shows septate hyphae branching at acute (about 45°) angles, consistent with invasive aspergillosis. The causative organism is:
- (A) *Mucor* species
 - (B) *Candida albicans*
 - (C) *Cryptococcus neoformans*
 - (D) *Aspergillus fumigatus*
- Q12.** Which protozoan parasite has the cat as its definitive host and causes congenital infection with tachyzoites crossing the placenta?
- (A) *Plasmodium vivax*
 - (B) *Giardia lamblia*
 - (C) *Toxoplasma gondii*
 - (D) *Leishmania donovani*
- Q13.** Which hookworm, whose larvae penetrate intact skin of the feet, is a leading parasitic cause of iron-deficiency anaemia?
- (A) *Ascaris lumbricoides*
 - (B) *Enterobius vermicularis*
 - (C) *Ancylostoma duodenale*
 - (D) *Wuchereria bancrofti*

Applied and Diagnostic Microbiology

- Q14.** Which test demonstrates capsular swelling when a bacterium is mixed with type-specific antiserum, classically used to identify *Streptococcus pneumoniae*?
- (A) Quellung reaction
 - (B) Optochin sensitivity test
 - (C) Catalase test



(D) Coagulase test

Q15. Which test detects antibody or complement already bound to the surface of a patient's red blood cells, for example in haemolytic disease of the newborn?

(A) Widal test

(B) Weil-Felix reaction

(C) Direct Coombs (antiglobulin) test

(D) Latex agglutination test



Detailed Solutions

Q1.

Solution

Concept – endospore staining: Endospores have a tough keratin-like coat that resists ordinary stains.

Step 1 – name the method: The **Schaeffer-Fulton stain** drives malachite green into the spore using heat, then rinses and applies safranin.

Step 2 – the result: Spores retain the green dye and appear green, while the vegetative cell body counterstains pink or red.

Why the other options are wrong:

- A, Albert stain: shows metachromatic granules of *Corynebacterium diphtheriae*.
- C, Ziehl-Neelsen stain: demonstrates acid-fast bacilli, not spores.
- D, Giemsa stain: used for blood films and intracellular parasites.

Final Answer: Schaeffer-Fulton stain $\Rightarrow$ **B**

Answer: (B) [Go Back to Q1](#)

Q2.

Solution

Concept – sterilising heat-sensitive items: Some devices melt or warp under autoclave or oven heat and need a gas method.

Step 1 – pick the agent: **Ethylene oxide gas** sterilises at low temperature, penetrating plastic tubing, endoscopes and prosthetics.

Step 2 – how it works: It alkylates microbial proteins and nucleic acids, killing spores; items are then aerated to remove toxic residue.

Why the other options are wrong:

- A, autoclaving at 121 °C: moist heat damages plastics and delicate optics.
- B, dry heat: even higher temperatures, unsuitable for plastics.
- D, red-heat flaming: only for inoculating loops and wires.

Final Answer: Ethylene oxide gas $\Rightarrow$ **C**

Answer: (C) [Go Back to Q2](#)



Q3.

Solution

Concept – bacterial surface appendages: Different appendages serve motility, adhesion or protection.

Step 1 – read the label: X points to the many short hair-like projections on the cell surface.

Step 2 – name the structure: These are **pili (fimbriae)**, which mediate adhesion and attachment of bacteria to host cell surfaces.

Why the other options are wrong:

- A, flagellum: the long whip-like structure for motility, not adhesion.
- C, capsule: the outer gel layer that resists phagocytosis.
- D, cell wall: the rigid peptidoglycan layer giving shape.

Final Answer: Pili (fimbriae) ⇒

Answer: (B) [Go Back to Q3](#)

Q4.

Solution

Concept – passive immunity: Protection can be borrowed by transferring ready-made antibody.

Step 1 – classify it: Giving preformed anti-tetanus immunoglobulin is **passive immunity**, since the host receives antibody rather than making it.

Step 2 – the trade-off: Protection is immediate but short-lived, because there is no memory and the antibody is gradually cleared.

Why the other options are wrong:

- B, active natural immunity: follows recovery from natural infection.
- C, active artificial immunity: follows vaccination, producing memory.
- D, innate immunity: non-specific defences present from birth.

Final Answer: Passive immunity ⇒

Answer: (A) [Go Back to Q4](#)



Q5.

Solution

Concept – MHC restriction of T cells: Each T-cell subset reads antigen on a particular class of MHC molecule.

Step 1 – read the figure: X is the MHC class I molecule displaying an endogenous peptide on the infected cell.

Step 2 – name the subset: CD8 cytotoxic T cells recognise peptide on MHC class I and kill the infected cell.

Why the other options are wrong:

- A, CD4 helper T cell: recognises peptide on MHC class II.
- C, regulatory T cell: a CD4 subset that dampens responses.
- D, natural killer cell: kills cells lacking MHC-I and is not MHC-restricted.

Final Answer: CD8 cytotoxic T cell $\Rightarrow$ **B**

Answer: (B) [Go Back to Q5](#)

Q6.

Solution

Concept – gram-negative diplococci: Two *Neisseria* species differ by disease and growth requirements.

Step 1 – apply the clues: An intracellular gram-negative diplococcus on chocolate agar causing epidemic meningitis is *Neisseria meningitidis*.

Step 2 – the features: It ferments both glucose and maltose and can be typed by its polysaccharide capsule.

Why the other options are wrong:

- A, *S. pneumoniae*: a gram-positive lancet-shaped diplococcus.
- B, *H. influenzae*: a gram-negative coccobacillus needing factors X and V.
- C, *L. monocytogenes*: a gram-positive rod causing neonatal meningitis.

Final Answer: *Neisseria meningitidis* $\Rightarrow$ **D**

Answer: (D) [Go Back to Q6](#)



Q7.

Solution

Concept – pigmented gram-negative rods: Pigment and odour help place an oxidase-positive non-fermenter.

Step 1 – match the description: A non-lactose-fermenting, oxidase-positive rod with blue-green pigment and a fruity odour is *Pseudomonas aeruginosa*.

Step 2 – the pigment: It produces pyocyanin (blue-green) and pyoverdine, and thrives in moist hospital environments.

Why the other options are wrong:

- A, *Klebsiella*: a lactose fermenter with large mucoid colonies, oxidase negative.
- B, *E. coli*: a lactose fermenter, oxidase negative.
- C, *Proteus*: swarms and is urease positive, without this pigment.

Final Answer: *Pseudomonas aeruginosa* ⇒ D

Answer: (D) [Go Back to Q7](#)

Q8.

Solution

Concept – MacConkey agar: This selective, differential medium separates bacteria by lactose use.

Step 1 – read the plate: X marks the deep-pink colonies, in contrast to the pale colourless ones.

Step 2 – interpret it: Pink colonies mean the organism is a **lactose fermenter**; acid from lactose lowers the pH and turns the neutral-red indicator pink, as with *E. coli*.

Why the other options are wrong:

- A, non-lactose fermenter: gives the pale colourless colonies instead.
- C, urease producer: shown on urea medium, not MacConkey.
- D, spore former: unrelated to lactose fermentation and not shown here.

Final Answer: Lactose fermenter ⇒ B

Answer: (B) [Go Back to Q8](#)



Q9.

Solution

Concept – HIV entry: The virus attaches through a specific envelope glycoprotein.

Step 1 – name the protein: gp120 on the HIV envelope binds the CD4 receptor on the host T cell.

Step 2 – what follows: A conformational change lets gp120 engage a co-receptor (CCR5 or CXCR4), and gp41 then drives membrane fusion.

Why the other options are wrong:

- B, p24: the internal capsid antigen, not the attachment protein.
- C, reverse transcriptase: copies the RNA genome after entry.
- D, integrase: inserts the DNA copy into the host genome.

Final Answer: gp120 ⇒

Answer: (A) [Go Back to Q9](#)

Q10.

Solution

Concept – enteroviruses: One small RNA virus targets anterior horn motor neurons.

Step 1 – name the virus: Poliovirus, an enterovirus of Picornaviridae, spreads faecal-orally and causes acute flaccid paralysis.

Step 2 – prevention: Oral polio vaccine (OPV, live) and inactivated polio vaccine (IPV) protect against it.

Why the other options are wrong:

- B, rabies virus: a bullet-shaped rhabdovirus causing encephalitis.
- C, measles virus: a paramyxovirus causing a respiratory rash illness.
- D, rotavirus: causes infantile diarrhoea, not paralysis.

Final Answer: Poliovirus ⇒

Answer: (A) [Go Back to Q10](#)



Q11.

Solution

Concept – filamentous fungi in tissue: Hyphal shape and branching angle identify the mould.

Step 1 – read the morphology: Septate hyphae branching at acute (about 45°) angles in a neutropenic patient point to *Aspergillus fumigatus*.

Step 2 – the disease: It causes aspergilloma in cavities and invasive aspergillosis with vascular invasion in the immunocompromised.

Why the other options are wrong:

- A, *Mucor*: broad aseptate hyphae branching at wide (90°) angles.
- B, *Candida*: yeasts with pseudohyphae, not acute-angle septate hyphae.
- C, *Cryptococcus*: a capsulated budding yeast, not a mould.

Final Answer: *Aspergillus fumigatus* ⇒ D

Answer: (D) [Go Back to Q11](#)

Q12.

Solution

Concept – toxoplasmosis: This protozoan cycles between cats and other hosts.

Step 1 – name the parasite: *Toxoplasma gondii* has the cat as its definitive host, where sexual reproduction and oocyst shedding occur.

Step 2 – congenital disease: Tachyzoites can cross the placenta, causing congenital toxoplasmosis with chorioretinitis and intracranial calcification.

Why the other options are wrong:

- A, *P. vivax*: a malarial parasite spread by *Anopheles* mosquitoes.
- B, *Giardia lamblia*: a gut flagellate causing malabsorption.
- D, *Leishmania donovani*: causes visceral leishmaniasis via sandfly bite.

Final Answer: *Toxoplasma gondii* ⇒ C

Answer: (C) [Go Back to Q12](#)



Q13.

Solution

Concept – hookworm anaemia: One intestinal nematode feeds on blood and drains iron.

Step 1 – name it: *Ancylostoma duodenale*, the hookworm, whose filariform larvae penetrate the skin of the feet.

Step 2 – the effect: Adult worms attach to the small-intestinal mucosa and suck blood, producing chronic iron-deficiency anaemia.

Why the other options are wrong:

- A, *Ascaris*: the large roundworm, spread by ingested eggs.
- B, *Enterobius*: pinworm, causes perianal itching, not anaemia.
- D, *Wuchereria*: causes lymphatic filariasis, transmitted by mosquitoes.

Final Answer: *Ancylostoma duodenale* ⇒

Answer: (C) [Go Back to Q13](#)

Q14.

Solution

Concept – capsular identification: Type-specific antiserum can make a capsule visibly swell.

Step 1 – name the test: The **Quellung reaction** shows apparent capsular swelling when antiserum binds the polysaccharide capsule.

Step 2 – the classic use: It is used to serotype and identify *Streptococcus pneumoniae*, and also *Haemophilus* and *Klebsiella*.

Why the other options are wrong:

- B, optochin sensitivity: separates pneumococcus from other streptococci, but does not use antiserum.
- C, catalase test: distinguishes staphylococci from streptococci.
- D, coagulase test: identifies *Staphylococcus aureus*.

Final Answer: Quellung reaction ⇒

Answer: (A) [Go Back to Q14](#)



Q15.

Solution

Concept – the antiglobulin (Coombs) test: It detects antibody or complement coating red cells.

Step 1 – name the test: The **direct Coombs (antiglobulin) test** uses antihuman globulin to detect antibody or complement already bound to the patient's red cells.

Step 2 – the use: A positive direct test occurs in haemolytic disease of the newborn and autoimmune haemolytic anaemia.

Why the other options are wrong:

- A, Widal test: agglutination screen for enteric fever.
- B, Weil-Felix reaction: a heterophile test for rickettsial infection.
- D, latex agglutination: detects soluble antigens, not cell-bound antibody.

Final Answer: Direct Coombs (antiglobulin) test ⇒

Answer: (C) [Go Back to Q15](#)



Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	B	2	C	3	B	4	A	5	B
6	D	7	D	8	B	9	A	10	A
11	D	12	C	13	C	14	A	15	C

