■ Comprehensive MCQ Collection

Topic: **Heart**

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Question 1 of 29

Q1: Question
Download Solution PDF
What is the basis of most useful classification of medications in medical chemistry?
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69th BPSC Prelims Exam Official Paper (Held On: 30 Sept, 2023)
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Pharmacological effect
Molecular targets
Chemical structure
None of the above

Options:

A. Pharmacological effect

B. Molecular targets

C. Chemical structure

D. None of the above

■ Answer & Detailed Solution:

The correct answer is Molecular targets.

Key Points

The most useful classification of drugs for medicinal chemists is based on molecular targets.
This classification is based on the target molecules, which are usually biomolecules like carbohydrates, lipids, proteins, and nucleic acids.
Drugs that target specific biomolecules tend to have better results.
These drugs possess some common structural features and may have the same mechanism of action on a specific drug target.
There are other ways to classify drugs as well. For example, drugs can be classified based on their chemical structure, pharmacological effect, or drug action.
However, the classification based on molecular targets is considered the most useful for medicinal chemists.

Additional Information
Common examples of molecular targets:

Receptors: Many drugs work by binding to and modulating the activity of cell surface receptors. For example, beta-blockers target beta-adrenergic receptors in the heart to reduce heart rate and blood pressure.
Enzymes: Enzymes are proteins that catalyze chemical reactions in the body. Drugs can inhibit or enhance the activity of specific enzymes to regulate biological processes.
DNA and RNA: Some drugs target nucleic acids. For example, chemotherapy drugs often target the DNA in cancer cells to inhibit their replication.
Proteins in Disease-Related Pathways: In diseases like cancer, drugs may target specific proteins or pathways that are dysregulated in the disease. For example, drugs like Imatinib target the BCR-ABL fusion protein in chronic myeloid leukemia.
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Question 2 of 29

Q2: Question
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Which of the following pairs are correctly matched?

1. Anorexia : Sleep disorder

2. Insomnia : Eating disorder

3. Dyspnoea : Shortness of breath

4. Anosmia : Partial or full loss of smell

Select the correct answer using the codes given below.

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Only 1 and 2
Only 2 and 3
Only 3 and 4
All of the above

Options:

A. Only 1 and 2

B. Only 2 and 3

C. Only 3 and 4

D. All of the above

■ Answer & Detailed Solution:

The correct answer is Option 3.

Key Points
Anorexia:

Anorexia, also known as anorexia nervosa, is a serious and potentially life-threatening eating disorder characterized by an intense fear of gaining weight and a distorted body image that leads to self-imposed starvation and extreme thinness. Hence pair 1 is not correct.
Individuals with anorexia go to great lengths to lose weight and maintain an extremely low body weight.
Anorexic individuals typically have a distorted perception of their own body size and shape.
Thoughts about food, calories, and dieting dominate the lives of people with anorexia.
They may meticulously count calories, weigh food, and avoid eating certain foods or food groups.
Anorexia can lead to a range of serious physical health problems, including malnutrition,

electrolyte imbalances, and heart problems.

Insomnia:

Insomnia is a common sleep disorder characterized by difficulty falling asleep, staying asleep, or experiencing non-restorative or poor-quality sleep.
It can lead to a range of negative consequences, including daytime fatigue, irritability, difficulty concentrating, and impaired functioning.
High levels of stress, anxiety, or emotional distress can lead to insomnia.
Racing thoughts and worries can make it difficult to relax and fall asleep.
Certain medical conditions, such as chronic pain, respiratory problems, or hormonal imbalances, can disrupt sleep and lead to insomnia.
Poor sleep habits, such as irregular sleep schedules, excessive caffeine or alcohol consumption, and lack of physical activity, can contribute to insomnia.
Noise, light, or uncomfortable sleeping conditions can make it challenging to sleep well. Hence pair 2 is incorrect.

Dyspnoea:

Dyspnoea, often spelled as dyspnea in American English, is a medical term used to describe the subjective sensation of difficult or labored breathing.
It is commonly referred to as "shortness of breath."
Respiratory disorders such as asthma, chronic obstructive pulmonary disease (COPD), pneumonia, and interstitial lung disease can lead to dyspnoea.
Heart-related problems, such as congestive heart failure, coronary artery disease, and heart valve disorders, can result in shortness of breath. Hence pair 3 is correct.

Anosmia:

Anosmia is a medical term that refers to the complete or partial loss of the sense of smell.
It can be temporary or permanent and can result from various causes.
Anosmia can affect an individual's quality of life in several ways because the sense of smell plays a significant role in our ability to detect and enjoy flavors, detect hazards such as smoke or spoiled food, and experience various scents in the environment.
Anosmia can be caused by various factors, including viral infections (such as the common cold or flu), head injuries, sinus issues, nasal polyps, and neurological disorders.
Anosmia can lead to a loss of appetite and a reduced ability to taste and enjoy food. Hence pair 4 is correct.
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Question 3 of 29

Q3: Question
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Input and output nerves meet at
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liver
central nervous system

heart
None of the above

Options:

A. liver

B. central nervous system

C. heart

D. None of the above

■ Answer & Detailed Solution:

The correct answer is central nervous system.

Key Points

Input and output nerves meet at a structure called the synapse, part of central nervous system.
The synapse is a specialized junction between two nerve cells (neurons) or between a neuron and a target cell, such as a muscle cell or another neuron.
At the synapse, information is transmitted from the presynaptic neuron (the input) to the postsynaptic neuron (the output) or target cell.
This transmission is typically mediated by chemical neurotransmitters that are released from the presynaptic neuron and received by receptors on the postsynaptic neuron or target cell, allowing for the propagation of nerve signals.

Additional Information
Central Nervous System (CNS):

The central nervous system (CNS) is a crucial part of the human body responsible for processing and coordinating information from the body's sensory organs and controlling various bodily functions.

It consists of the brain and the spinal cord. Here are some key aspects of the central nervous system:

Brain:
The brain is the most complex and vital organ in the CNS.
It plays a central role in controlling and coordinating various bodily functions, such as thinking, memory, emotions, movement, and sensory perception.
It is protected by the skull and is divided into different regions, each with specific functions.
Spinal Cord:
The spinal cord is a long, thin, tubular structure that extends from the brain down the vertebral column.
It serves as a bridge between the brain and the rest of the body, carrying signals to and from the brain.
The spinal cord is responsible for reflex actions and relaying sensory and motor information.
Neurons:
Neurons are the functional units of the CNS.
They are specialized cells that transmit electrical and chemical signals, allowing communication within the nervous system.
Neurons have dendrites that receive signals, a cell body that processes information, and an axon that transmits signals to other neurons or to muscles and glands.
White Matter and Gray Matter:
The brain and spinal cord contain both white matter and gray matter.
Gray matter consists of neuron cell bodies and synapses and is involved in information

processing.
White matter is composed of myelinated axons that transmit signals over longer distances and connects different regions of the CNS.
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Question 4 of 29

Q4: Question
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A fan produces a feeling of comfort during the hot weather because
This question was previously asked in
67th BPSC Prelims Held on 8 May 2022 Official Question Paper
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fan supplies cool air
our body radiates more heat in air
conductivity of air increases
our perspiration evaporates rapidly
None of the above/More than one of the above

Options:

A. fan supplies cool air

B. our body radiates more heat in air

C. conductivity of air increases

D. our perspiration evaporates rapidly

E. None of the above/More than one of the above

■ Answer & Detailed Solution:

The correct option is our perspiration evaporates rapidly.
CONCEPT:
Demonstrates the heat transfer mechanism in the human body:

Perspiration is basically sweating which occurs in the human body because of the sweat glands present under the skin.

Radiation is only dependent on the absolute Temperature it has nothing to do with air or without air, the intensity of radiation remains the same.

A fan in a room circulates the air which is present inside the room, it never provides cooler or warmer air rather it provides the air at the room temperature.

The conductivity of air is a function of temperature so a sole fan can never change the temperature of the air as we know fan only circulates the air at the room temperature thus conductive doesn't change by the virtue of the fan.

The process by which the human body gives off heat (Tambient < Tskin):

The process by which the human body receives heat (Tambient > Tskin):

When the ambient temperature is above body temperature, then radiation, conduction, and convection all transfer heat into the body rather than out. Since there must be a net outward heat transfer, the only mechanisms left under those conditions are the evaporation of perspiration from the skin and the evaporative cooling from exhaled moisture.

If part of a liquid evaporates, it cools the liquid remaining behind because it must extract the necessary heat of vaporization from that liquid in order to make the phase change to the

gaseous state. It is, therefore, an important means of heat transfer in certain circumstances, such as the cooling of the human body when it is subjected to ambient temperatures above the normal body temperature.

EXPLANATION:

A fan produces a feeling of comfort during hot weather because our perspiration evaporates rapidly.
Perspiration is basically sweating which occurs in the human body because of the sweat glands present under the skin.
Due to the warm weather condition, we sweat. Now as the sweat comes out it spreads over the skin, this sweat evaporates under the action of the fan blowing the air which results in effective convection thus taking away the heat from the skin resulting in the cooling effect.
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Question 5 of 29

Q5: Question
Download Solution PDF
According to Chinese source, Meghavarman, the ruler of Sri Lanka, sent a missionary to which of the following Gupta Kings for permission to build a Buddhist temple at Gaya?
This question was previously asked in
69th BPSC Prelims Exam Official Paper (Held On: 30 Sept, 2023)
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Chandragupta I
Samudragupta
Chandragupta II
None of them

Options:

A. Chandragupta I

B. Samudragupta

C. Chandragupta II

D. None of them

■ **Answer & Detailed Solution:**

The correct answer is Samudragupta.

Key Points

Meghavarman sent a missionary to Samudragupta for permission to build a Buddhist temple at Gaya.
Samudragupta granted permission to Buddhist king of Ceylon Meghavarman to build a monastery at Bodh Gaya.

Additional Information

The Gupta kingdom was enlarged enormously by Chandragupta's son and successor Samudragupta (A.D. 335-380).
He was the opposite of Ashoka. Ashoka believed in a policy of peace and non-aggression, but Samudragupta delighted in violence and conquest.
His court poet Harishena wrote a glowing account of the military exploits of his patron.
In a long inscription the poet enumerates the peoples and countries that were conquered of Samudragupta. The inscription is engraved at Allahabad on the same pillar which carries the inscriptions of the peace-loving Ashoka.
The places and the countries conquered by Samudragupta can be divided into five groups.
Group one includes princes of the Ganga-Yamuna doab who were defeated and whose kingdoms were incorporated into the Gupta Empire.
Group two includes the rulers of the eastern Himalayan states and some frontier states such as princes of Nepal, Assam, Bengal etc., who were made to feel the weight of Samudragupta's arms. It also covers some republics of Punjab.
The republics, which flickered on the ruins of the Maurya empire, were finally destroyed by Samudragupta.
Group three includes the forest kingdoms situated in the Vindhya region and known as Atavika rajyas; they were brought under the control of Samudragupta.
Group four includes twelve rulers of the eastern Deccan and south India, who were conquered and liberated.
Samudragupta's arms reached as far as Kanchi in Tamil were compelled to recognize his suzerainty.
Group five includes the names of the Shakes and Kushans, some of them ruling in Afghanistan.
It is said that Samudragupta swept them out of power and received the submission of the rulers of distant lands.
The prestige and influence of Samudragupta spread even outside India.
If we believe the eulogistic inscription from Allahabad, it would appear that Samudragupta never knew any defeat, and because of his bravery and generalship he is called the Napoleon of India.
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Question 6 of 29

Q6: Question
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Which States of India have a common border with Myanmar?
This question was previously asked in
68th BPSC Prelims (Held on 12 Feb 2023) (Set: B) - Official Paper
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Manipur, Mizoram, Nagaland, Tripura
Arunachal Pradesh, Nagaland, Manipur, Mizoram
Arunachal Pradesh, Assam, Manipur, Mizoram
More than one of the above
None of the above

Options:

A. Manipur, Mizoram, Nagaland, Tripura

B. Arunachal Pradesh, Nagaland, Manipur, Mizoram

C. Arunachal Pradesh, Assam, Manipur, Mizoram

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is Arunachal Pradesh, Nagaland, Manipur, Mizoram

Key Points

Indian States bordering Myanmar

Myanmar shares a long land border of over 1600 Km with India as well as a maritime boundary in the Bay of Bengal.
Four North-Eastern States viz. Arunachal Pradesh, Nagaland, Manipur, and Mizoram share international boundaries with Myanmar.
Both countries share a heritage of religious, linguistic, and ethnic ties. Myanmar has a substantial population of Indian origin (est. 1.5- 2 million).
Myanmar is our gateway to South East Asia and ASEAN with which we are seeking greater economic integration through India’s 'Look East' and ‘Act East Policy.

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Question 7 of 29

Q7: Question
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The odour of acetic acid resembles that of
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vinegar
tomato
kerosene
More than one of the above
None of the above

Options:

A. vinegar

B. tomato

C. kerosene

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is -vinegar.

Key Points

Odour of acetic acid
It primarily resembles vinegar.
Acetic acid is a colourless liquid
It has a sharp, pungent smell and sour taste.
The concentration of acetic acid in vinegar can range from 4 to 8 per cent, with higher concentrations resulting in a stronger smell.
The smell is so strong because of the volatile nature of acetic acid.

Additional Information

Odour of Tomato
The chemical responsible for the odour of tomato is methyl ketone or 2-nonanone
It gives a sweet, fruity aroma.
Tomato odour is essential in the food industry as it adds flavour to various dishes.
It also helps in attracting pollinators.
Odour of Kerosene
The odour of kerosene is primarily due to aliphatic hydrocarbons such as naphthalene and alkylbenzenes.
These chemicals are typically present in small concentrations.
Kerosene has a pungent odour due to its small concentration.
Kerosene odour is essential in ensuring that the fuel is not contaminated with other substances, which can affect its performance and safety.
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Question 8 of 29

Q8: Question
Download Solution PDF
Blood pressure is measured by
This question was previously asked in
BSSC Group D Official Paper (Held On: 11 May, 2025)
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Thermometer
Barometer
Crescograph
Sphigmometer

Options:

A. Thermometer

B. Barometer

C. Crescograph

D. Sphigmometer

■ **Answer & Detailed Solution:**

The correct answer is Sphigmometer.

Key Points

A sphygmomanometer is a medical device used to measure blood pressure accurately.
It typically consists of an inflatable cuff, a measuring unit (manometer), and a mechanism to inflate the cuff (bulb).
The device measures blood pressure in millimeters of mercury (mmHg) and provides two readings: systolic (maximum pressure) and diastolic (minimum pressure).
Modern sphygmomanometers are available in two types: manual (aneroid) and digital.
This instrument is widely used in clinical settings and at home to monitor cardiovascular health.

Additional Information

Blood Pressure (BP):
BP is the force of blood pushing against the walls of the arteries as the heart pumps.
It is expressed as two values: systolic pressure (when the heart beats) and diastolic pressure (when the heart rests between beats).
Normal blood pressure is around 120/80 mmHg, though this can vary.
Types of Sphygmomanometers:
Aneroid sphygmomanometer: Manual device used with a stethoscope for precise readings.
Digital sphygmomanometer: Automatic device that provides easy-to-read digital outputs.
Usage of Sphygmomanometer:
Primarily used by healthcare providers to diagnose and manage hypertension (high blood pressure).
Regular monitoring of BP helps in preventing cardiovascular diseases like stroke and heart attack.

Associated Instruments:
Stethoscope: Used alongside a manual sphygmomanometer to listen to arterial sounds.
Pulse oximeter: Measures oxygen saturation and pulse rate, often used together with BP monitoring.
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Question 9 of 29

Q9: Question
Download Solution PDF
‘Rust Bowl’ of the USA is associated with which one of the following regions?
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BPSC 63rd Combined Competitive Exam Official paper
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Great Lakes region
Alabama region
California region
Pittsburg region
None of the above/ More than one of the above

Options:

A. Great Lakes region

B. Alabama region

C. California region

D. Pittsburg region

E. None of the above/ More than one of the above

■ Answer & Detailed Solution:

The correct answer is Pittsburg region.

The Pittsburg region of the USA is associated with the Rust Bowl of the USA.
Rust bowl is a geographic area of the USA which is known for manufacturing the heartland, of the nation.
It is also known as the ‘Rust Belt’.

Additional Information

The Great Lakes also called the Great Lakes of North America, is known for its industry that produces steel, chemicals, and other products.
The shipping opportunities in the Great Lakes played a critical role in the settlement of the region and the development of the industry.
California leads the U.S. in agricultural production.
The state is also home to famous cultural institutions and national parks including Hollywood, Disneyland, Yosemite National Park, Alcatraz, Angel Island, and the Golden Gate Bridge.

Alabama is nicknamed the Yellowhammer State, after the state bird.
Alabama is also known as the "Heart of Dixie" and the "Cotton State".
The state tree is the longleaf pine, and the state flower is the camellia.
Alabama's capital is Montgomery.
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Question 10 of 29

Q10: Question
Download Solution PDF
Shaikh Bahauddin Zakaria belonged to which sect?
This question was previously asked in
BPSC 64TH CCE (Preliminary) Exam Official Paper (Held On: 16 Dec 2018)
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Suhrawardi Silsilah
Rishi Silsilah
Chisti Silsilah
Firdausi Silsilah
None of the above/More than one of the above

Options:

A. Suhrawardi Silsilah

B. Rishi Silsilah

C. Chisti Silsilah

D. Firdausi Silsilah

E. None of the above/More than one of the above

■ Answer & Detailed Solution:

The correct answer is Suhrawardi Silsilah.

Shaikh Bahauddin Zakaria belonged to Suhrawardi Silsilah.

Key Points

It was founded by Shaikh Shihabuddin Suhrawardi it was popular in Multan, Lahore and Sindh.
This silsilah is considered as more orthodox than Chisti.
Baha-ud-din Zakaria was the greatest saint of this silsilah.
Baha-ud-din Zakaria invited Iltutmish to attack Qubacha in Multan and was given the title of Shaikh-ul-Islam by Iltutmish.

Additional Information

The Chisti order was founded by Khwaja Abdal Chisti in Heart.
It was brought to India by Khwaja Moin-ud-din Chisti.
Shah Niamatullah Qadri was probably the first notable saint of Qadariya order to enter India but it was Syed Muhammad Jilani, who organised it on an effective basis.
Sheikh Nuruddin began the rishi movement in Kashmir which was a synthesis of Kashmiri Shaivism and Islamic thought.
Sheikh Badruddin of Samark first established Firdausi Silsila in Delhi, but later on, it moved to Bihar and became the most influential mystic older.
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Question 11 of 29

Q11: Question
Download Solution PDF
The first human heart transplant was performed in _____.
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BPSC 2015 Combined Competitive Exam Official paper
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America
England
South Africa
France

Options:

A. America

B. England

C. South Africa

D. France

■ Answer & Detailed Solution:

The correct answer is South Africa.

Key Points

The first human heart transplant was performed in South Africa.
First human heart transplant:
The first human heart transplant was performed on December 3, 1967.
The operation was led by a surgeon named Christiaan Barnard, in Groote Schuur Hospital, Cape Town, South Africa.
At the time, it was one of the most widely publicized events in the world.
Louis Washkansky was the recipient of the heart.
The donor was Denise Darvall, a 25-year-old woman who had been fatally injured in a car accident.

Additional Information

This first heart transplant and subsequent ongoing research in cardiac transplantation at the University of Cape Town and in a few other dedicated centres over the subsequent 15 years laid the foundation for heart transplantation to become a well-established form of therapy for end-stage cardiac disease.
During this period from 1968 to 1983, Chris Barnard and his team continued to make major contributions to organ transplantation, notably the development of the heterotopic heart transplants; advancing the concept of brain death, organ donation and other related ethical issues; better preservation and protection of the donor's heart (including hypothermic perfusion storage of the heart; studies on the haemodynamic and metabolic effects of brain death; and even early attempts at xenotransplantation.
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Question 12 of 29

Q12: Question
Download Solution PDF
Which of the following States of India borders with the maximum number of districts in Bihar?
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68th BPSC Prelims (Held on 12 Feb 2023) (Set: B) - Official Paper
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West Bengal
Uttar Pradesh
Orissa
More than one of the above
None of the above

Options:

A. West Bengal

B. Uttar Pradesh

C. Orissa

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is option 2.

Key Points

Bihar is bordered by three states and one country.
The boundaries of Bihar are shared with Uttar Pradesh to the west, Nepal to the north, West Bengal to the east, and Jharkhand to the south.
Jharkhand and Uttar Pradesh share their boundaries with the maximum number of districts of Bihar (8 districts).
West Bengal shares its boundary with 3 districts of Bihar.
Nepal shares its boundary with 7 districts of Bihar.
Uttar Pradesh:- West Champaran, Gopalganj, Siwan, Saran, Buxar, Bhojpur, Rohtas, and Kaimur
Jharkhand:- Katihar, Bhagalpur, Banka, Jamui, Nawada, Gaya, Aurangabad and Rohtas
West Bengal:- Kishanganj, Prunea and Katihar
Nepal:- West Champaran, East Champaran, Sitamarhi, Madhubani, Supaul, Araria and Kishanganj
Both Uttar Pradesh and Jharkhand state have a common
border with 8 districts of Bihar. We have verified this with maps of these three states where we find that the eastern tip of Katihar district touches Jharkhand and the Western tip of Rohtas district touches Uttar Pradesh.
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Question 13 of 29

Q13: Question
Download Solution PDF
A clinical death takes place when
This question was previously asked in
BPSC CDPO Prelims 2018 Official Paper
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there is no pulse
there is no heart beat
pupils are fixed and dilated and there is no reaction to light
all the above three conditions are present together
None of the above/More than one of the above

Options:

A. there is no pulse

B. there is no heart beat

C. pupils are fixed and dilated and there is no reaction to light

D. all the above three conditions are present together

E. None of the above/More than one of the above

■ **Answer & Detailed Solution:**

The correct answer is More than one of the above.

Key Points

Clinical death is a phenomenon in which the pulse rate and beating of the heart stop their function.
When the heart stops pumping the lungs stop breathing, the person is in a state of clinical death.
Usually, this is measured from the moment the cessation of heart and lung functions begin.
In such a type of death, various body cells and organs remain to live for a few hours after the death.
Biological death refers to the condition when all the organs of the body including the brain have ceased functioning.
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Question 14 of 29

Q14: Question
Download Solution PDF

Direction : Read the following sentence to find out whether there is an error in any underlined part. No sentence has more than one error. If you feel there is no error in a sentence, write (D) to signify 'No error'.

Many patients have plastic valves (A) / inserted in his heart (B) / when their hearts function in a faulty manner. (C) / No error (D)

This question was previously asked in
BPSC AE Paper 1 (General English) 10 Nov 2022 Official Paper
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A
B
C
D

Options:

A. A

B. B

C. C

D. D

■ **Answer & Detailed Solution:**

The correct answer is Option 2.

Key Points
The primary issue in the sentence is the use of the pronoun "his" in part B.
The pronoun "his" should be replaced with "their" to match the plural noun "patients".
The correct phrase should be "inserted in their heart," ensuring grammatical correctness and clarity.
Thus, the error is located in part B of the sentence.
Therefore, the correct answer is B.

Correct Sentence: "Many patients have plastic valves inserted in their heart when their hearts function in a faulty manner."

Additional Information
A: "Many patients have plastic valves," – This part of the sentence is grammatically correct and does not require any changes.
C: "when their hearts function in a faulty manner." – This part of the sentence is grammatically correct and does not require any changes.
No error – This would be the correct option if there were no mistakes in the sentence, but there is an error in part B.
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Question 15 of 29

Q15: Question
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In a parallel flow heat exchanger, if the heat capacity ratio is 1, then what is the maximum value of effectiveness?
This question was previously asked in
BPSC AE Paper V Mechanical 2024 Official Paper
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0.75
2/3
0.5
1

Options:

A. 0.75

B. 2/3

C. 0.5

D. 1

■ Answer & Detailed Solution:

Explanation:

Effectiveness of a Parallel Flow Heat Exchanger

Definition: In heat exchanger analysis, the effectiveness (ε) is a measure of how well a heat exchanger transfers heat relative to its maximum possible heat transfer. It is defined as the ratio of the actual heat transfer to the maximum possible heat transfer that could occur if the outlet temperature of one fluid reached the inlet temperature of the other fluid.

Mathematically, the effectiveness (ε) is expressed as:

ε = Qactual / Qmax

Where:

Qactual: The actual heat transfer rate in the heat exchanger.
Qmax: The maximum possible heat transfer rate, which occurs when one of the fluids undergoes the maximum possible temperature change.

For a parallel flow heat exchanger, the two fluids enter the heat exchanger at their respective inlet temperatures and flow in the same direction. The effectiveness of such a heat exchanger depends on the heat capacity ratio (Cr) and the number of transfer units (NTU).

Heat Capacity Ratio (Cr):

The heat capacity ratio is defined as:

Cr = Cmin / Cmax

Where:

Cmin: The smaller heat capacity rate of the two fluids (C = ■ × cp).
Cmax: The larger heat capacity rate of the two fluids.

When the heat capacity ratio (Cr) is equal to 1, it implies that both fluids have the same heat capacity rate.

Effectiveness for Parallel Flow Heat Exchanger:

The effectiveness of a parallel flow heat exchanger is given by the following equation:

$\varepsilon = [1 - \exp(-NTU \times (1 + Cr))] / [1 + Cr]$

Where:

NTU: Number of Transfer Units, a dimensionless parameter that represents the size and effectiveness of the heat exchanger.
Cr: Heat capacity ratio.

Analysis for Cr = 1:

When Cr = 1, the equation for effectiveness simplifies to:

$\varepsilon = [1 - \exp(-2 \times NTU)] / 2$

The maximum value of effectiveness occurs when NTU approaches infinity (i.e., a very large heat exchanger). In this case:

$\exp(-2 \times NTU) \rightarrow 0$

Therefore, the effectiveness becomes:

$\varepsilon = [1 - 0] / 2 = 0.5$

Conclusion: For a parallel flow heat exchanger with a heat capacity ratio (Cr) of 1, the maximum value of effectiveness is 0.5.

Q16: Question
Download Solution PDF
What does the cell usually use to produce energy?
This question was previously asked in
Bihar Primary Teacher Official Paper (Held On: 24 Aug, 2023 Shift 2)
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Amino acid
Glucose
Fatty acid
More than one of the above
None of the above

Options:

A. Amino acid

B. Glucose

C. Fatty acid

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct optio is 2 .

Concept:

The building elements of proteins, amino acids can also be used by cells to produce energy, particularly when lipids and carbohydrates are insufficient.
Most cells' main source of energy is glucose, a simple sugar. Glycolysis, a metabolic process, transforms glucose into pyruvate throughout its metabolism.
A significant source of energy for the body, notably for the heart and skeletal muscles, are fatty acids.

Explanation:

Glucose, amino acids, and fatty acids are all sources of energy for cells. Often, glucose serves as the body's main energy source. This process is known as glycolysis.
During times of fasting or vigorous exercise, fatty acids can also be digested to provide energy, particularly in the heart and skeletal muscles as well as in the liver.
Although they are typically utilized to make proteins, amino acids can also be used to make ATP when other energy sources are in short supply.
Deamination is a process that removes the amino group from the amino acid, allowing the residual carbon skeleton to join several metabolic pathways to produce ATP.
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Question 17 of 29

Q17: Question
Download Solution PDF
When there is a decrease in the concentration of oxygen in the blood, the rate of breathing
This question was previously asked in
Bihar Secondary Teacher (Science) Official Paper (Held On: 26 Aug, 2023 Shift 1)
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decreases
increases
does not change
More than one of the above
None of the above

Options:

A. decreases

B. increases

C. does not change

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

Concept:

The process of exchange of O_2 from the atmosphere with CO_2 produced by the cells is called breathing.
Breathing involves two steps- inspiration and expiration.
During inspiration, atmospheric air is drawn into the lungs, and expiration by which the alveolar air is released out to the atmosphere.
Air movement into and out of the lungs creates a pressure gradient between the lungs and the atmosphere.
Alveoli are the primary sites of exchange of gases and the exchange of gases also occurs between blood and tissues.
O_2 and CO_2 are exchanged in these sites by simple diffusion mainly based on pressure/concentration gradient.
O_2 is transported through haemoglobin molecules in the form of Oxyhaemoglobin.
While 70% of CO_2 is transported as bicarbonate and 20-25% by haemoglobin as Carbamino-haemoglobin.

Explanation:

When there is a decrease in the concentration of oxygen in the blood, the rate of breathing increases.
So that the respiratory system takes more oxygen from the atmosphere that is required for various physiological functions.
A decreased oxygen level in the blood also causes an increase in the heart rate to be able to meet the demand for oxygen supply.
On average, a healthy human breathing rate is 12-16 times/minute.

Additional Information

The volume of air involved in breathing movements can be estimated by using a Spirometer which helps in clinical assessment of pulmonary functions.

Hence, the correct option is (2) Increases.

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Question 18 of 29

Q18: Question
Download Solution PDF
Al-Aqsa Mosque, which was in news recently, is located in which city?
This question was previously asked in
Bihar Primary Teacher Official Paper (Held On: 24 Aug, 2023 Shift 2)
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Rome
Jerusalem
Riyadh
More than one of the above
None of the above

Options:

A. Rome

B. Jerusalem

C. Riyadh

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is Jerusalem.

Key Points

Al-Aqsa Mosque:

The Al-Aqsa Mosque, located in the city of Jerusalem, Israel, is the third holiest site in Islam.
The mosque is said to be built on top of the Temple Mount.
The mosque is located on the southern part of the Temple Mount or Haram al-Sharif, an enclosure expanded by King Herod the Great beginning in 20 BCE during his reconstruction of the Second Jewish Temple.
Over the decades, this site in Jerusalem's Old City has frequently been a flashpoint for violence between Palestinians and Israeli forces and hardline groups and is at the heart of competing for historical claims.

The al-Aqsa Mosque is one of Jerusalem’s most recognized monuments.
The site is part of the Old City of Jerusalem, sacred to Christians, Jews and Muslims.
The United Nations Educational, Scientific and Cultural Organization (UNESCO), has classified the Old City of Jerusalem and its walls as a World Heritage Site.

Important Points

Both the State of Israel and Palestine claim Jerusalem as their capital.
Israel maintains its primary governmental institutions there, and Palestine ultimately foresees it as its seat of power.
Neither claim, however, is widely recognized internationally.

Question 19 of 29

Q19: Question
Download Solution PDF
Where was the 4th Session of the UN Environment Assembly (UNEA - 4) held recently?
This question was previously asked in
BPSC 65th Combined Competitive Exam Official paper
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Paris-France
Ulaanbaatar-Mangolia
Beijing-China
Nairobi-Kenya
None of the above/More than one of the above

Options:

A. Paris-France

B. Ulaanbaatar-Mangolia

C. Beijing-China

D. Nairobi-Kenya

E. None of the above/More than one of the above

■ Answer & Detailed Solution:

The correct answer is Nairobi-Kenya.

Important Points

The fourth session of the UN Environment Assembly of the UN Environment Programme 11 - 15 March 2019, United Nations Environment Programme Headquarters, Nairobi, Kenya.

The overall theme, ‘Innovative Solutions for Environmental Challenges and Sustainable Consumption and Production.'

Key Points

UNEA-4 :

Environmental challenges associated to poverty and natural resources management, including sustainable food systems, food security and halting biodiversity loss; Life-cycle approaches to resource efficiency, energy, chemicals and waste management; and innovative sustainable business development at a time of rapid technological change.

Additional Information

About the UN Environment Assembly:
The United Nations Environment Assembly was created in June 2012.
The United Nations Environment Assembly is the world's highest-level decision-making body on the environment.
It addresses the critical environmental challenges facing the world today.
Recognizing these challenges and protecting and rehabilitating our environment is at the heart of the 2030 Agenda for Sustainable Development.
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Question 20 of 29

Q20: Question
Download Solution PDF
Which is the most reactive metal?
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Sodium
Potassium
Iron
Calcium

Options:

A. Sodium

B. Potassium

C. Iron

D. Calcium

■ Answer & Detailed Solution:

The correct answer is Potassium.

Metals in decreasing order of their reactivity are - Potassium, Sodium, Lithium, Barium, Strontium, and Calcium.

Key Points

Reactivity Series:
The reactivity series of metals, also known as the activity series, refers to the arrangement of metals in the descending order of their reactivities.
The metals at the top of the reactivity series are powerful reducing agents since they are easily oxidized.
These metals tarnish/corrode very easily.
The reducing ability of the metals grows weaker while traversing down the series.
The electro positivity of the elements also reduces while moving down the reactivity series of metals.
All metals that are found above hydrogen in the activity series liberate H_2 gas upon reacting with dilute HCl or dilute H_2SO_4.

Additional Information

Sodium:
Sodium is a chemical element with the symbol "Na" and the atomic number is 11.

It is a soft, silvery-white, highly reactive metal.
Sodium is an alkali metal, being in group 1 of the periodic table.
Calcium:
Calcium is a mineral that is necessary for life.
The symbol of Calcium is "Ca" and its atomic number is 20
In addition to building bones and keeping them healthy, calcium enables our blood to clot, our muscles to contract, and our heart to beat.
About 99% of the calcium in our bodies is in our bones and teeth.
Every day, we lose calcium through our skin, nails, hair, sweat, urine, and feces.
Our bodies cannot produce their own calcium.
Iron:
Iron is a chemical element with the symbol "Fe" and atomic number 26.
It is a metal that belongs to the first transition series and group 8 of the periodic table.
It is, by mass, the most common element on Earth, right in front of oxygen (32.1% and 30.1%, respectively), forming much of Earth's outer and inner core.
It is the fourth most common element in the Earth's crust.
Potassium:
Potassium is a mineral and an electrolyte.
It helps your muscles work, including the muscles that control your heartbeat and breathing.
Potassium comes from the food you eat.
Your body uses the potassium it needs.
The extra potassium that your body does not need is removed from your blood by your kidneys.
It has an atomic number 19.

Question 21 of 29

Q21: Question
Download Solution PDF
Instruction decoder is a part of the ______.
This question was previously asked in
BELTRON DEO Official Paper (Held On: 10 Dec 2019 Shift 1)
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CPU
controller
HDD
cache

Options:

A. CPU

B. controller

C. HDD

D. cache

■ Answer & Detailed Solution:

The correct answer is CPU.

Key Points

The instruction decoder is a crucial component of the CPU (Central Processing Unit) that interprets the instructions fetched from the memory and converts them into signals to control other parts of the CPU.
It plays a significant role in the execution of instructions by breaking down complex instructions into simpler operations that the CPU can execute.

Additional Information

Controller: A controller is typically used in various hardware devices to manage the data flow between the device and the computer. It is not specifically part of the CPU.
HDD (Hard Disk Drive): This is a storage device used to store and retrieve digital information using magnetic storage. It is not involved in decoding instructions.
Cache: This is a smaller, faster memory component that stores copies of the data from frequently used main memory locations. While crucial for speeding up data access, it is not responsible for decoding instructions.

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Question 22 of 29

Q22: Question
Download Solution PDF
What is measured in hertz?
This question was previously asked in
BPSC 65th Combined Competitive Exam Official paper
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Frequency
Energy
Heat
Quality
None of the above / More than one of the above

Options:

A. Frequency

B. Energy

C. Heat

D. Quality

E. None of the above / More than one of the above

■ Answer & Detailed Solution:

The correct answer is Frequency.

Frequency is the number of occurrences of a repeating event per unit of time.
It is also known as temporal frequency.
Frequency is measured in units of hertz (Hz) which is equal to one occurrence of a repeating event per second.
The relation between the frequency and the period, T, of a repeating event, is given by
F=1/T

Additional Information

Content

Measure in(SI Unit)

Frequency

Hertz

Energy

Joule

Heat

Joule

Quality

None

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[illegible]

Question 23 of 29

Q23: Question
Download Solution PDF
Which parts of the brain control blood pressure?
This question was previously asked in
Bihar Primary Teacher Official Paper (Held On: 24 Aug, 2023 Shift 2)
Download PDF
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Spinal cord, skull, hypothalamus
Spinal cord, skull, cerebrum
Pons, medulla, cerebellum
More than one of the above
None of the above

Options:

A. Spinal cord, skull, hypothalamus

B. Spinal cord, skull, cerebrum

C. Pons, medulla, cerebellum

D. More than one of the above

E. None of the above

■ **Answer & Detailed Solution:**

The correct option is 3 that is pons,medulla,cerebellum.

Explanation:

Numerous bodily processes regulate blood pressure, but the Medulla and the Pons in the brainstem, which house the cardiorespiratory centers responsible for controlling heart rate and blood vessel constriction and consequently influencing blood pressure, are important regulatory regions.
Although its function in directly regulating blood pressure is less clear, the cerebellum is primarily assumed to be involved in the coordination and fine-tuning of motor activities.

Key Points

The adrenal glands are small glands located on top of each kidney.

The adrenal cortex produces several hormones.
The most important are aldosterone (a mineralocorticoid), cortisol (a glucocorticoid), and androgens and estrogen (sex hormones).
These hormones help regulate metabolism, immune system, blood pressure, response to stress, and other essential functions.
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Question 24 of 29

Q24: Question
Download Solution PDF
The maximum total settlement for isolated foundations on clayey soils should be limited to
This question was previously asked in
BPSC AE Paper 4 (General Engineering Science) 2019 Official Paper
Download PDF
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25 mm
40 mm
65 mm
100 mm

Options:

A. 25 mm

B. 40 mm

C. 65 mm

D. 100 mm

■ **Answer & Detailed Solution:**

Explanation:

As per IS-1904(1966):

The maximum permissible settlement for isolated foundations is 40mm on sandy soil and 65mm in clayey soils.
The permissible settlement for the raft foundation on clay soil is 65-100 mm and for sandy soil, it is 65 mm.

Additional Information

Differential settlement:

Foundation on clay soil = 40 mm.

The foundation on Sandy soil = 25 mm.
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Question 25 of 29

Q25: Question
Download Solution PDF
The increase in concentration of toxic substances in successive trophic level is referred to as
This question was previously asked in
Bihar Primary Teacher Official Paper (Held On: 24 Aug, 2023 Shift 2)
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eutrophication
biomagnification
bioaccumulation
More than one of the above
None of the above

Options:

A. eutrophication

B. biomagnification

C. bioaccumulation

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is Biomagnification.

Key Points

Biomagnification is the accumulation of the increasing amount of non-degradable pollutants through the food chain.
The major causes of biomagnification are Agriculture, Organic Contaminants, Industrial Activities and Mining Activities in the Ocean.
The impact of biomagnification on Human Health is that it makes humans more prone to cancer, kidney problems, liver failure, birth defects, respiratory disorders, and heart diseases.
Bioaccumulation is the accumulation of a toxic chemical in the tissue of a particular organism.

Additional Information

The harmful chemicals (pesticides, fertilizers or others) get consumed by primary consumers.
It is further magnified as each stage.
This process is called Biomagnification.
Human beings are at the top of this whole food web. So maximum effect is observed in human beings.
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Question 26 of 29

Q26: Question
Download Solution PDF
'Red-hot' is a compound word that is formed by
This question was previously asked in
Bihar Secondary Teacher (English) Official Paper (Held On: 26 Aug, 2023 Shift 1)
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noun + noun
adjective + adjective
noun + gerund
More than one of the above
None of the above

Options:

A. noun + noun

B. adjective + adjective

C. noun + gerund

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is 'adjective + adjective'.

Key Points

In English, compound words can be formed by combining two adjectives. This is less common than noun + noun or adjective + noun, but it is still a legitimate and often used construction.
The compound word 'red-hot' is made up of two adjectives, 'red' and 'hot'.
Each of these words, 'red' and 'hot', is an adjective when used independently. When they are combined, they form the compound adjective 'red-hot', which means extremely hot or heated. It can also metaphorically mean excited or fervent.

Therefore, the correct answer is Option 2.

Additional Information

There is often a hyphen between the two words in an adjective + adjective compound word, but this is not always the case. Compound words may also be written as one word without a hyphen (e.g., bluegreen) or as two separate words (e.g., high school). The form depends on the specific word and its usage.
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Question 27 of 29

Q27: Question
Download Solution PDF
At what percentage has Bihar registered the lowest Female Workforce Participation Rate for the year 2020-2022?
This question was previously asked in
68th BPSC Prelims (Held on 12 Feb 2023) (Set: B) - Official Paper
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7% in rural and 9.1% in urban areas
4% in rural and 6.5% in urban areas
6% in rural and 8.1% in urban areas
More than one of the above
None of the above

Options:

A. 7% in rural and 9.1% in urban areas

B. 4% in rural and 6.5% in urban areas

C. 6% in rural and 8.1% in urban areas

D. More than one of the above

E. None of the above

■ Answer & Detailed Solution:

The correct answer is option 2.

Key Points

At just 4% in rural and 6.5% in urban areas, Bihar had the lowest female labour force participation rate (LFPR).
The discriminatory complexity of women's job, which magnify the issue of undercounting them in the labour force, are one of the causes of Bihar's low level of female work participation rate.
According to the distribution of workers by job status, 40% of the female workers in Bihar were either working on their own dime (32.3%) or as assistants in household businesses (7.7%).
The majority of job opportunities are still being offered by the primary sector. 66.8% of female workers were employed in the agriculture, forestry, and fishing industries.
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Question 28 of 29

Q28: Question
Download Solution PDF
The total volume of blood in a normal adult human being is?
This question was previously asked in
BPSC 2015 Combined Competitive Exam Official paper
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5-6 liters
3-4 liters
8-10 liters
10-12 liters

Options:

A. 5-6 liters

B. 3-4 liters

C. 8-10 liters

D. 10-12 liters

■ Answer & Detailed Solution:

The correct answer is 5-6 litres.

Key Points

The total volume of blood in a normal adult human being is 5-6 litres.
Blood:
Blood is one of the most important components of life.
Almost any animal that possesses a circulatory system has blood.
From an evolutionary perspective, blood was speculated to have risen from a type of cell that was responsible for phagocytosis and nutrition.
Billions of years later, blood and the circulatory system have drastically helped the evolution of more complex lifeforms.
There are many cellular structures in the composition of blood.
When a sample of blood is spun in a centrifuge machine, they separate into the following constituents: Plasma, buffy coat, and erythrocytes.

Additional Information

Blood is a fluid that transports oxygen and nutrients to the cells and carries away carbon dioxide and other waste products.
Technically, blood is a transport liquid pumped by the heart (or an equivalent structure) to all parts of the body, after which it is returned to the heart to repeat the process.
Blood is both a tissue and a fluid.
It is a tissue because it is a collection of similarly specialized cells that serve particular functions.
These cells are suspended in a liquid matrix (plasma), which makes the blood fluid.
If blood flow ceases, death will occur within minutes because of the effects of an unfavourable environment on highly susceptible cells.
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Question 29 of 29

Q29: Question
Download Solution PDF
The pH of a solution changes from 3 to 6. The H+ ion concentration will
This question was previously asked in
BPSC 66th Combined Competitive Exam Official paper
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increase 3 times
decrease 3 times
decrease 10 times
decrease 1000 times
None of the above / More than one of the above

Options:

A. increase 3 times

B. decrease 3 times

C. decrease 10 times

D. decrease 1000 times

E. None of the above / More than one of the above

■ Answer & Detailed Solution:

The correct answer is Decrease 1000 times.

Given, pH = 3.

Therefore, [H+] = 10^{-3}.
Now, pH = 6, so, [H+] = 10^{-6}.
Hence [H+] reduced by 10^{-3} times i.e: 1000 times.

Important Points

pH Scale:

Introduced by Sorensen in 1909.
It is used to express the acidity or basicity of an aqueous solution in terms of hydrogen ion concentration [H+].
This scale is based upon the ionic product of water.
It is the negative logarithm to the base 10 of the hydrogen ion concentration in mole per litre i.e:
PH= - log [H+].
pH= log 1/ [H+].
pH is:
7 for neutral solutions.
Greater than 7 for a basic solution.
Less than 7 for acidic solutions.
In general, pH decreases with rising in temperature.

The pH of some common substances

Substances	pH Value
Gastric juice	1.5-3.5
Soft drinks	2.0-4.0
Lemon	2.2-2.4
Seawater	8.5
Vinegar	2.4-3.4
Urine	4.8-8.4
Saliva	6.5-7.5
Milk of magnesia	10.5
Blood plasma (human)	7.35-7.45

Additional Information

Application of pH:
Brewing and winemaking.
Agriculture and gardening.
Aquaculture and aquatic ecosystems.
Water treatment.
Swimming pool maintenance.
Food Industry.

■ End of MCQ Collection

This comprehensive collection contains **29 questions** on the topic of **'Heart'**.

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