AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII

MODEL EXAMINATION PAPER 2023 AND ONWARDS

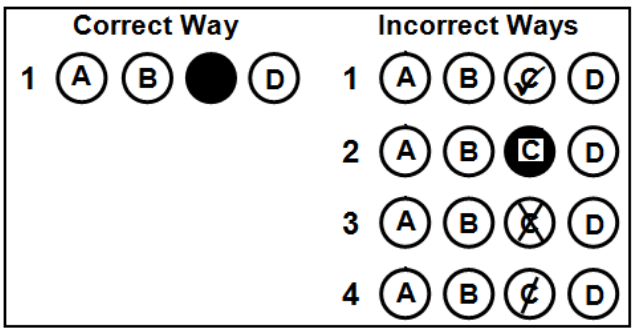
Biology Paper I

Time: 1 hour 30 minutes Marks: 50

AKU-EB Model Paper 2023 for Teaching & Learning Only

INSTRUCTIONS

1. Read each question carefully.
2. Answer the questions on the separate answer sheet provided. DO NOT write your answers on the question paper.
3. There are 100 answer numbers on the answer sheet. Use answer numbers 1 to 50 only.
4. In each question, there are four choices A, B, C, D. Choose ONE. On the answer grid, black out the circle for your choice with a pencil as shown below.



Candidate's Signature

5. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
6. DO NOT write anything in the answer grid. The computer only records what is in the circles.

1. As compared to the nephrons of freshwater vertebrates, the nephrons of desert rodents have

   A. longer loop of Henle.
   B. shorter collecting duct.
   C. less convoluted distal tubule.
   D. more convoluted proximal tubule.

2. Vasa recta is the cluster of blood capillaries present in the nephron of human beings. It is derived from **X** and surrounds **Y**, where **X** are arterioles and **Y** are tube-like structures.

   Which of the following CORRECTLY identifies **X** and **Y**?

	X	**Y**
A	Efferent arterioles	Proximal convoluted tubules
B	Afferent arterioles	Proximal convoluted tubules
C	Efferent arterioles	Loop of Henle
D	Afferent arterioles	Loop of Henle

AKU-EB Model Paper 2023 for Teaching & Learning Only

3. A person is suffering from hyper-secretion of aldosterone.

   The laboratory report of his urine composition will show the absence or very low level of

   A. glucose.
   B. creatinine.
   C. sodium ions.
   D. phosphate ions.

4. Which of the following options shows the effects of increased ADH (Antidiuretic hormone) plasma concentration on the osmolarity of fluid in the peritubular capillaries and the volume of urine formed in human kidney nephron?

	Osmolarity of Fluid in Peritubular Capillaries	**Volume of Urine**
A	Decreases	Decreases
B	Increases	Increases
C	Increases	Decreases
D	Decreases	Increases

5. The excretory opening through which fresh water flatworms remove their metabolic waste is

   A. cloaca.
   B. urethra.
   C. nephrostome.
   D. nephridiopore.

6. Read the given features.

   I. Globular proteins
   II. Thin thread-like structure
   III. Wound around the actin filament

   The feature(s) which describe(s) tropomyosin molecules is/ are

   A. I only.
   B. I and II.
   C. III only.
   D. II and III.

7. In the muscle fibre, transverse tubules (T-tubules) are formed by the invagination of sarcolemma. The function of these T-tubules is to

   A. unblock the binding sites of actin.
   B. conduct nerve impulse into the cell.
   C. synthesise glycogen in the sarcoplasm.
   D. store calcium ions in the sarcoplasmic reticulum.

8. Following structures are components of a skeletal muscle at macroscopic and microscopic levels.

   I. Muscle fibre
   II. Thick filament
   III. Myofibril

   The CORRECT sequence of these components according to their size in ascending order is

   A. I, II, III
   B. II, I, III
   C. II, III, I
   D. III, II, I

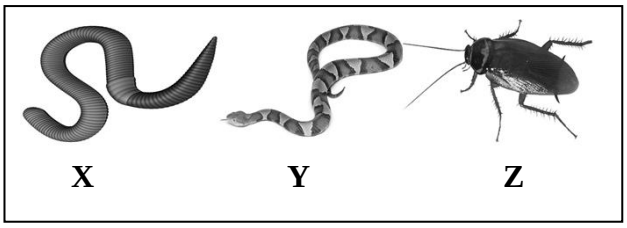
9. In bryophytes, flagellated sperms swim towards the eggs due to the secretion of sugars and malic acid by female gametophyte.

   The type of movement exhibited by the sperms of bryophytes is

   A. geotropism.
   B. hydrotropism.
   C. chemotropism.
   D. thigmotropism

AKU EB Model Paper 2023 for Teaching & Learning Only

10. Consider the given diagram.



Which type of skeleton is present in the given animals, **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	Hydrostatic	Endoskeleton	Exoskeleton
B	Hydrostatic	Exoskeleton	Endoskeleton
C	Endoskeleton	Hydrostatic	Exoskeleton
D	Exoskeleton	Hydrostatic	Endoskeleton

AKU-EB Model Paper 2023 for Teaching & Learning Only

11. It is observed that if plants are grown in dark, their stems elongate much more rapidly than normal and fail to form chlorophyll.

This phenomenon is called

A. etiolation.
B. chlorosis.
C. dormancy.
D. retarded growth.

12. Auxins and gibberellins are plant hormones. The common role of these hormones is to

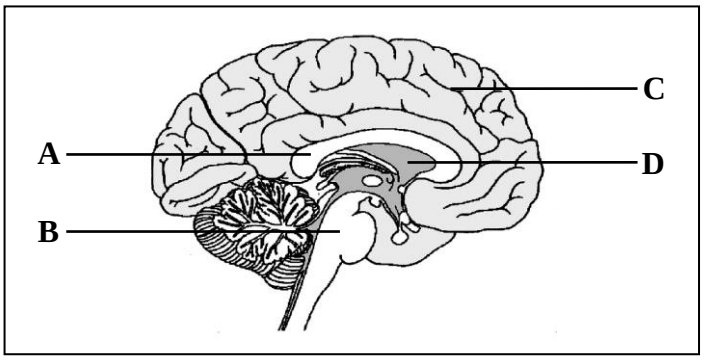
A. delay both bud initiation and leaf senescence.
B. promote both bud initiation and leaf senescence.
C. promote bud initiation and delay leaf senescence.
D. promote leaf senescence and delay bud initiation.

13. In contrast to motor and relay neurons, the sensory neurons contain

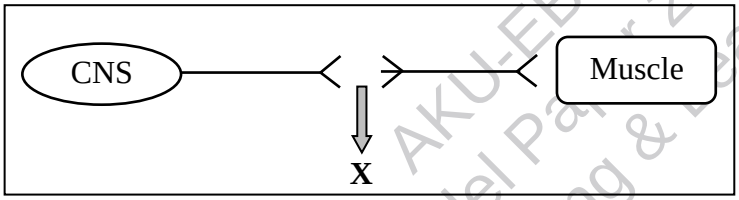
A. single axon.
B. single dendron.
C. multiple dendrites.
D. multiple nodes of Ranvier.

14. The given diagram shows a section through the midline of the human brain.

The labelled structure that connects right and left cerebral hemisphere is



15. The given diagram shows a synapse. **X** is a chemical substance which transfers impulse from presynaptic neuron to postsynaptic neuron.



The substance **X** is identified as

A. nicotine.
B. sodium ions.
C. acetylcholine.
D. potassium ions.

16. When two heterozygotes (AaBb) of completely dominant traits are crossed, then the probability of appearance of AABB genotype would be

A. 1/16
B. 3/16
C. 6/16
D. 9/16

AKU-EB Model Paper 2023 for Teaching & Learning Only

17. In a particular type of pigeons, brown (B) feather and red (R) eye colour is completely dominant over white (b) feather and black (r) eye colour.

The following result is obtained from a cross between two such pigeons.

Genotypes of offspring: BbRr, Bbrr, bbRr and bbrr Genotypic Ratio: 1:1:1:1

The genotypes of the parent pigeons would be

A. BBrr and Bbrr.
B. Bbrr and bbRr.
C. BBRr and Bbrr.
D. BbRr and bbRR.

18. The genotypes of parents of a baby girl who is born with haemophilia would be

	Genotype of Mother	**Genotype of Father**
A	carrier	normal
B	haemophiliac	normal
C	carrier	haemophiliac
D	normal	haemophiliac

AKU-ER Model Paper 2023 for Teaching & Learning Only

19. XX-XY type of sex determination is found in humans and drosophila.

A drosophila offspring with genotype XXY produced through non-disjunctional gametes will be a

A. sterile male.
B. fertile male.
C. sterile female.
D. fertile female.

20. Some patterns of inheritance for an X-linked traits are listed below.

I. It is more common in females than males.
II. An affected father will pass the trait to all of his daughters.
III. A carrier mother will pass the trait to one of every two sons.

The pattern(s) of inheritance for an X-linked dominant trait is/ are

A. I only.
B. III only.
C. I and II.
D. II and III.

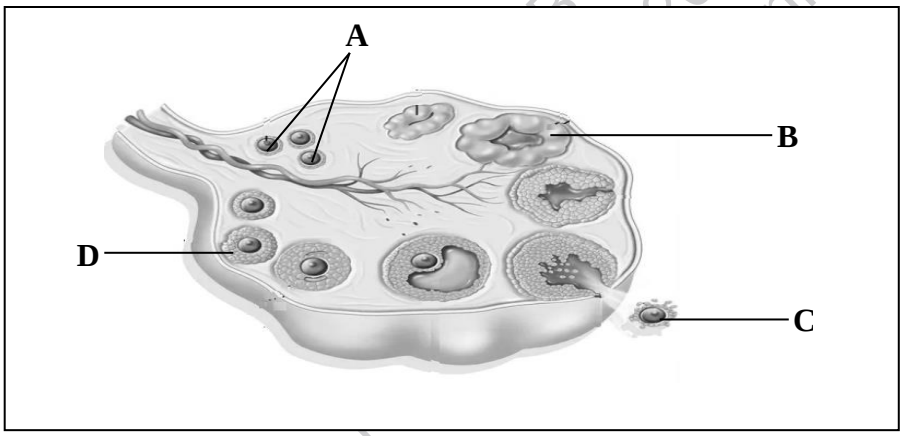
21. In human beings, what is the ratio of the number of functional gametes produced from one primary spermatocyte to the number of gametes produced from one primary oocyte respectively?

A. 1 : 3
B. 1 : 4
C. 3 : 1
D. 4 : 1

22. The phase of uterine cycle in which degeneration of endometrium occurs is

A. luteal.
B. follicular.
C. ovulation.
D. menstruation.

23. In the given ovarian cycle of humans, the structure that produces estrogen is labelled as



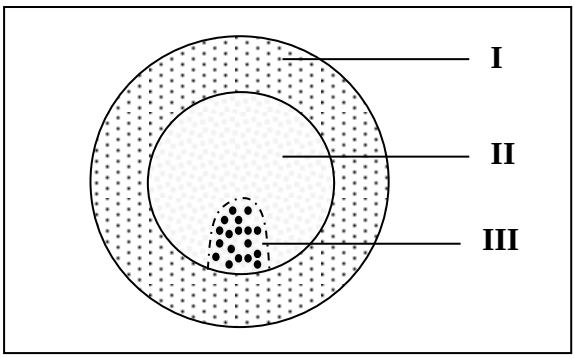
24. Following are some of the events that occur during the development of animals.

Gamete formation → Fertilisation → **X** → Gastrulation → Organogenesis

The structures formed during the event **X** are

A. somites.
B. blastomeres.
C. epiblast and hypoblast.
D. neural groove and neurocoel.

25. The given diagram shows a chick's embryo after 4 hours of incubation.



The labelled structures **I**, **II** and **III** represent

	I	II	III
A	area opaca	area pellucida	primitive streak
B	area pellucida	area opaca	Hensen's node
C	epiblast	hypoblast	notochord
D	hypoblast	epiblast	mesoderm

AKU-EB Model Paper 2023 for Teaching & Learning Only

26. Open growth occurs in plants because meristematic tissues

A. continuously replace themselves.
B. are produced by all types of cells.
C. for secondary growth are present in the shoot tips.
D. for primary growth are present throughout the plant body.

27. The genetic code is universal across organisms.

This feature is advantageous in the process of

A. karyotyping.
B. amplification of a gene.
C. isolation of genes from organism.
D. synthesis of insulin from bacteria.

28. A section of deoxyribonucleic acid (DNA) contains the following sequence of bases.

G A T C A G C C A T A C

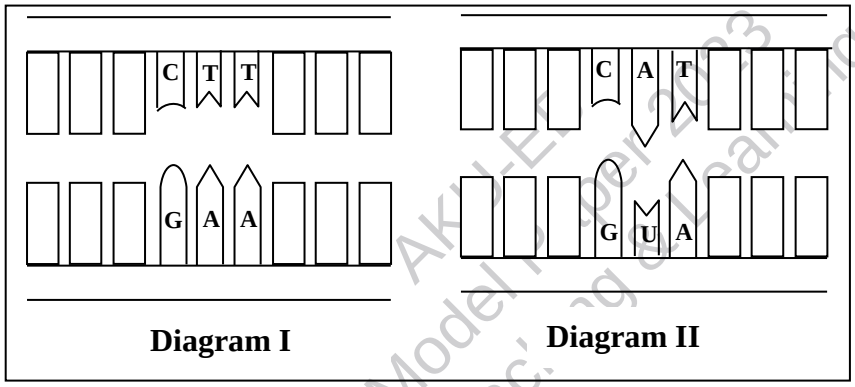
The number of amino acids that the given section of DNA can code is

A. 3
B. 4
C. 6
D 12

29. During the process of DNA replication, the direction of synthesis of Okazaki fragments and the construction of daughter strand is

	Direction of Synthesis	Daughter Strand
A	away from the replication fork	lagging
B	towards the replication fork	leading
C	away from the replication fork	leading
D	towards the replication fork	lagging

30. Diagrams **I** and **II** represent normal and mutant nucleotide sequence for haemoglobin respectively.



The type of mutation as shown in diagram **II** is

A. deletion.
B. insertion.
C. transposition.
D. base substitution.

31. Which of the following CORRECTLY represents the separation of sister chromatids and homologous chromosomes during mitosis and meiosis?

	Mitosis	Meiosis I	Meiosis II
A	Sister Chromatids	Sister Chromatids	Homologous Chromosomes
B	Homologous Chromosomes	Homologous Chromosomes	Sister Chromatids
C	Sister Chromatids	Homologous Chromosomes	Sister Chromatids
D	Homologous Chromosomes	Sister Chromatids	Homologous Chromosomes

AKU-EB Paper 2023 Model Paper for Teaching and Learning Only

32. A cell contains 8 chromosomes in its diploid state.

When this cell undergoes meiosis, its each daughter cells would contain

A. two genetically identical chromosomes.
B. two genetically different chromosomes.
C. four genetically identical chromosomes.
D. four genetically different chromosomes.

33. Haploid (n) number of chromosomes in a cell is 10.

In a monosomic condition due to meiotic error (non-disjunction), the number of chromosomes in this cell will be

A. 21
B. 20
C. 19
D. 18

34. Cancerous cells lack the property of

A. metastasis.
B. rapid division.
C. differentiation.
D. energy production.

35. Genetic counselling should be regarded as an integral part of the genetic testing process and should be strongly recommended in most genetic testing situations.

The role of a genetic counsellor is to inform parents about the

A. risks of appearance of disorders in the baby.
B. gender of the baby using ultrasound technique.
C. benefits of family planning for healthy parents.
D. nutritional requirements of the mother and the baby.

36. Bacterial plasmids used in the recombinant DNA technology include

I. genes for antibiotic resistance
II. an origin of replication (promoter)
III. genes necessary for the respiration of bacteria

A. I only.
B. I and II.
C. III only.
D. II and III.

AKU-EB Model Paper 2023 for Teaching & Learning Only

37. The given table shows a forensic investigation result comprising of DNA fingerprints.

DNA Fingerprints of Blood Sample from				
Crime Scene	**Suspect 1**	**Suspect 2**	**Suspect 3**	**Suspect 4**
				

Based on the given result, the culprit would be

A. suspect 1.
B. suspect 2.
C. suspect 3.
D. suspect 4.

38. Polymerase chain reaction (PCR) requires all of the following EXCEPT

A. primers.
B. DNA helicase.
C. Taqss polymerase.
D. deoxy ribonucleotides.

39. If the frequency of allele q is 0.568 in a population, then the frequency of heterozygous genotype in the population would be

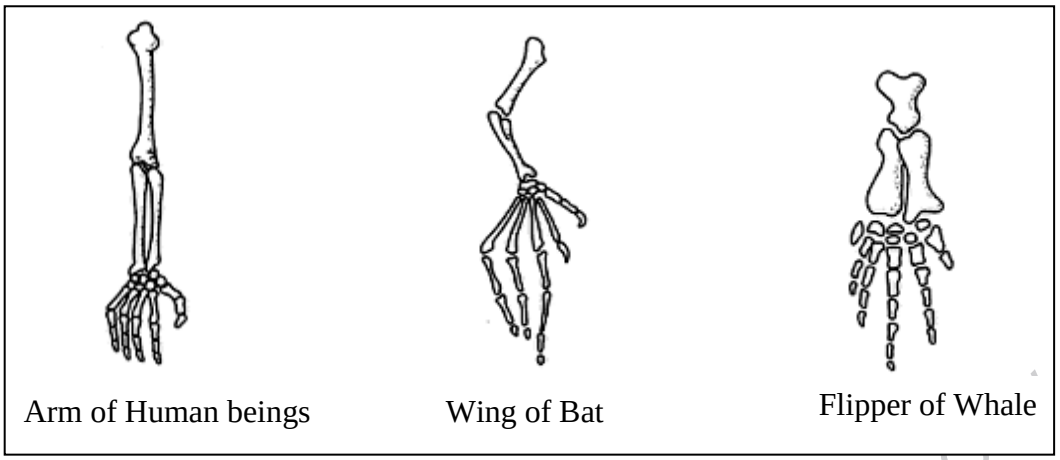
A. 0.490
B. 0.980
C. 1.058
D. 1.136

40. An example of a vestigial organ in men is

A. coccyx.
B. clavicle.
C. pelvic bone.
D. pectoral girdle.

AKU-E... Model Paper... for Teaching & Lea...

41. The given diagrams show internal bone structure of different animals.



Which of the following is CORRECT about the evolutionary relationship among these animals?

	Structure	Type of Evolution
A	Analogous	Convergent
B	Analogous	Divergent
C	Homologous	Divergent
D	Homologous	Convergent

42. The phenomenon of artificial selection leads to

A. the formation of new species.
B. the development of resistance in bacteria.
C. increased genetic diversity in a population.
D. reduced proportion of heterozygotes in a population.

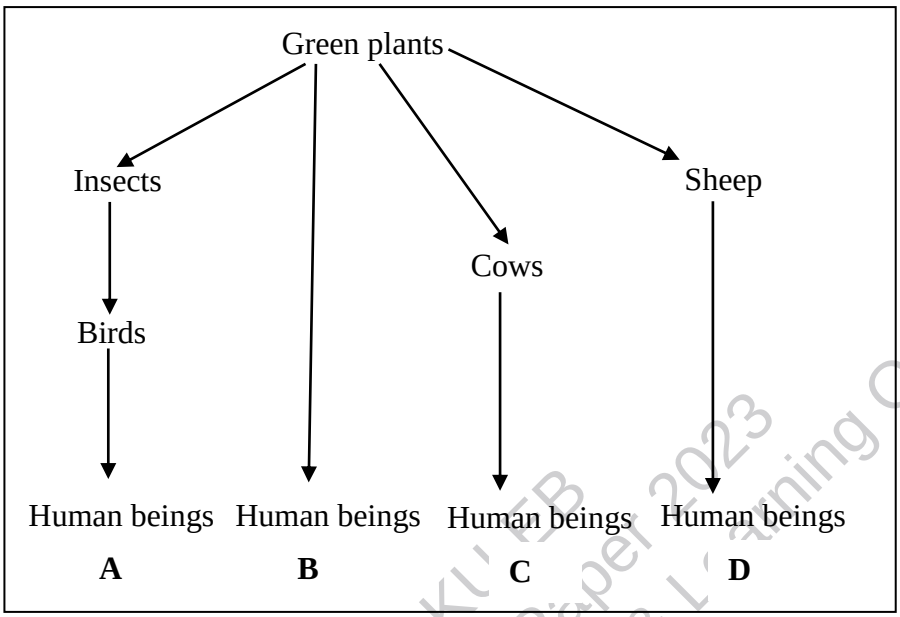
43. In a pyramid of energy, if the energy at a specific trophic level is 1,000 J, the amount of energy available for the next higher trophic level would be

A. 10 J.
B. 100 J.
C. 1,000 J.
D. 10,000 J.

AKUEB Model Paper 2023 for Teaching & Learning

44. The given diagram shows four food chains.

The food chain that transfers MINIMUM energy to the human beings is



AKU EB Model Paper 2023 for Teaching & Learning Only

45. Asif finds different populations of animals like chinkara, blackbuck and the white-footed fox in Thar Desert.

The animal population that would be considered while studying the autecology of Thar Desert is/ are of

A. chinkara only.
B. chinkara and the blackbuck.
C. white-footed fox and blackbuck.
D. chinkara, blackbuck and the white-footed fox.

46. The terrestrial biome in which the average temperature remains low throughout the year is

A. tundra.
B. grassland.
C. tropical rain forest.
D. temperate deciduous forest.

47. The reason that coniferous forests MAINLY comprise of evergreen coniferous trees is

A. low altitude.
B. heavy rainfall.
C. highly fertile soil.
D. short summer season.

48. Moisture content of soil is limited in the grassland ecosystem because of

	Precipitation	**Evaporation**
A	low	high
B	low	low
C	high	low
D	high	high

49. An abnormal condition develops in an individual upon exposure to microbes.

This condition would be classified as a

A. genetic disorder.
B. pathogenic disease.
C. metabolic disorder.
D. nutritional deficient disease.

50. In an environment where sulphur dioxide and nitrogen dioxide are present in excess, the pH value of the rainfall would be approximately

A. 4.0
B. 6.9
C. 7.5
D. 8.0

AKU-EB Model Paper 2023 for Teaching & Learning Only

END OF PAPER

Please use this page for rough work

AKU-EB
Model Paper 2023
for Teaching & Learning Only

Please use this page for rough work

AKU-EB
Model Paper 2023
for Teaching & Learning Only