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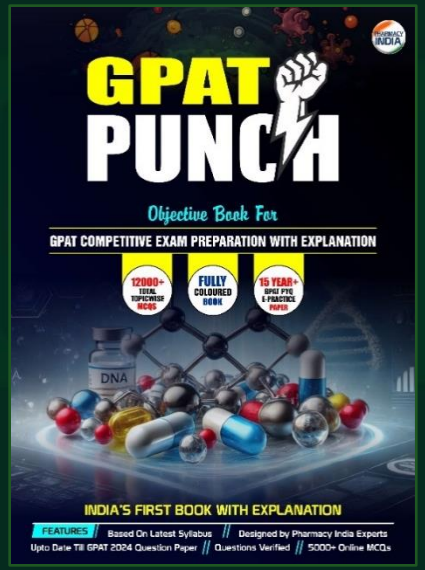

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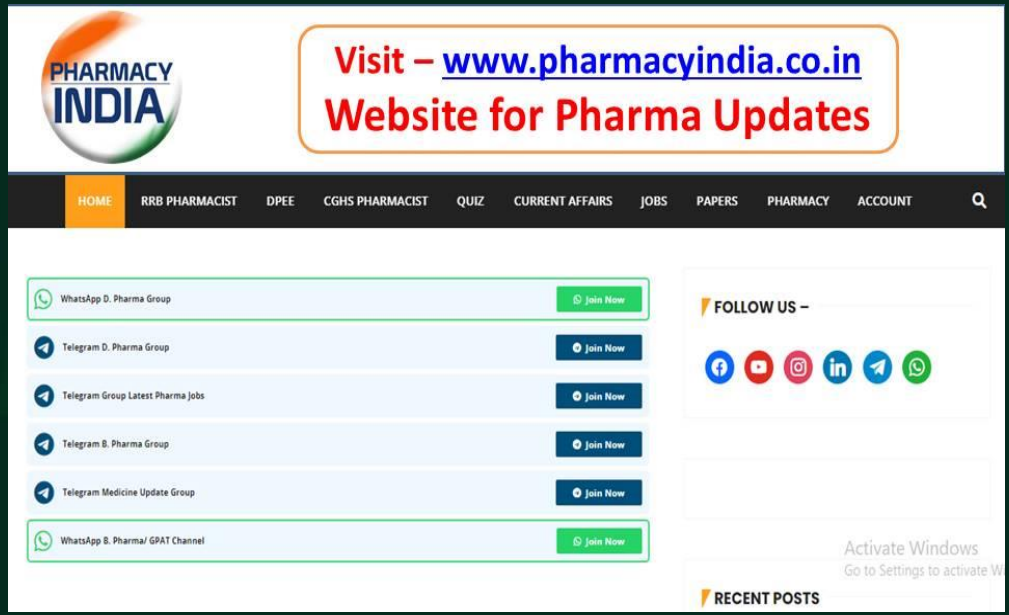


BIOLOGY OF MICROORGANISMS

1. **The optimum temperature for rapid growth of mesophiles is: [GPAT-2024]**

(a) 15 to 20 °C
(b) 40 to 50 °C
(c) 25 to 40 °C
(d) 50 to 60 °C

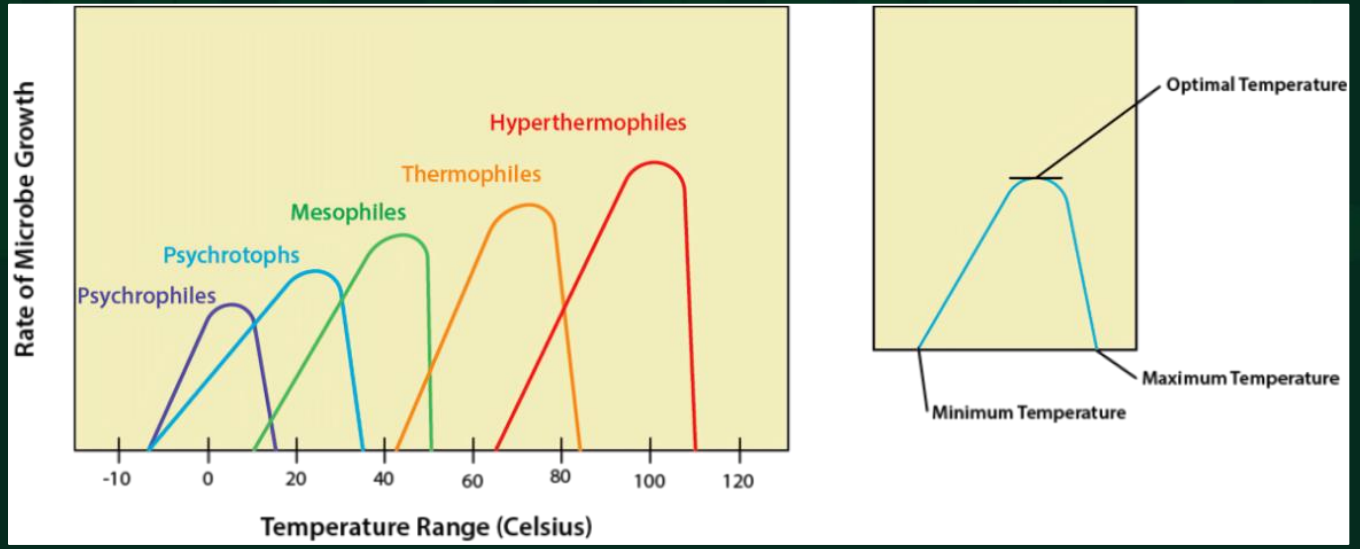
1. **The optimum temperature for rapid growth of mesophiles is: [GPAT-2024]**

(a) 15 to 20 °C
(b) 40 to 50 °C
(c) 25 to 40 °C
(d) 50 to 60 °C

- **Explanation**:
  - **Mesophiles** are microorganisms that grow best at **moderate temperatures**. Their growth temperature ranges from **20°C to 45°C**, with an **optimum growth temperature** between **25°C and 40°C.**

Type of Microbe	Temperature Range	Optimum Temperature
Psychrophiles	Below 20°C	Below 20°C
Mesophiles	20°C to 45°C	25°C to 40°C
Thermophiles	45°C to 80°C	55°C to 65°C
Hyperthermophiles	Above 80°C	80°C and above

Most **pathogenic bacteria** that infect humans are mesophiles because they thrive at body temperature. Examples include **Escherichia coli** and **Staphylococcus aureus.**



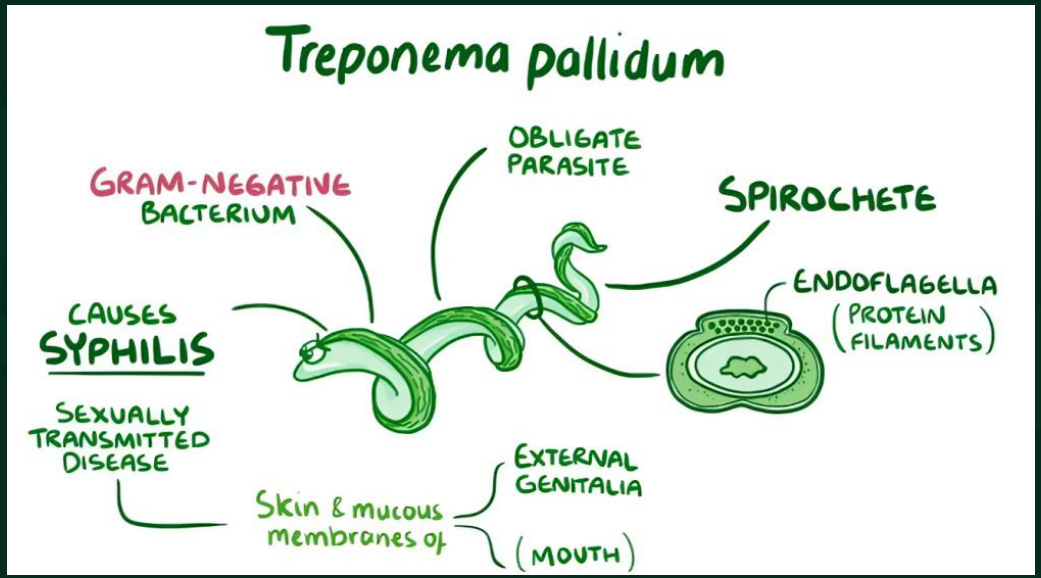
2. **Which of the following is a causative organism for Syphilis: [GPAT-2024]**

(a) Clostridium tetani
(b) Vibrio cholerae
(c) Bacillus pertussis
(d) Treponema pallidum

2. **Which of the following is a causative organism for Syphilis: [GPAT-2024]**

(a) Clostridium tetani
(b) Vibrio cholerae
(c) Bacillus pertussis
(d) Treponema pallidum

- **Explanation**:
  - **Treponema pallidum** is a **spirochete bacterium** responsible for causing **syphilis**, a **sexually transmitted infection (STI)**. It has a characteristic **spiral shape** and moves using **axial filaments**. Syphilis progresses in stages: **primary, secondary, latent, and tertiary**, with each stage exhibiting different symptoms. **Clostridium tetani** causes tetanus, **Vibrio cholerae** causes cholera, and **Bacillus pertussis** causes whooping cough. Thus, **Treponema pallidum** is the causative agent of syphilis.



Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 11.

3. **Leprosy is a: [GPAT-2024]**

(a) Fungal disease
(b) Viral disease
(c) Metazoal disease
(d) Bacterial disease

3. **Leprosy is a: [GPAT-2024]**

(a) Fungal disease
(b) Viral disease
(c) Metazoal disease
(d) Bacterial disease

- **Explanation**:

Leprosy, also known as **Hansen's disease**, is caused by the **bacterium Mycobacterium leprae**. It is a **chronic infectious disease** that primarily affects the **skin**, **peripheral nerves**, and the **upper respiratory tract**. Mycobacterium leprae is an **acid-fast bacillus** that grows best at cooler temperatures, which is why it predominantly affects **extremities** like hands, feet, and face. Leprosy is not a fungal, viral, or metazoal disease.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 104.

4. **Given below are two statements; one is labelled as Assertion [A] and the other is labelled as Reason [R] [GPAT-2023 SHIFT-I]**

Assertion [A]: Exotoxins diffuse freely through the bacterial cell wall into the medium in which the organisms are growing.

Reason [R]: They are water soluble and can pass into the surrounding medium.

(a) Both [A] and [R] are true and [R] is the correct explanation of [A]

(b) Both [A] and [R] are true but [R] is NOT the correct explanation of [A]

(c) [A] is true but [R] is false

(d) [A] is false but [R] is true

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(c) [A] is true but [R] is false

(d) [A] is false but [R] is true

- **Explanation**:

Exotoxins are **proteins** secreted by **bacteria** during their growth. These toxins diffuse freely through the **bacterial cell wall** into the surrounding medium due to their **water-soluble nature.** Exotoxins are **highly potent** and specific, affecting specific tissues or organs.

For example, **tetanospasmin** from Clostridium tetani and **botulinum toxin** from Clostridium botulinum are exotoxins. The reason accurately explains the assertion since their **water solubility** allows them to diffuse into the external environment.

Reference: Tortora, 13th Edition, Pages 431–432.

5. Which of the following statements are true [GPAT-2022]

[A] Bacteria are categorized underneath the kingdom Monera

[B] Protista are unicellular and eukaryotic organisms

[C] Yeasts and molds are under kingdom Fungi

[D] Multinucleated higher fungi are under Animalia

(a) A, B and C only

(b) B, C and D only

(c) A and B only

(d) C and D only

5. Which of the following statements are true [GPAT-2022]

[A] Bacteria are categorized underneath the kingdom Monera

[B] Protista are unicellular and eukaryotic organisms

[C] Yeasts and molds are under kingdom Fungi

[D] Multinucleated higher fungi are under Animalia

(a) A, B and C only

(b) B, C and D only

(c) A and B only

(d) C and D only

- **Explanation:**

Microbial Form	Resistance Level	Example
Vegetative bacterial cell	Low	Escherichia coli
Protozoan cyst	Moderate	Entamoeba histolytica
Naked Virus	High	Poliovirus
Bacterial endospore	Highest	Bacillus subtilis endospores

- **[A] True**: **Bacteria** are **prokaryotic** microorganisms categorized under the **kingdom Monera**.
- **[B] True**: **Protista** are **unicellular** and **eukaryotic** organisms, meaning they have a **nucleus** and membrane-bound organelles.
- **[C] True**: **Yeasts and molds** belong to the **kingdom Fungi**. Yeasts are **unicellular**, while molds are **multicellular** fungi.
- **[D] False**: Multinucleated fungi (e.g., molds) remain under the **kingdom Fungi**, not Animalia.

Reference: NK Jain, Pages 11–13

6. **Which of the following microbial form listed below exhibits the highest level of resistance to physical and chemical methods of growth control [GPAT-2021]**

(a) Naked Virus
(b) Protozoan cyst
(c) Vegetative bacterial cell
(d) Bacterial endospore

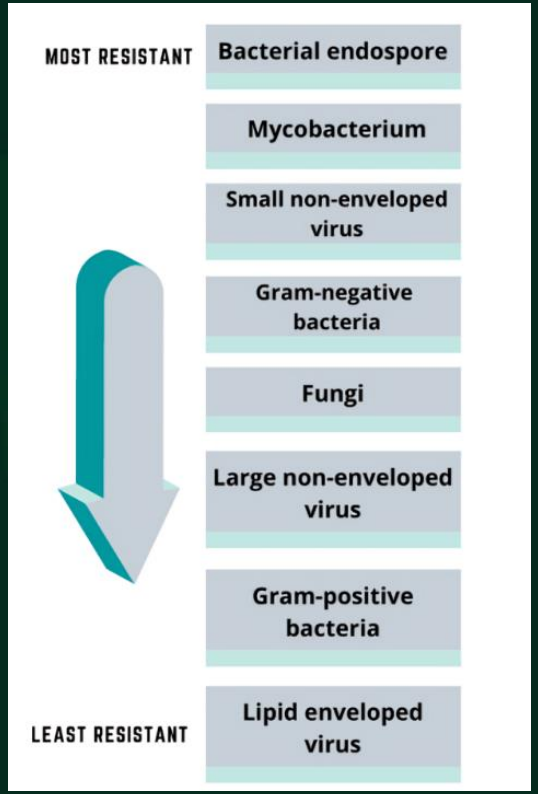
6. **Which of the following microbial form listed below exhibits the highest level of resistance to physical and chemical methods of growth control [GPAT-2021]**

(a) Naked Virus
(b) Protozoan cyst
(c) Vegetative bacterial cell
(d) Bacterial endospore

- **Explanation:**

Bacterial endospores are the **most resistant forms** of microbial life. They are produced by bacteria like **Bacillus** and **Clostridium** as a survival mechanism under harsh conditions. Endospores have a **thick protective coat** and can withstand **high temperatures**, **radiation**, **desiccation**, and **chemical disinfectants**. This makes them far more resistant compared to naked viruses, protozoan cysts, or vegetative bacterial cells.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 132.



7. Given below are two statements; one is labelled as Assertion [A] and the other is labelled as Reason [R] [GPAT-2021]

Assertion [A]: Gram-negative bacteria do not retain the primary stain when washed with alcohol and subsequently stained again with secondary stain.
Reason [R]: The outer membrane of Gram-negative bacteria contains lipopolysaccharides.

(a) Both [A] and [R] are true and [R] is the correct explanation of [A]
(b) Both [A] and [R] are true but [R] is NOT the correct explanation of [A]
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Reason [R]: The outer membrane of Gram-negative bacteria contains lipopolysaccharides.

(a) Both [A] and [R] are true and [R] is the correct explanation of [A]

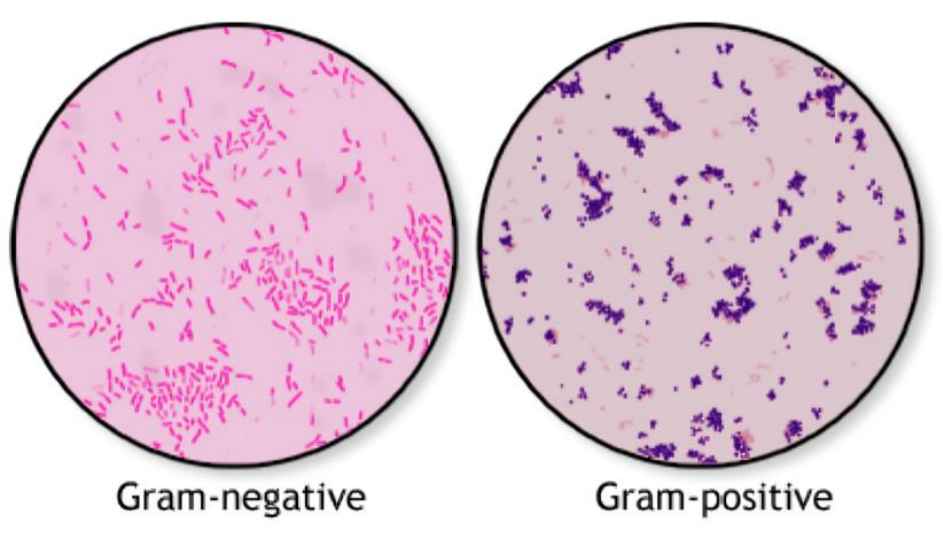
(b) Both [A] and [R] are true but [R] is NOT the correct explanation of [A]

(c) [A] is true but [R] is false

(d) [A] is false but [R] is true

- **Explanation**:

During **Gram staining**, **Gram-negative bacteria** lose the **primary stain (crystal violet)** when treated with **alcohol** because of their **thin peptidoglycan layer** and **outer membrane** rich in **lipopolysaccharides (LPS)**. The **LPS** is disrupted by alcohol, allowing the stain to wash away. The **secondary stain** (safranin) then colors Gram-negative bacteria **pink or red**. Both statements are true, and the **outer membrane** explains why Gram-negative bacteria cannot retain the primary stain.



Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 42.

8. **The following Gram-positive bacterial species is positive for the coagulase test: [GPAT-2020]**

(a) S. epidermidis
(b) S. aureus
(c) S. saprophyticus
(d) S. lactis

8. **The following Gram-positive bacterial species is positive for the coagulase test: [GPAT-2020]**

(a) S. epidermidis

(b) S. aureus

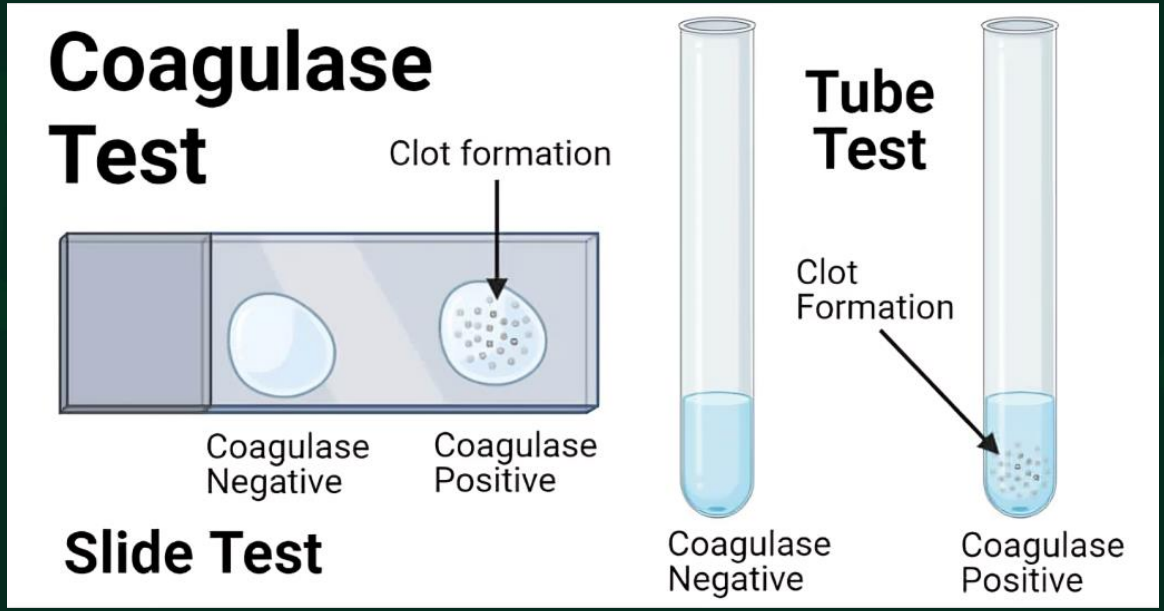
(c) S. saprophyticus

(d) S. lactis

- **Explanation:**

Staphylococcus aureus is a **Gram-positive bacterium** that is **coagulase-positive**, meaning it produces the enzyme **coagulase**. This enzyme causes **plasma to clot**, which helps the bacterium evade the host immune system. The coagulase test is a key differentiating feature used in microbiology to distinguish **S. aureus** from other **coagulase-negative staphylococci** like **S. epidermidis**.

- **Explanation:**



Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 126.

9. **Following is the important sterol in feces formed from cholesterol by bacteria in the lower intestine: [GPAT-2020]**

(a) 7-α-Hydroxy cholesterol
(b) Coprostanol
(c) 7-Dehydrocholesterol
(d) Lithocholic acid

9. **Following is the important sterol in feces formed from cholesterol by bacteria in the lower intestine: [GPAT-2020]**

(a) 7-α-Hydroxy cholesterol

(b) Coprostanol

(c) 7-Dehydrocholesterol

(d) Lithocholic acid

- **Explanation**:

Coprostanol is a **bile sterol** derived from **cholesterol** by the action of **gut bacteria** in the **lower intestine**. It is formed by the **reduction of cholesterol** and is excreted in feces. The presence of coprostanol in feaces is an indicator of microbial activity in the gut and is often used in studies of digestion and gut microbiota.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 111

10. **SCHICK Test Toxin is a sterile filtrate from a culture of [GPAT-2020]**

(a) Rickettsia prowazekii
(b) Mycobacterium diphtheriae
(c) Corynebacterium diphtheriae
(d) Actinobacillus mallei

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(a) Rickettsia prowazekii
(b) Mycobacterium diphtheriae
(c) Corynebacterium diphtheriae
(d) Actinobacillus mallei

- **Explanation:**

The **Schick test** is a diagnostic test for **diphtheria**, caused by **Corynebacterium diphtheriae**. It involves injecting a **sterile filtrate** of the **diphtheria toxin** intradermally. A **positive test** (redness and swelling at the site) indicates susceptibility to diphtheria, whereas a **negative test** suggests immunity. This test helps determine the presence of **antibodies** against diphtheria toxin in the individual.

Reference: Pharmaceutical Microbiology, W.B. Hugo, Page 334.

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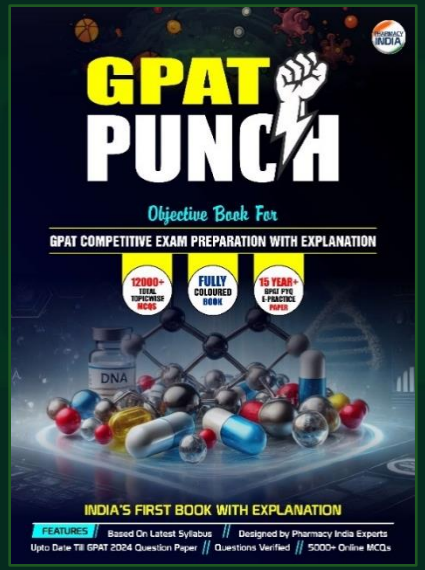

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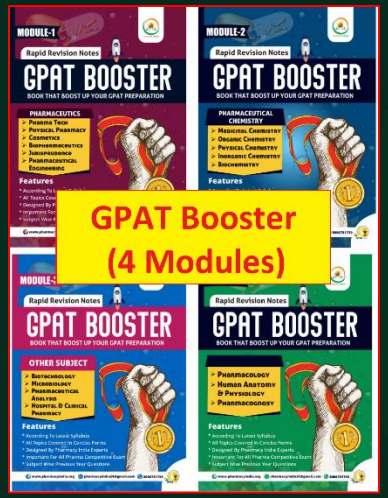

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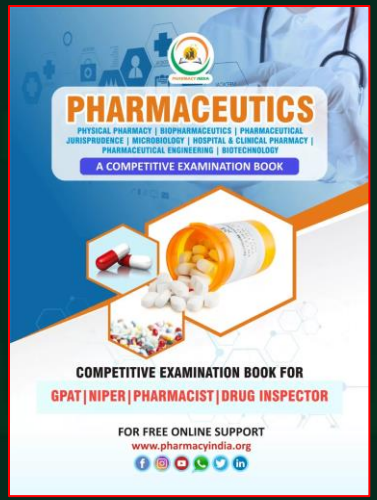

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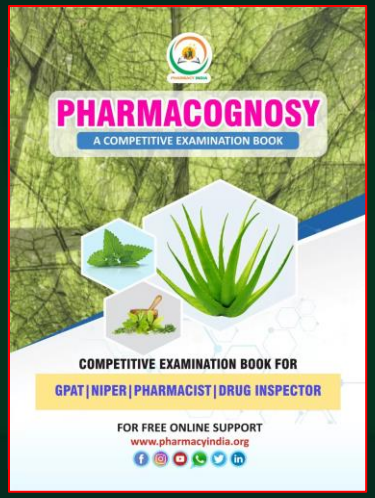

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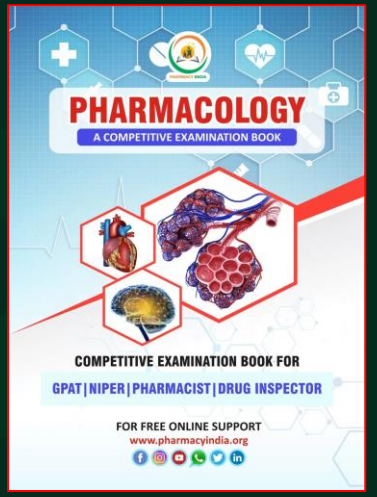

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11. **Production of Acetyl methyl carbinol can be detected by which of the following test [GPAT-2020]**

(a) Voges-Proskauer test
(b) Indole test
(c) Citrate utilization test
(d) Methyl red test

11. **Production of Acetyl methyl carbinol can be detected by which of the following test [GPAT-2020]**

(a) Voges-Proskauer test
(b) Indole test
(c) Citrate utilization test
(d) Methyl red test

Explanation:

- The **Voges-Proskauer (VP) test** is specifically designed to detect **acetyl methyl carbinol (acetoin)**, an intermediate in the **butanediol fermentation pathway.** In this test, bacteria produce **acetoin** by fermenting glucose. Upon the addition of **alpha-naphthol** and **potassium hydroxide (KOH)**, acetoin gets oxidized to **diacetyl**, which reacts with guanidine components in the medium to form a **red or pink color**.

This indicates a positive result.

Reference: Prescott's Microbiology, 10th Edition, Page 153.

12. **The acidic polymers of Ribitol/Glycerol phosphate present in Gram-positive microorganisms are known as [GPAT-2020]**

(a) Polysaccharides
(b) Teichoic acids
(c) Peptidoglycans
(d) Lysozymes

12. **The acidic polymers of Ribitol/Glycerol phosphate present in Gram-positive microorganisms are known as [GPAT-2020]**

(a) Polysaccharides
(b) Teichoic acids
(c) Peptidoglycans
(d) Lysozymes

- **Explanation:**

Teichoic acids are unique **acidic polymers** found in the **cell wall of Gram-positive bacteria.** They are composed of **ribitol phosphate** or **glycerol phosphate** and are covalently linked to the **peptidoglycan layer.** Teichoic acids play a critical role in maintaining **cell wall stability**, **ion exchange**, and serving as **adhesion sites** for bacterial attachment. Their presence distinguishes Gram-positive bacteria from Gram-negative bacteria.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 339.

13. **Roll-tube technique is the modification of [GPAT-2019]**

(a) Pour plate technique
(b) The streak plate technique
(c) Micromanipulator technique
(d) Spread plate technique

13. **Roll-tube technique is the modification of [GPAT-2019]**

(a) Pour plate technique

(b) The streak plate technique

(c) Micromanipulator technique

(d) Spread plate technique

- **Explanation:**

The **roll-tube technique** is a modification of the **streak plate technique** used for the **cultivation of anaerobic bacteria**. In this method, a test tube containing a solidified medium (e.g., agar) is rolled horizontally after inoculation, creating an **anaerobic environment** for bacterial growth. This technique improves upon the streak plate method by ensuring better isolation and growth of **strict anaerobes** like **Clostridium species**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 146.

14. **The phase contrast microscopy is valuable in studying living cells which are [GPAT-2019]**

(a) Stained
(b) Unstained
(c) Treated with fluorescent dye
(d) Treated with fluorescent antibody

14. **The phase contrast microscopy is valuable in studying living cells which are [GPAT-2019]**

(a) Stained

(b) Unstained

(c) Treated with fluorescent dye

(d) Treated with fluorescent antibody

- **Explanation:**

Phase contrast microscopy is an advanced optical technique used to observe **unstained, living cells**. It converts the phase differences caused by light passing through transparent specimens into **variations in light intensity**. This technique allows visualization of live cells' **internal structures**, such as **nuclei** and **vacuoles**, without the need for staining, which can alter or kill the cells.


Phase contrast microscopy of living cell

Reference: Tortora, 13th Edition, Pages 55–56

15. **Which of the following statement is not true about prokaryotes [GPAT-2018]**

(a) Nucleus is not bounded by nuclear membrane
(b) Cell wall contains peptidoglycan
(c) 80s ribosomes are distributed in cytoplasm
(d) It is Haploid in nature

15. **Which of the following statement is not true about prokaryotes [GPAT-2018]**

(a) Nucleus is not bounded by nuclear membrane

(b) Cell wall contains peptidoglycan

(c) 80s ribosomes are distributed in cytoplasm

(d) It is Haploid in nature

- **Explanation:**

Prokaryotic cells contain **70S ribosomes** (composed of 50S and 30S subunits), not **80S ribosomes**. The **80S ribosomes** are found in **eukaryotic cells.** Prokaryotes lack a **membrane-bound nucleus**, their cell wall contains **peptidoglycan**, and they are **haploid**, meaning they possess a single, circular chromosome. This makes option **(c) incorrect.**

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 34–37.

16. **Match the following diseases under column I with the respective causative organisms under Column II [GPAT-2018]**

Column I (Diseases)	Column II (Causative Organisms)
Creutzfeldt-Jacob disease	Prions (Q)
Typhus	Rickettsia prowazekii (R)
Syphilis	Treponema pallidum (S)
Plague	Yersinia pestis (P)

(a) 1-[R], 2-[S], 3-[P], 4-[Q]
(b) 1-[P], 2-[Q], 3-[R], 4-[S]
(c) 1-[Q], 2-[R], 3-[S], 4-[P]
(d) 1-[S], 2-[P], 3-[Q], 4-[R]

16. **Match the following diseases under column I with the respective causative organisms under Column II [GPAT-2018]**

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Plague	Yersinia pestis (P)

(a) 1-[R], 2-[S], 3-[P], 4-[Q]
(b) 1-[P], 2-[Q], 3-[R], 4-[S]
(c) 1-[Q], 2-[R], 3-[S], 4-[P]
(d) 1-[S], 2-[P], 3-[Q], 4-[R]

- **Explanation:**

Creutzfeldt-Jacob disease → Caused by **Prions** (Q), which are infectious protein particles that induce abnormal protein folding in the brain, leading to neurodegenerative disorders.

Typhus → Caused by **Rickettsia prowazekii** (R), a bacterium transmitted by lice. It causes epidemic typhus, characterized by fever, rash, and headaches.

Syphilis → Caused by **Treponema pallidum** (S), a spirochete bacterium responsible for this sexually transmitted infection.

Plague → Caused by **Yersinia pestis** (P), a bacterium transmitted by fleas and responsible for the bubonic plague.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 11, 108.

17. **Which of the following disinfectant effectively destroys vegetative bacterial cells including Gram-positive and Gram-negative bacteria, bacterial endospores, fungi, and viruses [GPAT-2018]**

(a) 8% formaldehyde + 70% alcohol
(b) 70% Alcohol
(c) 0.1% Phenol aqueous
(d) 0.1% Iodine aqueous

17. **Which of the following disinfectant effectively destroys vegetative bacterial cells including Gram-positive and Gram-negative bacteria, bacterial endospores, fungi, and viruses [GPAT-2018]**

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(d) 0.1% Iodine aqueous

- **Explanation:**

Disinfectant	Effectiveness
8% formaldehyde + 70% alcohol	Broad spectrum (bacteria, endospores, fungi)
70% Alcohol	Limited to vegetative cells and viruses
0.1% Phenol aqueous	Limited effectiveness on Gram-positive bacteria
0.1% Iodine aqueous	Effective against bacteria but not endospores

The combination of **8% formaldehyde** and **70% alcohol** acts as a **broad-spectrum disinfectant**, effectively destroying:

- **Vegetative bacterial cells** (both Gram-positive and Gram-negative)
- **Bacterial endospores**
- **Fungi**
- **Viruses**

Formaldehyde acts as a **potent alkylating agent** that disrupts proteins and nucleic acids, while alcohol enhances protein denaturation and lipid dissolution, making this combination highly effective.

Reference: NK Jain, Pages 119–120

18. **Which of the following test is used for differentiation of Mycobacteria [GPAT-2015]**

(a) Niacin test
(b) Aryl sulfatase test
(c) Nitrate reaction test
(d) Amidase test

18. **Which of the following test is used for differentiation of Mycobacteria [GPAT-2015]**

(a) Niacin test
(b) Aryl sulfatase test
(c) Nitrate reaction test
(d) Amidase test

- **Explanation:**

The **Amidase test** is used for the **differentiation of mycobacteria**, particularly in distinguishing **Mycobacterium tuberculosis** from other atypical mycobacteria.

- **Amidase** is an enzyme produced by certain species of mycobacteria, and its activity can be detected through specific biochemical assays.
- The test identifies the ability of mycobacteria to hydrolyze **amide substrates** into **ammonia** and corresponding acids, which helps differentiate between various mycobacterial species.

This test is particularly useful in laboratories for **biochemical characterization** and differentiation of closely related mycobacteria, including **M. tuberculosis complex** and **non-tuberculous mycobacteria (NTM)**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 158

19.

Study the following four statements [GPAT-2012]

[P] Gram-negative bacteria produce potent pyrogenic substances called endotoxins.

[Q] Ethylene oxide mixed with carbon dioxide or fluorinated hydrocarbons is used in gas sterilization.

[R] D value is the time (for heat or chemical exposure) or the dose (for radiation exposure) required for the microbial population to decline by one logarithmic unit.

[S] Spores of Geobacillus stearothermophilus (Bacillus stearothermophilus) are used for sterility testing of moist heat sterilization process.

19.

Choose the correct answer:

(a) P, Q and R are correct but S is incorrect

(b) Q, R and S are correct but P is incorrect

(c) R, S and P are correct but Q is incorrect

(d) P, Q, R and S all are correct

19.

Choose the correct answer:

(a) P, Q and R are correct but S is incorrect

(b) Q, R and S are correct but P is incorrect

(c) R, S and P are correct but Q is incorrect

(d) P, Q, R and S all are correct

- **Explanation:**
- **[P] Endotoxins**: Produced by **Gram-negative bacteria**, endotoxins are lipopolysaccharides (LPS) that are **pyrogenic** (cause fever).
- **[Q] Ethylene oxide**: Used in **gas sterilization**, often mixed with **carbon dioxide** to reduce flammability.
- **[R] D value**: Represents the time/dose required to reduce a microbial population by **90%** **(one log unit)**.
- **[S] Geobacillus stearothermophilus** spores: Used as **biological indicators** for testing **moist heat sterilization** because of their high resistance to heat.

Reference: Tortora, 13th Edition, Page 431; Ashutosh Kar, Page 200

20. A given Gram-positive bacterium is differentiated from Gram-negative by Gram staining. This is because its cell wall contains [GATE-2009]

(a) Lysozyme
(b) Teichoic acid
(c) Membrane proteins
(d) Lipid A

20. **A given Gram-positive bacterium is differentiated from Gram-negative by Gram staining. This is because its cell wall contains [GATE-2009]**

(a) Lysozyme
(b) Teichoic acid
(c) Membrane proteins
(d) Lipid A

- **Explanation:**

Feature	Gram-Positive	Gram-Negative
Peptidoglycan Thickness	Thick	Thin
Teichoic Acid	Present	Absent
Lipid Content	Low	High (lipopolysaccharides in outer membrane)
Stain Retention	Retains crystal violet (purple)	Does not retain crystal violet (pink)

The **cell wall of Gram-positive bacteria** contains **teichoic acid**, a polymer of **glycerol phosphate** or **ribitol phosphate**. Teichoic acids are absent in **Gram-negative bacteria** and are responsible for maintaining the **rigidity and structural integrity** of the thick **peptidoglycan layer**. This thick layer retains the **crystal violet stain** during Gram staining, giving Gram-positive bacteria their characteristic **purple color**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 51–53

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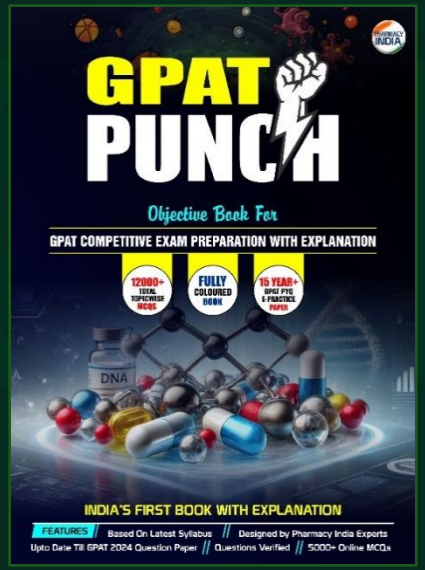

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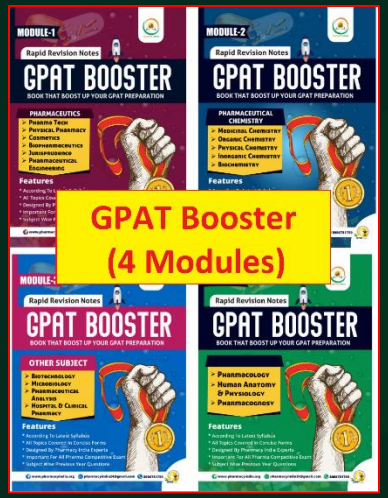

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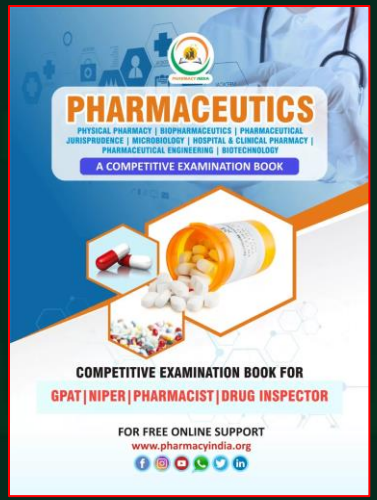

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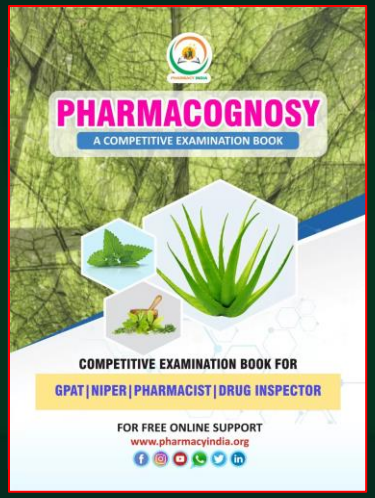

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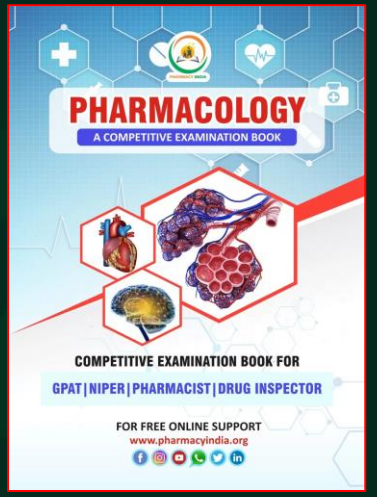

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21. **Match the followings [GATE-2009]**

Group I (Process)	Group II (Required Molecules)
Post-translational modification	Signal peptidase (P)
DNA repair	Photolyase (S)
Control of prokaryotic transcription	Sigma factor (Q)
Protein degradation	Proteasome complex (R)

(a) 1-[P], 2-[S], 3-[Q], 4-[R]
(b) 1-[Q], 2-[R], 3-[P], 4-[S]
(c) 1-[R], 2-[Q], 3-[S], 4-[P]
(d) 1-[Q], 2-[P], 3-[R], 4-[S]

21. **Match the followings [GATE-2009]**

Group I (Process)	Group II (Required Molecules)
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Protein degradation	Proteasome complex (R)

(a) 1-[P], 2-[S], 3-[Q], 4-[R]
(b) 1-[Q], 2-[R], 3-[P], 4-[S]
(c) 1-[R], 2-[Q], 3-[S], 4-[P]
(d) 1-[Q], 2-[P], 3-[R], 4-[S]

- **Explanation:**

1. **Post-translational modification → Signal peptidase (P):** Signal peptidase cleaves signal peptides from proteins during post-translational modification.
2. **DNA repair → Photolyase (S):** Photolyase repairs **UV-induced DNA damage** by reversing thymine dimer formation using visible light.
3. **Control of prokaryotic transcription → Sigma factor (Q):** Sigma factors assist **RNA polymerase** in initiating transcription by recognizing the promoter sequence.
4. **Protein degradation → Proteasome complex (R):** Proteasomes degrade **misfolded** or **damaged proteins** in a highly selective manner.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 336; Tortora, Page 210

22. **The most important microbial virulence factor in etiology of meningitis is [GATE-2008]**

(a) Exotoxin
(b) Components of the capsule
(c) Coagulase
(d) Hyaluronidase

22. **The most important microbial virulence factor in etiology of meningitis is [GATE-2008]**

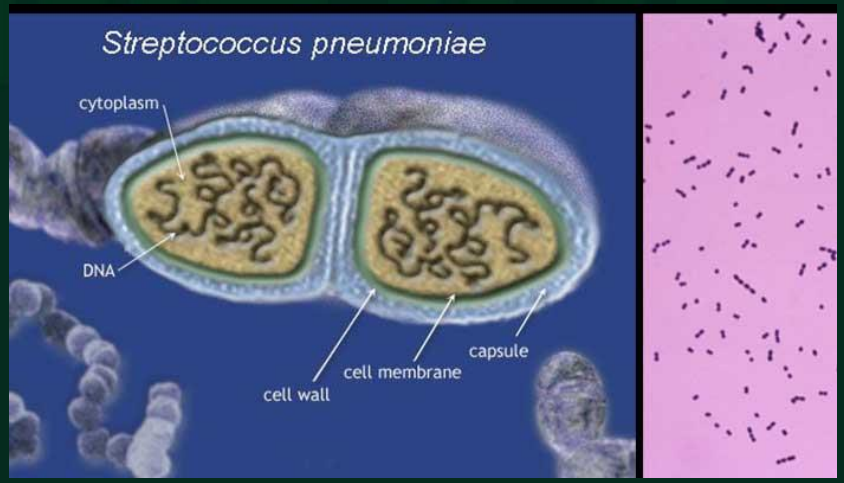
(a) Exotoxin

(b) Components of the capsule

(c) Coagulase

(d) Hyaluronidase

- **Explanation:**
  - The **capsule** is the major **virulence factor** in the etiology of meningitis caused by bacteria like **Neisseria meningitidis**, **Streptococcus pneumoniae**, and **Haemophilus influenzae**.
  - The capsule helps bacteria evade **phagocytosis** by the host immune system, allowing them to survive and cause infection in the **central nervous system (CNS)**.
  - This protective polysaccharide layer is critical for bacterial pathogenesis.



Reference: Kuby Immunology, Page 291

23. **Gram-positive bacteria typically contain [GATE-2008]**

(a) Cell wall that lacks peptidoglycans
(b) Repeating units arabinogalactan and mycolates in their cell walls
(c) Peptidoglycan muramic acid and D-amino acids in their cell walls
(d) Cell walls containing predominantly polysaccharides and glycoproteins

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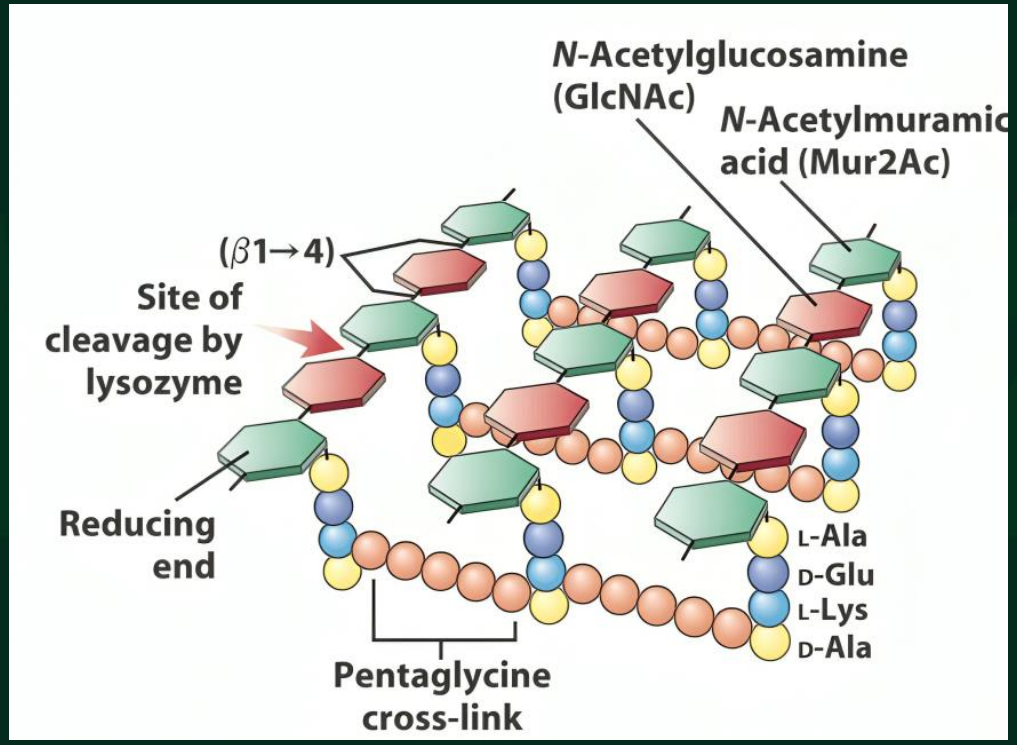
(c) Peptidoglycan muramic acid and D-amino acids in their cell walls

(d) Cell walls containing predominantly polysaccharides and glycoproteins

- **Explanation**:

The **cell wall** of **Gram-positive bacteria** is primarily composed of **peptidoglycan**, which consists of alternating units of **N-acetylglucosamine (NAG)** and **N-acetylmuramic acid (NAM)**. These are cross-linked with **D-amino acids** like **D-alanine** to provide rigidity and structural strength. The thick peptidoglycan layer retains the **crystal violet stain** during Gram staining, differentiating Gram-positive bacteria from Gram-negative bacteria.



Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 51–53.

24. Two important advantages of using microorganisms for bio-transformations in drug synthesis are [GATE-2006]

[P] Having been produced from micro-organisms, they are certain to have antibacterial properties
[Q] They are abundant in nature and hence reduce the processing cost significantly
[R] They produce the specific stereoisomer only
[S] They are highly selective and therefore yield products with high purity

Choose the correct statements:

(a) [P], [Q]
(b) [Q], [R]
(c) [P], [S]
(d) [R], [S]

24. Two important advantages of using microorganisms for bio-transformations in drug synthesis are [GATE-2006]

[P] Having been produced from micro-organisms, they are certain to have antibacterial properties
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Choose the correct statements:

(a) [P], [Q]
(b) [Q], [R]
(c) [P], [S]
(d) [R], [S]

- **Explanation**:

- **[R] They produce the specific stereoisomer only:** Microorganisms are highly specific and can produce **specific stereoisomers** of compounds, which is critical in drug synthesis where stereochemistry affects efficacy and safety.
- **[S] They are highly selective and therefore yield products with high purity:** Microorganisms perform **highly selective biotransformations**, ensuring the product has **minimal impurities** and high purity. This selectivity is a key advantage in pharmaceutical production.

Reference: Tortora, 13th Edition, Pages 232–234

25. **A common organism that causes meningitis belongs to the genus [GATE-2006]**

(a) Candida
(b) Neisseria
(c) Pseudomonas
(d) Clostridium

25. **A common organism that causes meningitis belongs to the genus [GATE-2006]**

(a) Candida

(b) Neisseria

(c) Pseudomonas

(d) Clostridium

- **Explanation**:

Neisseria meningitidis is a Gram-negative diplococcus that causes **bacterial meningitis**, also known as **meningococcal meningitis**. This organism colonizes the **nasopharynx** and can invade the bloodstream, reaching the **central nervous system** (CNS) to cause inflammation of the meninges. It is one of the leading causes of **community-acquired meningitis**, particularly in children and young adults.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 14

26. **Commercial production of citric acid is carried out by the microbial culture of [GATE-2003]**

(a) Fusarium moniliforme
(b) Rhizopus nigricans
(c) Aspergillus niger
(d) Candida utilis

26. **Commercial production of citric acid is carried out by the microbial culture of [GATE-2003]**

(a) Fusarium moniliforme
(b) Rhizopus nigricans
(c) Aspergillus niger
(d) Candida utilis

- **Explanation**:

Aspergillus niger, a species of **fungus**, is widely used for the **commercial production of citric acid** through **fermentation**. This organism efficiently converts sugars such as glucose or sucrose into **citric acid** under controlled conditions. Citric acid is extensively used in the food, beverage, and pharmaceutical industries due to its acidulant and preservative properties.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 15

27. For thermophilic microorganisms, the minimum growth temperature required is [GATE-2003]

(a) 20°C
(b) 37°C
(c) 45°C
(d) 65°C

27. For thermophilic microorganisms, the minimum growth temperature required is [GATE-2003]

(a) 20°C
(b) 37°C
(c) 45°C
(d) 65°C

- **Explanation**:

Thermophilic microorganisms thrive at high temperatures, typically between **45°C and 80°C**. The **minimum temperature** required for their growth is approximately **45°C**. These organisms are adapted to survive in extreme environments such as **hot springs**, **geothermal vents**, and **compost piles**. Enzymes produced by thermophiles are stable and functional at high temperatures, making them valuable in industrial processes.

Reference: NK Jain, Page 57

28. **Obligatory anaerobes [GATE-2003]**

(a) Can tolerate oxygen and grow better in its presence
(b) Do not tolerate oxygen and die in its presence
(c) Can grow in oxygen levels below normal
(d) Can grow in presence of atmospheric oxygen

28. **Obligatory anaerobes [GATE-2003]**

(a) Can tolerate oxygen and grow better in its presence

(b) Do not tolerate oxygen and die in its presence

(c) Can grow in oxygen levels below normal

(d) Can grow in presence of atmospheric oxygen

- **Explanation:**

Obligate anaerobes are microorganisms that cannot tolerate **oxygen** and die when exposed to it. Oxygen is toxic to these organisms because they lack enzymes like **superoxide dismutase** and **catalase**, which neutralize harmful oxygen radicals. Obligate anaerobes rely on **anaerobic respiration** or **fermentation** for energy production. Examples include **Clostridium species**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 65.

29. **Plasmid is a [GATE-2003]**

(a) Macromolecule involved in the protein synthesis
(b) Circular piece of duplex DNA
(c) A hybrid DNA that is formed by joining pieces of DNA
(d) Endogenous substance secreted by one type of cell

29. **Plasmid is a [GATE-2003]**

(a) Macromolecule involved in the protein synthesis

(b) Circular piece of duplex DNA

(c) A hybrid DNA that is formed by joining pieces of DNA

(d) Endogenous substance secreted by one type of cell

- **Explanation:**

A **plasmid** is a small, **circular piece of double-stranded DNA** that exists independently of the chromosomal DNA in **bacteria** and some eukaryotes. Plasmids often carry genes for traits such as **antibiotic resistance**, toxin production, or metabolic activities. They are widely used in **genetic engineering** as vectors for cloning and gene transfer due to their ability to replicate autonomously.

Reference: Tortora, 13th Edition, Page 229

30. A specimen isolated from a patient suffering from septicemia was found to be a strict aerobe. Its culture vial had a characteristic grape-like odor, and it was susceptible to Carbenicillin. Identify the organism [GATE-2002]

(a) Pseudomonas fluorescens
(b) Salmonella typhi
(c) Staphylococcus aureus
(d) Pseudomonas aeruginosa

30. **A specimen isolated from a patient suffering from septicemia was found to be a strict aerobe. Its culture vial had a characteristic grape-like odor, and it was susceptible to Carbenicillin. Identify the organism [GATE-2002]**

(a) Pseudomonas fluorescens
(b) Salmonella typhi
(c) Staphylococcus aureus
(d) Pseudomonas aeruginosa

- **Explanation:**

Pseudomonas aeruginosa is a **strict aerobe** (requires oxygen for growth) that produces a **characteristic grape-like odor** due to the secretion of volatile compounds like **2-aminoacetophenone**. It is commonly associated with **septicemia, burns, and respiratory infections** and is susceptible to **Carbenicillin**, an anti-pseudomonal penicillin. Pseudomonas aeruginosa is known for its ability to survive in harsh environments and its resistance to many antibiotics.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 291

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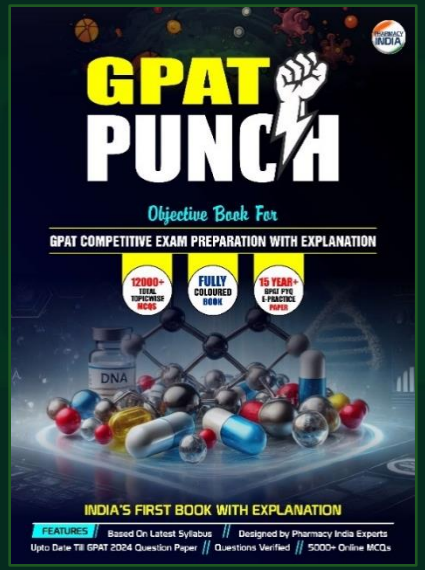

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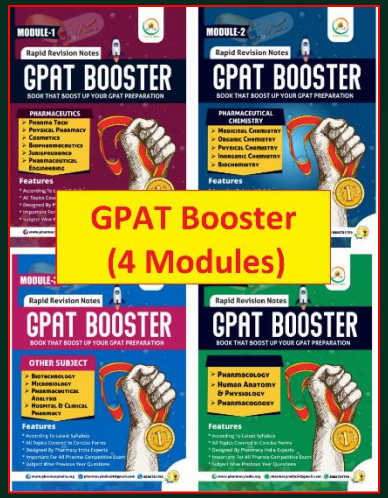

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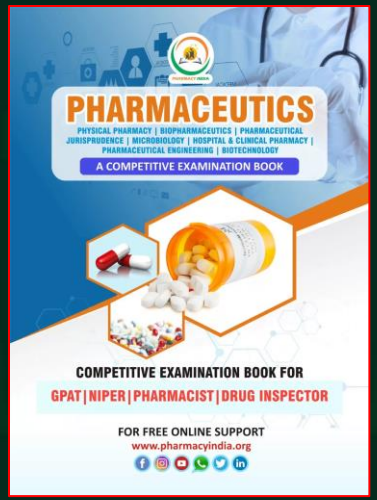

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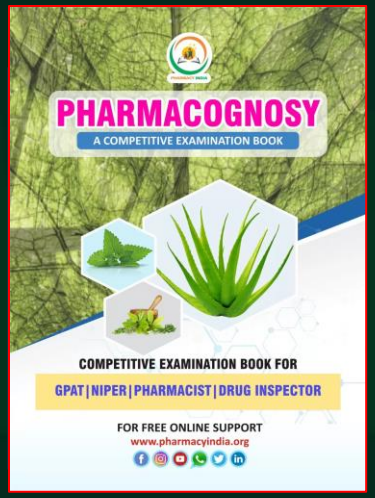

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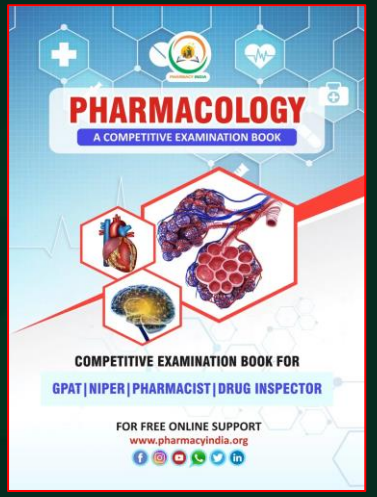

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31. **A typical example of exotoxin is [GATE-2002]**

(a) Lipid-A
(b) Cytokine
(c) Tetanospasmin
(d) Tuberculin

31. A typical example of exotoxin is [GATE-2002]

(a) Lipid-A
(b) Cytokine
(c) Tetanospasmin
(d) Tuberculin

- **Explanation:**

Tetanospasmin is a potent **exotoxin** produced by **Clostridium tetani**, the bacterium responsible for **tetanus**. Exotoxins are **protein toxins** secreted by bacteria, which disrupt host cellular functions. Tetanospasmin targets the **nervous system**, blocking the release of inhibitory neurotransmitters like **GABA**, leading to muscle spasms and paralysis. Its action is highly specific and characteristic of **exotoxins**, which differ from endotoxins in their mode of action and secretion.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 204

32. **A microscopic examination of a culture isolate revealed spherical bodies with a smooth outline growing in long chains. Identify the microorganism [GATE-2000]**

(a) Staphylococcus aureus
(b) Streptococcus pyogenes
(c) Rhizopus stolonifer
(d) Bacillus subtilis

32. **A microscopic examination of a culture isolate revealed spherical bodies with a smooth outline growing in long chains. Identify the microorganism [GATE-2000]**

(a) Staphylococcus aureus

(b) Streptococcus pyogenes

(c) Rhizopus stolonifer

(d) Bacillus subtilis

- **Explanation**:

Streptococcus pyogenes is a Gram-positive bacterium that forms **spherical (cocci) cells** arranged in **long chains**. This arrangement results from its division in one plane, characteristic of **streptococci**. It is an important pathogen causing diseases like **pharyngitis**, **rheumatic fever**, and **scarlet fever**. Unlike **Staphylococcus aureus**, which forms clusters, Streptococcus pyogenes consistently appears in chains.

Reference: NK Jain, Page 47–48

33. **The most common causative agent of bacterial pneumonia is [GATE-1999]**

(a) Staphylococcus aureus
(b) Escherichia coli
(c) Streptococcus pneumoniae
(d) Mycoplasma pneumoniae

33. **The most common causative agent of bacterial pneumonia is [GATE-1999]**

(a) Staphylococcus aureus
(b) Escherichia coli
(c) Streptococcus pneumoniae
(d) Mycoplasma pneumoniae

- **Explanation**:

Streptococcus pneumoniae, also known as **pneumococcus**, is the leading cause of **bacterial pneumonia**, particularly in children, the elderly, and immunocompromised individuals. It is a Gram-positive, alpha-hemolytic bacterium that resides in the upper respiratory tract. Its virulence is largely due to its **polysaccharide capsule**, which inhibits phagocytosis and promotes survival in the host.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 338

34. **The principal structural component of the cell wall in bacteria is made up of [GATE-1997]**

(a) Simple protein
(b) Peptidoglycan polymer
(c) Complex polysaccharides
(d) Glycoprotein

34. **The principal structural component of the cell wall in bacteria is made up of [GATE-1997]**

(a) Simple protein

(b) Peptidoglycan polymer

(c) Complex polysaccharides

(d) Glycoprotein

- **Explanation:**

Peptidoglycan (also known as **murein**) is the major structural component of the bacterial cell wall, especially in **Gram-positive bacteria**. It is composed of alternating sugar residues (**N-acetylglucosamine (NAG)** and **N-acetylmuramic acid (NAM)**) cross-linked by short peptides containing **D-amino acids**. This structure provides **mechanical strength** and protects the bacterial cell from osmotic lysis.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 34

35. **Size, shape, and mode of arrangement are typical of certain microorganisms. Match them correctly [GATE-1997]**

Microorganism	Feature
1. Streptococci	[Q] Gram-positive arranged in chains
2. Sarcina	[R] Multiples of eight (cubical packets)
3. Bacillus anthracis	[S] Large bacilli, rectangular, Gram-positive
4. Vibrios and Spirilla	[P] Comma and S-shaped form

(a) 1-[Q], 2-[R], 3-[U], 4-[P]
(b) 1-[P], 2-[R], 3-[S], 4-[T]
(c) 1-[P], 2-[Q], 3-[R], 4-[U]
(d) 1-[Q], 2-[R], 3-[S], 4-[P]

35. **Size, shape, and mode of arrangement are typical of certain microorganisms. Match them correctly [GATE-1997]**

Microorganism	Feature
1. Streptococci	[Q] Gram-positive arranged in chains
2. Sarcina	[R] Multiples of eight (cubical packets)
3. Bacillus anthracis	[S] Large bacilli, rectangular, Gram-positive
4. Vibrios and Spirilla	[P] Comma and S-shaped form

(a) 1-[Q], 2-[R], 3-[U], 4-[P]

(b) 1-[P], 2-[R], 3-[S], 4-[T]

(c) 1-[P], 2-[Q], 3-[R], 4-[U]

(d) 1-[Q], 2-[R], 3-[S], 4-[P]

- **Explanation:**

1. **Streptococci → [Q] Gram-positive arranged in chains:**
   Streptococci are **Gram-positive cocci** that form **chains** due to division in a single plane. A classic example is **Streptococcus pyogenes**, which causes strep throat.
2. **Sarcina → [R] Multiples of eight:**
   Sarcina bacteria divide in **three perpendicular planes**, resulting in **cubical packets of eight** cells. This arrangement is characteristic of the genus **Sarcina**.

3. Bacillus anthracis → [U] Rod-shaped, acid-fast:
Bacillus anthracis is a **rod-shaped** bacterium, though not acid-fast. It is Gram-positive and rectangular, a defining characteristic of **Bacillus species**.

4. Vibrio's and Spirilla → [P] Comma and S-shaped form:
Vibrio species (e.g., **Vibrio cholerae**) are **comma-shaped**, while **Spirilla** are **S-shaped** bacteria with a spiral morphology.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 46–48

36. **The following bacteria are classified based on their staining [P] to [T]. Match them [GATE-1993]**

Bacteria	Classification
Clostridium tetani	Gram-positive bacilli
Escherichia coli	Gram-negative bacilli
Neisseria gonorrhoeae	Gram-negative cocci
Streptococcus pyogenes	Gram-positive cocci

(a) 1-[Q], 2-[P], 3-[S], 4-[P]
(b) 1-[P], 2-[S], 3-[R], 4-[Q]
(c) 1-[S], 2-[P], 3-[R], 4-[Q]
(d) 1-[Q], 2-[S], 3-[R], 4-[P]

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Bacteria	Classification
Clostridium tetani	Gram-positive bacilli
Escherichia coli	Gram-negative bacilli
Neisseria gonorrhoeae	Gram-negative cocci
Streptococcus pyogenes	Gram-positive cocci

(a) 1-[Q], 2-[P], 3-[S], 4-[P]
(b) 1-[P], 2-[S], 3-[R], 4-[Q]
(c) 1-[S], 2-[P], 3-[R], 4-[Q]
(d) 1-[Q], 2-[S], 3-[R], 4-[P]

- **Explanation:**

Clostridium tetani → [Q] Gram-positive bacilli: A rod-shaped bacterium responsible for tetanus.

Escherichia coli → [S] Gram-negative bacilli: A rod-shaped Gram-negative bacterium commonly found in the gut.

Neisseria gonorrhoeae → [R] Gram-negative cocci: A spherical Gram-negative bacterium causing gonorrhea.

Streptococcus pyogenes → [P] Gram-positive cocci: A chain-forming Gram-positive bacterium causing strep throat.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Pages 83–87.

37. **Limulus test is a rapid in-vitro test for parenterals to detect the presence of [GATE-1988]**

(a) Particulate matter
(b) Fungus
(c) Pyrogens
(d) Bacteria

37. **Limulus test is a rapid in-vitro test for parenterals to detect the presence of [GATE-1988]**

(a) Particulate matter
(b) Fungus
(c) Pyrogens
(d) Bacteria

- **Explanation**:

The **Limulus Amebocyte Lysate (LAL) test**, commonly known as the **Limulus test**, detects the presence of **Gram-negative bacterial endotoxins** in parenteral drugs and medical devices. It works by activating a **clotting cascade** in the **amebocytes** of horseshoe crab blood when endotoxins are present.

- **Amebocytes**: These blood cells play a vital role in the horseshoe crab's immune defense against Gram-negative bacteria and **fungal pathogens**.
- Upon contact with endotoxins, **coagulogen**, a clotting factor, is released. This triggers a cascade of enzymatic reactions leading to the **coagulation** of the pathogen.
- This test is highly sensitive and widely used in the pharmaceutical industry to ensure the **safety of injectable products** and medical devices.

Reference: Tortora, 13th Edition, Pages 435–436

38. **Lipid content is more in**

(a) Gram-negative bacteria
(b) Gram-positive bacteria
(c) Both (a) and (b)
(d) None of the above

38. Lipid content is more in

(a) Gram-negative bacteria

(b) Gram-positive bacteria

(c) Both (a) and (b)

(d) None of the above

- **Explanation:**

The **cell envelope of Gram-negative bacteria** contains an **outer membrane** rich in **lipids**, especially **lipopolysaccharides (LPS)**. This lipid-rich outer layer provides structural integrity and resistance to antibiotics and detergents. Gram-positive bacteria lack this outer membrane and have less lipid content, but their thick peptidoglycan layer makes them structurally rigid.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 106.

39. **The first phase of a growth curve is**

(a) Log phase
(b) Lag phase
(c) γ phase
(d) Both (a) and (b)

39. **The first phase of a growth curve is**

(a) Log phase

(b) Lag phase

(c) γ phase

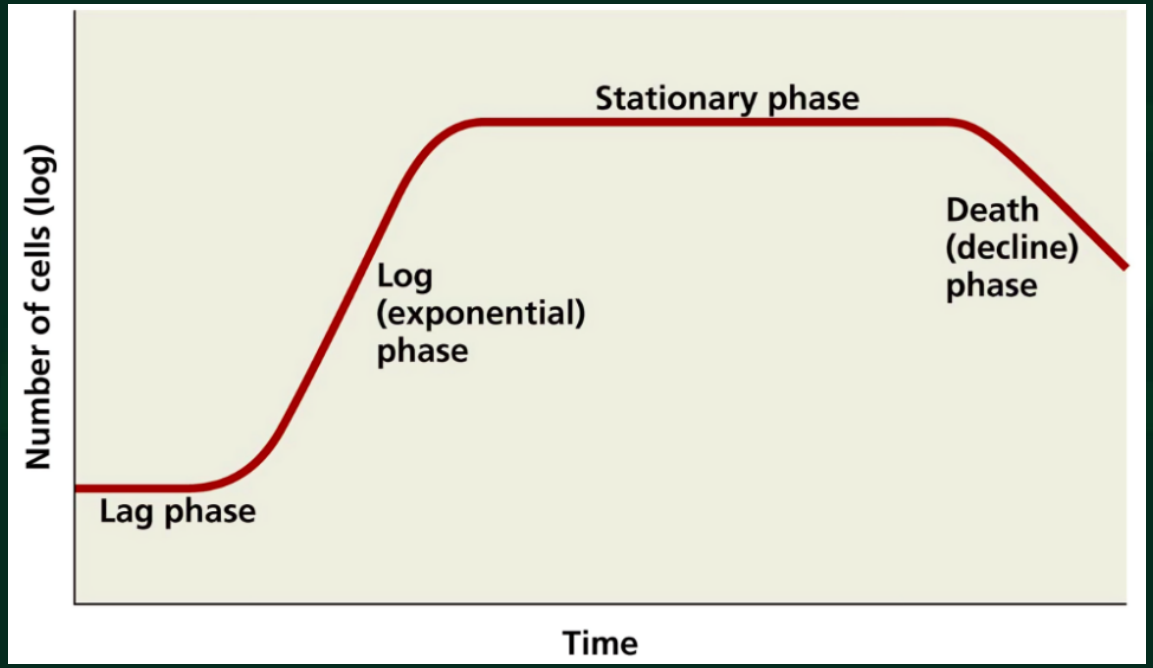
(d) Both (a) and (b)

- **Explanation**:

The **Lag phase** is the initial stage of the bacterial growth curve. During this phase:

- Bacteria adapt to their environment.
- Cells are metabolically active, synthesizing **enzymes**, **proteins**, and **nucleic acids** required for growth.
- There is no significant increase in cell number.

This phase is followed by the **Log (exponential) phase**, where bacteria grow and divide rapidly.



Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 150

40. **Physiologically the cells are active and are synthesizing new protoplasm in which stage of the growth in bacteria**

(a) Log phase
(b) Lag phase
(c) Stationary phase
(d) None of the above

40. **Physiologically the cells are active and are synthesizing new protoplasm in which stage of the growth in bacteria**

(a) Log phase
(b) Lag phase
(c) Stationary phase
(d) None of the above

- **Explanation:**

During the **Lag phase**, bacterial cells are physiologically active but not dividing. They:

- Synthesize **enzymes**, **protoplasm**, and other molecules needed for replication.
- Repair cellular damage from environmental stress.
  This phase is essential for preparing the cells for rapid division in the subsequent **Log phase.**

Reference: Ashutosh Kar, Pharmaceutical Microbiology, Page 150

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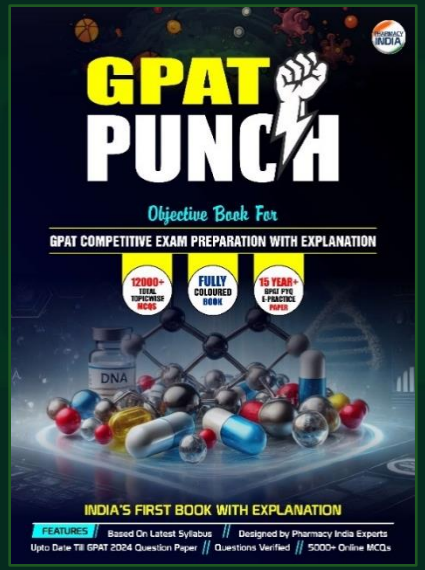

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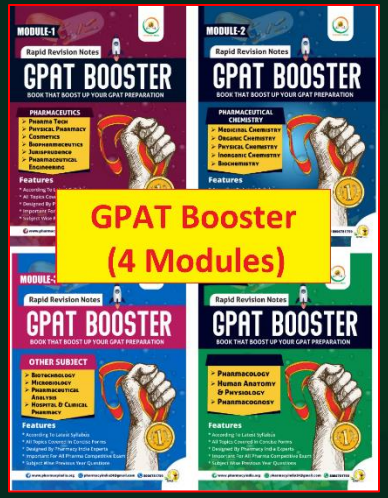

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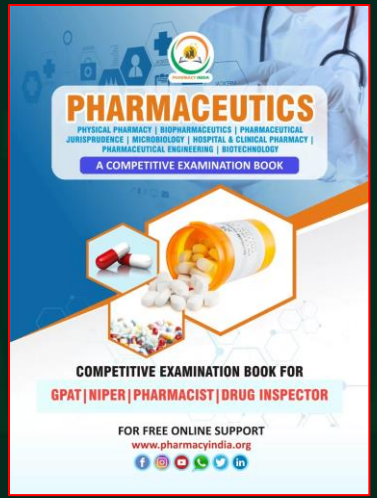

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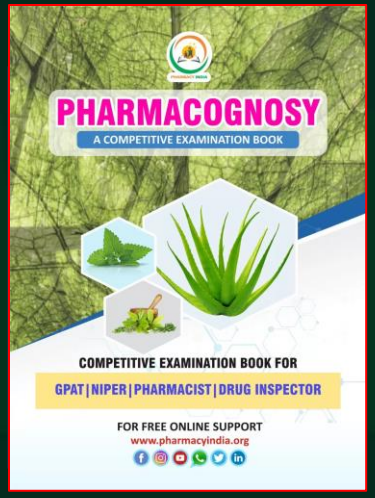

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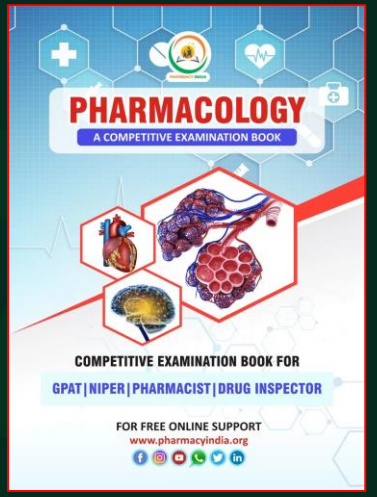

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41. **Which of the following microorganisms lacks a cell wall?**

(a) Bacillus subtilis
(b) Mycoplasma pneumoniae
(c) Escherichia coli
(d) Staphylococcus aureus

41. **Which of the following microorganisms lacks a cell wall?**

(a) Bacillus subtilis

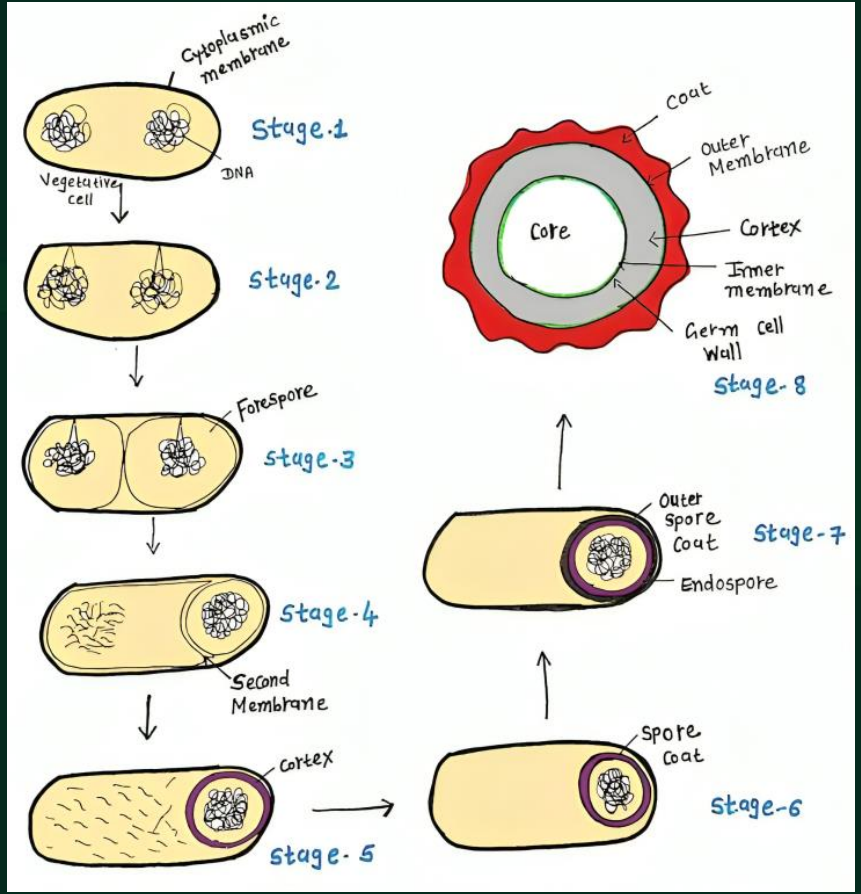
(b) Mycoplasma pneumoniae

(c) Escherichia coli

(d) Staphylococcus aureus

- **Explanation:**

- **Mycoplasma pneumoniae** is a unique microorganism because it **lacks a cell wall.**
- This absence of a **peptidoglycan layer** makes **Mycoplasma** resistant to antibiotics like **penicillin** and **cephalosporins** that target cell wall synthesis.
- Instead, Mycoplasma has a **sterol-enriched plasma membrane**, which provides structural stability.
- It is a common causative agent of **atypical pneumonia** (walking pneumonia).



Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 65.**

42. **The major site of ATP generation in aerobic bacteria is:**

(a) Nucleus
(b) Cell membrane
(c) Ribosomes
(d) Cytoplasm

42. **The major site of ATP generation in aerobic bacteria is:**

(a) Nucleus

(b) Cell membrane

(c) Ribosomes

(d) Cytoplasm

- **Explanation:**

- Aerobic bacteria generate **ATP** (adenosine triphosphate) via **oxidative phosphorylation**, which occurs at the **cell membrane**.
- Unlike eukaryotic cells, bacteria **lack mitochondria**. Instead, the **electron transport chain (ETC)** is located in the **plasma membrane**.
- The membrane's **proton gradient** drives ATP synthesis through **ATP synthase**.
- Examples include **Escherichia coli** and **Pseudomonas aeruginosa**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 72**

43. **Which microorganism causes Q fever?**

(a) Coxiella burnetii

(b) Yersinia pestis

(c) Mycobacterium tuberculosis

(d) Bacillus anthracis

43. Which microorganism causes Q fever?

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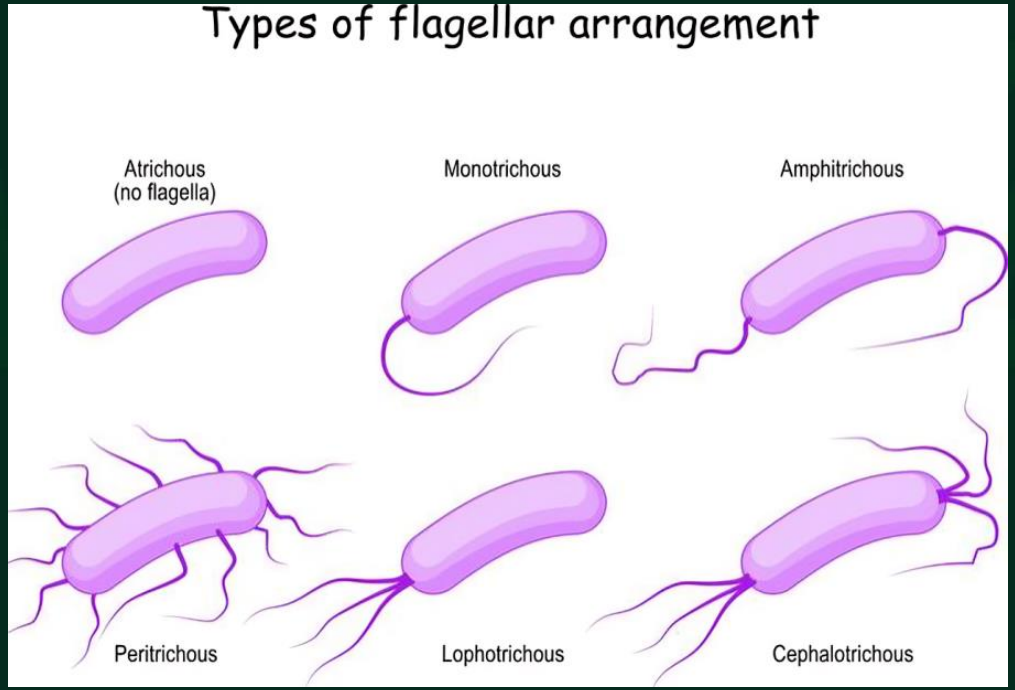
- **Explanation**:



- **Coxiella burnetii** is an **obligate intracellular pathogen** responsible for **Q fever**, a zoonotic disease.
- It is transmitted through **inhalation of aerosols** contaminated with **animal feces**, **urine**, or **placental tissues**.
- Symptoms include **fever**, **headache**, **pneumonia**, and **hepatitis**.
- C. burnetii has a **high resistance** to environmental stresses due to its **spore-like form**.

Reference: Tortora, 13th Edition, **Page 565**

44. **The enzyme involved in the replication of bacterial DNA is:**

(a) DNA polymerase
(b) RNA polymerase
(c) Reverse transcriptase
(d) Lysozyme

44. **The enzyme involved in the replication of bacterial DNA is:**

(a) DNA polymerase

(b) RNA polymerase

(c) Reverse transcriptase

(d) Lysozyme

- **Explanation:**
- **DNA polymerase** is the enzyme responsible for **replicating bacterial DNA** during cell division.
- It synthesizes a **new complementary DNA strand** using the **template strand** in the 5’ to 3’ direction.
- In bacteria, **DNA Polymerase III** is the primary enzyme involved in **elongation**, while **DNA Polymerase I** helps in **repair and primer removal.**

Reference: NK Jain, Microbiology, **Page 123**

45. **Which staining technique is used to visualize bacterial capsules?**

(a) Gram staining
(b) Acid-fast staining
(c) Negative staining
(d) Endospore staining

45. **Which staining technique is used to visualize bacterial capsules?**

(a) Gram staining

(b) Acid-fast staining

(c) Negative staining

(d) Endospore staining

- **Explanation**:

- **Negative staining** is used to visualize **bacterial capsules** by staining the **background** rather than the cell.
- The capsule appears as a **clear halo** around the bacterial cell because it **repels stains** like India ink or nigrosin.
- **Capsules** are composed of **polysaccharides** and protect bacteria from **phagocytosis**.
- Example: **Klebsiella pneumoniae** and **Streptococcus pneumoniae**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 132**

46. **The causative organism for Rocky Mountain spotted fever is:**

(a) Rickettsia rickettsii
(b) Treponema pallidum
(c) Vibrio cholerae
(d) Clostridium tetani

46. **The causative organism for Rocky Mountain spotted fever is:**

(a) Rickettsia rickettsii

(b) Treponema pallidum

(c) Vibrio cholerae

(d) Clostridium tetani

- **Explanation:**
- **Rickettsia rickettsii** is an **obligate intracellular bacterium** that causes **Rocky Mountain spotted fever** (RMSF).
- It is transmitted to humans via **tick bites** (e.g., Dermacentor ticks).
- Symptoms include **fever**, **rash**, **muscle pain**, and complications like **multi-organ failure**.
- RMSF is treated with **tetracyclines**, such as doxycycline.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 100**

47. **Which microorganism is used in the commercial production of lactic acid?**

(a) Saccharomyces cerevisiae
(b) Rhizopus oryzae
(c) Lactobacillus delbrueckii
(d) Penicillium chrysogenum

47. **Which microorganism is used in the commercial production of lactic acid?**

(a) Saccharomyces cerevisiae

(b) Rhizopus oryzae

(c) Lactobacillus delbrueckii

(d) Penicillium chrysogenum

- **Explanation:**

- **Lactobacillus delbrueckii** is a **lactic acid bacterium** widely used for the **commercial production of lactic acid**.
- It ferments **carbohydrates** (e.g., glucose) to produce **lactic acid**, which is used in the **food**, **pharmaceutical**, and **bioplastic** industries.
- Lactic acid is a critical product in **yogurt fermentation** and other dairy products.

Reference: Tortora, 13th Edition, **Page 232**

48. **Which microorganism is primarily responsible for dental caries?**

(a) Streptococcus mutans
(b) Escherichia coli
(c) Pseudomonas aeruginosa
(d) Bacillus subtilis

48. **Which microorganism is primarily responsible for dental caries?**

(a) Streptococcus mutans

(b) Escherichia coli

(c) Pseudomonas aeruginosa

(d) Bacillus subtilis

- **Explanation**:

- **Streptococcus mutans** is a **Gram-positive cocci** that ferments dietary **sugars** to produce **lactic acid**.
- This acid demineralizes tooth enamel, leading to the formation of **dental caries**.
- S. mutans adheres to the teeth via **dextran**, a polysaccharide produced from sucrose.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 117**.

49. **Which phase of bacterial growth curve is characterized by rapid multiplication?**

(a) Lag phase

(b) Log phase

(c) Stationary phase

(d) Decline phase

49. **Which phase of bacterial growth curve is characterized by rapid multiplication?**

(a) Lag phase

(b) Log phase

(c) Stationary phase

(d) Decline phase

- **Explanation**:

- The **log phase** (exponential phase) of bacterial growth is marked by **rapid cell division** and **population doubling**.
- Bacteria utilize **nutrients** efficiently, and the growth rate reaches its maximum.
- This phase is crucial for producing **primary metabolites** like amino acids and enzymes.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 150**

50. **Endospores are produced by which genus of bacteria?**

(a) Staphylococcus
(b) Bacillus
(c) Escherichia
(d) Vibrio

50. **Endospores are produced by which genus of bacteria?**

(a) Staphylococcus

(b) Bacillus

(c) Escherichia

(d) Vibrio

- **Explanation**:

- **Endospores** are produced by bacteria like **Bacillus** and **Clostridium** as a survival strategy under harsh conditions.
- They are **highly resistant** to heat, radiation, desiccation, and chemical disinfectants due to their **thick protective coat** and low water content.
- Example: **Bacillus subtilis** and **Clostridium botulinum**.

Reference: Ashutosh Kar, Pharmaceutical Microbiology, **Page 132**

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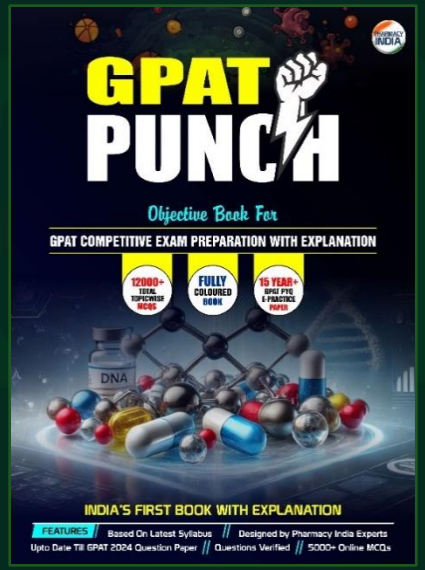

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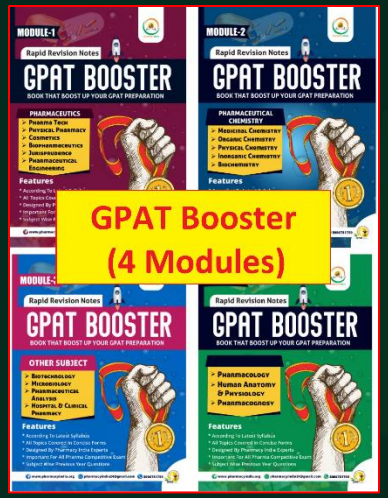

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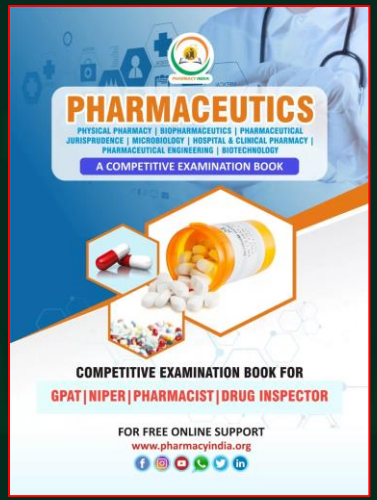

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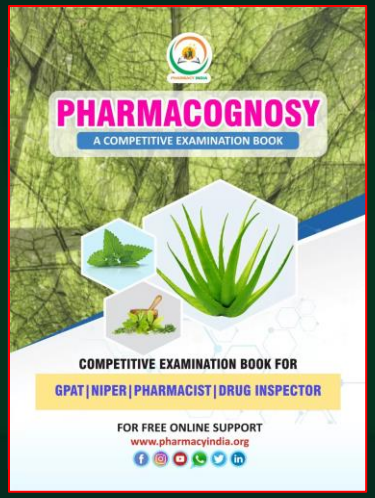

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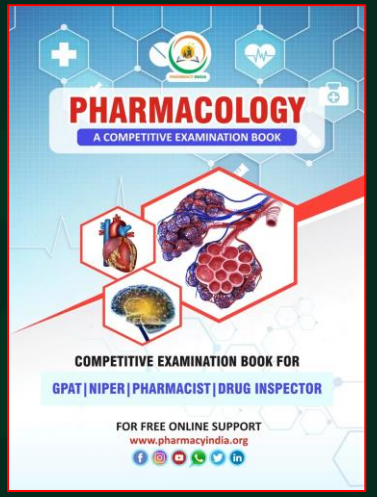

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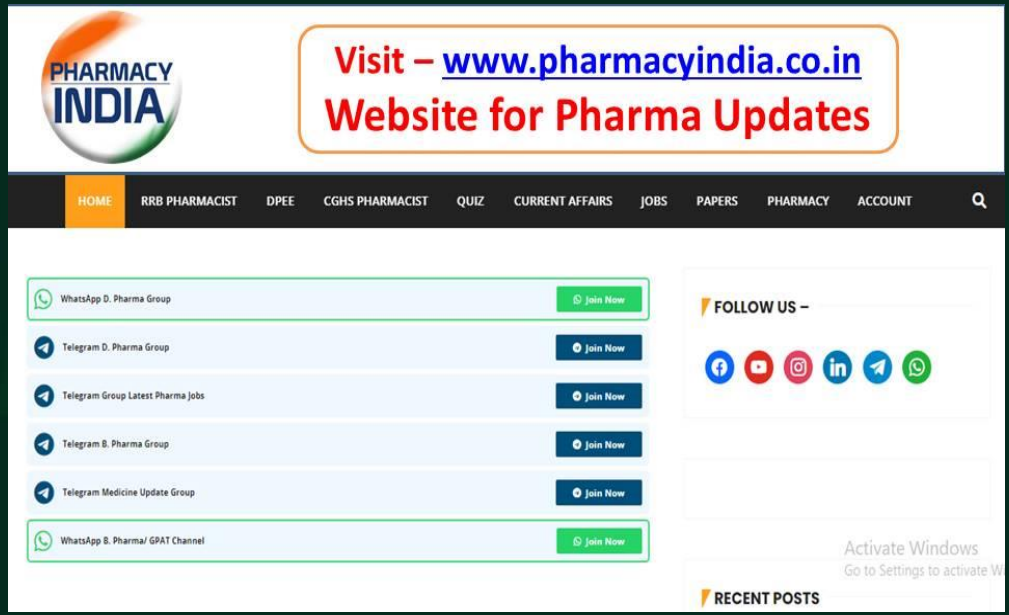

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