# Bihar Public Service Commission

Drug Inspector Written (Objective) Competitive Examination (Advt. No. 09/2022)

**(Examination Date : 10.07.2023)**

## PROVISIONAL ANSWER KEY : Microbiology

## (Paper-4, Unit II)

आयोग द्वारा उपलब्ध कराये गये उत्तर पूर्णतः औपबंधिक (**Provisional**) हैं। उपर्युक्त निर्धारित तिथि तक आपत्तिकर्त्ताओं से प्राप्त आपत्ति की गहन समीक्षा विषय विशेषज्ञों की समिति द्वारा की जायेगी और गहन समीक्षोपरान्त सभी प्रश्नों का अन्तिम आदर्श उत्तर तैयार किया जायेगा। विषय विशेषज्ञों की समिति द्वारा तैयार किये गये उक्त अन्तिम आदर्श उत्तर का आयोग द्वारा अनुमोदनोपरान्त उसके आधार पर ओ०एम०आर० उत्तर पत्रक (**OMR Answer Sheet**) का मूल्यांकन किया जायेगा।

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 1 | B | 13 | C | 25 | D | 38 | A | Antisepsis is the method of using chemicals, called antiseptics, to destroy the germs that cause infections. The British surgeon Joseph Lister developed it. Joseph Lister, 1827–1912 found a way to prevent infection in wounds during and after surgery. |
| 2 | B | 14 | C | 26 | D | 39 | A | The term chemolithotrophis used to designate organisms that generate energy by the oxidation of inorganic molecules for biosynthesis or energy conservation via aerobic or anaerobic respiration. *E.coli* fall under this category. |
| 3 | A | 15 | B | 27 | C | 40 | A | Spores are already dried so drying has no effect on sterilization of spore. Whereas Autoclave and Hot air oven easily kill spores. |
| 4 | D | 16 | A | 28 | B | 41 | C | The basic principle of steam sterilization, as accomplished in an autoclave, is to expose each item to direct steam contact at the required temperature and pressure for the specified time. Thus, there are four parameters of steam sterilization: steam, pressure, temperature, and time. |
| 5 | C | 17 | D | 29 | A | 42 | B | Differential staining is a staining process which uses more than one chemical stain. Using multiple stains can better differentiate between different microorganisms or structures/cellular components of a single organism. Moeller staining involves the use of a steamed dye reagent in order to increase the stainability |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| | | | | | | | | of endospores. Carbolfuchsin is the primary stain used in this method. Endospores are stained red, while the counterstain methylene blue stains the vegetative bacteria blue. |
| 6 | A | 18 | B | 30 | C | 43 | D | Negri bodies are eosinophilic, sharplyoutlined, pathognomonic incl usion bodies (2–10 μm in diameter) found in the cytoplasm of certain nerve cells containing the virus of rabies. They are also often found in the Purkinje cells of the cerebellar cortex from postmortem brain samples of rabies victims. They consist of ribonuclear proteins produced by the virus. It shoes characteristic basophilic inner granules. |
| 7 | D | 19 | A | 31 | B | 44 | C | IgE, mast cells, basophils, and eosinophils are essential components of allergic inflammation. Antigen-specific IgE production, with subsequent fixation of IgE to FcεRI receptors on basophils, is central to the initiation and propagation of immediate hypersensitivity reactions. |
| 8 | C | 20 | D | 32 | A | 45 | B | CDR is complementarity-determining regions, which impart the diversity in the variable region of both heavy and light chains. These are three small hypervariable regions and remaining part is called framework region. |
| 9 | A | 21 | B | 33 | C | 46 | D | **Setter's answer is option 'D', but the correct answer is option 'A'.** The hall mark of human immunodeficiency virus (HIV) infection is a gradual loss of CD4 + T-cells and imbalance in CD4 + T-cell homeostasis, with progressive impairment of immunity that leads ultimately to death. HIV infection in humans is caused by two related yet distinct viruses: HIV-1 and HIV-2. In Aids Patients Cd4 /Cd8 Ratio always less than 1. |
| 10 | D | 22 | A | 34 | B | 47 | C | The T-cell based immunity that targets the cells and the intracellular pathogen is known as 'Cellular Immunity'. Whereas B-cells secrete antibodies that act against antigens. |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 11 | D | 23 | A | 35 | B | 48 | C | Colicins exert their lethal action by first binding to specific receptors, which are outer membrane proteins used for the entry of specific nutrients. |
| 12 | B | 24 | C | 36 | D | 49 | A | Penicillin kills susceptible bacteria by specifically inhibiting the transpeptidase that catalyzes the final step in cell wall biosynthesis, the cross-linking of peptidoglycan. |
| 13 | B | 25 | A | 37 | B | 50 | A | Bacitracin is an important antibacterial natural product predominantly produced by Bacillus licheniformis and Bacillus subtilis, and it is characterized by a broad antimicrobial spectrum, strong activity and low resistance, thus bacitracin is extensively applied in animal feed and veterinary medicine industries. |
| 14 | C | 26 | C | 38 | C | 1 | C | Paper Disk diffusion is the most widely used AST method in microbiology laboratories because of its low cost and ease of performance and applicability of numerous bacterial species and antibiotics. Tube dilution method is also frequently used. |
| 15 | C | 27 | D | 39 | A | 2 | B | The quinolone class of antibiotics inhibits the DNA synthesis of bacteria by disrupting the bacterial topoisomerase type II; inhibiting the catalytic activity of DNA gyrase and topoisomerase IV. These two enzymes are critical bacterial enzymes that regulate the chromosomal supercoiling required for DNA synthesis. |
| 16 | A | 28 | B | 40 | C | 3 | D | Examples of acid-fast bacteria include *Mycobacteriumtuberculosis* (causative agent of human tuberculosis), *Mycobacterium leprae* (the causative agent of human leprosy). Whereas *Escherichia coli* are Gram negative; *Bacillus subtilis* and *Streptococcus pyogenes* are Gram positive. |
| 17 | C | 29 | D | 41 | A | 4 | B | A neutral dye is a complex salt of a dye acid with a dye base so eosinate of methylene blue is an example of a neutral dye. |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 18 | D | 30 | A | 42 | B | 5 | C | Gram negative bacteria contain outer membrane which is made of lipid. Alcohol dissolve lipid so outer membrane destroyed and permeability of cell wall ultimately increased. |
| 19 | D | 31 | A | 43 | B | 6 | C | The two prokaryote domains, Bacteria and Archaea, split from each other early in the evolution of life. Other options include eukarya. |
| 20 | A | 32 | B | 44 | C | 7 | D | Hypochlorite has been used as a disinfectant for more than 100 years. It has many of the properties of an ideal disinfectant, including a broad antimicrobial activity, rapid bactericidal action, reasonable used for treatment potable water, aseptic room etc. Its ease in use, solubility in water, relative stability, relative nontoxicity at use concentrations, no poisonous residuals, no color, no staining, and low cost make it most popular. Other options are either acid or very harsh chemicals. |
| 21 | B | 33 | C | 45 | D | 8 | A | Pasteurization is done below 100$^{o}$C which does not kill resistant endospores whereas all other three options easily kill endospores. |
| 22 | B | 34 | C | 46 | D | 9 | A | The lowest temperature that kills all microorganisms in a liquid suspension in 10 minutes is known is the standard definition of Thermal death Point. |
| 23 | A | 35 | B | 47 | C | 10 | D | Preservative.<br>It prevents growth of microorganism but doesn't kill the microorganism. Antibiotics, Germicides and Bactericides are substance responsible for killing of microorganism. |
| 24 | A | 36 | B | 48 | C | 11 | D | *Streptomyces venezuelae*<br>Jadomycin, a novel group of antibiotics is produced by *Streptomyces venezuelae*. |
| 25 | C | 37 | D | 49 | A | 12 | B | Both type of immunization may provide long term protection to the immune system.<br>In active immunity, memory cells are formed in response to naturally or artificially attack of live or dead |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| | | | | | | | | or weakened pathogen. Hence, it is responsible for long term while in passive immunitization adminis-tration of performed antibodies wouldn't let the formation of memory cell. Hence, it is short-term immunity. |
| 26 | D | 38 | A | 50 | B | 13 | C | Hepatitis B.<br>Hepatitis B vaccine (1986) for Hepatitis B. |
| 27 | A | 39 | B | 1 | C | 14 | D | Killed and incativated vaccine used after 1955 before that live vaccine is used . |
| 28 | C | 40 | D | 2 | A | 15 | B | Both titrimetric and turbidimetric method.<br>Microbiological assay of vitamin can be performed by both titrimetric &turbidimetric method. |
| 29 | B | 41 | C | 3 | D | 16 | A | *Lactobacillus leichmannii.*<br>Vitmain $B_{12}$ can be estimated & determined by using *Lactobacillus leichmannii.* |
| 30 | D | 42 | A | 4 | B | 17 | C | Hypersensitivity type-IV.<br>Type four hypersensitivity reaction is a cell –mediated reaction that can occur in response to contact with certain allergens resulting in what is called contact dermatitis or in response to some diagnostic procedures as in the tuberculin skin test. |
| 31 | D | 43 | A | 5 | B | 18 | C | MR test and TSI test.<br>In triple sugar iron test & Methyl Red test (MR test) are used to test ability of microorganisms to ferment sugar. |
| 32 | C | 44 | D | 6 | A | 19 | B | Whiff test is used for diagnosis of Trichomoniasis |
| 33 | B | 45 | C | 7 | D | 20 | A | Interferons.<br>The antiviral action of interferons is attributed to interference of protein sysnthesis. They are secreted from infected cells & activate innate immune response that promotes not only cytokine production but also natural killer cell functions & antigen presentation. |
| 34 | C | 46 | D | 8 | A | 21 | B | Kirby-Bauer disc diffusion test.<br>E-test, microbroth dilution test &Microbroth dilution test are common method to determine the minimum inhibitory concentration of an antimicrobial drug against a particular onicrobes. |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 35 | C | 47 | D | 9 | A | 22 | B | Macrolides.<br>The macrolides are bacterostatic antibiotics with a broad spectrum of activity against many gram-positive bacteria.<br>Fluoroquinolones are family of broad spectrum, systemic antibacterial agents that have been used widely as therapy of respiratory & urinary tract infections.<br>Aminoglycoside is a medicinal & bacteriologic category of traditional Gram(-ve) antibacterial medications that inhibit protein synthesis & contain as a portion of the molecule, an amino-modified glycoside.<br>Monobactam is also antibacterial agent. |
| 36 | B | 48 | C | 10 | A | 23 | B | They all have a β lactam ring as apart of there biological interaction .<br>Penicilin, Cephalosporins, Carbapenems & Monabactum share a common chemical moiety i.e. a four-member ring with an amidic function, commonly called 'β-lactam ring' or 'azetidinone'.<br>Penicillins generally have good CNS penetration. |
| 37 | D | 49 | D | 11 | D | 24 | D | All of the above.<br>The immunodiffusion test are of four different types:-<br>**i.** One-dimensional single diffusion i.e. oudis procedure<br>**ii.** One-dimensional double diffusion i.e. Oakley fulthrope procedure<br>**iii.** One-dimensional double diffusion i.e. Mancini Procedure<br>**iv.** Two-dimensional double diffusion i.e. Ouchterlony procedure.<br><br>So, (A), (B) & (C) are immune-diffusion test. Hence, correct answer is (D) all of the above. |
| 38 | D | 50 | A | 12 | B | 25 | C | Proportional to the amount of antigen place in each well.<br>In rocket immunodiffusion the length of the rocket is proportional to the amount of antigen placed in each well. |
| 39 | C | 1 | D | 13 | A | 26 | B | *Mycoplasma*.<br>*Mycroplasma* lack cell wall : while *Escherichia*, *Pseudomonas*, *Mycob45acterium* have cell wall. |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 40 | A | 2 | B | 14 | C | 27 | D | *Proteus* sp.<br>*Proteus mirabilis*from Enterobacteriaceae that has<br>Swarming growth on culture media<br>Producing urease<br>Major urinary tract infection |
| 41 | C | 3 | D | 15 | A | 28 | B | Tenericutes.<br>In the first edition, Bergey classified the kingdom Prokaryotae is four divisions.<br>**I.** Gracilicutes: Gram (-ve) cell wall<br>**II.** Firmicutes: Gram (+ve) cell wall<br>**III.** Tenericutes: lack cell wall<br>**IV.** Mendosicutes: lack peptidogcycan is their cell wall & are similar to Archaea. |
| 42 | Deleted | 4 | Deleted | 16 | Deleted | 29 | Deleted | The setter's option is (A). But the answer is not proper as the question is not clear for a perfect answer from given question. Question may be deleted. |
| 43 | B | 5 | C | 17 | D | 30 | A | Clostridium sporogenes<br>It is a non-pathogenic, spore-forming, anaerobic bacterium that is often chosen because it is relatively easy to work with in laboratory settings and can provide a reliable indicator of the medium's ability to support the growth of anaerobic organisms. |
| 44 | D | 6 | A | 18 | B | 31 | C | Streptococci.<br><br>Catalse is an enzyme present in some microorganism that break down $H_2O_2$ into $H_2O$ & $O_2$.<br>$H_2O_2 \xrightarrow{\text{catalse}} H_2O + O_2$.<br><br>Release of free Oxygen gas in form of bubbles give positive result. |
| 45 | D | 7 | A | 19 | B | 32 | C | Getting the recommended vaccine short against the disease.<br>Getting the recommended vaccine shot against the disease is Vaccination. It is not an important sanitation practices that can help in killing or reducing viable pathogen. |
| 46 | A | 8 | B | 20 | C | 33 | D | *E.coli*<br>*E.coli* can synthesize all required amino acids for protein synthesis from inorganic compound and glucose. |

| Series-A | | Series-B | | Series-C | | Series-D | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Question No. | Answer | Question No. | Answer | Question No. | Answer | Question No. | Answer | |
| 47 | A | 9 | B | 21 | C | 34 | D | Gram-positive.<br>Acridine dyes are more active against Gram-positive bacteria.<br>Their activity is enhanced in alkaline medium and antagonized by hypochlorites. |
| 48 | B | 10 | C | 22 | D | 35 | A | Long term use of broad spectrum antimicrobials.<br>Super infection is a secondary infection in a patient having a pre-existing infection. A Super infection develop, when the anti-bacterial intended for the pre-existing infection kill the protective microbiota, allowing another pathogen resistant to the anti-bacterial to proliferate and cause a secondary infection. |
| 49 | C | 11 | D | 23 | A | 36 | B | Human Immuno Deficiency Virus.<br>As originally stated Koch's postulates, there are four criteria :<br>**I.** The microorganism must be found in diseased but not healthy individuals.<br>**II.** The microorganism must be cultured from diseased individuals.<br>**III.** Inoculation of a healthy individual with the cultured microorganism must recapitulate the disease.<br>**IV.** The microorganism must be reisolated from the inoculated, diseased individual and matched to the original microorganism.<br>Organism such as *Plasmodium falciparum*herpes simplex virus, human<br>immune-deficiency virus cannot be grown alone;<br>i.e. cell – free culture and hence, cannot fulfil koch's postulates. |
| 50 | C | 12 | D | 24 | A | 37 | B | Pathogen A.<br>The two important indicators of virulence are the median infectious dose($ID_{50}$) and median leathal dose ($LD_{50}$).<br>The $ID_{50}$ is the number of pathogen cells required to cause active infection in 50% of inoculated animals.<br>Pathogen A of which only 50 particles are required for active infection in 50% of inoculated animals.<br>It is followed by pathogen B (which require 1000 particles) and then pathogen C ($1*10^6$ particles). |