AGA KHAN UNIVERSITY EXAMINATION BOARD

HIGHER SECONDARY SCHOOL CERTIFICATE

CLASS XII

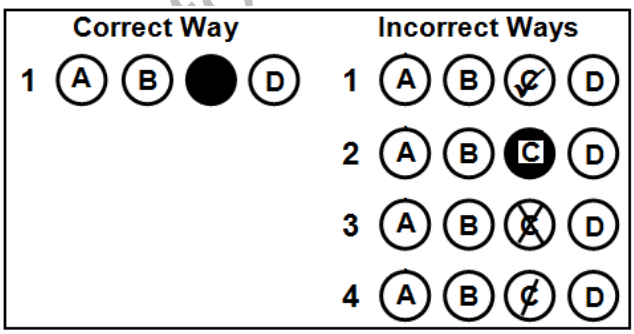
ANNUAL EXAMINATIONS (THEORY) 2024

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. An osmoregulatory adaptation in xerophytes is that their

   A. stomata are closed during daytime.
   B. vascular tissues are well-developed.
   C. reproductive organs are multicellular.
   D. leaves have salt glands on the upper surface.

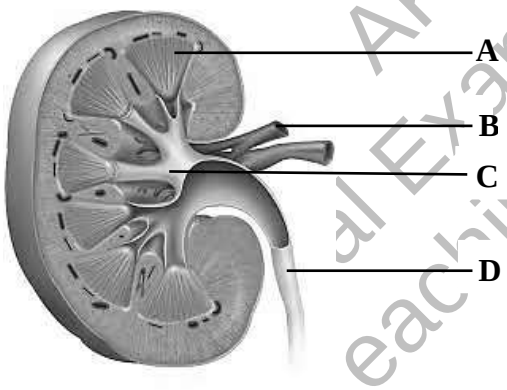
2. Ammonia CANNOT be excreted by animals living in

   A. lakes.
   B. ponds.
   C. oceans.
   D. deserts.

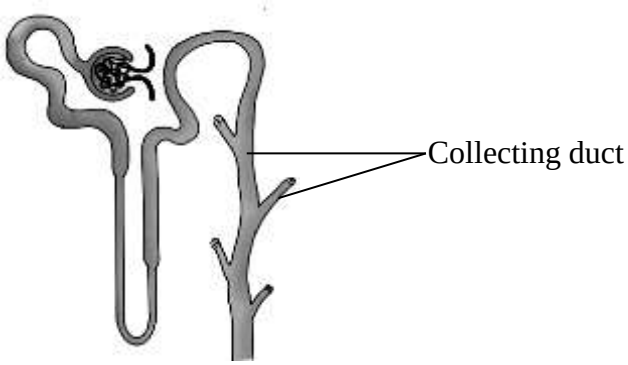
3. Malpighian tubules remove nitrogenous wastes from the

   A. blood of earthworms.
   B. haemolymph of insects.
   C. tissue fluid of flatworms.
   D. interstitial fluid of hydra.

4. In the human kidney, the labelled part where all the collecting ducts of nephrons open is



5. A human nephron is shown in the given diagram.



The branch-like structure of collecting duct in the given nephron suggests that

A. a single nephron has a single collecting duct.
B. a single nephron has multiple collecting ducts.
C. several nephrons have multiple collecting ducts.
D. several nephrons have a common collecting duct.

6. In the cross section of trunks of large trees, a central dark region called heartwood is observed.

It is significant to plants because it

A. forms the bark.
B. helps in translocation.
C. involves in ascent of sap.
D. is resistant to insect and fungal attacks.

7. A paediatrician observes the following symptoms in a new-born baby.

- Difficulty in feeding and swallowing
- Ear infection
- Hearing problem

Based on the given symptoms, the baby might have

A. a cleft palate.
B. microcephaly.
C. infectious gums.
D. an infection in tonsils.

8. Zeeshan feels severe knee pain during movement. His laboratory reports reveal that the synovial membrane of his knee joint is inflamed.

This inflammation causes pain because the synovial membrane is unable to

A. hold bones together and keep them stable.
B. provide strength to the associated muscles of joints.
C. secrete synovial fluid which allows joints to move smoothly.
D. absorb the synovial fluid which is enclosed in the joint capsule.

9. Which of the following models of joints exemplifies the proximal radioulnar joint between radius and ulna in human arm?

			
A	B	C	D

10. The given diagram shows the ultra-structure of a sarcomere.

The muscle in this diagram is in relaxed form because in its sarcomere

A. I band is short.
B. A band is short.
C. H zone is visible.
D. Z lines are visible.

11. A farmer wants to ripen the raw apples in his farm. For this purpose, he keeps the raw apples with the apples that are already ripened.

The hormone produced by the ripened apples is

A. auxin.
B. ethene.
C. cytokinin.
D. gibberellin.

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

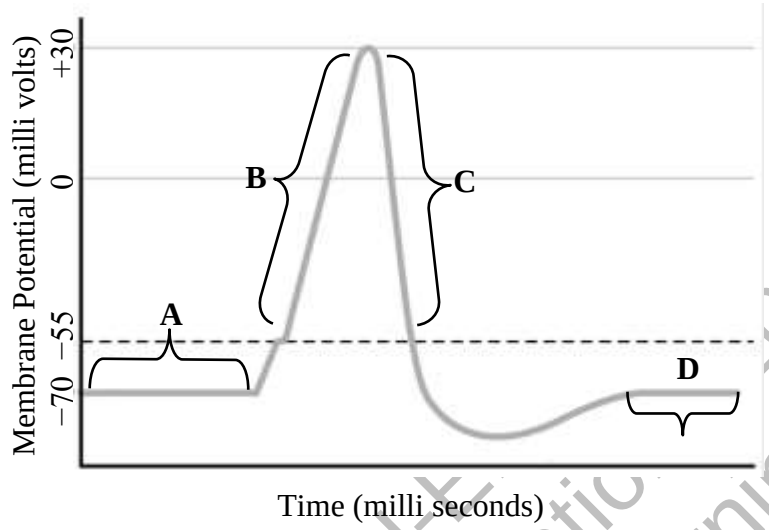
A. single axon.
B. single dendron.
C. multiple dendrites.
D. multiple nodes of Ranvier.

13. The nervous system of hydra is classified as a diffused nervous system because it has

A. several pressure receptors.
B. numerous differentiated neurons.
C. a network of neurons between ectoderm and endoderm.
D. several nodes of Ranvier along the length of sensory axons.

14. The given graph depicts the steps involved in the action potential and propagation of nerve impulse.

The step where K^+ channels are opened to allow K^+ on the inside of neuron to rush out of the cell is labelled as



15. Brain injury survivors with hippocampus damage may experience

A. vision and perception problems.
B. difficulty in recalling old memories.
C. inability to understand spoken or written language.
D. trouble with emotional reactions and decision-making.

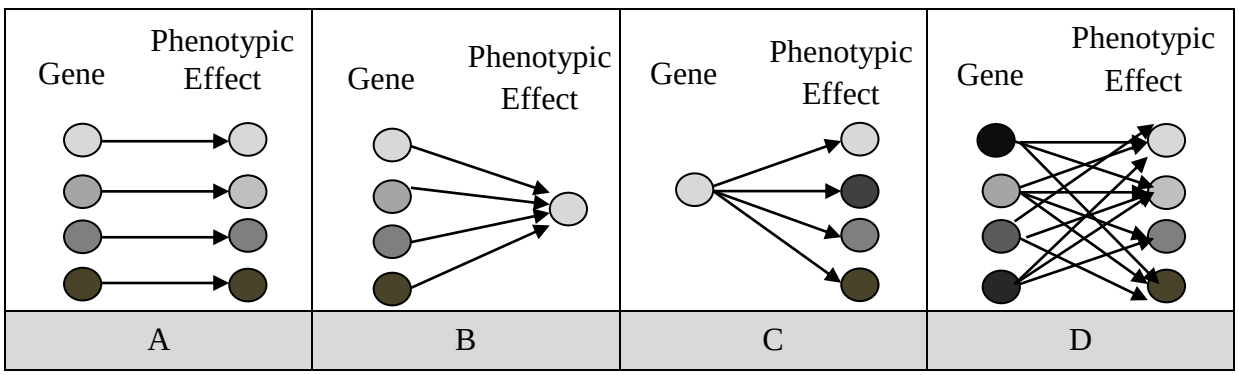
16. An Rh^{-ve} man marries an Rh^{+ve} (homozygous) woman.

What are the chances of their children being Rh^{+ve}?

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

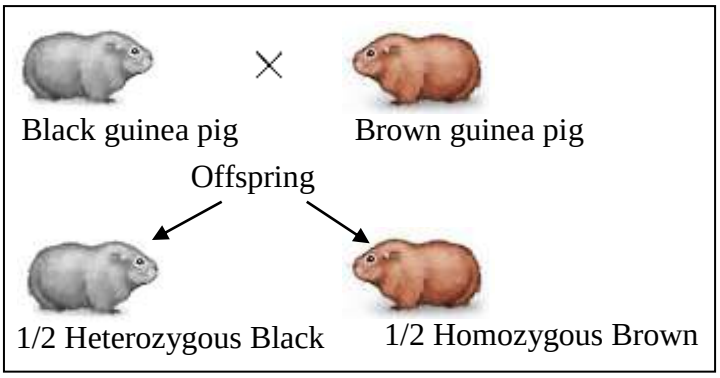
17. The given diagrams show the gene(s) and their phenotypic effect(s).

The CORRECT depiction of pleiotropic inheritance is



18. Consider the given cross.

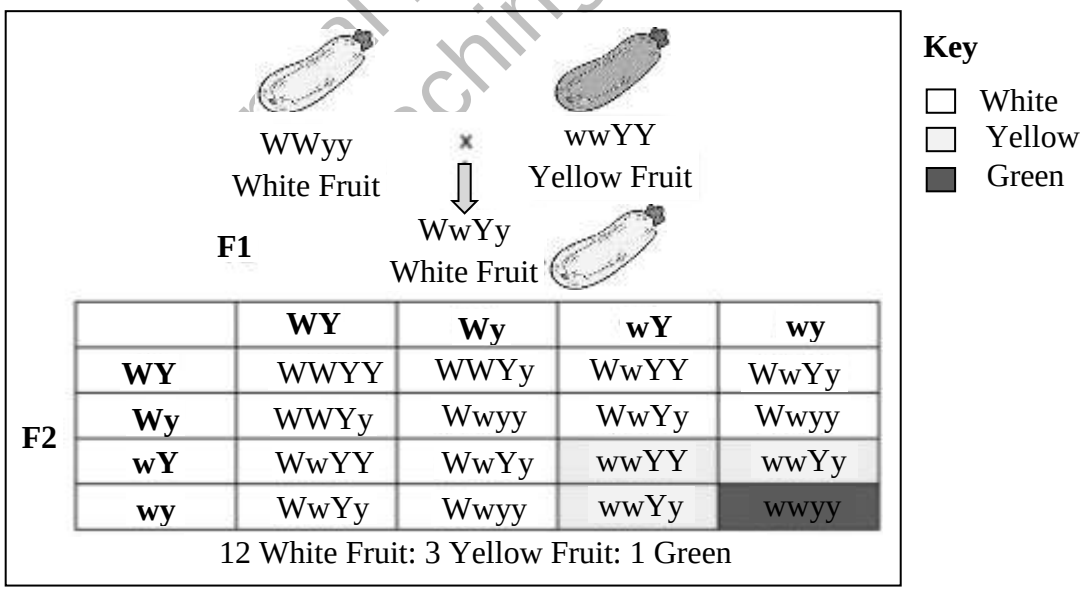
(**Note**: The allele for black coat colour is dominant over brown coat colour in guinea pig.)



The option that shows the CORRECT genotypes of the parental guinea pigs is

	Black Guinea Pig	Brown Guinea Pig
A	homozygous	homozygous
B	homozygous	heterozygous
C	heterozygous	homozygous
D	heterozygous	heterozygous

19. The given cross shows dominant epistasis in the appearance of fruit colour in summer squash.



F2

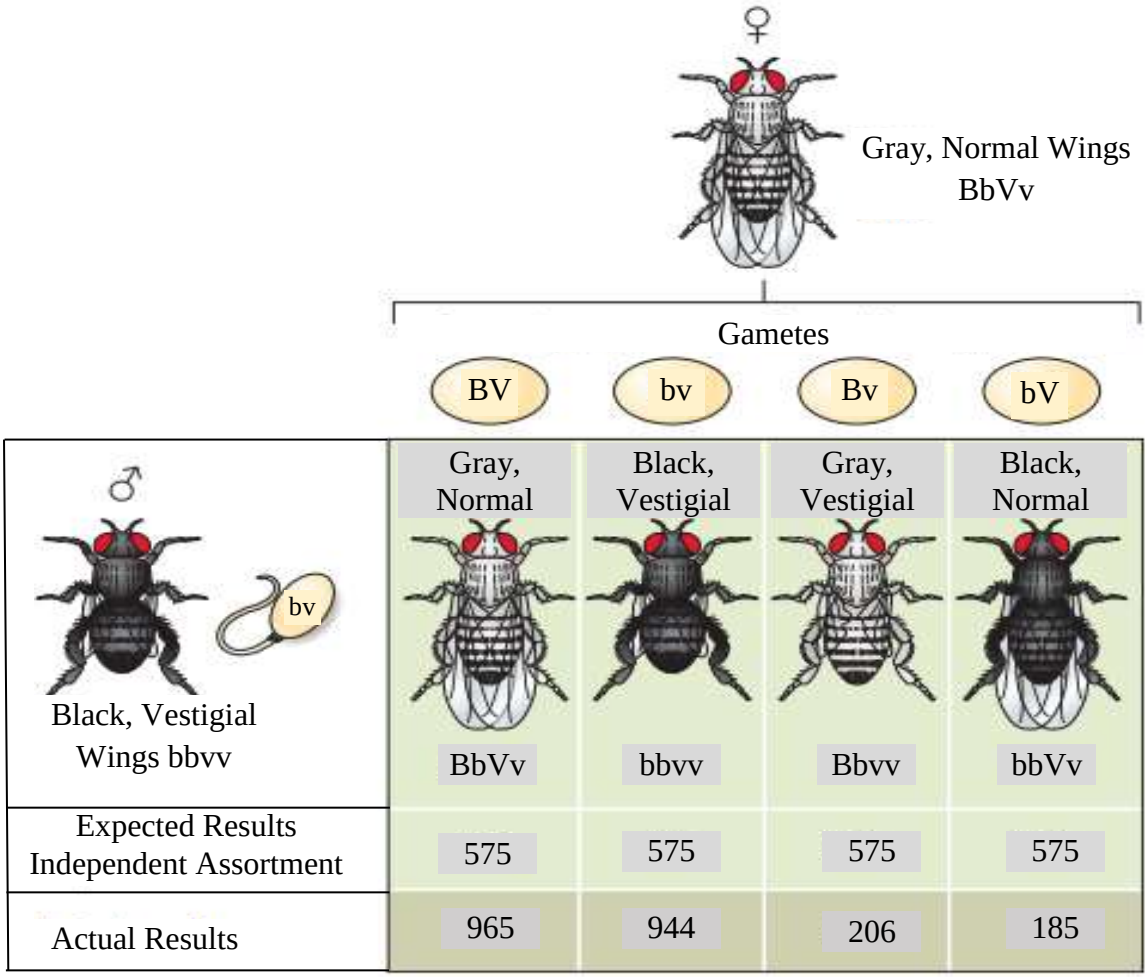
	WY	**Wy**	**wY**	**wy**
WY	WWYY	WWYy	WwYY	WwYy
Wy	WWYy	Wwyy	WwYy	Wwyy
wY	WwYY	WwYy	wwYY	wwYy
wy	WwYy	Wwyy	wwYy	wwyy

12 White Fruit: 3 Yellow Fruit: 1 Green

In F2 generation, white fruit colour appears in highest ratio which shows that alleles at

A. W locus supresses the expression of an allele at locus Y.
B. Y locus supresses the expression of an allele at locus W.
C. w locus supresses the expression of an allele at locus Y.
D. w locus supresses the expression of an allele at locus y.

20. Fruit flies with gray, normal wings (BbVv) are crossed with flies that have black, vestigial wings (bbvv).



The difference in actual results and expected results of this cross indicates that the alleles for body colour and wing length

A. are linked on homologous chromosome.
B. have wide range of phenotypes.
C. are codominant.
D. are pleiotropic.

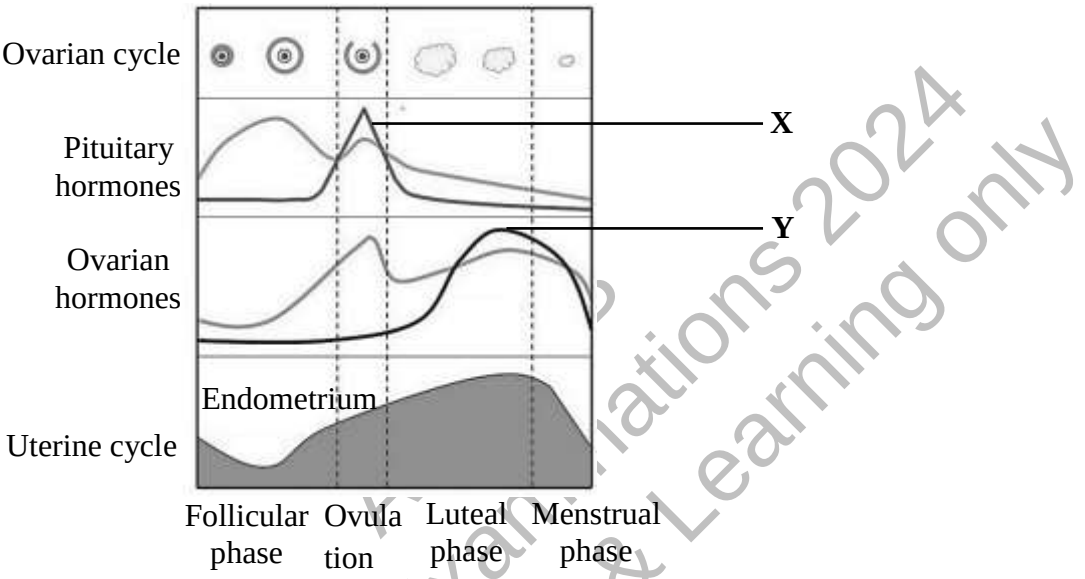
21. In contrast to the female gametophyte of angiosperms, the female gametophyte of gymnosperms bears two or more

A. synergids.
B. archegonia.
C. polar nuclei.
D. antipodal cells.

22. During seed dormancy, seeds do not germinate because the seeds

A. are devoid of all kinds of nutrients.
B. could produce fruits with hard fruit wall.
C. require a period of rest before germination.
D. could produce plants that are vulnerable to diseases.

23. The given diagram shows different stages of reproductive cycle and its hormonal control in human female.



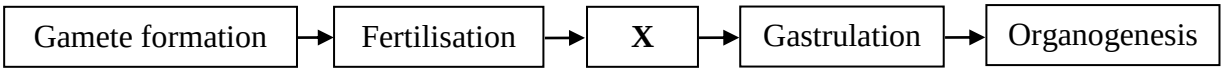
Hormone **X** and hormone **Y** are identified as

	X	**Y**
A	luteinising hormone	progesterone
B	luteinising hormone	follicle stimulating hormone
C	follicle stimulating hormone	progesterone
D	follicle stimulating hormone	luteinising hormone

24. In most of the plants, intercalary meristems are situated at the

A. root apex.
B. shoot apex.
C. base of internodes.
D. lateral sides of shoots.

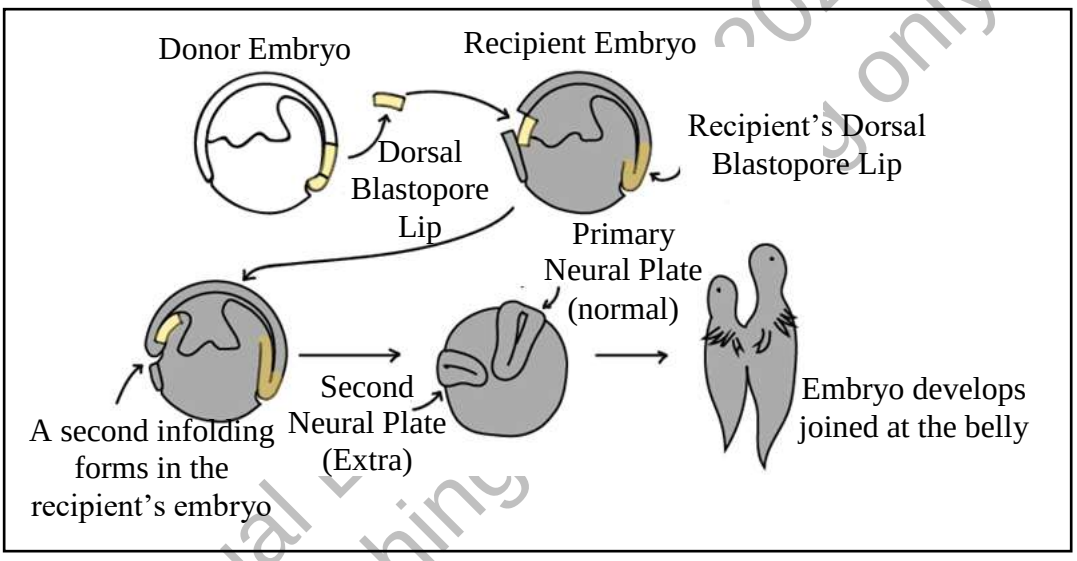
25. Following are some of the events that occur during the development of animals.



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

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

26. The given diagram shows the experiment of embryonic induction performed by Spemann and Mangold.



After analysing the result of experiment, the structure that was designated by Spemann as primary organiser is the

A. second neural plate in recipient's embryo.
B. dorsal blastopore lip area of donor's embryo.
C. mesoderm opposite to dorsal blastopore lip in donor's embryo.
D. mesoderm opposite to dorsal blastopore lip in recipient's embryo.

27. 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

28. A nucleosome is composed of

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

29. The genetic disorder that can NOT be diagnosed by using a chromosomal karyotype is

A. mongolism.
B. phenylketonuria.
C. Turner's syndrome.
D. Klinefelter's syndrome.

30. Isoniazid is an antibiotic drug prescribed by physicians to treat tuberculosis (TB). It works by inhibiting the activity of RNA polymerase in the pathogenic bacterial cell.

Which of the following process(es) will be directly affected in the bacterial cell by this inhibition?

I. DNA replication
II. Transcription
III. ATP synthesis

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

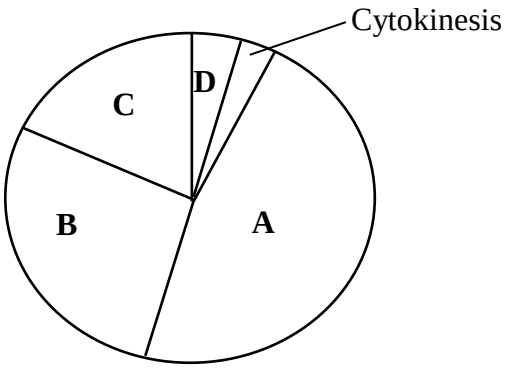
31. An example that demonstrates apoptosis is

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.

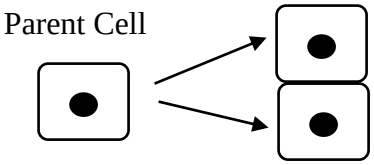
32. In sexually reproducing organisms, the MAIN purpose of formation of haploid gametes by meiosis is to

A. increase the chances of mutation.
B. increase the growth rate of organisms.
C. replace the worn-out cells by producing identical cells.
D. maintain the diploid number of chromosomes in zygote.

33. In the given diagram of cell cycle, the sub-phase of interphase in which DNA replication occurs is labelled as



34. The given diagram shows mitotic cell division in a potato cell.



At the end of prophase (2n = 48)

Daughter cells just after telophase

The number of DNA molecules in the nucleus of parent cell and each daughter cell is

	Parent Cell	Daughter Cell
A	48	24
B	48	48
C	96	24
D	96	48

35. In Sanger's method of DNA sequencing, dideoxy nucleotides terminate the elongation of DNA during replication.

This is because the 3` carbon of dideoxy nucleotides

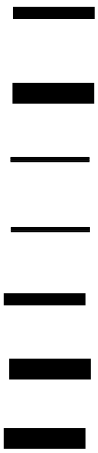
A. lack a hydroxyl group.
B. lack a hydrogen group.
C. have a nitrogenous base.
D. have a phosphate group.

36. Sameen is 20 weeks pregnant. Her doctor came to know that she has a family history of Down's syndrome.

The prenatal diagnostic test that the doctor would recommend her to check the presence of this disease in the baby is

A. X-ray.
B. ultrasound.
C. amniocentesis.
D. complete blood count.

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. A goat is genetically modified to produce human antithrombin III, which is secreted in its milk.

In this process, the human gene of antithrombin III is inserted into the goat's cell **X** by using technique **Y**.

With reference to the given process, cell **X** and technique **Y** are identified as

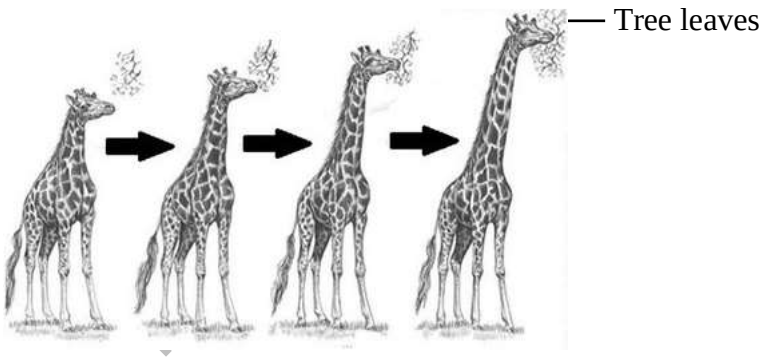
	Cell X	**Technique Y**
A	egg cell	gene therapy
B	egg cell	microinjection
C	stem cell	gene therapy
D	stem cell	microinjection

39. One of the hypotheses about origin of life is that life began deep in the oceans, in underwater hot springs.

The occurrence of which of the following organisms supports the given hypothesis?

A. Sycon
B. Green algae
C. Zooflagellates
D. Archaebacteria

40. Consider the given diagram.



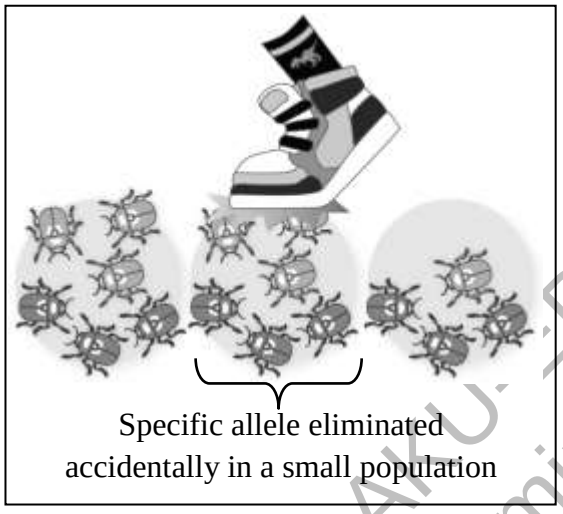
According to Lamarck's theory of evolution, the long neck in giraffe appears due to

A. genetic mutation.
B. natural selection.
C. ecological succession.
D. inheritance of acquired characters.

41. Which of the following statements exemplifies comparative embryology as evidence of organic evolution?

A. The cleavage in chick's embryos is discoidal and meroblastic.
B. The grey crescent in frog's embryo marks the dorsal side of the frog.
C. The embryos of all vertebrates have gill slits, a notochord and a nerve cord.
D. The coelom in the embryo of bird is formed from the wall of the embryonic gut.

42. Consider the given hypothetical image.



The mechanism of evolution exemplified in this image is

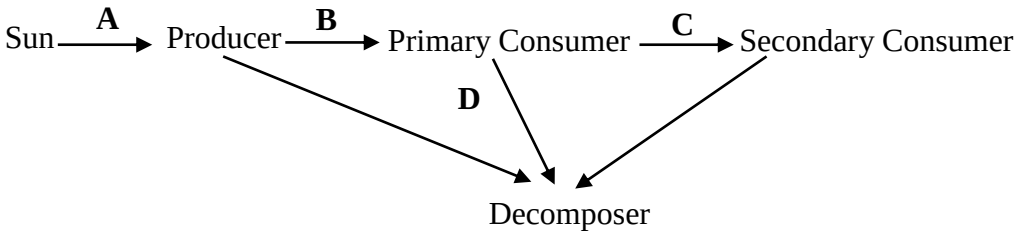
A. mutation.
B. migration.
C. genetic drift.
D. natural selection.

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

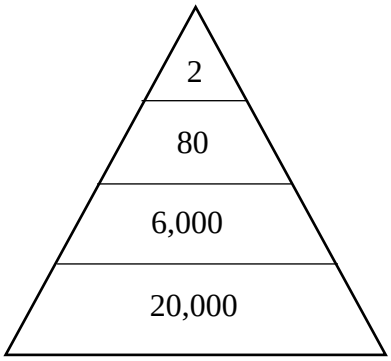
The animal population that would be considered while studying the autecology of Thar Desert is/ are

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

44. In the given food chain, the stage at which the energy transfer is LEAST efficient is labelled as



45. The given diagram shows a pyramid of number.



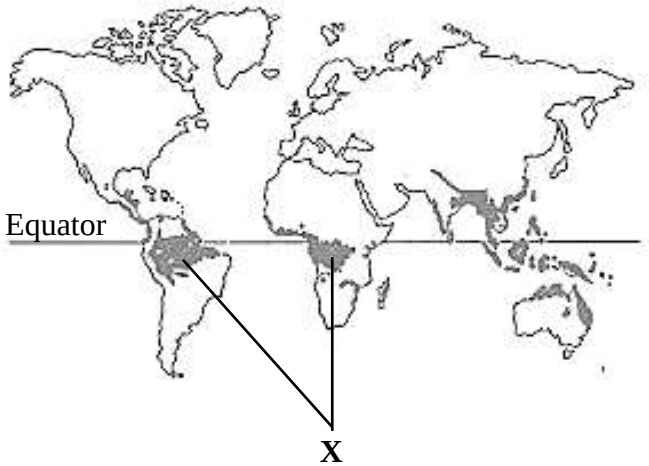
The total number of consumers in this pyramid is

A. 82
B. 6,080
C. 6,082
D. 26,000

46. The CORRECT sequence of zones of pond water based on the penetration of sunlight in decreasing order is

A. littoral → limnetic → profundal.
B. profundal → limnetic → littoral.
C. littoral → profundal → limnetic.
D. profundal →littoral → limnetic.

47. Consider the given map.



Based on the location in the map, the labelled biomes **X** are

A. coniferous forest.
B. tropical rain forest.
C. temperate rain forest.
D. temperate deciduous forest.

48. Given are the climatic features of a terrestrial biome.

- Long winter
- Heavy snowfall
- Nutrient deficient soil

Based on the given characteristics, this biome is a

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

49. One of the impacts of overpopulation of humans on agriculture is

A. scarcity of land resources.
B. unavailability of pesticides.
C. loss of mechanical industries.
D. decreased demand of synthetic fertilisers.

50. Which of the following diseases are categorised as degenerative diseases?

A. Anaemia and syphilis
B. Osteomalacia and rickets
C. Osteoarthritis and arteriosclerosis
D. Diabetes mellitus and hypertension

END OF PAPER

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