

West Bengal Madhyamik Board Class 10 Life Science 2016 Question Paper with Solutions

Group-A

1. Choose the correct answer to complete the sentence (any five) [1x5=5]

i. What is the photosensitive layer of a human eyeball?

- (a) Retina
- (b) Sclera
- (c) Choroid
- (d) Cornea

Answer: (a) Retina

ii. Which is the Thyroxine hormone secreting endocrine gland?

- (a) Adrenal
- (b) Testis
- (c) Thyroid
- (d) Pancreas

Answer: (c) Thyroid

iii. Which is the phase of mitosis in which chromosome counting can be done?

- (a) Prophase
- (b) Metaphase
- (c) Anaphase
- (d) Telophase

Answer: (c) Anaphase

iv. From hybridisation of two hybrid tall pea plants, what is the percentage of hybrid till offsprings will be obtained in the next filial generation?

- (a) 25%
- (b) 50%
- (c) 75%
- (d) 100%

Answer: (b) 50%

v. What are the wings of birds and wings of butterflies?

- (a) Analogous organ
- (b) Vestigial organ
- (c) Homologous organ
- (d) Transplanted organ

Answer: (a) Analogous organ

vi. Name the plants in which stomata are present on the upper surface of the leaf.

- (a) Sundari plant
- (b) Lotus plant
- (c) Pea plant
- (d) Cactus

Answer: (b) Lotus plant

vii. Which is the human disease caused by protozoa?

- (a) Malaria
- (b) Filaria
- (c) Cholera
- (d) Hepatitis

Answer: (a) Malaria

2. Answer in one sentence (any ten) [1x10=10]

i. Which plant excretory product is used to polish wooden doors and windows?

Answer: Latex is a plant excretory product that is used to polish wooden doors and windows.

ii. Which is the one organic excretory product present in the human urine?

Answer: Urea, uric acid or Ammonia are the organic excretory products present in the human urine.

iii. Apart from hearing, what is the other function of the human ear?

Answer: Other than hearing, the other function of the human is maintaining balance. The eustachian tube and the vestibular complex are the important parts of the ear responsible for the balance.

iv. Which is the blood sugar controlling hormone secreted from pancreas?

Answer: Insulin is the hormone secreted by pancreas that helps in regulating the blood sugar.

v. Name the plant hormone that regulates tropic movement.

Answer: Auxins are the plant hormone that regulates tropic movement.

vi. In which phase of mitosis two sister chromatids got separated?

Answer: The splitting of the sister chromatids marks the onset of anaphase phase of mitosis.

vii. Which is the process by which a male honeybee or drone is formed from the unfertilised egg of a queen bee?

Answer: The male honeybee or drone is formed from an unfertilised egg of a queen bee by the parthenogenesis process.

viii. Reproduction in Bryophyllum by leaf buds is what kind of reproduction?

Answer: Reproduction in Bryophyllum takes place asexually by vegetative propagation of the leaves.

ix. Who is the proponent of the theory of "Natural Selection"?

Answer: Charles Darwin and Alfred Wallace Russel jointly proposed the concepts that are covered in the theory of "Natural Selection."

x. Give an example of an animal fossil.

Answer: Dinosaur footprints or worm burrows are examples of animal fossils.

xi. For what purpose phylloclades of cactus bear a thick cuticle?

Answer: In some phylloclades of Cactus, the cuticle is thick thus allowing you to scratch the wax off from the plant with a finger nail. This loss of wax could damage the plant. The cuticle will also prevent the water stored inside the plant from evaporating into the outside atmosphere, and it protects the cactus from germs that may try to invade through the skin. It serves as a protective barrier for the plant.

xii. Name the 'bacteria infecting viruses'

Answer: Bacteriophages are the 'bacteria infecting viruses'.

xiii. Name a fungus that produces antibiotic medicine.

Answer: The first mass-produced antibiotic was penicillin, which was derived from the Penicillium fungi.

3. Attempt any six questions from the given: [2x6=12]

i. Write two significance of excretion in Animals.

Answer: Given here are the significance of excretion in animals:

- For the elimination of nitrogenous wastes formed during the metabolism of proteins (amino acids) and nucleic acids.
- For elimination of excess salts like Sodium chloride (NaCl), vitamins, bile pigments (from the breakdown of old RBCs).
- The removal of excess water or its retention in case of shortage. This helps to maintain the required quantity of water – osmoregulation in the body.

ii. What is the one function each of “dendron” and “axon”?

Answer: Dendrites are receptive regions which have tapering extensions and are short. They assist to convey incoming signals to the cell body. Axons project from cone-shaped regions of the cell body known as axon hillocks. Extensions are the conducting areas of the neurons. Axons are the sites where the nerve impulses are generated and passed away from the cell body to the synapse.

iii. Why are hormones called “chemical co-ordinators”?

Answer: The prominent role of hormones is that of a messenger or a coordinator. Hypothalamus is a part of the forebrain where a numerous number of neurosecretory cells are present. These neurosecretory cells are specialised in the secretion of a hormone called neurohormones. They stimulate the anterior lobe of the pituitary to produce various other hormones.

Sometimes, hormones act more than a regulator than a messenger. The changes in the level of hormone production lead to certain changes in the body. Thus, hormones as a regulator maintains the homeostasis of the body. Once the hormones meet their target, their production needs to be controlled and this is attained by a mechanism called feedback control mechanism. The feedback mechanism could either be positive or negative.

iv. If cytokinesis fails to occur in the division of an animal cell, what would happen?

Answer: If cytokinesis does not occur after karyokinesis, the formation of daughter cells from the parent cell will not take place. Then the parent cell will have more than one nucleus. A mitotic cell cycle, where the mitosis is completed but cytokinesis has not taken place, results in a cell containing multiple nuclei. In such a scenario, a diploid cell will become tetraploid. Also, Cytokinesis failure would lead to both centrosome amplification and production of tetraploid cells, thus setting the stage for the development of tumour cells.

v. In Mendel’s “monohybrid cross” experiment, a pea plant producing round seeds is crossed with another pea plant producing wrinkled seeds. What would be the phenotypes of the F_2 generation plants and what would be their ratio?

Answer: For monohybrid cross, Mendel began with a pair of pea plants with two contrasting traits, i.e., one round seed and another wrinkled seed. The cross-pollination of the round and wrinkled seed plants resulted in round seed plants. All the hybrid plants produced round seeds. He called this as a first hybrid generation (F_1) and offspring were called Filial, or F_1 progeny, who showed one pattern in their behaviour, i.e., they resembled one of the parents. Another parent character was completely absent. Mendel continued his experiment with self-pollination of F_1 progeny plants. Surprisingly, he observed that one out of four plants in the F_2 progeny were of wrinkled seeds while the other three were of round seeds. The round and the wrinkled seed plants were in the ratio of 3:1.

vi. What are the differences between the “Homologous organs” and “Analogous organs”?

Answer: Homologous organs are those organs which have the same basic structural design and origin but have different functions. For example: The forelimbs of humans and the wings of birds look different externally, but their skeletal structure is similar.

Analogous organs are those organs which have the different basic structural design and origin but have similar functions. For example: The wings of birds and insects. For more information check out the details about [homologous and analogous organs](#).

vii. What are the adaptive features of the respiratory organ of the pigeon?

Answer: Pigeons use its lungs as the respiratory organ. These small lungs are supplemented by air sacs that reduce the body weight. Expiration is more active than inspiration. There is no muscular diaphragm to separate the thoracic chamber from the abdominal chamber. The respiratory system of a pigeon includes respiratory organs, air sacs and respiratory tract. In pigeons, the expiration is an active process, while the process of inspiration is passive. In a resting bird, the intercostal and the abdominal muscles move the sternum up and down. At the same time, during flight, the sternum is said to be immovable due to the support of wings, but the action of the wings and the lowering of the vertebral column raises and lowers the body cavity.

viii. Mention the scientific name of a beneficial unicellular fungus and a plant pathogenic multicellular fungus.

Answer: A heterotrophic fungal microbe found on carbon compounds, Yeast is a eukaryotic type of cell with 1500 various species in existence. It is a unicellular fungus, with a thread-like or filamentous structure. It reproduces by budding. *Cryptococcus neoformans*, *S. Cerevisiae*, etc are examples. Meanwhile, pathogenic fungi are found to be the main cause of plant diseases as well. Some fungi kill their hosts and feed on dead material (necrotrophs), while others colonise the living tissue (biotrophs). The most common pathogenic species are *Aspergillus fumigatus* and *Aspergillus flavus*. *Aspergillus flavus* produces aflatoxin which is both a toxin and a carcinogen and which can potentially contaminate foods such as nuts.

4. Attempt any ten questions from the following:

[3x10=30]

i. Write two methods of removal of plant excretory products with examples.

Answer: Find here [methods for removal of plant excretory product](#).

ii. What is a synapse? Mention differences between ‘Afferent’ and ‘Efferent’ Nerves.

Answer: [Synapse](#) is a junction between two neurons or a neuron and a target or effector cell such as a muscle cell. It permits transmission of electrical or chemical signals. The central nervous system comprises the brain and the spinal cord. The peripheral nervous system comprises the network of nerves connected to the brain and the spinal cord. The nerves fibres are of two types – afferent fibres and efferent fibres. The afferent nerve fibres are responsible for the transmission of impulses from the tissues to the central nervous system while the efferent nerve fibres are responsible for the transmission of impulses from the central nervous system to the concerned tissues or organs.

iii. Define “Nerve Ganglion.” Mention two functions of the spinal cord.

Answer: Retina, the innermost layer of the eyeball is made up of three layers of nerve cells, one of which is the Ganglion cells. Ganglion cells are present closest to the vitreous body. The primary light-sensitive layer is of photoreceptor cells, which is made up of rods and cones. The image gets translated into neural impulses which travel to the brain for visual perception. Ganglion cells receive signals from bipolar cells. The axons of ganglion cells unite to form the optic nerve, which transmits the signal to the thalamus for further processing by the brain. The visual cortex area of the brain processes the nerve impulses and the image is recognised. Meanwhile, Important functions of Spinal Cord are mentioned below:

- Forms a connecting link between the brain and the PNS
- Provides structural support and builds a body posture
- Facilitates flexible movements

iv. What are the three characteristic features of hormones?

Answer: [Hormones](#) are chemicals synthesised and produced by the specialised glands to control and regulate the activity of certain cells and organs. These specialised glands are known as endocrine glands. Hormones are chemicals that essentially function as messengers of the body and are secreted by special glands known as the endocrine glands. These endocrine glands are distributed throughout the body. These messengers control many physiological functions as well as psychological health. They are also quite important in maintaining homeostasis in the body.

v. Write the site of secretion and two functions of progesterone.

Answer: Progesterone is a steroid hormone produced by the Ovaries that foster the development of reproductive organs by maintaining the proper uterine cycle and by developing female secondary sex characteristics. During menopause, usually between age 45 and 55, the uterine cycle stops, and the ovaries no longer produce progesterone hormones. It is a female sex hormone also responsible for menstrual cycle, pregnancy and embryogenesis. During pregnancy, this hormone reduces contractility of the uterus and stimulates the growth of mammary glands. It also induces the growth of decidual cells.

vi. Point out three differences between 'Prokaryotic Cells' and 'Eukaryotic Cells'.

Answer: Know from here the [differences between 'Prokaryotic Cells' and 'Eukaryotic Cells'](#).

vii. Why is 'Meiosis' called reductional division? What types of cell division occur respectively in the cells of root tip in a higher plant and pollen mother cell?

Answer: 'Meiosis' is called reductional division. The salient features of meiotic division that make it different from mitosis are as follows:-

1. It occurs in two stages of the nuclear and cellular division as Meiosis I and Meiosis II. DNA replication occurs, however, only once.
2. It involves the pairing of homologous chromosomes and recombination between them.
3. Four haploid daughter cells are produced at the end, unlike two diploid daughter cells in mitosis.

Meanwhile, mitosis is the cell division that takes place in the cells of the root tip in a higher plant. At the same time, for the pollen mother cell, meiosis is the type of cell division that occurs.

viii. Explain in relation to heredity, how a female child is born in humans?

Answer: We know that human beings have 23 pairs of chromosomes, out of these, we contain 22 pairs of autosomes, and the last pair varies in males and females. Males are heterogametic – they produce two types of male gametes or sperms, where 50% of the sperms carry the 'X' chromosome, while the rest 50% carry the 'Y' chromosome. On the other hand, females are homogametic – they produce only one type of gamete, the ova, each of which carries the 'X' chromosome only. Once the male and female gametes have fused to form the zygote, it would carry either XX chromosome or XY chromosome, depending on whether sperm carrying X or Y fertilised the ovum. Hence, if the sperm carrying 'X' fertilises the ovum (zygote XX), then it would develop into a female baby.

ix. What are the three differences between Asexual and Sexual reproduction?

Answer: Find here the [difference between sexual and asexual reproduction](#).

x. How many hereditary variations are selected by 'Natural Selection'?

Answer: According to Darwin's Theory of Evolution, branching descent and natural selection are the two factors for evolution. Environmental factors like climate, temperature, availability of resources, etc. had a great impact on the evolutionary process. Suppose a colony of bacteria is growing in a medium A. They feed on, reproduce and find themselves fit for that particular medium A. If you change the composition of medium A to B, every bacterium wouldn't make it. Only a portion, which can adapt to a new condition, will survive in the medium B. Eventually, they separate out and arise as new species. Here, the nature of medium filters the fittest and marks an onset for evolution. Another factor which can lead to natural selection is inheritance. Two organisms compete for the same resource. If one can multiply much faster than the other, they will dominate over the other. Thus, the inherited gene in organisms helps them in getting selected and to evolve. In other words, the more you adapt to the changing environment, the more chance you have to get selected by nature. The inadequate climatic changes, natural resources, predators, competition, etc., are amazing challenges given by nature to select the fittest. The one which has more inherited adaptations will have more chances of survival and others won't flourish. The one which is selected by nature grows, reproduces and a new population will arise at the cost of others. Thus, we can conclude that during the course of evolution there is 'survival of the fittest'.

xi. Describe three adaptive characteristics of Cactus with reasons.

Answer: Check here to know the [adaptive characteristics of cactus](#)

xii. Name two diseases causing protozoa. What is the utility of drinking boiled water?

Answer: There are many protozoa that cause various diseases in animals and humans, e.g. Plasmodium (malarial parasite), Trypanosoma (sleeping sickness), Trichomonas (trichomoniasis), etc. Drinking hot water is a good natural remedy for colds, cough or a sore throat. Meanwhile, the best possible way to put off on impending ill- health is by boiling the drinking water. Some reasons on why to boil water is given below:

- Helps to kill the bacteria and viruses
- Removes the microorganisms or chemicals that may be in the water
- It is also effective in destroying the waterborne pathogens
- Drinking hot water is the best way to increase circulation

xiii. Name three diseases of children which can be prevented through universal immunisation.

Answer: Diphtheria, Meningitis and Polio are some diseases of children which can be prevented through [Universal Immunisation](#).

Group-B

Answer any 5 from the Question. No. 5 to question no.11

5. What is the role of liver in human excretion? Name the part which remains in between proximal and distal convoluted tubules of nephron. "All excretory products are waste products, but all waste products are not excretory products"-Explain with example.

[2+1+2=5]

Answer: The important human excretory organs are- kidneys, ureter, urethra, urinary bladder, skin, liver, intestine and lungs. Liver is the largest gland in our body. It secretes bilirubin, biliverdin, vitamins, drugs etc, which are substances containing bile. Bile pigments are produced by the breakdown of haemoglobin in the worn-out red blood cells in the liver. These are eliminated from the body and the organ thus helps in excretion.

Liver also helps in the conversion of ammonia into less toxic urea. There is another gland called the sebaceous gland, which eliminates substances like sterols, hydrocarbons and waxes through sebum. These glands are attached to the hair follicle. Our lower intestinal tract also helps in the excretion by removing the waste products of digestion. The part that remains in between proximal and distal convoluted tubules of the Nephron are the loop of Henle, or nephritic loop because it forms a loop (with descending and ascending limbs) that goes through the renal medulla .PCT continues to form the loop of Henle which ascends to DCT, which in turn opens into the collecting duct.

Meanwhile, elimination of toxic and waste products from the body is called excretion. Carbon dioxide, excess water produced during respiration and nitrogenous compounds produced during protein metabolism are the major excretory products in plants. Thus, we can conclude that all excretory products are waste products. Removal of ammonia waste in the form of urea (in humans) is called excretion. However, all waste products are not excretory products. Giving

out carbon dioxide is a part of respiration. Carbon dioxide is formed as a waste product of respiration and hence is not exactly an excretory activity.

6. Describe the structural characteristics of 'Axon'. Where is the 'organ of corti' located and what's its function?

Answer: Axon is a tube-like structure that carries electrical impulse from the cell body to the axon terminals that passes the impulse to another neuron. There is only one Axon per nerve cell, longer than the dendrite, and it arises from the discharging end of a neuron. It is uniformly thick throughout its length. The Axon is the longest thread on the cell body of a neuron and has an insulating and protective sheath of myelin around it. Meanwhile, find [where the "organ of corti" is located and its functions](#).

7. From where is Adrenaline secreted in humans? Why is it called "Emergency Hormone"? Mention two functions of "Gibberellin."

Answer: Adrenal glands are the endocrine glands, found on top of each kidney. The adrenal gland secretes the adrenaline hormone into the blood and is carried to various parts of the body. In the event of stress, emergency or any threat, adrenaline is released in larger quantities. The adrenaline hormone is secreted in large amounts when a person is afraid, or mentally disturbed. Learn from here [why Adrenaline is known as emergency hormones](#). Gibberellins are any group of plant hormones that stimulate elongation of the stem, flowering and germination. Gibberellins are plant growth regulators that facilitate cell elongation, help the plants to grow taller. They also play major roles in germination, elongation of the stem, fruit ripening and flowering. Find here two main functions of Gibberellin:

- The buds that are formed in autumn stay dormant until the next spring. This dormancy can be overcome by treating them with gibberellin.
- Gibberellins have almost no effect on the growth of roots. However, some inhibition of growth can occur at a higher concentration in a few plants.

8. What kind of cell division occurs at the growing part of a plant body? Cells in the leaf at a certain plant possess 24 chromosomes, how many chromosomes are found respectively in a cell of a petal and in a pollen cell of that plant? Mention two significance of "meiosis".

Answer: Mitosis is the cell division that occurs at the growing part of a plant body. Mitosis is that step in the cell cycle where the newly formed DNA is separated and two new cells are formed with the same number and kind of chromosomes as the parent nucleus.

The number of chromosome in root cells of a plant is given as $2n = 24$, then $n = 24/2 = 12$

So that the number of chromosomes in the cell of a pollen grain is 12 because pollen grains are haploid (n) in nature. In the meantime, given that the diploid chromosome number of a flowering plant is 24, the somatic cells of the plant will also each contain 24 chromosomes (12 maternal and 12 paternal).

The significance of meiotic division are as follows:-

1. It occurs in two stages of the nuclear and cellular division as Meiosis I and Meiosis II. DNA replication occurs, however, only once.

- It involves the pairing of homologous chromosomes and recombination between them.
- Four haploid daughter cells are produced at the end, unlike two diploid daughter cells in mitosis.

9. What is meant by 'pure breed' organisms in hereditary experiments? Guinea pig with pure black and rough fur is hybridised with another guinea pig having pure white and smooth fur. Show with the help of a checkerboard the types of offsprings produced in the F_1 and F_2 generation. (Factor B for black is dominant over factor b for white and R for rough fur is dominant over factor r for smooth fur).

Answer:

BBRR bbr
|
BbRr
|
Gametes from heterozygous parents

	BR	bR	Br	br
BR	BBRR	BbRR	BBRr	BbRr
bR	BbRR	bbRR	BbRr	bbRr
Br	BBRr	BbRr	BBrr	Bbrr
br	BbRr	bbRr	Bbrr	bbrr

Mendel took a pair of contradicting traits together for crossing. He picked the guinea pig with pure black and rough fur and the one with pure white and smooth fur and crossed them. He obtained only pure black rough fur in the F_1 generation. This indicated that black colour and rough are dominant in nature.

Meanwhile, the pure white and smooth tail of guinea pigs are recessive traits. Then, F_1 progeny was self-pollinated. This resulted in four different combinations of guinea pigs in the F_2 generation. The phenotypic ratio was 9:3:3:1.

10. Define fossil and give an example. What kind of evolutionary changes are observed in the hearts of fishes, toads and lizards?

Answer: A fossil is an impression or the preserved remains of a once-living organism. Typically, the most common type of fossils is bones. Fossils can also be formed from shells, exoskeleton, hairs, skin imprints, and even petrified wood. Interestingly, animal footprints, tracks, trails and even animal burrows could become fossilized. However, not all fragments of bone qualify as a fossil; only if a specimen is older than 10,000 years, it qualifies as a fossil. Fossils are important from an evolutionary perspective as they reveal important details and insights about an organism and how it lived. Animals like the dinosaurs died out millions of years ago and one of the best ways to study their anatomy is through their fossil records. Some animals, such as jellyfish do not have any hard parts such as bones, thereby fossils of these organisms are extremely rare. However, the bodies of these

organisms do fossilize, given the right environmental conditions. Such fossils are called “soft-fossils”, and leave an imprint of their bodies on the rock.

Meanwhile, an evolutionary change in the pattern of heart among the vertebrates has been observed through careful analysis. Vertebrates possess a muscular heart, it is chambered. They have evolved from having a two chambered heart(fish) to possessing a four-chambered heart(mammals). A fish has a two-chambered heart. It pumps deoxygenated blood to the gills where it is oxygenated and sent to the body. The blood that is oxygenated is then carried to the heart. Three-chambered hearts are found in amphibians – a ventricle and 2 atria(left atrium and right atrium). The left atrium receives oxygenated blood from the respiratory organs while deoxygenated blood is received by the right atrium from the organs of the body. But, both types of blood are eventually mixed in the ventricle, hence the body receives mixed blood. Half septum in reptiles divides the ventricle partially hence both types of blood do not get mixed. But in birds, crocodiles and mammals, the heart is completely segregated into halves hence deoxygenated and oxygenated blood are separated. A structural modification in the hearts of fish up till mammals is observed, checking that oxygen-rich blood is supplied to the body while the four-chambered heart ensures that the blood flow is synchronized. As the structure of the heart has evolved, the type of circulation also depends on it, if it is single or double circulation.

11. Mention one adaptive importance of each of the followings:

- a. **Bones of Pigeon**
- b. **Body contour of Rohu fish**
- c. **Dorsal fin of Rohu fish**
- d. **Eyes of Pigeon**
- e. **Leaves of Sundari Plants**

Answer: (a) As compared to mammals, the skeletal system of birds is light weighted. But they are sufficiently strong to overcome the stresses they face during flight and landing. Also, the numbers of bones are far lesser than reptiles and mammals.

(b) Rohu, a bony fish, has a single gill opening on either side. These gills are adaptive to breathe and swim.

(c) Rohu has only one dorsal fin that starts from the mid-dorsal line of the trunk, midway between the snout and the base of the tail, and it consists of 13 fin-rays. The dorsal fin is usually used for sudden direction changes and can act as a "keel", thus helping to keep the fish stable in the water.

(d) The eyes of the pigeon have an orange/ yellow/ red iris with a pale, inner ring. The eyelids are orange and encapsulated in a white-grey eye ring. Around the eyes, the skin is bare.

(e) Mangrove trees also known as Sundari plants have some unique leaf features that enable their adaptation, because these plants grow in unstable, variable and saline environments where there is regular tidal influence. Special stomatal structures with extended cuticles of the leaves render the transpiration rate. As well as the presence of glandular and non-glandular hairs on the abaxial and/or adaxial leaf surfaces are related to salt secretion of these plants.

Group-C

Answer any one question of the following:

12. Draw a neat labelled diagram of the longitudinal section of the eyeball in human and label the following parts: [5+(1×3)=8]

- a) Optic nerve
- b) Lens
- c) Iris

Answer: Find the [image of the longitudinal section of the eyeball](#) here.

13. Draw a neat labelled diagram of a lotus plant and mark the following parts: [5+(1×3)=8]

- a) Leaf lamina
- b) Rhizome
- c) Thallamus

Answer:



