

# INI CET Microbiology

## Sample Paper – 8

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.

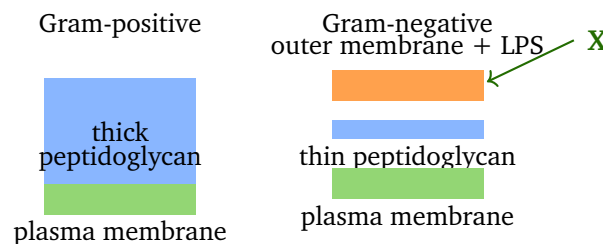
### General Microbiology and Sterilization

- Q1.** Penicillin and other beta-lactam antibiotics act by inhibiting the synthesis of which specific component of the bacterial cell wall?
- (A) Lipopolysaccharide of the outer membrane  
(B) Teichoic acid  
(C) Peptidoglycan (murein), built from a NAM-NAG backbone  
(D) Capsular polysaccharide
- Q2.** Which method of sterilization is a “cold” technique of choice for pre-packed, heat-sensitive disposable items such as plastic syringes and surgical sutures?



- (A) Autoclaving at 121 °C
- (B) Hot-air oven at 160 °C
- (C) Gamma (ionising) radiation sterilization
- (D) Boiling for 30 minutes

**Q3.** The two cell-wall structures below compare a gram-positive wall with a gram-negative wall. Which feature, marked X on the right-hand wall, is present only in gram-negative bacteria?



- (A) A thick multilayered peptidoglycan sheet
- (B) An outer membrane containing lipopolysaccharide (LPS)
- (C) Teichoic and lipoteichoic acids
- (D) A single plasma membrane

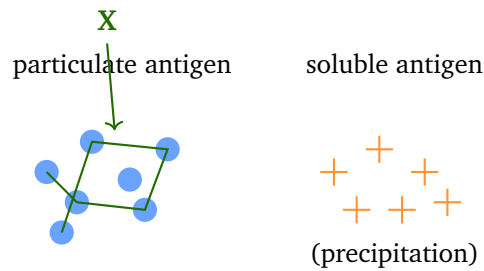
### Immunology

**Q4.** Which cell is regarded as the most potent professional antigen-presenting cell, uniquely able to prime naive T lymphocytes?

- (A) Dendritic cell
- (B) Neutrophil
- (C) Mast cell
- (D) Erythrocyte

**Q5.** In the two serological reactions drawn below, the left panel shows antibody cross-linking a particulate antigen into visible clumps, while the right shows a soluble antigen forming a lattice. What is the reaction shown in the left panel (marked X) called?



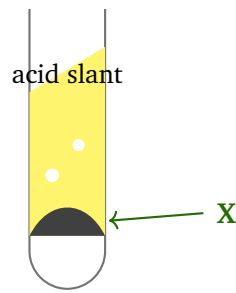


- (A) Precipitation
- (B) Agglutination
- (C) Opsonisation
- (D) Neutralisation

### Systematic Bacteriology

- Q6.** A gram-positive coccus in clusters is coagulase-negative and novobiocin-sensitive, and is a leading cause of biofilm-related infections on prosthetic heart valves and intravascular catheters. The most likely organism is:
- (A) *Staphylococcus epidermidis*
  - (B) *Staphylococcus aureus*
  - (C) *Staphylococcus saprophyticus*
  - (D) *Micrococcus luteus*
- Q7.** Which gram-negative enteric bacillus is non-motile, a non-lactose fermenter, does not produce gas, and causes bacillary dysentery?
- (A) *Salmonella Typhi*
  - (B) *Klebsiella pneumoniae*
  - (C) *Shigella dysenteriae*
  - (D) *Proteus mirabilis*
- Q8.** In the triple sugar iron (TSI) agar slant below, inoculated with a gram-negative bacillus, the tube shows an acid (yellow) slant and acid butt with gas bubbles and a black precipitate marked X. What does the black colour indicate?





- (A) Lactose fermentation
- (B) Urease activity
- (C) Hydrogen sulphide ( $H_2S$ ) production
- (D) Indole formation

### Virology

**Q9.** Which virus causes infectious mononucleosis, is detected by heterophile (Paul-Bunnell) antibodies, and is associated with Burkitt lymphoma and nasopharyngeal carcinoma?

- (A) Epstein-Barr virus (EBV)
- (B) Cytomegalovirus (CMV)
- (C) Herpes simplex virus type 2
- (D) Rubella virus

**Q10.** Which virus is the commonest cause of non-bacterial gastroenteritis outbreaks, notoriously affecting cruise ships, hospitals and other closed institutions?

- (A) Rotavirus
- (B) Astrovirus
- (C) Adenovirus type 40/41
- (D) Norovirus

### Mycology and Parasitology

**Q11.** A KOH mount of skin scrapings from hypopigmented patches shows short hyphae and round yeast cells in a “spaghetti and meatballs” pattern, diagnostic of pityriasis (tinea) versicolor. The causative fungus is:

- (A) *Trichophyton rubrum*
- (B) *Malassezia furfur*
- (C) *Microsporum canis*
- (D) *Epidermophyton floccosum*

**Q12.** Which blood and tissue flagellate, transmitted by the tsetse fly, causes African sleeping sickness and (as a related species) Chagas disease, with trypomastigotes seen in a blood film?

- (A) *Leishmania tropica*
- (B) *Giardia lamblia*
- (C) *Toxoplasma gondii*
- (D) *Trypanosoma*

**Q13.** Which intestinal nematode is capable of autoinfection, produces the migrating skin eruption “larva currens”, and can cause a life-threatening hyperinfection syndrome in immunocompromised hosts?

- (A) *Ascaris lumbricoides*
- (B) *Strongyloides stercoralis*
- (C) *Enterobius vermicularis*
- (D) *Trichuris trichiura*

### Applied and Diagnostic Microbiology

**Q14.** Which modern technique identifies cultured bacteria within minutes by generating a characteristic ribosomal-protein “fingerprint” spectrum?

- (A) MALDI-TOF mass spectrometry
- (B) Gram staining
- (C) Coagulase test
- (D) Widal test



- Q15.** Which blood test detects latent tuberculosis by measuring the release of a cytokine from sensitised T cells after stimulation with *M. tuberculosis*-specific antigens, and is not confounded by prior BCG vaccination?
- (A) Mantoux (tuberculin skin) test
  - (B) Ziehl-Neelsen sputum smear
  - (C) Lowenstein-Jensen culture
  - (D) Interferon-gamma release assay (IGRA)



**Detailed Solutions****Q1.****Solution**

**Concept – target of beta-lactams:** The bacterial cell wall owes its rigidity to a mesh polymer that penicillins attack.

**Step 1 – name the component:** Beta-lactams inhibit synthesis of **peptidoglycan (murein)**, a lattice of alternating N-acetylmuramic acid (NAM) and N-acetylglucosamine (NAG) cross-linked by short peptides.

**Step 2 – the mechanism:** They bind penicillin-binding proteins (transpeptidases) and block the final cross-linking step, so the wall weakens and the cell lyses.

**Why the other options are wrong:**

- A, LPS: a gram-negative outer-membrane lipid, not the beta-lactam target.
- B, teichoic acid: a wall accessory polymer, not what penicillin inhibits.
- D, capsule: an outer polysaccharide coat unrelated to this drug action.

**Final Answer:** Peptidoglycan (murein) ⇒

**Answer: (C)** [Go Back to Q1](#)

**Q2.****Solution**

**Concept – cold sterilization of heat-sensitive items:** Some disposables cannot survive heat, so a non-thermal method is used.

**Step 1 – pick the method: Gamma (ionising) radiation sterilization** passes high-energy rays through pre-packed items and destroys microbial nucleic acid without raising the temperature.

**Step 2 – the use:** It is an industrial cold method for plastic syringes, catheters, sutures, gloves and similar single-use goods.

**Why the other options are wrong:**

- A, autoclave: moist heat would melt or distort plastics.
- B, hot-air oven: dry heat at 160 °C also damages plastics.
- D, boiling: only disinfects and does not reliably kill spores.

**Final Answer:** Gamma (ionising) radiation ⇒

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



Q3.

**Solution**

**Concept – gram-positive vs gram-negative walls:** The two wall types differ in peptidoglycan thickness and an extra membrane.

**Step 1 – read the figure:** X points to the extra layer sitting outside the thin peptidoglycan on the gram-negative wall.

**Step 2 – name the feature:** This is the **outer membrane containing lipopolysaccharide (LPS)**, unique to gram-negatives; its lipid A is the endotoxin.

**Why the other options are wrong:**

- A, thick peptidoglycan: characteristic of gram-positives, not gram-negatives.
- C, teichoic acids: found in gram-positive walls only.
- D, plasma membrane: present in both types, so not distinguishing.

**Final Answer:** Outer membrane with LPS ⇒ **B**

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

Q4.

**Solution**

**Concept – professional antigen-presenting cells:** Only a few cell types can activate a naive T cell for the first time.

**Step 1 – name the cell:** The **dendritic cell** is the most potent professional APC and the only one that reliably primes naive T cells.

**Step 2 – why:** It captures antigen in tissues, matures, migrates to lymph nodes, and displays peptide on MHC with strong co-stimulation.

**Why the other options are wrong:**

- B, neutrophil: a phagocyte of acute inflammation, not an APC for naive T cells.
- C, mast cell: releases histamine in allergy, not an antigen presenter.
- D, erythrocyte: has no nucleus and does not present antigen.

**Final Answer:** Dendritic cell ⇒ **A**

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





Q5.

**Solution**

**Concept – agglutination vs precipitation:** Antigen physical form decides the name of the antibody reaction.

**Step 1 – read the figure:** X marks antibody cross-linking a *particulate* antigen (cells or latex beads) into visible clumps.

**Step 2 – name the reaction:** A reaction of antibody with a particulate antigen is called **agglutination**; with a soluble antigen it would be precipitation (right panel).

**Why the other options are wrong:**

- A, precipitation: needs a *soluble* antigen forming a lattice, not particles.
- C, opsonisation: coating a microbe to aid phagocytosis, not visible clumping.
- D, neutralisation: blocking a toxin or virus, no clumping involved.

**Final Answer:** Agglutination ⇒ B

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

Q6.

**Solution**

**Concept – coagulase-negative staphylococci:** These skin commensals cause device-related infection through biofilm.

**Step 1 – apply the clues:** Coagulase-negative, novobiocin-sensitive clusters that stick to prosthetic material point to *Staphylococcus epidermidis*.

**Step 2 – the disease:** It forms a slime biofilm on catheters, prosthetic valves and joints, causing indolent device infections.

**Why the other options are wrong:**

- B, *S. aureus*: coagulase-*positive*, so excluded.
- C, *S. saprophyticus*: coagulase-negative but novobiocin-*resistant*, causes cystitis.
- D, *Micrococcus luteus*: a modified-oxidase-positive skin coccus, not a biofilm pathogen here.

**Final Answer:** *Staphylococcus epidermidis* ⇒ A

**Answer: (A)** [Go Back to Q6](#)



Q7.

**Solution**

**Concept – causes of bacillary dysentery:** A non-motile, non-lactose-fermenting enteric rod is characteristic.

**Step 1 – apply the clues:** Non-motile, non-lactose fermenter, no gas, causing dysentery describes *Shigella dysenteriae*.

**Step 2 – the disease:** It invades colonic mucosa (aided by Shiga toxin) and causes bloody, mucoid diarrhoea with a very low infective dose.

**Why the other options are wrong:**

- A, *Salmonella Typhi*: motile and H<sub>2</sub>S positive, causes enteric fever.
- B, *Klebsiella*: a lactose fermenter with a large capsule.
- D, *Proteus*: strongly motile with swarming and urease activity.

**Final Answer:** *Shigella dysenteriae* ⇒

**Answer: (C)** [Go Back to Q7](#)

Q8.

**Solution**

**Concept – triple sugar iron (TSI) agar:** TSI reads sugar fermentation, gas and hydrogen sulphide at once.

**Step 1 – read the tube:** X marks the black precipitate in the butt of the slant.

**Step 2 – interpret it:** Blackening indicates **hydrogen sulphide (H<sub>2</sub>S) production**; H<sub>2</sub>S reacts with the ferrous salt in the medium to form black ferrous sulphide.

**Why the other options are wrong:**

- A, lactose fermentation: shown by a yellow slant, not blackening.
- B, urease: not tested on TSI; it needs urea medium.
- D, indole: needs Kovac's reagent on a separate tryptophan broth.

**Final Answer:** H<sub>2</sub>S production ⇒

**Answer: (C)** [Go Back to Q8](#)



Q9.

**Solution**

**Concept – Epstein-Barr virus:** One herpesvirus links glandular fever to specific tumours.

**Step 1 – name the virus:** Epstein-Barr virus (EBV) causes infectious mononucleosis and produces heterophile (Paul-Bunnell) antibodies.

**Step 2 – the associations:** It infects B cells and is linked to Burkitt lymphoma and nasopharyngeal carcinoma.

**Why the other options are wrong:**

- B, CMV: causes a heterophile-negative mononucleosis-like illness.
- C, HSV-2: causes genital herpes, not glandular fever.
- D, rubella: causes German measles and congenital rubella syndrome.

**Final Answer:** Epstein-Barr virus  $\Rightarrow$

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

Q10.

**Solution**

**Concept – viral gastroenteritis outbreaks:** One virus dominates explosive outbreaks in closed settings.

**Step 1 – name the virus:** Norovirus is the commonest cause of non-bacterial gastroenteritis outbreaks.

**Step 2 – the setting:** Its low infective dose and environmental stability cause sudden vomiting-and-diarrhoea outbreaks on cruise ships, in hospitals and in care homes.

**Why the other options are wrong:**

- A, rotavirus: chiefly severe diarrhoea in infants, not adult outbreaks.
- B, astrovirus: milder paediatric diarrhoea, far less common.
- C, adenovirus 40/41: enteric diarrhoea in young children, not outbreak-defining.

**Final Answer:** Norovirus  $\Rightarrow$

**Answer: (D)** [Go Back to Q10](#)



Q11.

**Solution**

**Concept – pityriasis versicolor:** A lipophilic yeast alters skin pigment and gives a classic KOH picture.

**Step 1 – name the fungus:** The “spaghetti and meatballs” KOH appearance on hypopigmented patches is caused by *Malassezia furfur*.

**Step 2 – the mount:** Short curved hyphae (spaghetti) mixed with round yeast cells (meatballs) are seen on scrapings.

**Why the other options are wrong:**

- A, *Trichophyton rubrum*: a dermatophyte causing tinea corporis and onychomycosis.
- C, *Microsporum canis*: a dermatophyte of tinea capitis, fluoresces under Wood’s lamp.
- D, *Epidermophyton floccosum*: a dermatophyte of tinea cruris and pedis.

**Final Answer:** *Malassezia furfur* ⇒ B

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

Q12.

**Solution**

**Concept – blood and tissue flagellates:** One genus links sleeping sickness and Chagas disease.

**Step 1 – name the parasite:** *Trypanosoma* causes African sleeping sickness (tsetse-fly transmitted *T. brucei*) and Chagas disease (*T. cruzi*).

**Step 2 – the clue:** Motile trypomastigotes are seen in a peripheral blood film during the parasitaemic phase.

**Why the other options are wrong:**

- A, *Leishmania tropica*: sandfly-borne, causes cutaneous leishmaniasis.
- B, *Giardia lamblia*: an intestinal flagellate causing diarrhoea.
- C, *Toxoplasma gondii*: an apicomplexan acquired from cats and undercooked meat.

**Final Answer:** *Trypanosoma* ⇒ D

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



Q13.

**Solution**

**Concept – autoinfecting nematode:** One worm can multiply within the host and overwhelm the immunosuppressed.

**Step 1 – name the parasite:** *Strongyloides stercoralis* undergoes autoinfection and produces the racing skin track “larva currens”.

**Step 2 – the danger:** In immunocompromised hosts (steroids, HTLV-1) autoinfection escalates into a fatal hyperinfection with disseminated larvae.

**Why the other options are wrong:**

- A, *Ascaris*: a large roundworm without autoinfection.
- C, *Enterobius*: pinworm causing perianal itching, no hyperinfection.
- D, *Trichuris*: whipworm causing colitis and rectal prolapse, no autoinfection.

**Final Answer:** *Strongyloides stercoralis* ⇒ B

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

Q14.

**Solution**

**Concept – rapid bacterial identification:** A protein-fingerprint method has transformed the modern laboratory.

**Step 1 – name the technique:** MALDI-TOF mass spectrometry ionises ribosomal proteins from a colony and reads their mass spectrum.

**Step 2 – the use:** The spectrum is matched to a database, giving a species identification within minutes from cultured growth.

**Why the other options are wrong:**

- B, Gram staining: gives only morphology and staining reaction, not species.
- C, coagulase test: separates *S. aureus* from other staphylococci alone.
- D, Widal test: a serological test for enteric fever, not identification of a colony.

**Final Answer:** MALDI-TOF mass spectrometry ⇒ A

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



Q15.

**Solution**

**Concept – detecting latent tuberculosis:** A cytokine-release blood test avoids the pitfalls of the skin test.

**Step 1 – name the test:** The **interferon-gamma release assay (IGRA)** measures interferon-gamma released by sensitised T cells after exposure to *M. tuberculosis*-specific antigens (ESAT-6, CFP-10).

**Step 2 – the advantage:** Because those antigens are absent from BCG, the IGRA is not confounded by prior BCG vaccination.

**Why the other options are wrong:**

- A, Mantoux: a skin test that cross-reacts with BCG, giving false positives.
- B, Ziehl-Neelsen smear: detects active bacilli in sputum, not latent infection.
- C, Lowenstein-Jensen culture: grows the organism from active disease, taking weeks.

**Final Answer:** Interferon-gamma release assay (IGRA) ⇒ D

Answer: (D)   [Go Back to Q15](#)



**Answer Key**

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

