Faith Academy

Model Paper, 22-23

Class XII

Biology Theory (044)

Time: 3 Hours **Maximum Marks:70**

General Instructions:

(i) All questions are compulsory.

(ii) The question paper has five sections and 33 questions. All questions are compulsory.

(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section–D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.

(iv) There is no overall choice. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

(v) Wherever necessary, neat and properly labelled diagrams should be drawn.

(vi) This question paper has 7 printed pages.

SECTION A (16X1=16)

1.What is normally given to a patient with myocardial infarction when they arrive at the hospital?

(a) Penicillin

(b) Streptokinase

(c) Cyclosporin-A

(d) Statins

2. Which of the following is the basis for DNA fingerprinting?

(a) The relative proportions of purines and pyrimidines in DNA

(b) Satellite DNA occurring as highly repeated short DNA segments

(c) The relative difference in the DNA occurrence in blood, skin and saliva

(d) The relative amount of DNA in the ridges and grooves of the fingerprints

3. Which of the following is considered a hot spot of biodiversity in India?

(a) Indo-Gangetic Plain

(b) the Eastern Ghats

(c) Aravalli Hills

(d) the Western Ghats

4. Species whose populations have been severely depleted and their ultimate survival is uncertain are known as?

(a) Threatened species

(b) Endangered species

(c) Vulnerable species

(d) Rare species

5. Which disease is diagnosed by the identification of antibodies against antigen?

(a) Gonorrhea

(b) Syphilis

(c) Hepatitis

(d) AIDS

6. In which of the following pairs of codons is their function or the signal for the specific amino acid matched correctly?

(a) GUU, GCU-Alanine

(b) UAG, UGA-Stop

(c) AUG, ACG-Start/Methionine

(d) UUA, UCA-Leucine

7. The similarity of one organism to another for protection and hiding is called?

(a) Mimicry

(b) Predation

(c) Adaptation

(d) Camouflage

8. Which of the following is the most serious threat to biodiversity?

(a) Competition from exotic species

(b) Commercial harvesting

(c) Habitat destruction

(d) Overexploitation

9. What is the reason for the popularity of the barrier method of family planning?

(a) The absence of side effect

(b) Comparatively more reliable

(c) Protection from sexually transmitted diseases.

(d) Both a and b

10. Eukaryotic cells have a nucleus that is considerably larger than the DNA molecule. How is the DNA accommodated here?

(a) super-coiling in nucleosomes

(b) DNase digestion

(c) through the elimination of repetitive DNA

(d) deletion of non-essential genes

11. Suppose an electrical current has moved DNA fragments through a gel. What does the band on this gel that is furthest from the top (that is, from where the DNA fragments were added) represent?

(a) shortest fragments of DNA

(b) longest fragments of DNA

(c) restriction enzyme used to cut the DNA into fragments

(d) ligase used to bind the DNA fragments together

12. Trophic levels are formed by:
(a) plants
(b) animals
(c) organisms linked in food chain
(d) carnivores

DIRECTIONS: Question No. 13 to 16 consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions selecting the appropriate option given below:

A. Both A and R are true and R is the correct explanation of A.

B. Both A and R are true and R is not the correct explanation of A.

C. A is true but R is false.

D. A is False but R is true.

13. **Assertion:** Nuclear endosperm is formed by subsequent nuclear division without wall formation.

Reason: Coconut is an example of such endosperm, where endosperm remain nuclear throughout the development of the fruit.

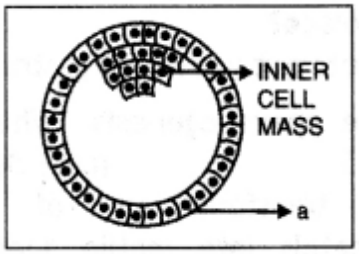
14. **Assertion:** Due to excessive synthesis of gene for adenosine deaminase ADA deficiency disorder is caused.
Reason: It affects the human digestive system.

15. **Assertion:** The progeny in F_2-generation traits were identical to their parental type.
Reason: The progeny shows no blending of traits.

16. **Assertion:** In lichens, mycobiont and phocobiont are symbiotically associated in algae which is predominant and fungi is a subordinate partner.
Reason: In this symbiotic association, the fungus provides food while the alga protects fungus from unfavourable conditions.

SECTION B **5X2=10**

17. Study the figure given below and answer the questions that follow:



(i) Name the stage of the human embryo the figure represents.
(ii) Identify 'a' in the figure and mention its function.
(iii) Mention the fate of the inner cell mass after implantation in the uterus.

18. How does a vaccine for a particular disease immunise the human body against that disease?
19. Differentiate between two different types of pyramids of biomass with the help of an example.

20. Why is a person with cuts and bruises following an accident administered tetanus antitoxin? Give reasons.

21. How is insertional inactivation of an enzyme used as a selectable marker to differentiate recombinants from non-recombinants?

SECTION C **7X3=21**

22. List a few adaptations that parasites have developed.

23. Human insulin when synthesised in the body needs to be processed before it can act. Explain giving reasons.

24. Write advantage of GM crops.

25. a. Justify the statement "Predators and scavengers are markedly different."
b. Mention any two significant roles predators play in nature.

26. (i) State the role of DNA ligase in biotechnology.
(ii) What happens when Meloidogyne incognita consumes cells with RNAi gene?

27. Explain how natural selection operates in nature by taking an example of white-winged and dark-winged moths of England.

28. Many plant and animal species are on the verge of their extinction because of loss of forest land by indiscriminate use by the humans. As a biology student what method would you suggest along with its advantages that can protect such threatened species from getting extinct?

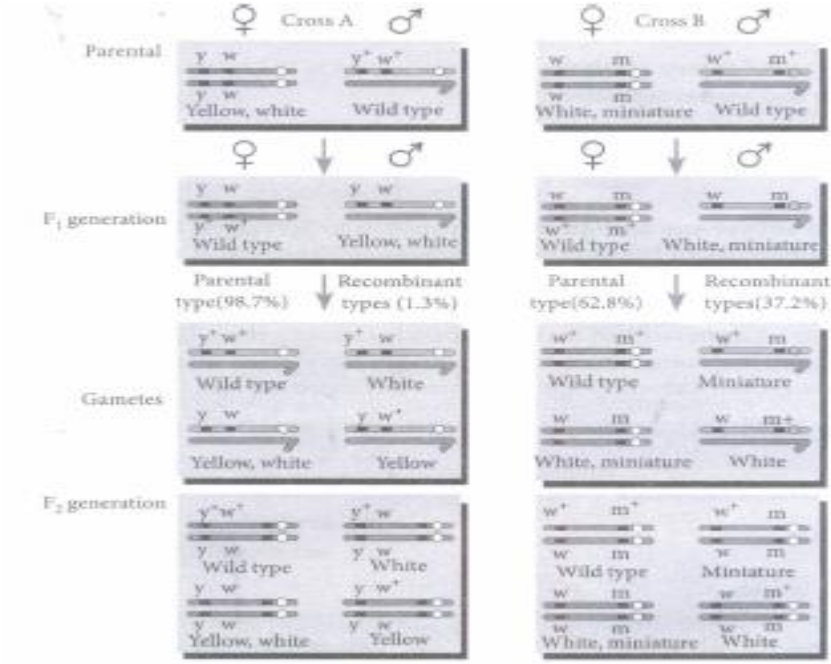
SECTION D

29. Read the following and answer any four questions from (i) to (v) given below: **4X1=4**
Turner's syndrome is an example of monosomy. It is formed by the union of an allosome free egg and a normal 'X' containing sperm or a normal egg and an allosome free sperm. The individual has 2n = 45 chromosomes (44 + X0) instead of 46. Such individuals are sterile females who have rudimentary ovaries, under developed breasts, small uterus, short stature, webbed neck and abnormal intelligence. They may not menstruate or ovulate. This disorder can be treated by giving female sex hormone to the women from the age of puberty to make them develop breasts and have menstruation. This makes them feel more normal.

(i) Number of Barr body present in a female with Turner's syndrome is-
(ii) Turner's syndrome is an example of_____

(iii) Turner's syndrome is monosomy or Trisomy?
(iv) Write the symptoms of turner syndrome.

30. During a study on the inheritance of two genes, the teacher asked students to perform an experiment. The students crossed white-eyed, yellow-bodied female Drosophila with a red-eyed, brown-bodied male Drosophila (i.e., wild). They observed that progenies in F2 generation had 1.3 percent recombinants and 98.7 percent parental type combinations. The experimental cross with results is shown in the given figure. **4X1=4**



(i) By conducting the given experiment, the teacher can conclude that-
A. Genes for eye colour and body colour are linked

B. Genes for eye colour and body colour show complete linkage.
C. Linked genes remain together and are inherited.

(ii) Why Teacher asked to conduct an experiment on Drosophila. Give any two reasons.

(iii) Genes white-eyed and yellow-bodied located very close to one another on the same chromosome tend to be transmitted together and are called----------

(iv) Percentage of crossing over is more when ----------

SECTION E **3X5=15**

31. How did Hershey and Chase established that DNA is transferred from virus to bacteria?

OR

(a) Work out a dihybrid cross up to F_2 generation between pea plants bearing violet-coloured axial flowers and white coloured terminal flowers. Give their phenotypic ratio.

(b) State the Mendel's law of inheritance that was derived from such a cross.

32. (a) Describe any two devices in a flowering plant which prevent both autogamy and geitonogamy.

(b) Explain the events up to double fertilisation after the pollen tube enters one of the synergids in an ovule of an angiosperm.

OR

Explain the genetic basis of blood grouping in human population.

33. A) State the 'Central dogma' as proposed by Francis Crick. Are there any exceptions to it? Support your answer with a reason and an example.

B) Explain how the biochemical characterisation (nature) of 'Transforming Principle' was determined, which was not defined from Griffith's experiments.

OR

a) Explain menstrual cycle in human females.
b) How can the scientific understanding of the menstrual cycle of human females help as a contraceptive measure?

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ANSWER KEY OF 12th BIOLOGY

1. Streptokinase
2. Satellite DNA occurring as highly repeated short DNA segments
3. the Western Ghats
4. Endangered species
5. AIDS
6. UAG, UGA-Stop
7. Mimicry
8. Habitat destruction

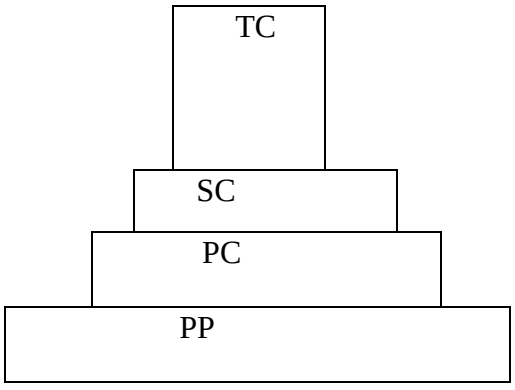
9. (d) Both a and b

10. (a) super-coiling in nucleosomes
11. (a) shortest fragments of DNA
12. C
13. C
14. D
15. A- Both the characters appear during the formation of F2-generation, so no blending occurs.

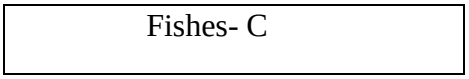
16. D
17. i) Blastocyst (Blastula) ½
    ii)Trophoblast ½
    iii) Inner cell mass gets differentiated as embryo after implantation. **1**

18. During vaccination for a particular disease, an antigen or antigenic protein or pathogen which is in inactive form is introduced into the body which induces mild immunoresponse. The vaccine generates antibodies that neutralises the toxin/pathogen and produces memory B or T-cells, which recognise the pathogen in the subsequent encounters and produce antibodies.

19. Pyramid of biomass refers to the relationship between producers and consumers in terms of biomass. It can be upright, e.g., in grasslands ecosystem or inverted, e.g., in pond ecosystem. **1**



Pyramid of biomass. **1**



Phytoplankton- P

20. Tetanus is a disease caused by Mycobacterium tetani. A person with cuts and bruises following an accident is administered tetanus antitoxin because this toxin contains antibody against the pathogen. This inactivates the pathogen (called passive immunity. **(½+1+½)**

21. The insertional activation of β-galactosidase enzyme, i.e., by inserting the desired gene in the coding region of enzyme, results in inactivation of (β-galactosidase gene in recombinants. The recombinant on transformed hosts are unable to produce any colour when grown on chromogenic substrate. Thus, acting as a selectable marker to differentiate recombinants from non-recombinants. **(1+1)**

22. Parasites have evolved one or more of the following adaptations: **(½X6=3)**

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1. Loss of unnecessary sense organs.
2. Presence of hooks/adhesive organs and suckers.
3. Loss of digestive system.
4. High reproductive capacity.
5. Produces antitoxins to counter toxins to the host.
6. Feeding organ absent in endoparasite.

23. Human insulin when initially synthesised in human body consists of three peptide chains- A, B and C. 1 The C-peptide is an extra stretch of amino acids joining the A and B-chains. This is called proinsulin or prohormone. 1 It undergoes processing or splicing to release the functional mature insulin that can carry out its normal functions. During processing, the C-peptide is removed. Only A and B-chains contribute to form the functional insulin. **1**

24. The advantages of the production of genetically modified crops are:

1. They have proved to be extremely valuable tools in studies on plant molecular biology, regulation of gene action, identification of regulatory/ promontory sequences.
2. Genetically modified crops have improved agronomic and other features such as resistance to biotic and abiotic stresses.
3. Over-ripening losses can be reduced, e.g., flavour saves tomato.
4. Nutritional values are improved, e.g., Golden rice has high vitamin A content.
5. Viral resistance can be introduced.
6. The number of pharmaceuticals like insulin, interferon, blood clotting factors are improved.
7. Insect resistance can be introduced, e.g., cry gene can be introduced into cotton, wheat, and rice from Bacillus Thuringiensis.

25. a. Predators feed on another organism, i.e., prey, /whereas scavenger feeds on dead animals or an animal killed by another animal. A predator can be a prey also, e.g., a frog eats insects and the frog may be eaten by a snake. But a scavenger such as jackals, hyenas and vultures cannot kill zebra or giraffe or deer but a lion kills them and leaves a part of it to be eaten by such scavengers. **(½x4)**

b. Role of predators:

1.Transferring energy to a higher trophic level.

2.Keeping the prey population under control. **(½+½)**

26. (i) DNA ligase enzyme is used to join two DNA fragments from their ends. **1**

(ii) When Meloidogyne incognita (parasite) consumes cells with RNAi gene, parasite cannot survive and this prevents infection. The introduced DNA forms both sense and anti-sense RNA. These two strands being complementary to each other form of sRNA, leading to RNAi. Thus, the mRNA of nematode is silenced and the parasite cannot survive there. This produces Meloidogyne incognita resistant tobacco plants. **(½+4)**

27. In England, prior to industrialisation, the tree trunks were covered with white lichens hence, white moths survive and were protected from predators due to white colour. On the other hand, black moths (a dark-winged moths) could be easily identified due to their dark colour and declined in number due to predation. However, as industrialisation progressed, the lichens were replaced by soot and dust particles and dark coloured moths were benefitted due to camouflage, /while white-winged moths could be easily eaten up by the predators being easily identifiable. Thus, only the dark-winged moths who were able to fit and survive, i.e., adapted well in conditions, reproduced well in nature. Thus, natural selection operates in nature by selecting the fittest characters of organisms. **(½+6)**

28. Ex-situ conservation **1**

Threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care **1**

Botanical garden / tissue culture / micro propagation / seed bank ½

Zoological Park / wild life safari park / cryopreservation ½

29. i. The number of Barr bodies is one less than total number of X chromosomes. In Turner's syndrome genotype is 45 + X0, so, the number of Barr body is O. ½

ii. Turner's syndrome is a chromosomal disorder that occurs due to absence of one chromosome. ½

iii. In Turner's syndrome individual lacks one X chromosome. This situation is known as monosomy. **1**

iv. short stature, webbed-neck, broad chest, lack of secondary sexual characteristics and sterility. **1**

30. i. Answer: (c) A and C only **1**

ii. the male and female flies are easily distinguishable.
it completes its life cycle in about two weeks.
a single mating could produce a large number of progeny flies. **1**

iii. Answer: (c) linked genes. **1**

iv. linked genes are located far apart from each other. **1**

31.

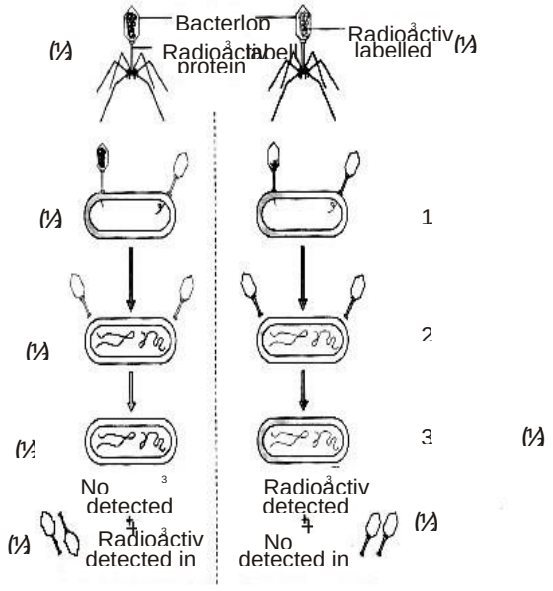
- Some bacteriophages were grown in a medium that contained ^{32}P / radioactive phosphorus, while some were grown in a medium that contained ^{35}S / radioactive sulphur. ½ × **2**
- the labelled bacteriophage from both media were allowed to infect E. coli. **1**
- In both the cases viral coats were removed from the bacteria by agitating them in a blender. **1**

- The virus particles were separated from the bacteria by spinning them in a centrifuge. **1**
- No radioactivity was detected in cells (E. coli) but detected in supernatant in case where bacteriophage was labelled with radioactive sulphur ½
- Radioactivity detected in cells (E. coli) while no radioactivity detected in supernatant in another case where bacteriophage was labelled with radioactive phosphorus ½

(Phosphorus being a constituent of DNA indicates that DNA is the genetic material that is passed from virus to bacteria)

[5 Marks]

Th following diagrammatic representation can be considered in lieu of the above explanation.



32. (a)- Dioecy / production of unisexual flowers (in different plants) Self-incompatibility **1 + 1**

(b) - Pollen tube releases 2 male gametes in the cytoplasm of synergid
One male gamete fuse with egg cell / syngamy, resulting in diploid zygote
Other male gamete fuses with polar nuclei, triple fusion, to form triploid
PEN (Primary Endosperm Nucleus) / PEC (Primary Endosperm Cell) **1 × 3**

[2 + 3 = 5 marks]

OR

(i) Blood group in human population determined by gene ' I ' , which has three allele I^A and I^B and i (multiple allelism) ½ + ½

(ii) I^A I^B are dominant allele (codominance) each forming different type of sugar polymer on the surface of RBC, while allele ' i ' is recessive and does not produce any sugar.

½+ ½

I^A I^A , I^A i — A group = ½

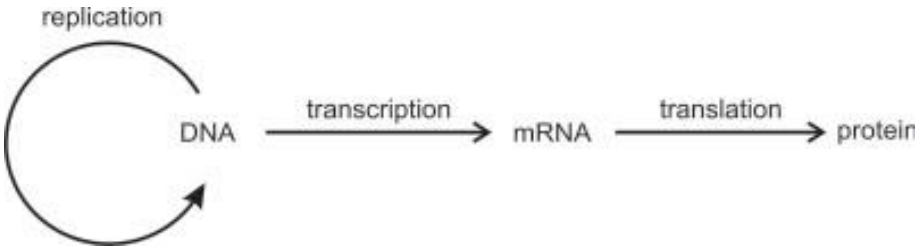
I^B I^B , I^B i — B group = ½

IA IB —— AB group = ½

i i — O group = ½

(iii) Since humans are diploid / each person possesses any two of three ' I ' gene alleles , resulting into six different genotypic combination and four phenotypic expression. **1**

33.



= **1**

A) Yes, in some viruses flow of information is in reverse direction / reverse transcription. ½ +½

e.g., Any Retrovirus / HIV = ½

B) Protein and DNA and RNA were purified from heat killed S strain / smooth *Streptococcus / Diplococcus pneumoniae* = ½

Protein + Protease transformation occurred (R cell to S type) = ½

RNA + RNA ase transformation occurred (R cell to S type) = ½

DNA + DNA ase transformation inhibited = ½

Hence DNA alone is the transforming material = ½

[2 + 3 = 5 marks]

OR

(a) -Menstrual Phase - Menstrual flow occurs / due to breakdown of endometrial lining of uterus , when fertilization does not occur.

- Follicular Phase - Primary follicles grow into mature graafian follicles and endometrium regenerates through proliferation, changes induced by pituitary and ovarian hormones

- Ovulatory Phase - LH surge, induces rupture of graafian follicle and release of secondary oocyte / ovum during middle of cycle (i.e., 14th day)

-Luteal phase - Ruptured graafian follicle transforms into corpus luteum which secrete large amount of progesterone, essential for maintaining endometrium

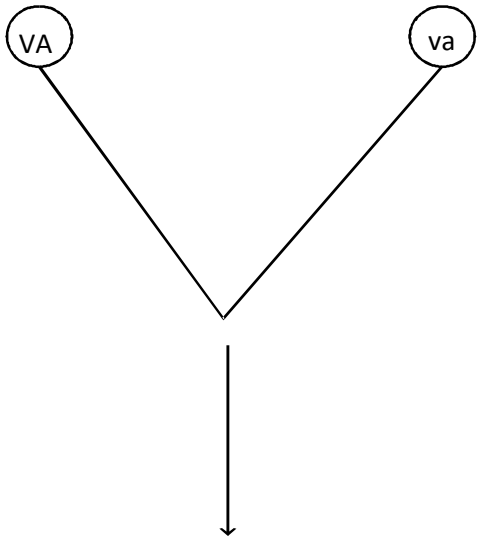
1 × 4

b) Because ovulation occurs during mid cycle chances of fertilisation are very high so, couples should abstain from coitus between day 10 -17. ½ + ½

(3 + 2 = 5 marks)

32.

Ans. (a) Parents: V V A A × v v a a = (1)
Violet, axial White, terminal



gametes:

F_1 VvAa (Violet axial) **= 1**

F_2	VA	vA	Va	va
VA	Violet axial	Vv AA Violet axial	Violet axial	VvAa Violet axial
vA	VvAA Violet axial	vvAA White Axial	VvAa Violet axial	vvAa White Axial
Va	VVAa Violet axial	VvAa Violet axial	VVaa Violet terminal	Vvaa Violet terminal
va	VvAa Violet axial	vvAa white Axial	Vvaa Violet terminal	vvaa White terminal

= 1

VVAA VVAa

Phenotypes – violet axial : white axial : violet terminal : white terminal

1

Phenotype ratio – 9 : 3 : 3 : 1

b) Law of Independent Assortment: When two pairs of traits are combined in a hybrid segregation of one pair of characters is independent of the other pair of characters. **1**

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