INI CET Microbiology

Sample Paper – 1

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 technique is used to demonstrate acid-fast bacilli such as *Mycobacterium tuberculosis*?

(A) Gram stain

(B) Albert stain

(C) Ziehl-Neelsen stain

(D) India ink preparation

Q2. Which set of conditions correctly describes moist-heat sterilization in a standard autoclave?

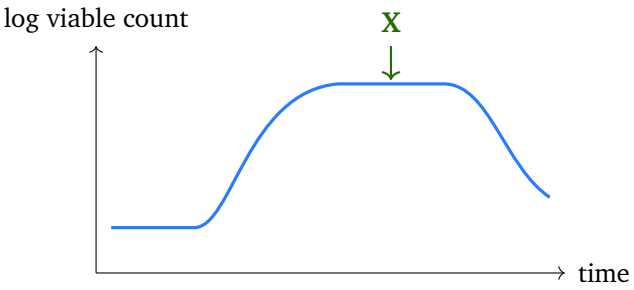
(A) 121 °C at 15 psi for 15 minutes

(B) 100 °C at atmospheric pressure for 30 minutes

(C) 160 °C dry heat for 2 hours

(D) 63 °C for 30 minutes

Q3. In the bacterial growth curve below, the phase marked **X**, where the number of viable cells stays almost constant because the rate of division equals the rate of death, is the:



(A) Lag phase

(B) Log (exponential) phase

(C) Stationary phase

(D) Decline (death) phase

Immunology

Q4. Which immunoglobulin class is the first antibody to be produced in a primary immune response?

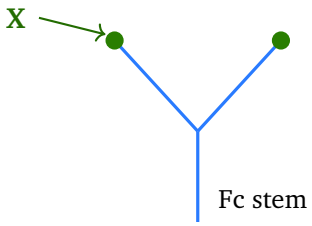
(A) IgM

(B) IgG

(C) IgA

(D) IgE

Q5. In the schematic antibody molecule below, the region marked **X** at the tips of the arms, which binds the antigen, is the:



(A) Fc region

(B) Fab (antigen-binding) region

(C) Hinge region

(D) Constant heavy (CH3) domain

Systematic Bacteriology

Q6. A gram-positive, catalase-negative coccus arranged in chains produces beta-haemolysis on blood agar and is bacitracin sensitive. The most likely organism is:

(A) *Staphylococcus aureus*

(B) *Streptococcus pneumoniae*

(C) *Enterococcus faecalis*

(D) *Streptococcus pyogenes*

Q7. Which organism, a curved gram-negative rod with rapid darting motility, is the causative agent of cholera?

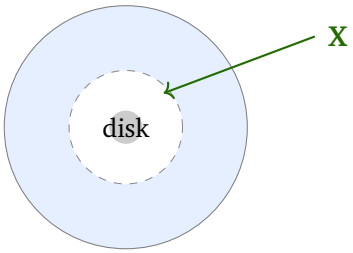
(A) *Campylobacter jejuni*

(B) *Vibrio cholerae*

(C) *Helicobacter pylori*

(D) *Escherichia coli*

Q8. In the disk-diffusion (Kirby-Bauer) antibiotic susceptibility plate below, the clear region marked **X** around the antibiotic disk indicates:



(A) Bacterial overgrowth toward the disk

(B) Contamination of the plate

(C) Resistance of the organism to the antibiotic

(D) A zone of inhibition indicating susceptibility

Virology

Q9. Hepatitis A virus, a small non-enveloped positive-sense single-stranded RNA virus, belongs to which family?

(A) Hepadnaviridae

(B) Herpesviridae

(C) Picornaviridae (genus *Hepatovirus*)

(D) Orthomyxoviridae

Q10. The enzyme reverse transcriptase, which synthesizes DNA from an RNA template, is a defining feature of which virus family?

(A) Retroviridae (e.g. HIV)

(B) Adenoviridae

(C) Poxviridae

(D) Caliciviridae

Mycology and Parasitology

Q11. An India-ink preparation of cerebrospinal fluid showing a wide unstained capsule around budding yeast cells points to meningitis caused by:

(A) *Candida albicans*

(B) *Aspergillus fumigatus*

(C) *Cryptococcus neoformans*

(D) *Histoplasma capsulatum*

Q12. Which *Plasmodium* species is responsible for the most severe, potentially fatal cerebral malaria?

(A) *Plasmodium vivax*

(B) *Plasmodium ovale*

(C) *Plasmodium malariae*

(D) *Plasmodium falciparum*

Q13. Which parasite is the causative agent of amoebic dysentery and amoebic liver abscess?

(A) *Entamoeba histolytica*

(B) *Giardia lamblia*

(C) *Trichomonas vaginalis*

(D) *Leishmania donovani*

Applied and Diagnostic Microbiology

Q14. Which laboratory test detects antibodies through an enzyme-linked colour change and is widely used to screen for HIV infection?

(A) Widal test

(B) ELISA (enzyme-linked immunosorbent assay)

(C) Gram staining

(D) Catalase test

Q15. The Mantoux (tuberculin skin) test, read 48 to 72 hours after intradermal injection, is an example of which type of hypersensitivity reaction?

(A) Type I (immediate, IgE mediated)

(B) Type IV (delayed-type, cell mediated)

(C) Type II (cytotoxic)

(D) Type III (immune complex)

Detailed Solutions

Q1.

Solution

Concept – acid-fast staining: Mycobacteria have a waxy, mycolic-acid-rich wall that resists ordinary stains.

Step 1 – name the method: The **Ziehl-Neelsen stain** uses hot carbol fuchsin, an acid-alcohol wash, then a methylene blue counterstain.

Step 2 – the result: Acid-fast bacilli retain the red fuchsin and appear as red rods against a blue background.

Why the other options are wrong:

- A, Gram stain: mycobacteria stain poorly and are not classified this way.
- B, Albert stain: shows metachromatic granules of *Corynebacterium diphtheriae*.
- D, India ink: a negative stain for capsules, such as *Cryptococcus*.

Final Answer: Ziehl-Neelsen stain $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept – moist-heat sterilization: The autoclave kills spores using saturated steam under pressure.

Step 1 – recall the standard cycle: The routine condition is **121 °C at 15 psi for 15 minutes**.

Step 2 – why it works: Steam under pressure reaches a higher temperature than boiling water and denatures microbial proteins, including bacterial endospores.

Why the other options are wrong:

- B, 100 °C open boiling: disinfects but does not reliably kill spores.
- C, 160 °C dry heat for 2 hours: a hot-air oven cycle, not an autoclave.
- D, 63 °C for 30 minutes: holder pasteurisation of milk, not sterilization.

Final Answer: 121 °C at 15 psi for 15 minutes $\Rightarrow$ A

Answer: (A) Go Back to Q2

Q3.

Solution

Concept – the bacterial growth curve: It has four phases: lag, log, stationary and decline.

Step 1 – read the label: **X** sits on the flat top of the curve after exponential growth.

Step 2 – identify the phase: This is the **stationary phase**, where nutrient depletion and waste build-up make new division equal to cell death, so viable numbers plateau.

Why the other options are wrong:

- A, lag phase: the initial flat part before growth, cells adapting.
- B, log phase: the steep rising portion of exponential division.
- D, decline phase: the falling tail where death exceeds division.

Final Answer: Stationary phase $\Rightarrow$ C

Answer: (C) Go Back to Q3

Q4.

Solution

Concept – primary immune response: The first exposure to an antigen has a characteristic antibody sequence.

Step 1 – name the class: **IgM** is the first immunoglobulin produced, a large pentamer well suited to early defence.

Step 2 – what follows: Class switching then raises IgG, which dominates the later and secondary responses.

Why the other options are wrong:

- B, IgG: rises later and is the main memory antibody.
- C, IgA: guards mucosal surfaces and secretions.
- D, IgE: mediates allergy and antiparasitic responses.

Final Answer: IgM $\Rightarrow$ A

Answer: (A) Go Back to Q4

Q5.

Solution

Concept – antibody architecture: The Y-shaped molecule has antigen-binding arms and a constant stem.

Step 1 – read the figure: **X** points to the tips of the two arms, which carry the variable regions.

Step 2 – name the region: These tips are the **Fab (antigen-binding) region**, formed by variable light and heavy chains.

Why the other options are wrong:

- A, Fc region: the stem that binds complement and cell receptors, not antigen.
- C, hinge region: the flexible junction between Fab arms and Fc stem.
- D, CH3 domain: a constant domain within the Fc stem.

Final Answer: Fab (antigen-binding) region $\Rightarrow$ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept – identifying beta-haemolytic streptococci: Chain-forming cocci are separated by haemolysis and bacitracin sensitivity.

Step 1 – apply the clues: Catalase-negative chains, beta-haemolysis and bacitracin sensitivity point to Group A *Streptococcus*.

Step 2 – name it: This is ***Streptococcus pyogenes***, cause of pharyngitis, impetigo and rheumatic fever.

Why the other options are wrong:

- A, *S. aureus*: catalase-positive cocci in clusters.
- B, *S. pneumoniae*: alpha-haemolytic and optochin sensitive.
- C, *E. faecalis*: grows in bile-aesculin and 6.5% salt, not bacitracin sensitive.

Final Answer: *Streptococcus pyogenes* $\Rightarrow$ D

Answer: (D) Go Back to Q6

Q7.

Solution

Concept – curved gram-negative rods: Several comma-shaped organisms cause gastrointestinal disease.

Step 1 – match the description: A comma-shaped gram-negative rod with rapid darting motility on dark-field is ***Vibrio cholerae***.

Step 2 – the disease: It produces cholera toxin, causing profuse rice-water stool and dehydration.

Why the other options are wrong:

- A, *Campylobacter jejuni*: curved but causes enteritis, not classical cholera.
- C, *Helicobacter pylori*: gastric, linked to ulcers, not watery diarrhoea.
- D, *E. coli*: a straight rod; only some strains cause diarrhoea.

Final Answer: *Vibrio cholerae* $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q7

Q8.

Solution

Concept – disk-diffusion testing: Antibiotic diffuses outward from the disk into a bacterial lawn.

Step 1 – read the plate: **X** marks the clear ring where no bacteria grew around the disk.

Step 2 – interpret it: This **zone of inhibition indicates susceptibility**; a wider zone means greater sensitivity, measured against standard breakpoints.

Why the other options are wrong:

- A, overgrowth: the opposite of a clear zone.
- B, contamination: would show stray unrelated colonies, not a neat ring.
- C, resistance: shown by growth right up to the disk with no clear zone.

Final Answer: A zone of inhibition indicating susceptibility $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q8

Q9.

Solution

Concept – classifying hepatitis viruses: Each hepatitis virus belongs to a distinct family.

Step 1 – recall Hepatitis A: It is a small non-enveloped positive-sense RNA virus of the **Picornaviridae** family, genus *Hepatovirus*.

Step 2 – transmission: It spreads by the faecal-oral route and causes an acute, self-limiting hepatitis.

Why the other options are wrong:

- A, Hepadnaviridae: Hepatitis B, a DNA virus.
- B, Herpesviridae: enveloped DNA viruses such as HSV.
- D, Orthomyxoviridae: influenza, a segmented RNA virus.

Final Answer: Picornaviridae $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q9

Q10.

Solution

Concept – reverse transcription: One family copies its RNA genome into DNA before replication.

Step 1 – name the family: Retroviridae, including HIV, carry reverse transcriptase to make DNA from their RNA genome.

Step 2 – the consequence: The DNA copy integrates into the host genome as a provirus, allowing latent infection.

Why the other options are wrong:

- B, Adenoviridae: double-stranded DNA viruses, no reverse transcriptase.
- C, Poxviridae: large DNA viruses replicating in the cytoplasm.
- D, Caliciviridae: positive-sense RNA viruses (e.g. norovirus) without this enzyme.

Final Answer: Retroviridae (HIV) $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q10

Q11.

Solution

Concept – capsulated yeast in CSF: India ink is a negative stain that outlines thick capsules.

Step 1 – match the picture: A wide clear halo around budding yeast in CSF is classic for ***Cryptococcus neoformans***.

Step 2 – the disease: It causes subacute meningitis, especially in immunocompromised patients such as those with HIV.

Why the other options are wrong:

- A, *Candida albicans*: forms pseudohyphae and germ tubes, not a broad capsule.
- B, *Aspergillus*: septate hyphae with acute-angle branching.
- D, *Histoplasma*: small intracellular yeasts in macrophages.

Final Answer: *Cryptococcus neoformans* $\Rightarrow$ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept – severity among malaria species: Four main species differ sharply in danger.

Step 1 – name the culprit: ***Plasmodium falciparum*** causes the most severe disease, including cerebral malaria.

Step 2 – why: Infected red cells sequester in cerebral capillaries and cause high parasitaemia, unlike the milder species.

Why the other options are wrong:

- A, *P. vivax*: causes relapses via hypnozoites but rarely cerebral disease.
- B, *P. ovale*: mild tertian malaria with relapses.
- C, *P. malariae*: quartan malaria, generally chronic and mild.

Final Answer: *Plasmodium falciparum* $\Rightarrow$ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept – amoebic disease: One intestinal protozoan invades tissue and spreads to the liver.

Step 1 – name it: ***Entamoeba histolytica*** causes amoebic dysentery and anchovy-sauce liver abscess.

Step 2 – the clue: Trophozoites containing ingested red cells confirm the invasive form.

Why the other options are wrong:

- B, *Giardia lamblia*: causes malabsorptive diarrhoea, not dysentery or abscess.
- C, *Trichomonas vaginalis*: a urogenital flagellate.
- D, *Leishmania donovani*: causes visceral leishmaniasis (kala-azar).

Final Answer: *Entamoeba histolytica* $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q13

Q14.

Solution

Concept – antibody detection assays: An enzyme-linked colour reaction reveals bound antibody.

Step 1 – name the test: **ELISA** uses an enzyme-conjugated antibody and a substrate that changes colour, read by absorbance.

Step 2 – the use: It is the standard screening test for HIV antibodies, confirmed later by Western blot.

Why the other options are wrong:

- A, Widal test: agglutination screen for enteric fever.
- C, Gram staining: shows morphology, not antibodies.
- D, catalase test: separates staphylococci from streptococci.

Final Answer: ELISA $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q14

Q15.

Solution

Concept – classifying hypersensitivity: The tuberculin reaction is delayed and cell mediated.

Step 1 – name the type: The Mantoux test is a **Type IV (delayed-type) hypersensitivity** reaction.

Step 2 – mechanism: Sensitised T cells release cytokines over 48 to 72 hours, producing an indurated area at the injection site.

Why the other options are wrong:

- A, Type I: immediate IgE reactions such as anaphylaxis.
- C, Type II: antibody-mediated cell destruction.
- D, Type III: immune-complex disease such as serum sickness.

Final Answer: Type IV (delayed-type) $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q15

Answer Key

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