

INI CET Microbiology

Sample Paper – 7

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.

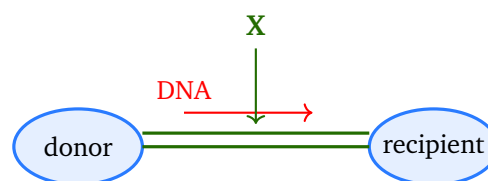
General Microbiology and Sterilization

- Q1.** In Griffith's classic experiment, live non-virulent pneumococci became virulent after taking up free DNA released by heat-killed virulent bacteria. This uptake of naked DNA from the surroundings is called:
- (A) Transformation
(B) Transduction
(C) Conjugation
(D) Lysogeny
- Q2.** A chemical agent applied to living skin or mucous membranes to reduce the microbial load before surgery is best described as a(n):



- (A) Antiseptic
- (B) Disinfectant
- (C) Sterilant
- (D) Detergent

Q3. In the diagram below, two bacteria are joined by a hollow tube (F or sex pilus) through which DNA passes from the donor to the recipient. This gene-transfer mechanism, which requires direct cell-to-cell contact via a pilus, is:



- (A) Transformation
- (B) Conjugation
- (C) Transduction
- (D) Spontaneous mutation

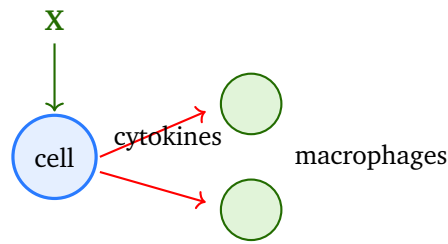
Immunology

Q4. Which category of vaccine, such as BCG, MMR and oral polio vaccine (OPV), generally produces the strongest and most durable immunity, often after a single dose?

- (A) Killed (inactivated) vaccine
- (B) Toxoid vaccine
- (C) Live attenuated vaccine
- (D) Subunit (protein) vaccine

Q5. In the schematic below, a sensitised cell marked X is releasing cytokines that recruit and activate macrophages to form a granuloma over 48 to 72 hours. The cell that mediates this Type IV (delayed-type) hypersensitivity is the:

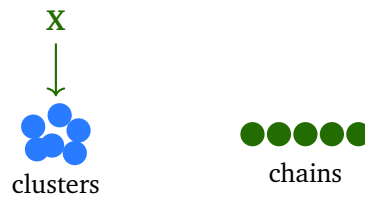




- (A) B lymphocyte (plasma cell)
- (B) T lymphocyte
- (C) Mast cell
- (D) Neutrophil

Systematic Bacteriology

- Q6.** Which organism is cultured on Lowenstein-Jensen medium, grows very slowly over several weeks, and forms buff-coloured, rough, tough colonies?
- (A) *Corynebacterium diphtheriae*
 - (B) *Bordetella pertussis*
 - (C) *Legionella pneumophila*
 - (D) *Mycobacterium tuberculosis*
- Q7.** A gram-positive anaerobic rod causes gas gangrene, shows double-zone haemolysis on blood agar, and gives a positive Nagler reaction due to its lecithinase (alpha toxin). This organism is:
- (A) *Clostridium tetani*
 - (B) *Clostridium botulinum*
 - (C) *Bacillus anthracis*
 - (D) *Clostridium perfringens*
- Q8.** The Gram-stained smear below contrasts two arrangements of gram-positive cocci. The grape-like clusters marked X, as opposed to the chains, are typical of:



- (A) *Staphylococcus*
- (B) *Streptococcus*
- (C) *Neisseria*
- (D) *Enterococcus*

Virology

Q9. Which enveloped RNA virus of the family Flaviviridae is blood-borne and progresses to chronic hepatitis and cirrhosis in a large proportion of those infected?

- (A) Hepatitis A virus
- (B) Hepatitis C virus
- (C) Rotavirus
- (D) Rhinovirus

Q10. Which virus, whose oncogenic types 16 and 18 express the E6 and E7 oncoproteins, is the principal cause of cervical cancer?

- (A) Human papillomavirus (HPV)
- (B) Epstein-Barr virus
- (C) Cytomegalovirus
- (D) Molluscum contagiosum virus

Mycology and Parasitology

Q11. A dimorphic fungus grows as small yeasts inside macrophages, is acquired by inhaling spores from soil enriched with bird or bat droppings (as in caves), and causes a respiratory infection resembling tuberculosis. This fungus is:



- (A) *Candida albicans*
- (B) *Aspergillus fumigatus*
- (C) *Histoplasma capsulatum*
- (D) *Mucor* species

Q12. A flagellate protozoan causes malabsorptive, non-bloody diarrhoea, shows a characteristic "falling-leaf" motility, and is detected by the string test or duodenal aspirate. This parasite is:

- (A) *Entamoeba histolytica*
- (B) *Giardia lamblia*
- (C) *Cryptosporidium parvum*
- (D) *Balantidium coli*

Q13. Which intestinal nematode is the whipworm, whose heavy infection can produce rectal prolapse and whose barrel-shaped eggs bear bipolar plugs?

- (A) *Ascaris lumbricoides*
- (B) *Enterobius vermicularis*
- (C) *Ancylostoma duodenale*
- (D) *Trichuris trichiura*

Applied and Diagnostic Microbiology

Q14. A rising titre in which serological test indicates a recent *Streptococcus pyogenes* infection and supports a diagnosis of rheumatic fever?

- (A) Widal test
- (B) VDRL test
- (C) ASO (antistreptolysin O) titre
- (D) Weil-Felix test

Q15. Which test detects rabies virus antigen in brain tissue (Negri-body-bearing neurons) using antibody tagged with a fluorescent dye?



- (A) Complement fixation test
- (B) Latex agglutination test
- (C) Direct fluorescent antibody (immunofluorescence) test
- (D) Radioimmunoassay



Detailed Solutions

Q1.

Solution

Concept – horizontal gene transfer: Bacteria can acquire new genes by three routes: transformation, transduction and conjugation.

Step 1 – read the experiment: Live cells took up **free, naked DNA** released from heat-killed bacteria in their surroundings.

Step 2 – name the mechanism: Uptake of soluble DNA directly from the environment is **transformation**, exactly what Griffith demonstrated with pneumococci.

Why the other options are wrong:

- B, transduction: DNA is carried between cells by a bacteriophage, not taken up free.
- C, conjugation: needs cell-to-cell contact through a pilus.
- D, lysogeny: integration of phage DNA as a prophage, not uptake of naked DNA.

Final Answer: Transformation ⇒

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

Q2.

Solution

Concept – antiseptic versus disinfectant: Both reduce microbes, but they differ by the surface on which they are used.

Step 1 – match the wording: The agent is applied to **living skin or mucous membranes**, so it is an **antiseptic**.

Step 2 – fix the distinction: A disinfectant is used on inanimate objects and surfaces; an antiseptic is safe enough for living tissue.

Why the other options are wrong:

- B, disinfectant: for inanimate surfaces, often too toxic for skin.
- C, sterilant: destroys all microbial life, used for instruments, not living tissue.
- D, detergent: a surfactant that cleans; it is not primarily a microbicidal category.

Final Answer: Antiseptic ⇒



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

Q3.

Solution

Concept – gene transfer needing contact: The figure shows two cells linked by a bridge with DNA moving across.

Step 1 – read the diagram: The donor and recipient are joined by an **F (sex) pilus**, and DNA passes through this direct connection.

Step 2 – name it: Transfer that requires physical cell-to-cell contact through a pilus is **conjugation**, often mediated by an F plasmid.

Why the other options are wrong:

- A, transformation: uptake of free DNA, no pilus or contact needed.
- C, transduction: phage-mediated transfer, again no pilus.
- D, mutation: an internal change in DNA, not transfer between cells.

Final Answer: Conjugation ⇒ **B**

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

Q4.

Solution

Concept – types of vaccine: Vaccines differ in how closely they mimic natural infection.

Step 1 – identify the group: BCG, MMR and OPV are **live attenuated vaccines**, using weakened organisms that still replicate.

Step 2 – why they are strong: Because the microbe multiplies, it stimulates both antibody and cell-mediated immunity, giving long-lasting protection, often from a single dose.

Why the other options are wrong:

- A, killed vaccine: safer but usually needs boosters and gives weaker immunity.
- B, toxoid: raises antitoxin only, as for tetanus and diphtheria.
- D, subunit vaccine: uses purified antigens, generally needing adjuvant and boosters.



Final Answer: Live attenuated vaccine $\Rightarrow$

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

Q5.

Solution

Concept – Type IV hypersensitivity: Delayed-type reactions are driven by cells, not antibody.

Step 1 – read the figure: X is a sensitised cell releasing cytokines that recruit macrophages into a granuloma.

Step 2 – name the cell: This is a **T lymphocyte**; sensitised T cells secrete cytokines such as interferon-gamma that activate macrophages over 48 to 72 hours.

Why the other options are wrong:

- A, B lymphocyte: makes antibody, central to humoral, not delayed-type, responses.
- C, mast cell: drives Type I immediate allergy via histamine.
- D, neutrophil: an early phagocyte of acute pyogenic infection, not the mediator here.

Final Answer: T lymphocyte $\Rightarrow$

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

Q6.

Solution

Concept – culturing mycobacteria: Slow-growing acid-fast bacilli need a special enriched medium.

Step 1 – match the clues: Growth on **Lowenstein-Jensen medium** over several weeks, with buff, rough, tough colonies, is classic for *Mycobacterium tuberculosis*.

Step 2 – confirm: Its waxy mycolic-acid wall makes it acid-fast and slow to divide (about 15 to 20 hours per generation).

Why the other options are wrong:

- A, *C. diphtheriae*: grows on Loeffler's serum and tellurite, not L-J medium.
- B, *B. pertussis*: needs Bordet-Gengou medium.



- C, *Legionella*: requires buffered charcoal yeast extract agar.

Final Answer: *Mycobacterium tuberculosis* ⇒ D

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

Q7.

Solution

Concept – gas gangrene organism: An anaerobic clostridium produces potent tissue-destroying toxins.

Step 1 – apply the clues: Double-zone haemolysis and a positive **Nagler reaction** (lecithinase/alpha toxin) with gas gangrene point to *Clostridium perfringens*.

Step 2 – confirm: Its alpha toxin (a phospholipase C) splits lecithin, giving the Nagler opacity that specific antitoxin neutralises.

Why the other options are wrong:

- A, *C. tetani*: causes tetanus via tetanospasmin, no Nagler reaction.
- B, *C. botulinum*: causes flaccid paralysis through botulinum toxin.
- C, *B. anthracis*: aerobic, causes anthrax, not gas gangrene.

Final Answer: *Clostridium perfringens* ⇒ D

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

Q8.

Solution

Concept – reading coccal arrangement: The way cocci group reflects their plane of division.

Step 1 – read the smear: X marks the grape-like **clusters**, formed by division in several planes.

Step 2 – name the genus: Cluster-forming, catalase-positive gram-positive cocci are *Staphylococcus*, while chains are typical of *Streptococcus*.

Why the other options are wrong:

- B, *Streptococcus*: divides in one plane, forming chains, not clusters.
- C, *Neisseria*: gram-negative diplococci, not gram-positive clusters.
- D, *Enterococcus*: catalase-negative, arranged in pairs or short chains.



Final Answer: *Staphylococcus* ⇒ A

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

Q9.

Solution

Concept – blood-borne hepatitis viruses: Some hepatitis viruses cause chronic liver disease.

Step 1 – match the description: An **enveloped RNA virus of Flaviviridae**, blood-borne with a high rate of chronicity, is **Hepatitis C virus**.

Step 2 – the outcome: A large fraction of infections become chronic and can progress to cirrhosis and hepatocellular carcinoma.

Why the other options are wrong:

- A, Hepatitis A: faecal-oral, acute and self-limiting, never chronic.
- C, Rotavirus: causes infantile diarrhoea, not hepatitis.
- D, Rhinovirus: a respiratory picornavirus causing the common cold.

Final Answer: Hepatitis C virus ⇒ B

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

Q10.

Solution

Concept – oncogenic viruses: Certain viruses transform host cells through specific oncoproteins.

Step 1 – identify the virus: Types 16 and 18 producing the **E6 and E7 oncoproteins** are the high-risk types of **Human papillomavirus (HPV)**.

Step 2 – mechanism: E6 degrades p53 and E7 inactivates Rb, driving uncontrolled division and cervical cancer.

Why the other options are wrong:

- B, Epstein-Barr virus: linked to Burkitt lymphoma and nasopharyngeal carcinoma.
- C, Cytomegalovirus: causes congenital and opportunistic disease, not cervical cancer.
- D, Molluscum contagiosum virus: causes benign skin papules.



Final Answer: Human papillomavirus $\Rightarrow$ A

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

Q11.

Solution

Concept – dimorphic fungi: Some fungi live as moulds in soil and yeasts in tissue.

Step 1 – match the picture: Small intracellular yeasts in macrophages, acquired from bird and bat droppings in caves, point to *Histoplasma capsulatum*.

Step 2 – the disease: Inhaled microconidia germinate to yeasts inside macrophages, producing a lung infection that mimics tuberculosis.

Why the other options are wrong:

- A, *Candida*: forms pseudohyphae and germ tubes, not intracellular yeasts from caves.
- B, *Aspergillus*: septate hyphae with acute-angle branching.
- D, *Mucor*: broad aseptate hyphae causing angioinvasive mucormycosis.

Final Answer: *Histoplasma capsulatum* $\Rightarrow$ C

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

Q12.

Solution

Concept – flagellate causing malabsorption: One duodenal protozoan disrupts fat absorption.

Step 1 – apply the clues: Non-bloody malabsorptive diarrhoea with "falling-leaf" motility and a positive string test is *Giardia lamblia*.

Step 2 – confirm: Its trophozoites attach to the duodenal mucosa by a sucking disc, and cysts are diagnosed in stool or duodenal aspirate.

Why the other options are wrong:

- A, *Entamoeba histolytica*: causes bloody dysentery and liver abscess, not malabsorption.
- C, *Cryptosporidium*: causes watery diarrhoea, especially in AIDS, with acid-fast oocysts.
- D, *Balantidium coli*: a ciliate causing dysentery, not falling-leaf motility.



Final Answer: *Giardia lamblia* ⇒ B

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

Q13.

Solution

Concept – intestinal nematodes: Each soil-transmitted worm has a signature egg and complication.

Step 1 – match the clues: The **whipworm**, causing rectal prolapse in heavy infection with **barrel-shaped, bipolar-plugged eggs**, is *Trichuris trichiura*.

Step 2 – confirm: Its thin anterior end threads into the colonic mucosa, and mass infection can prolapse the rectum, especially in children.

Why the other options are wrong:

- A, *Ascaris*: large roundworm with knobbly (mamillated) eggs.
- B, *Enterobius*: pinworm causing perianal itching, with D-shaped eggs.
- C, *Ancylostoma*: hookworm causing iron-deficiency anaemia, with oval thin-shelled eggs.

Final Answer: *Trichuris trichiura* ⇒ D

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

Q14.

Solution

Concept – serology of streptococcal infection: Antibodies to streptococcal products mark recent infection.

Step 1 – name the test: A rising **ASO (antistreptolysin O) titre** indicates recent *Streptococcus pyogenes* infection.

Step 2 – the use: It supports the diagnosis of post-streptococcal disease such as rheumatic fever, since streptolysin O is antigenic.

Why the other options are wrong:

- A, Widal test: detects antibodies in enteric fever (*Salmonella*).
- B, VDRL: a non-treponemal test for syphilis.
- D, Weil-Felix: an agglutination test for rickettsial disease.

Final Answer: ASO titre ⇒ C



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

Q15.

Solution

Concept – detecting rabies antigen: Rabies is confirmed by demonstrating viral antigen in nervous tissue.

Step 1 – name the test: The **direct fluorescent antibody (immunofluorescence) test** uses antibody tagged with a fluorescent dye to detect rabies antigen in brain tissue.

Step 2 – why it is chosen: It is the rapid gold-standard confirmatory test, revealing antigen in Negri-body-bearing neurons under a fluorescence microscope.

Why the other options are wrong:

- A, complement fixation: detects antibody, slower and less specific for tissue antigen.
- B, latex agglutination: a rapid antigen test but not the standard for brain rabies antigen.
- D, radioimmunoassay: quantifies antigen or antibody using radiolabel, not used for rabies brain diagnosis.

Final Answer: Direct fluorescent antibody test $\Rightarrow$ **C**

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



Answer Key

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

