**AGA KHAN UNIVERSITY EXAMINATION BOARD**

**HIGHER SECONDARY SCHOOL CERTIFICATE**

**CLASS XII**

**ANNUAL EXAMINATIONS (THEORY) 2025**

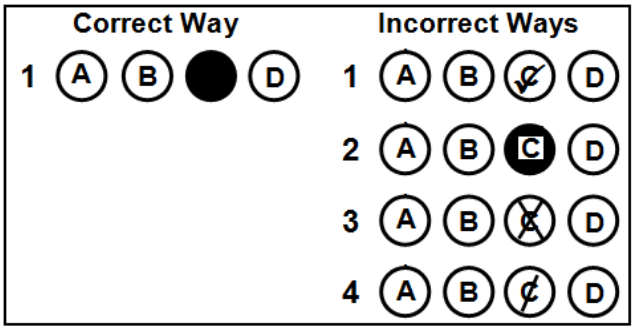
**Biology Paper I**

**Time: 1 hour 30 minutes Marks: 50**



**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.
7. You may use a scientific calculator if you wish.

1. The structural adaptation found in hydrophytes is

   A. large surface area of leaves.
   B. deep and extensive network of roots.
   C. stomata on the lower surface of leaves.
   D. thick and waxy cuticle on the plant surface.

2. The feature of the excretory system of a cockroach that makes it different from other animals is the

   A. presence of a network of closed tubules without internal openings.
   B. presence of an internal opening immersed in coelomic fluid.
   C. association of excretory structure with its digestive tract.
   D. excretion of nitrogenous waste as uric acid crystals.

3. The option that justifies the excretion of uric acid by uricotelic animals in dry and hot habitats is

| | **Toxicity of Uric Acid as Compared to Urea** | **Requirement of ATP for Synthesis of Uric Acid** | **Water (mL) required to Excrete 1 g of Nitrogenous Waste** |
|---|---|---|---|
| A | higher | × | 1 |
| B | lower | × | 500 |
| C | higher | ✓ | 500 |
| D | lower | ✓ | 1 |

4. Given is the overall reaction of urea formation (urea cycle) from ammonia, that takes place in the human liver.

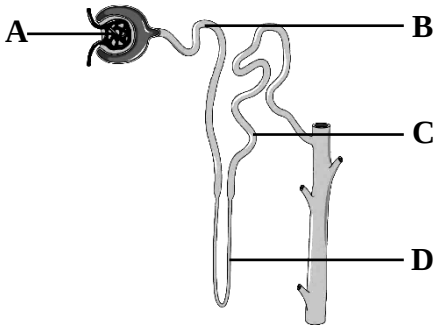
   2 Ammonia + **X** + **Y** ⟶ Urea + Water + 3 ADP

   Reactants **X** and **Y** are identified as

| | **X** | **Y** |
|---|---|---|
| A | $CO_2$ | 3 phosphates |
| B | $CO_2$ | 3 ATP |
| C | $O_2$ | 3 phosphates |
| D | $O_2$ | 3 ATP |

5. The given diagram shows a nephron of human kidney.

   The part where most of the water, glucose, amino acids, and small peptides are reabsorbed is labelled as




6. In flowers, due to greater growth rate of cells on the lower side of sepals, the floral bud closes.

   The type of movement exhibited by the sepals in a closed bud is

   A. epinasty.
   B. hyponasty.
   C. nyctinasty.
   D. photonasty.

7. In the given diagram of the cross-section of a woody stem, the labelled region **X**


   A. is suitable for making furniture.
   B. is responsible for conduction of sap.
   C. acts as a repellent to fungi and insects.
   D. contains cells that store tannins and resins.

8. The set of invertebrates that possesses an endoskeleton is

   A. star fish and sea cucumber.
   B. planaria and tapeworm.
   C. earthworm and leech.
   D. hydra and corals.

9. Which of the following is CORRECT about bicep and tricep muscles?

   A. These are unstriped with many nuclei per cell.
   B. These are regularly striped with one nucleus per cell.
   C. These are unstriped, slow to rapid in terms of speed of contraction.
   D. These are regularly striped, slow to rapid in terms of speed of contraction.

10. During muscle contraction, the binding of calcium ions to troponin molecules, exposes the binding site of

   A. actin.
   B. myosin.
   C. myoglobin.
   D. tropomyosin.

11. Auxin will induce all of the following phenomena in plants EXCEPT

   A. abscission.
   B. cytokinesis.
   C. parthenocarpy.
   D. apical dominance.

12. The component of the human nervous system that is NOT involved in any sensory or motor activity is

   A. axon.
   B. ganglia.
   C. dendrite.
   D. neuroglia.

13. During boxing, repeated blows to the head of boxer by his opponent cause an injury to the cerebrum of his brain.

   The body functions of the boxer that can be impaired by this injury are

   A. memory and speech.
   B. breathing and blood pressure.
   C. body balance and equilibrium.
   D. visual perception and sleeping pattern.

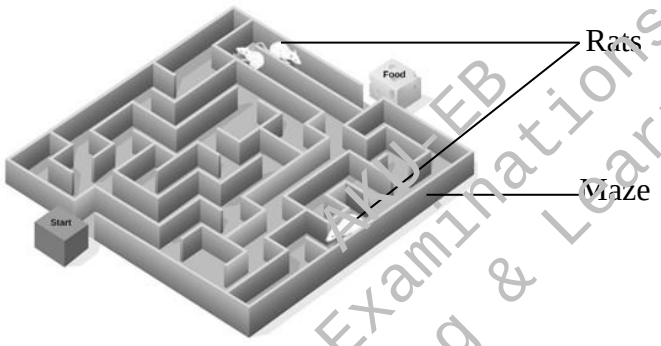
14. Saqib, an endocrinologist, observes the following symptoms in his patient.

- Bulging eyes
- Puffy eyelids
- Rapid heartbeat (palpitations)

To diagnose the observed symptoms, he might suggest a hormonal blood test to assess the levels of

A. insulin.
B. cortisol.
C. thyroxine.
D. androgens.

15. The given diagram shows Tolman's experiment to demonstrate a type of learned behaviour in rats.




This learned behaviour is identified as

A. latent learning.
B. insight learning.
C. classic conditioning.
D. operant conditioning.

16. The colour of seed in peas is controlled by two alleles Y (yellow) and y (green). Yellow is dominant over green.

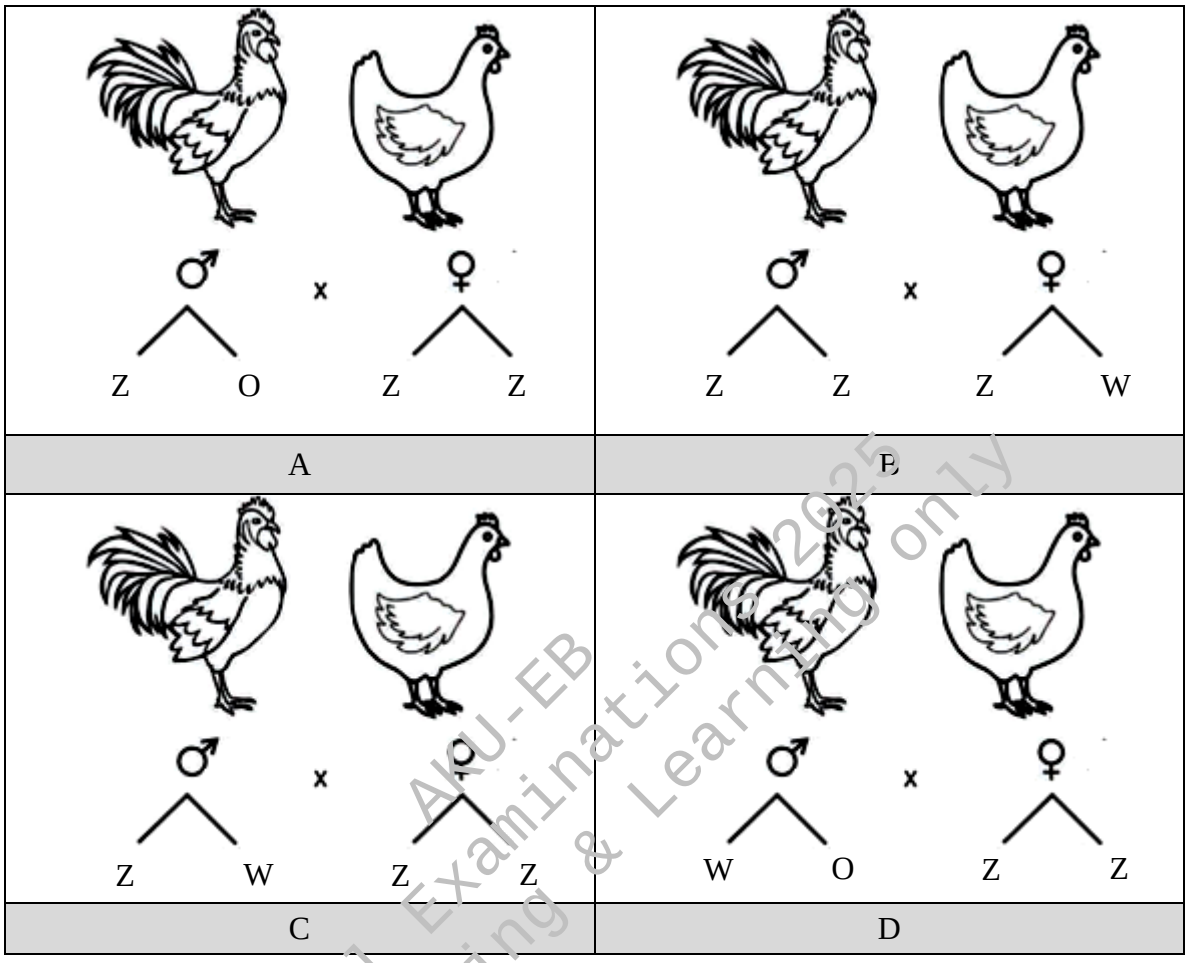
Which of the following parental crosses will give a 1:1 phenotypic ratio among the offspring?

A. Yy with YY
B. Yy with yy
C. Yy with Yy
D. YY with yy

17. A dihybrid cross is based on the principle of

A. segregation.
B. codominance.
C. purity of gametes.
D. independent assortment.

18. The CORRECT depiction of sex chromosomes in the sperms and ova of birds is




19. Two *Vinca rosea* plants with purple flowers and white flowers were crossed.

In F1 generation, all the plants had violet (light purple) flowers, showing incomplete dominance.

By self-crossing the F1 generation, the predicted phenotypic ratio of F2 generation will be

| | **Purple** | **Violet** | **White** |
|---|---|---|---|
| A | 1 | 2 | 1 |
| B | 2 | 1 | 1 |
| C | 1 | 1 | 2 |
| D | 1 | 2 | 2 |

20. In humans, a gene that influences growth rate also affects weight and height.

The given fact exemplifies the phenomenon of

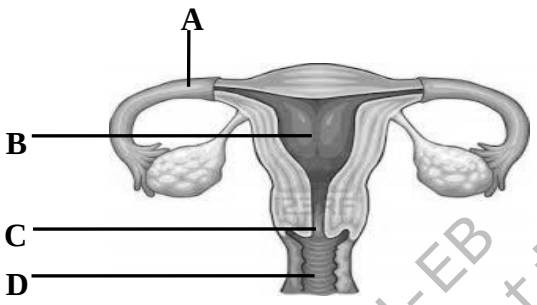
A. pleiotropy.
B. recessive epistasis.
C. dominant epistasis.
D. polygenic inheritance.

21. The presence of either form of phytochrome (P660 or P730) helps the plants to detect whether it is in a light or dark environment.

During 24 hours of a day, the time at which a plant contains more P730 is

A. 8.00 a.m. to 5.00 p.m.
B. 8.00 p.m. to 5.00 a.m.
C. 12.00 a.m. to 5.00 a.m.
D. 6.00 p.m. to 12.00 a.m.

22. In the given diagram of human female reproductive system, the labelled part in which the foetus completes the gestation period is




23. A sexually transmitted bacterial disease which when passed from the mother to the infant, can cause serious eye infection in the newborn is

A. syphilis.
B. gonorrhoea.
C. genital herpes.
D. acquired immune deficiency syndrome (AIDS).

24. Following are some events of a phase of growth in plants.

I. The walls of cells become thicker.
II. The walls of tissues become pitted.
III. New structural features develop.

The above events belong to the phase of

A. elongation.
B. maturation.
C. cell division.
D. differentiation.

25. The feature that characterises discoidal cleavage in a chick embryo is that the

A. pattern of cleavage is spiral.
B. cleavage is limited to a small blastodisc.
C. karyokinesis occurs without cytokinesis.
D. cleavage furrow completely penetrates the yolk.

26. In the gastrula of chick, the presumptive germinal layer(s) formed by the epiblast is/ are

I. ectoderm
II. mesoderm
III. endoderm

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

27. Which of the following types of chromosomes is shown in the given diagram?

A. Acrocentric
B. Telocentric
C. Metacentric
D. Sub-metacentric

28. Helicase is one of the enzymes that plays an important role in the process of DNA replication.

If a gene mutation makes the helicase enzyme non-functional in a cell, what consequence would likely occur?

A. Nucleotides will be added in the 3' to 5' direction.
B. The double helical structure of DNA will become unstable.
C. Phosphodiester bonds between nucleotides will fail to form.
D. Hydrogen bonds between nitrogenous bases will remain intact.

29. Codon of amino acid, leucine, is CUU.

During the process of translation, leucine will be transported to ribosome by the tRNA with anticodon

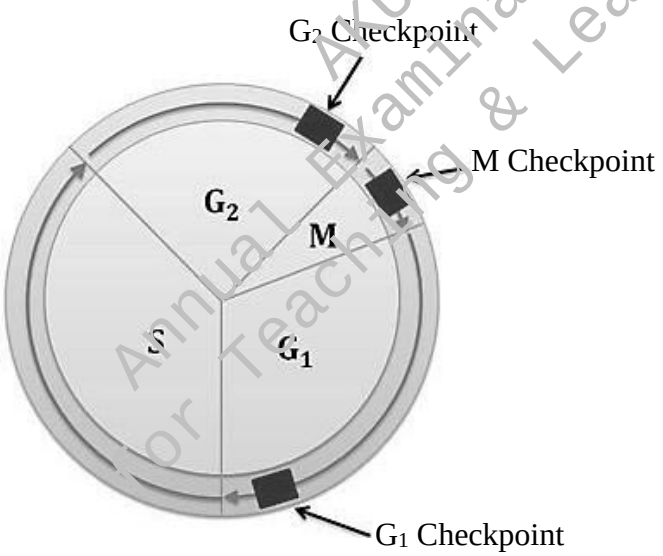
A. UUC.
B. GAA.
C. AGG.
D. GTT.

30. Which of the following is NOT an example of point mutation?

A. Base substitution
B. Transposition
C. Insertion
D. Deletion

31. The given diagram shows three different checkpoints of cell cycle.

(**Note**: Cell cycle checkpoints are critical to prevent the cell from progressing to the next phase of the cell cycle before the prior phase has been completed.)






The purpose of $G_2$ checkpoint in the cell cycle is to check whether the

A. chromosomes have attached to the spindle fibre.
B. cell has made necessary proteins for DNA replication.
C. ribosomal sub units are attached to the messenger RNA.
D. DNA of the cell has been replicated before cell division.

32. Interphase of mitosis and meiosis-II are different from each other in terms of the

A. synthesis of enzymes.
B. increase in cell size.
C. duplication of DNA.
D. storage of energy.

33. In the late prophase of mitosis, the condensation of chromosomes is crucial to guarantee that in later mitotic stages

A. non-disjunction of chromosomes can occur in the somatic cells.
B. the cell can accurately synthesise mRNA and chromosomal proteins.
C. proper replication of chromosomes and cell organelles can take place.
D. chromosomes remain undamaged by pulling and pushing forces during segregation.

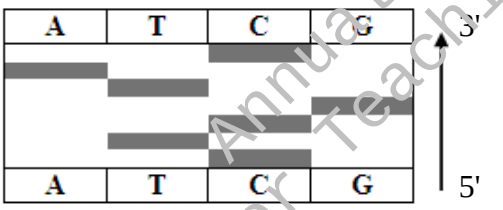
34. A person with Turner's syndrome lacks

A. both X and Y chromosomes.
B. chromosome number 21.
C. one X chromosome.
D. one Y chromosome.

35. Which of the following is CORRECT about the role of enzymes in recombinant DNA technology?

| | Cutting of Plasmid | Isolation of Gene of Interest |
|---|---|---|
| A | Restriction endonuclease | Restriction endonuclease |
| B | Restriction endonuclease | DNA ligase |
| C | DNA ligase | DNA ligase |
| D | DNA ligase | Restriction endonuclease |

36. The diagram shows the results of DNA sequencing through dideoxy method.




Based on the given results, the sequence of nucleotides will be noted as

A. ATTCCCG
B. TGATCCC
C. CTCGTAC
D. GCCCTTA

37. Sticky ends are produced when restriction enzymes cut fragments of deoxyribonucleic acid (DNA).

The advantage of these sticky ends in recombinant DNA technology is to

A. isolate gene of interest.
B. identify plasmids in bacteria.
C. synthesise complementary DNA from mRNA.
D. facilitate the insertion of foreign DNA into vector.

38. In the polymerase chain reaction, a primer (short, single-stranded DNA sequence) is used to

A. break the linkages between the strands of target DNA.
B. provide a starting point for DNA replication.
C. allow the joining of Okazaki fragments.
D. cut out the gene of interest.

39. All of the following evidence support that both mitochondrion and chloroplast may have arisen from prokaryotic organisms EXCEPT that both of them

A. divide by binary fission.
B. are present in plant cells.
C. have their own circular DNA.
D. are of same size as prokaryotic cells.

40. The given diagrams (**I** and **II**) shows the leaves of two plants with common anatomical theme that has been modified for divergent functions.

**I** **II**

The leaves of both plants are

A. homologous.
B. homozygous.
C. hemizygous.
D. analogous.

41. The option that CORRECTLY differentiates natural and artificial selection is

| | Natural Selection | Artificial Selection |
|---|---|---|
| A | variation occurs in offspring | identical offspring |
| B | takes place between different species | takes place within a species |
| C | production of best fitted organism | appearance of desired characteristics |
| D | fast process | slow process |

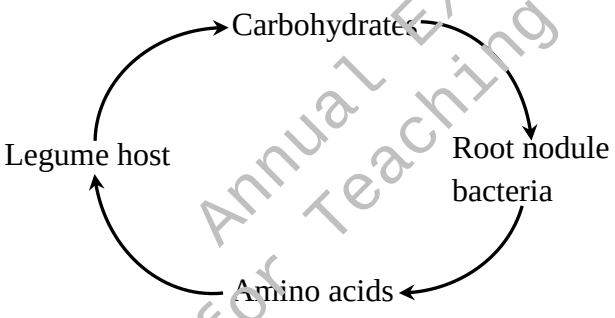
42. A random sample of 200 pea plants is taken from a population in Hardy-Weinberg equilibrium. It is found that 20 plants have white colour flowers and 180 plants have purple colour flowers.

(**Note**: In pea plants, the allele for purple colour flower is dominant over allele for white colour flower.)

The frequency of allele for white colour in this population is

A. 0.01
B. 0.31
C. 0.81
D. 0.94

43. Which type of association is shown in the given diagram?




A. Commensalism
B. Parasitism
C. Mutualism
D. Grazing

44. Soil erosion and activity of denitrifying bacteria in the soil cause nitrogen depletion. Despite these facts, the nitrogen cycle is still maintained.

This maintenance is attributed to the involvement of

A. lichens.
B. mycorrhiza.
C. parasitic bacteria.
D. rhizobium bacteria.

45. Certain types of silverfish, always move along with marching columns of army ants and share the abundant food caught by the ants. The army ants derive no apparent benefit or harm from the silverfish.

This ecological interaction between silverfish and ants is an example of

A. predation.
B. parasitism.
C. mutualism.
D. commensalism.

46. *Thar* and *Thal* are the desert ecosystems of Pakistan. These ecosystems are characterised by

A. nutrient rich soil.
B. large number of herbivores.
C. annual rainfall less than 25 cm.
D. a temperature range of 4-25°C.

47. Grasslands devoid of woody plants are referred to as

A. prairies.
B. savannahs.
C. tropical grasslands.
D. desertified grasslands.

48. The coniferous trees have long, thin waxy needle-like leaves with sloping branches and pyramidal shape of cones which allows them to

A. increase the rate of transpiration.
B. slide off the excessive rainwater and snow.
C. absorb maximum light and heat from the sun.
D. deposit more snow for maximising the moisture content.

49. The presence of dead or fading trees in areas affected by acid rain can be attributed to the fact that acid rain

A. increases the pH of soil.
B. washes out essential nutrients of the soil.
C. decreases the availability of some toxic elements in the soil.
D. stimulates the formation of deep and vertical roots in the soil.

50. Which of the following classification of diseases CORRECTLY matches with its example?

| | **Classification of Diseases** | **Example** |
|---|---|---|
| A | Genetic disease | Haemophilia |
| B | Pathogenic | Osteoarthritis |
| C | Aging | Scurvy |
| D | Nutritional disorder | Diphtheria |

END OF PAPER

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