

INI CET Microbiology

Sample Paper – 2

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.

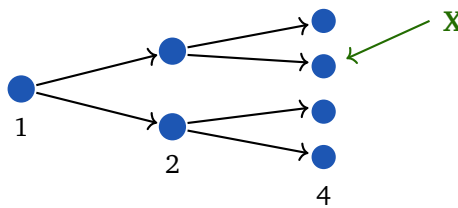
General Microbiology and Sterilization

- Q1.** In the Gram staining procedure, which single step is most critical in separating gram-positive from gram-negative bacteria, because it determines whether the crystal-violet–iodine complex is retained or washed out?
- (A) Application of the primary crystal-violet stain
(B) The decolourisation step with alcohol or acetone
(C) Fixing the smear with gentle heat
(D) Counterstaining with safranin
- Q2.** Which set of conditions correctly describes dry-heat sterilization in a standard hot-air oven, the method routinely used for glassware and powders?



- (A) 160 °C for 2 hours
- (B) 121 °C at 15 psi for 15 minutes
- (C) 63 °C for 30 minutes
- (D) 100 °C at atmospheric pressure for 10 minutes

Q3. The diagram below shows a single bacterium dividing by binary fission through successive generations. If growth starts from one cell, the number of bacteria after n generations, marked **X**, is given by:



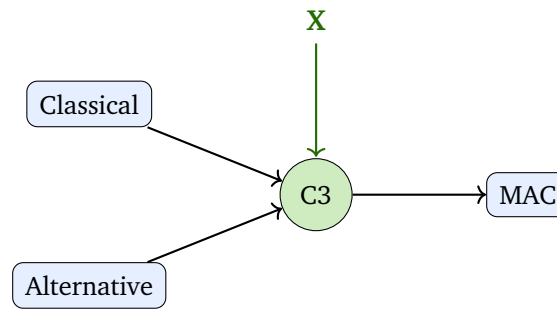
- (A) 2^n
- (B) $2n$
- (C) n^2
- (D) $n + 2$

Immunology

Q4. Which immunoglobulin class is the only one that crosses the human placenta, providing passive immunity to the newborn?

- (A) IgM
- (B) IgG
- (C) IgA
- (D) IgE

Q5. In the schematic of the complement system below, the classical and alternative pathways both converge on the component marked **X**, the central point of the cascade. This component is:

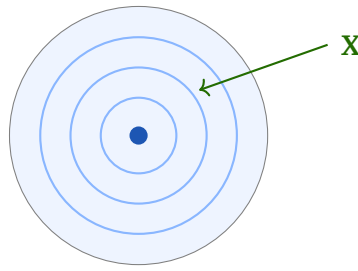


- (A) C1
- (B) C3
- (C) C9
- (D) Factor B

Systematic Bacteriology

- Q6.** A gram-positive coccus in grape-like clusters gives a positive **coagulase** test, the single feature that separates it from other staphylococci. The organism is:
- (A) *Staphylococcus epidermidis*
 - (B) *Staphylococcus saprophyticus*
 - (C) *Staphylococcus aureus*
 - (D) *Micrococcus luteus*
- Q7.** Albert staining of a throat smear shows club-shaped bacilli in a Chinese-letter arrangement with metachromatic (volutin) granules. The most likely organism is:
- (A) *Bacillus anthracis*
 - (B) *Listeria monocytogenes*
 - (C) *Clostridium tetani*
 - (D) *Corynebacterium diphtheriae*
- Q8.** The blood-agar plate below shows successive concentric rings of confluent growth spreading across the whole surface, marked X. This swarming, urease-positive organism is:





- (A) *Klebsiella pneumoniae*
- (B) *Pseudomonas aeruginosa*
- (C) *Proteus mirabilis*
- (D) *Escherichia coli*

Virology

Q9. In hepatitis B infection, the complete infectious virion, a 42 nm double-shelled DNA particle of the family Hepadnaviridae, is known as the:

- (A) Dane particle
- (B) Negri body
- (C) Guarnieri body
- (D) Councilman body

Q10. Histological examination of brain tissue from a suspected rabies case shows eosinophilic cytoplasmic inclusion bodies in the hippocampal and Purkinje neurons. These inclusions are called:

- (A) Owl-eye inclusions
- (B) Cowdry type A bodies
- (C) Guarnieri bodies
- (D) Negri bodies

Mycology and Parasitology

Q11. A yeast isolate is incubated in serum at 37 °C for 2 to 3 hours and forms germ tubes (the Reynolds-Braude phenomenon). This rapid identification test is positive for:



- (A) *Cryptococcus neoformans*
- (B) *Aspergillus fumigatus*
- (C) *Histoplasma capsulatum*
- (D) *Candida albicans*

Q12. Relapses of malaria weeks to months after the initial illness are caused by dormant liver-stage hypnozoites and require primaquine for radical cure. Which species is chiefly responsible?

- (A) *Plasmodium vivax*
- (B) *Plasmodium falciparum*
- (C) *Plasmodium malariae*
- (D) *Plasmodium knowlesi*

Q13. A nematode showing nocturnal periodicity, transmitted by the *Culex* mosquito and causing lymphatic obstruction leading to elephantiasis, is:

- (A) *Ascaris lumbricoides*
- (B) *Ancylostoma duodenale*
- (C) *Wuchereria bancrofti*
- (D) *Enterobius vermicularis*

Applied and Diagnostic Microbiology

Q14. The Widal test detects agglutinating antibodies against which antigens to aid the diagnosis of enteric fever caused by *Salmonella* Typhi?

- (A) Vi capsular antigen alone
- (B) K and F antigens
- (C) O (somatic) and H (flagellar) antigens
- (D) M and R antigens

Q15. A freshly prepared reagent turns deep blue-purple within seconds when rubbed on a colony of *Pseudomonas aeruginosa*, indicating the presence of cytochrome c oxidase. This test is the:



- (A) Catalase test
- (B) Oxidase test
- (C) Coagulase test
- (D) Urease test



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

Concept – the Gram stain: The stain works because gram-positive cells hold the crystal-violet–iodine complex while gram-negative cells lose it.

Step 1 – identify the decisive step: After crystal violet and iodine, the smear is treated with **alcohol or acetone**. This decolourisation is the critical, time-sensitive step.

Step 2 – what the decolouriser does: It dehydrates the thick peptidoglycan of gram-positive walls, trapping the dye complex (they stay purple), but dissolves the thin wall and outer membrane lipids of gram-negative cells, washing the dye out (they take up the safranin counterstain and appear pink).

Why the other options are wrong:

- A, crystal violet: stains all cells equally, so it cannot distinguish them.
- C, heat fixing: only anchors cells to the slide.
- D, safranin: merely counterstains the already decolourised cells.

Final Answer: The decolourisation step with alcohol/acetone $\Rightarrow$ **B**

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

Q2.**Solution**

Concept – dry-heat sterilization: A hot-air oven kills microbes by oxidative destruction of cell constituents, which needs a higher temperature and longer time than moist heat.

Step 1 – recall the standard cycle: The routine hot-air oven condition is **160 °C for 2 hours**.

Step 2 – typical uses: It suits items that must stay dry or that steam would damage, such as glass syringes, Petri dishes, powders and oils.

Why the other options are wrong:

- B, 121 °C at 15 psi for 15 minutes: this is autoclave (moist heat).
- C, 63 °C for 30 minutes: holder pasteurisation of milk, not sterilization.
- D, 100 °C for 10 minutes: mere boiling, which does not kill spores.



Final Answer: 160 °C for 2 hours $\Rightarrow$ A

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

Q3.

Solution

Concept – binary fission: Bacteria multiply by splitting one cell into two identical daughter cells, doubling the population each generation.

Step 1 – trace the doubling: Start with 1 cell. After 1 generation there are 2, after 2 generations 4, after 3 generations 8, and so on: each step multiplies the count by 2.

Step 2 – write the formula: Beginning from a single cell, the number after n generations is $1 \times 2^n = 2^n$. This is the value marked X.

Why the other options are wrong:

- B, $2n$: linear growth, which would give only 6 after 3 generations, not 8.
- C, n^2 : gives 9 after 3 generations, which does not match doubling.
- D, $n + 2$: additive, unrelated to exponential division.

Final Answer: $2^n \Rightarrow$ A

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

Q4.

Solution

Concept – placental transfer of antibody: Only one immunoglobulin class can be actively transported across the placenta.

Step 1 – name the class: IgG is the only immunoglobulin that crosses the placenta, carried by FcRn receptors on the trophoblast.

Step 2 – the consequence: Maternal IgG gives the newborn passive protection for the first few months of life until the infant's own antibody production matures.

Why the other options are wrong:

- A, IgM: a large pentamer, too big to cross the placenta; its presence in cord blood suggests intrauterine infection.
- C, IgA: reaches the infant through breast milk, not the placenta.
- D, IgE: mediates allergy and does not cross the placenta.



Final Answer: IgG $\Rightarrow$ B

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

Q5.

Solution

Concept – the complement cascade: The classical, alternative and lectin pathways each activate a shared central component before the terminal lytic sequence.

Step 1 – read the figure: X sits where both the classical and alternative arms meet before the membrane attack complex.

Step 2 – name the component: That convergence point is **C3**. Its cleavage to C3a and C3b is the pivotal, most abundant step, feeding into the common terminal pathway (C5–C9).

Why the other options are wrong:

- A, C1: begins only the classical pathway, not the alternative one.
- C, C9: a terminal component that polymerises to form the membrane pore, downstream of C3.
- D, Factor B: acts only within the alternative pathway, upstream of the shared C3 step.

Final Answer: C3 $\Rightarrow$ B

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

Q6.

Solution

Concept – identifying staphylococci: Gram-positive cocci in clusters are separated chiefly by the coagulase test.

Step 1 – apply the test: A **coagulase-positive** cluster-forming coccus clots plasma by producing coagulase.

Step 2 – name it: This is *Staphylococcus aureus*, the main pathogenic staphylococcus, causing abscesses, food poisoning and wound infection.

Why the other options are wrong:

- A, *S. epidermidis*: coagulase-negative, a skin commensal and device-related pathogen.



- B, *S. saprophyticus*: coagulase-negative, novobiocin resistant, causes cystitis.
- D, *Micrococcus luteus*: a catalase-positive, coagulase-negative environmental coccus.

Final Answer: *Staphylococcus aureus* ⇒

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

Q7.

Solution

Concept – Albert stain and volutin granules: Some bacilli store polyphosphate as metachromatic granules revealed by Albert stain.

Step 1 – read the clues: Club-shaped bacilli in a **Chinese-letter** arrangement with bluish-black metachromatic granules against a green body are classic for *Corynebacterium diphtheriae*.

Step 2 – the disease: It produces diphtheria toxin, causing a grey pseudomembrane in the throat; the granules of volutin store energy-rich phosphate.

Why the other options are wrong:

- A, *Bacillus anthracis*: large box-car bacilli in chains, not club shaped.
- B, *Listeria monocytogenes*: short rods with tumbling motility, no volutin granules.
- C, *Clostridium tetani*: drumstick spore former, not identified by Albert stain.

Final Answer: *Corynebacterium diphtheriae* ⇒

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

Q8.

Solution

Concept – swarming motility: A few motile bacteria spread across the entire agar surface in periodic waves rather than forming discrete colonies.

Step 1 – read the plate: X marks the concentric rings of confluent growth covering the plate, the hallmark of **swarming**.

Step 2 – name the organism: This urease-positive, highly motile organism is *Proteus mirabilis*, a cause of urinary tract infection and struvite stones.

Why the other options are wrong:



- A, *Klebsiella pneumoniae*: non-motile, forms large mucoid colonies, no swarming.
- B, *Pseudomonas aeruginosa*: motile with green pigment but does not swarm in concentric rings.
- D, *Escherichia coli*: forms discrete colonies, not a swarming lawn.

Final Answer: *Proteus mirabilis* ⇒

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

Q9.

Solution

Concept – the structure of hepatitis B virus: Serum of infected patients contains several particle types, but only one is the whole infectious virus.

Step 1 – name the particle: The complete 42 nm double-shelled virion of hepatitis B is the **Dane particle**.

Step 2 – its make-up: It has an outer HBsAg envelope surrounding an inner core (HBcAg) that contains partially double-stranded DNA and DNA polymerase; it belongs to the family Hepadnaviridae.

Why the other options are wrong:

- B, Negri body: a rabies cytoplasmic inclusion, not a hepatitis particle.
- C, Guarnieri body: an inclusion of poxviruses such as vaccinia.
- D, Councilman body: an apoptotic hepatocyte, seen in viral hepatitis and yellow fever, not the virion itself.

Final Answer: Dane particle ⇒

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

Q10.

Solution

Concept – pathology of rabies: The bullet-shaped rabies virus leaves a characteristic neuronal inclusion.

Step 1 – name the inclusion: Eosinophilic cytoplasmic inclusions in hippocampal and Purkinje neurons are **Negri bodies**.

Step 2 – significance: Their presence in brain tissue is diagnostic of rabies; they represent aggregates of viral nucleocapsid within infected neurons.



Why the other options are wrong:

- A, owl-eye inclusions: intranuclear inclusions of cytomegalovirus.
- B, Cowdry type A bodies: intranuclear inclusions of herpes simplex virus.
- C, Guarnieri bodies: cytoplasmic inclusions of poxviruses.

Final Answer: Negri bodies $\Rightarrow$

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

Q11.

Solution

Concept – the germ-tube test: A rapid presumptive test distinguishes one yeast by its ability to form germ tubes in serum.

Step 1 – read the result: Germ-tube formation in serum at 37°C within 2 to 3 hours (the Reynolds-Braude phenomenon) is positive for *Candida albicans*.

Step 2 – the detail: A germ tube is a filamentous outgrowth without a constriction at its origin, distinguishing true germ tubes from pseudohyphae.

Why the other options are wrong:

- A, *Cryptococcus neoformans*: a capsulated yeast, germ-tube negative.
- B, *Aspergillus fumigatus*: a mould with septate hyphae, not a yeast.
- C, *Histoplasma capsulatum*: a dimorphic fungus forming intracellular yeasts, not germ tubes.

Final Answer: *Candida albicans* $\Rightarrow$

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

Q12.

Solution

Concept – relapsing malaria: Some *Plasmodium* species leave dormant liver forms that cause true relapse.

Step 1 – name the species: Relapses from dormant hepatic **hypnozoites** are typical of *Plasmodium vivax* (and *P. ovale*).

Step 2 – the treatment point: Because chloroquine or artemisinins do not kill hypnozoites, **primaquine** is added for radical cure to prevent relapse.



Why the other options are wrong:

- B, *P. falciparum*: has no hypnozoite stage, so it causes recrudescence, not relapse.
- C, *P. malariae*: causes long-term recrudescence from persistent blood forms, not liver relapse.
- D, *P. knowlesi*: a zoonotic species with a short cycle and no hypnozoites.

Final Answer: *Plasmodium vivax* ⇒

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

Q13.

Solution

Concept – lymphatic filariasis: A tissue nematode blocks lymphatics and shows timed appearance of microfilariae in blood.

Step 1 – match the clues: Nocturnal periodicity, transmission by *Culex* and lymphatic obstruction point to *Wuchereria bancrofti*.

Step 2 – the outcome: Adult worms in lymphatics cause lymphoedema and, over years, elephantiasis and hydrocele; microfilariae circulate mainly at night.

Why the other options are wrong:

- A, *Ascaris lumbricoides*: an intestinal roundworm, not lymphatic.
- B, *Ancylostoma duodenale*: hookworm causing iron-deficiency anaemia.
- D, *Enterobius vermicularis*: pinworm causing perianal itching.

Final Answer: *Wuchereria bancrofti* ⇒

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

Q14.

Solution

Concept – the Widal test: A tube or slide agglutination test measures antibodies against *Salmonella* Typhi antigens.

Step 1 – name the antigens: The Widal test detects rising agglutinin titres against the **O (somatic)** and **H (flagellar)** antigens.

Step 2 – interpretation: Paired sera showing a fourfold rise, or a high single titre in an endemic area, support enteric fever; O antibody rises earlier and falls sooner



than H antibody.

Why the other options are wrong:

- A, Vi antigen alone: not part of the standard Widal test; used mainly to detect carriers.
- B, K and F antigens: capsular and fimbrial antigens of other Enterobacteriaceae.
- D, M and R antigens: not relevant *Salmonella* antigens for this test.

Final Answer: O (somatic) and H (flagellar) antigens ⇒

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

Q15.

Solution

Concept – the oxidase test: The test detects the enzyme cytochrome c oxidase in the bacterial respiratory chain.

Step 1 – read the reaction: A colony that turns the reagent (tetramethyl-p-phenylenediamine) deep blue-purple within seconds is **oxidase positive**.

Step 2 – the organisms: *Pseudomonas aeruginosa* and *Neisseria* species are strongly oxidase positive, a useful screening clue.

Why the other options are wrong:

- A, catalase test: detects catalase by bubbling in hydrogen peroxide, a different enzyme.
- C, coagulase test: clots plasma, used for staphylococci.
- D, urease test: detects urea splitting, positive for *Proteus* and *Helicobacter*.

Final Answer: Oxidase test ⇒

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



Answer Key

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

