Page 1 of 24

AGA KHAN UNIVERSITY EXAMINATION BOARD HIGHER SECONDARY SCHOOL CERTIFICATE CLASS XII

ANNUAL EXAMINATIONS 2021

Biology

Total Time: 2 hours 10 minutes

Total Marks: 65 (50-Theory & 15-Alternate to Practical)

INSTRUCTIONS

- 1. Read each question carefully.
- Ations 20kr only 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 65 only.

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4. Question Distribution:

Theory	Alternate to Practical (ATP)
50 MCQs	15 MCQs

5. 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	

- 6. If you want to change your answer, ERASE the first answer completely with a rubber, before blacking out a new circle.
- 7. DO NOT write anything in the answer grid. The computer only records what is in the circles.
- 8. The marks obtained on the 50 MCQs will be equated to the total marks of 85 for the theory examination results.
- 9. You may use a scientific calculator if you wish.

Page 2 of 24

THEORY (Questions 1-50)

1. The urine test report of a person shows the presence of free haemoglobin in urine, indicating that the red blood cells have been lysed.

The part of nephron that MOST LIKELY shows malfunctioning in the given situation is

- A. glomerulus.
- B. loop of Henle.
- C. collecting duct.
- D. proximal convoluted tubule.
- 2. The given diagram shows the transverse section of a leaf.



The plant having such leaves will be MAINLY found in a

- A. pond.
- B. river.
- C. desert.
- D. polar region.
- 3. The animal that is CORRECTLY categorised on the basis of the production of metabolic heat by its body is

	Animal	Based on the Production of Metabolic Heat
А	whale	exotherm
В	mice	exotherm
С	sparrow	endotherm
D	crocodile	endotherm

Page 3 of 24

4. Bony fish have some physiological adaptations which enable them to live in sea water.

The adaptation in glomerular filtration rate and the function of the salt secretory cells in the gills of these fish is

	Glomerular Filtration Rate	Function of Salt Secretory Cells in the Gills
А	high	excrete salts
В	low	excrete salts
С	low	absorb salts
D	high	absorb salts

5. In the human kidney, the part of nephron where receptors for antidiuretic hormone (ADH) are found is

- A. glomerulus.
- B. collecting duct.
- C. ascending loop of Henle.
- D. descending loop of Henle.

6. The given diagram shows two relaxed sarcomeres **I** and **II** from skeletal muscle.



The effect of contraction of sarcomeres I and II on the A-band is that it will

- A. disappear.
- B. reduce in size.
- C. lengthen in size.
- D. not change in size.

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Page 4 of 24

- 7. Following are the characteristics of a plant tissue.
 - I. It has angular thickening in its primary cell wall.
 - II. It provides support to young herbaceous parts of the plant.

The plant tissue with these characteristics is identified as

- A. sclereid.
- B. tracheid.
- C. parenchyma.
- D. collenchyma.
- 8. The given diagram shows a stem tendril helping a plant to climb up a support.



The type of growth movement exhibited by the plant is

- A. epinasty.
- B. nutation.
- С. hyponasty.
- D. nyctinasty.

9. The CORRECT functions of osteoblast and osteoclast of a bone are to

	Osteoblast	Osteoclast
А	act as mechanoreceptor	dissolve the bone
В	form new bone	produce bone marrow
С	form new bone	dissolve the bone
D	act as mechanoreceptor	produce bone marrow

Page 5 of 24

10. The set of structures which comprises human axial skeleton is

- A. skull, vertebrae, ribs and sternum.
- B. sternum, humerus, femur and phalanges.
- C. skull, pectoral girdle, pelvic girdle and ribs.
- D. vertebrae, clavicle, shoulder blade and humerus.

11. The hormone(s) synthesised in the meristematic tissue of the plant shoot and root is/ are

- I. abscisic acid
- II. auxin
- III. cytokinin
- A. I only.
- B. II only.
- C. I and II.
- D. II and III.

12. Deciduous plants lose their leaves each year in response to changes in the day length.

The biorhythm exemplified in the given statement is

- A. circadian rhythm.
- B. circannual rhythm.
- C. circatidal rhythm.
- D. circalunar rhythm.

13. An example of the monosynaptic reflex in humans is

- A. pupil reflex.
- B. knee-jerk stretch reflex.
- C. foot withdrawal by painful stimulation.
- D hand withdrawal when touched by a hot object.

14. In the human brain, the part that process long-term memory is

- A. thalamus.
- B. amygdala.
- C. hippocampus.
- D hypothalamus.

Page 6 of 24

15. The given diagram shows neurons connecting the eye with the central nervous system.



With reference to the given diagram, neuron **I** and neuron **II** are identified as

	Neuron I	Neuron II	
А	relay	sensory	SV.
В	sensory	motor	A A
С	motor	relay	on
D	relay	motor	

- 16. Autoimmune destruction of adrenal cortex is the most common cause of
 - A. Cushing's disease.
 - B. Addison's disease.
 - C. Grave's disease.
 - D. Acromegaly.
- 17. Given are the different types of hormones produced in the human body.
 - I. Testosterone
 - II. Corticosteroids
 - III. Luteinizing hormone (LH)
 - IV. Gonadotropin-releasing hormone (GnRH)

The hyposecretion of hormones that cause infertility in males are

- A. I and II.
- B. II and III.
- C. I, II, and III.
- D. I, III and IV.
- 18. When new animals are brought to zoos, initially they get scared, but after sometime they become familiar to the environment.

The type of learning behaviour exemplified in the given statement is

- A. imprinting.
- B. habituation.
- C. latent learning.
- D. insight learning.

Page 7 of 24

19. With reference to potassium, sodium and negative organic ions, the charge distribution inside a neuron compared to its outer side during resting condition (resting membrane potential) comprises of

	Potassium Ions	Sodium Ions	Negative Organic Ions
А	more	less	more
В	less	more	less
С	less	more	more
D	more	less	less

20. Red-green colour blindness is a recessive X-linked trait in humans.

The set of parents that are MOST LIKELY to produce a daughter with red-green colour blindness is a/ an

- A. carrier mother and a colour blind father.
- B. carrier mother and an unaffected father.
- C. colour blind mother and an unaffected father.
- D. unaffected, non-carrier mother and a colour blind father.
- 21. Given are the Rh blood groups of a couple.
 - Father \rightarrow Rh positive
 - Mother \rightarrow Rh negative

The mother conceives an Rh positive child. In the given scenario, the chances of mother-foetus Rh incompatibility will be

- A. 0%
- B. 25%
- C. 50%
- D. 100%

Page 8 of 24

22. The given pedigree shows the inheritance of earlobe shape in a family. The allele for free earlobes (**F**) is dominant to the allele for attached earlobes (**f**).



What is the probability of the next child from the same parents having free earlobes?

- A. 0 %
- B. 25 %
- C. 50 %
- D. 75 %

23. A chromosome have two genes **X** and **Y**. Gene **Y** influences the phenotypic effect of gene **X**.

Based on the influential phenotypic effect, the gene Y is

- A. linked to gene X.
- B. epistatic to gene X.
- C. hypostatic to gene X.
- D. independent of gene X for its expression.
- 24. The recombination frequency between two genes of a chromosome is directly proportional to the
 - A. length of the chromosome.
 - B. physical linkage between them.
 - C. protein content of the chromosome.
 - D. distance between the linked gene loci.

25. The given diagram shows the chromosomes of Drosophila melanogaster.



The autosomal pairs are labelled as

- A. I and II.
- B. III and IV.
- C. I, II and III.
- D. I, II and IV.

Page 9 of 24

26. The pattern of sex determination in which the female is heterogametic is found in

- A. protenor bugs.
- B. grasshoppers.
- C. butterflies.
- D. fruit flies.
- 27. It is observed that pea plants with white flowers have colourless seed coats and leaf axils. This shows that the gene for flower colour affects more than one characteristics.

The given observation exemplifies the

- A. epistatic inheritance.
- B. polygenic inheritance.
- C. pleiotropic inheritance.
- D. incomplete dominance.

28. The cross that shows the sex determination of a son $\hat{i}s_{j}$



- 29. In plants, reproduction through the process of cuttings is advantageous as compared to reproduction through seeds because it
 - A. increases the chances of mutation.
 - B. facilitates adaptation to environment.
 - C. provides variability in the population.
 - D. produces identical offspring in short time.

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Page 10 of 24

30. The option which characterises apomixes in the flowering plants is

	Cell Division in Maternal Tissues of Ovule	Formation of Seed
А	meiosis	sexual
В	meiosis	asexual
С	mitosis	sexual
D	mitosis	asexual

31. The event which does NOT occur in the life cycle of gymnosperms is the formation of

- A. pollen tube.
- B. two male gametes.
- C. endosperm nucleus.
- D. multi-nucleated female gametophyte.
- 32. The time period between fertilisation and birth in mammals is termed as
 - A. gestation.
 - B. ovulation.
 - C. conception.
 - D. implantation.
- 33. Which of the following option CORRECTLY identifies the level of follicle stimulating hormone (FSH) and estrogen that will stimulate the production of luteinizing hormone (LH)?

	FSH Level	Estrogen Level
А	Decrease	Decrease
В	Increase	Increase
С	Decrease	Increase
D	Increase	Decrease

Page 11 of 24

34. Different types of supportive cells in human testis are involved in

- I. the production of testosterone.
- II. providing structural and metabolic support to spermatogenic cells.
- III. providing nourishment to the developing sperms.

The function(s) of sertoli cells is/ are

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

35. The given diagram shows the karyotype of a person.



The abnormality indicated by this karyotype is

- A. Klinefelter's syndrome.
- B. Turner's syndrome.
- C. Down's syndrome.
- D. Patau's syndrome.

36. A nucleosome is composed of

- A. DNA and histone protein.
- Β. RNA and histone protein.
- C. nitrogenous base and sugar.
- D. nitrogenous base, sugar and phosphate.

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Page 12 of 24

37. Consider the given diagram.



The type of chromosomal aberration shown in the given diagram is ons 2042 only

- A. deletion.
- B. inversion.
- C. duplication.
- D. translocation.

38. In contrast to heterochromatin, euchromatin is

- A. stained darker.
- B. not able to transcribed.
- C. generally not very active.
- D. condensed only during cell division.

The diagram shows a complex formed during translation of proteins. 39.



The CORRECT identification of parts **X**, **Y** and **Z** is

	X	Y	Z
А	amino acid	transfer RNA	messenger RNA
В	amino acid	messenger RNA	transfer RNA
С	transfer RNA	messenger RNA	amino acid
D	messenger RNA	transfer RNA	amino acid

Page 13 of 24

- 40. In sexually reproducing organisms, before fertilisation, gametes are formed by reduction division to
 - I. increase the genetic variation
 - II. reduce the chances of mutation
 - III. ensure the diploid number of chromosomes in zygote
 - A. I only.
 - B. III only.
 - C. I and II.
 - D. II and III.
- 41. An example that demonstrates apoptosis is
 - A. a severe burn causes skin cells to die.
 - B. the self-destruction of an immune cell.
 - C. the irreversible loss of the liver cells in liver cancer.
 - D. an over stretched muscle fibre due to heavy exercise.
- 42. The event at metaphase-I which increases the genetic diversity is the
 - A. formation of bivalents at the equator.
 - B. contraction of the spindle fibres at both poles of the cell.
 - C. random orientation of homologous chromosomes at the equator.
 - D. dissociation of synaptonemal complex between homologous chromosomes.
- 43. Below are three processes that occur in the cells of living organisms.
 - I. Apoptosis
 - II. Mitosis
 - III. Meiosis

Which of these process(es) is/ are important in determining the body plan of an organism?

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

Page 14 of 24

44. The given diagram shows the second meiotic division in a cell.



The haploid number of chromosomes for this species will be

- A. 3
- B. 6
- C. 9
- D. 12

The process that occurs during prophase of the mitotic cell cycle in an animal cell is the 45.

- A. replication of DNA.
- separation of centrioles. B.
- C. division of centromeres.
- formation of chromatids. D.
- Hat Leaver for ge The given diagram depicts the process of 46.



- A. gel electrophoresis.
- B. DNA finger printing.
- C. polymerase chain reaction.
- recombinant DNA technology. D.

47. Given is the base sequence of a primer used in the polymerase chain reaction.

ATGACAAATCG

The base sequence of a DNA fragment to which this primer would bind is

- A. UACTGUUUAGC.
- Β. TUCTGTTTAGC.
- C. TACTGTTTAGC.
- UACUGUUUAGC. D.



The given DNA sequence will be read as

- A. CGATGGCCTGTCTTCAGAAA.
- B. AAAGACTTCTGCCCGGTAGC.
- C. AAAAACCCCCGGGGGGTTTTT.
- D. ACGTGGCCGTTTTCCGAAAA.

Page 16 of 24

ALTERNATE TO PRACTICAL (ATP: Questions 51-65)

51. The given diagram shows some of the parts of human skeleton.



The function of the curves, labelled as I, II, III and IV, in the vertebral column is to

- A. allow extension and flexion of the arms and legs.
- B. provide attachment for the pectoral and pelvic girdles.
- C. protect the spinal cord enclosed in the vertebral column.
- D. increase the strength and flexibility of the vertebral column.
- 52. Cardiac muscles of frog are identified under the microscope by the presence of
 - A. striations and branched fibres.
 - B. striations and unbranched fibres.
 - C. multiple nuclei and branched fibres.
 - D. multiple nuclei and unbranched fibres.
- 53. For the preparation of the temporary slide of the smooth muscles of frog, the sample is taken from the dissected organs.

The organ suitable for the selection of smooth muscles is

- A. skin.
- B. heart.
- C. forelimb.
- D. urinary bladder.
- 54. The X-ray report of a person reveals a dislocated head of femur in the pelvic girdle.

To resolve this problem the orthopaedic surgeon will fix the dislocated head of femur in the region labelled as



55. In the human skeleton, fibula proximally articulates with the

- A. lateral side of tibia.
- B. distal end of femur.
- C. anterior side of tibia.
- D. proximal end of femur.

56. Ankle joint is formed by the articulation of

- A. distal end of tibia and carpal bones.
- B. distal end of fibula and tarsal bones.
- C. proximal end of tibia and carpal bones.
- D. proximal end of fibula and tarsal bones.

57. The given table shows the number of students having various blood groups in a classroom.

Blood Group	Number of Student	1
А	. 05	X
В	6 6	
AB	3	
0		

If this data is to be presented on a pie chart, the angle of sector for blood group \mathbf{B} would be

A.	24°
B.	90°
С.	144°

D. 270°

58. In cats, the allele (**B**) for black tabby fur is dominant over the allele (**b**) for chocolate tabby fur.

Parents phenotype	Black tabby fur \times	Bl	ack tabby fur
Parents genotype	Bb	×	Bb

The total number of kittens produced by the given cross are 8.

The number of kittens with black tabby fur will be

A. 2 B. 3

- B. 3 C. 6
- D. 8

Page 18 of 24

59. In pea plants, the allele of inflated pod shape (I) is dominant over constricted pod shape (i) and the allele of yellow pod colour (Y) is dominant over green pod colour (y).

Parents phenotype	Inflated yellow pod	×	Inflated yellow pod
Parents genotype	IiYy	×	IiYy

If 112 offspring are produced by this cross, then out of these the number of offspring with constricted green pods would be

- A. 7
- B. 14
- C. 28
- D. 56
- 60. In horses, black colouring (**B**) is dominant and chestnut colouring (**b**) is recessive. A homozygous black horse crosses with a chestnut horse.

The percentage of offspring that are expected to be chestnut is

- A. 0%
- B. 25%
- C. 50%
- D. 75%
- 61. In dogs, black coat colour (**B**) is dominant over yellow coat colour (**b**), and straight fur (**C**) is dominant over curly fur (**c**).

In a cross between two **BbCc** parents, the predicted fraction of offspring with black coat colour and straight fur would be

- A. 3/4
- B. 1/4
- C. 9/16
- D. 1/16



Page 20 of 24

65. In the cortical region of the mammalian ovary, all of the following are observed under the microscope EXCEPT the

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- A. oocytes.
- B. blood vessels.
- C. corpus luteum.
- D. primary follicle.





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