57/4/1

COMMON PRE-BOARD EXAMINATION -2023

BIOLOGY THEORY (044)

MAX.MARKS: 70 **CLASS: XII** **TIME: 3 HOURS**

General Instructions: Read the following instructions carefully

(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 labeled diagrams should be drawn.

SECTION A

1 Rahul observed a plant in his garden. He hypothesized that the stem height exhibited incomplete dominance. For checking, he has created true-breeding lines of tall and short plants. Then he crossed these and sampled 1000 progeny. Which of the following cases, matches his hypothesis? 1

a) 500 tall plants, 250 intermediate plants, and 250 small plants

b) 250 tall plants, 500 intermediate plants, and 250 small plants

c) 250 tall plants, 250 intermediate plants, and 500 small plants

d) 125 tall plants, 750 intermediate plants, and 125 small plants

2 Tasmanian Wolf is a marsupial while Asian Wolf is a placental mammal. This shows: 1

a) Parallelism b) Inheritance of acquired characters

c) Convergent evolution d) Divergent evolution

3 Match the following enzymes with their functions: 1

COLUMN- I		COLUMN- II	
A)	Restriction endonuclease	i)	Joins the DNA fragments
B)	Restriction exonuclease	ii)	Active on high temperature
C)	DNA ligase	iii)	Cuts DNA at specific position
D)	Tag polymerase	iv)	Removes nucleotides from the ends of DNA

Select the correct option from the following:

a) (A)-(ii), (B)-(iv), (C)-(i), (D)-(iii)

b) (A)-(iii), (B)-(i), (C)-(iv), (D)-(ii)

c) (A)-(iii), (B)-(iv), (C)-(i), (D)-(ii)

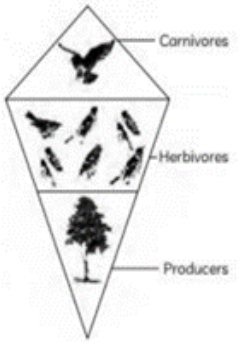
d) (A)-(iv), (B)-(iii), (C)-(i), (D)-(ii)

4 Cystic fibrosis is an autosomal recessive disorder. Consider a cross between two carrier parents, each with genotype Ff. What will be the genotype of the AFFECTED offspring in the F1 generation? 1

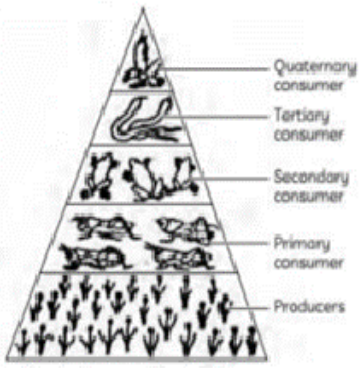
a) ff
b) FF
c) ffff
d) FfFf

5 Identify the correct pyramid of number in grassland ecosystem. 1

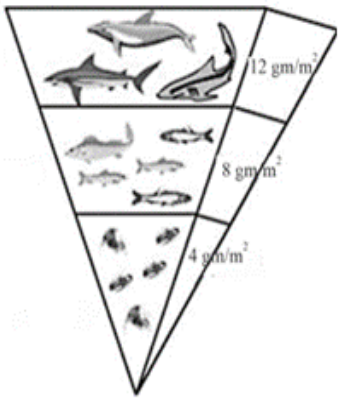
a)



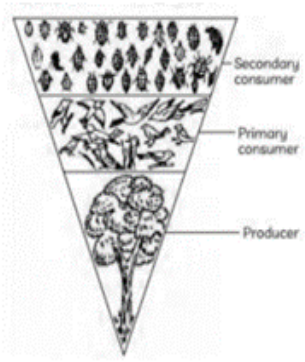
b)



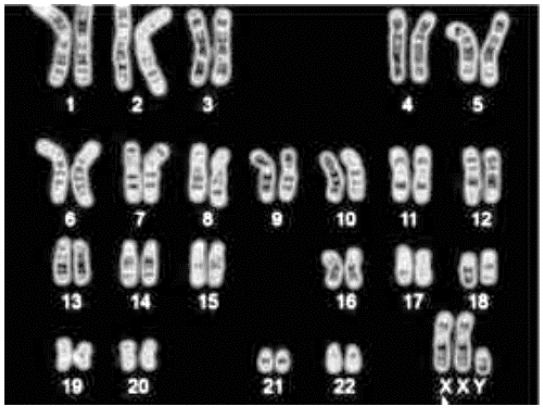
c)



d)



6 Study the human karyotype given below. 1



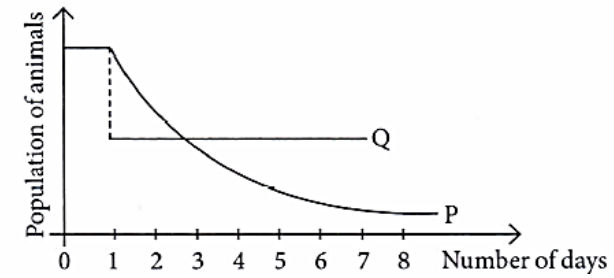
Which among the following does the karyotype represent?

a) a normal human female.
b) a normal human male.
c) a sterile human female.
d) a sterile human male.

7 Recent studies have indicated that one of the possible reasons behind male infertility is specific mutations in the mitochondrial DNA of the sperms. Due to this mutation, mitochondria become nonfunctional in the sperms. What could be a possible effect of such a mutation on the sperm? 1

a) It lowers the sperm count.
b) It lowers the sperm motility.
c) It lowers the ability to penetrate the egg.
d) It lowers the ability to produce hormones.

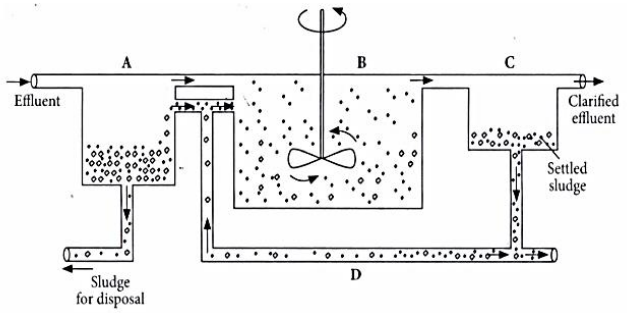
8 The population of species P in a certain community was constant until a population species Q from a distant land was subsequently introduced into that community. The interaction between the two populations is reflected in the graph below. 1



What could be the possible reason for the decrease in the population of species P over a number of days?

a) Species Q is a predator of species P.
b) Species Q is a prey species which wiped out the population of species P.
c) Species P and Q compete for space but feeds on different food.
d) Q and P both have different habitat

9 Saurin, a M.Sc student, get an assignment on sewage treatment plant (STP) to study the microbial load. After visiting such plant in his locality, he makes a Simplified diagram of the STP for his project. Study the diagram given below and answer the following questions. 1



In the diagram "**A"** denotes

a) aeration tank b) primary settling tank c) secondary settling tank d) sludge digester.

10 Choose the correct option wherein, the correct stages of the development of human embryo takes place. 1

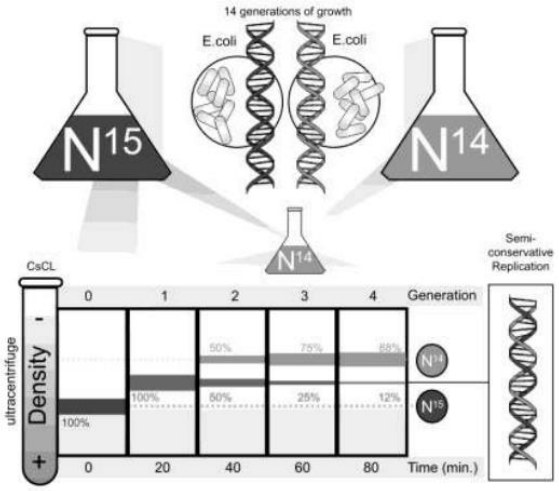
1	**Ovary**	**Fallopian Tube**	**Uterus**
2	Morula	Fertilized egg	Blastocyst
3	Unfertilized egg	Fertilized egg	Morula
4	Unfertilized egg	Fertilized egg	Blastocyst
5	Fertilized egg	Morula	Blastocyst

a) 1 b) 2 c) 3 d) 4

11 In Swiss cheese, big holes are made by a 1

a) bacterium producing methane gas
b) machine
c) fungus releasing a lot of gases while its metabolic activities
d) bacterium producing large quantities of carbon dioxide

12 The diagram below represents Meselson and Stahl's experiment on DNA replication. 1



For several generations, E. coli was grown in a medium containing an isotope of nitrogen, N15 DNA was extracted periodically, at successive generations, and it was subjected to ultracentrifugation to check the percentage of the isotope that was transmitted across generations. How did the centrifugation process help in providing evidence of the nature of DNA replication?

a) It mixed the medium well.
b) It destroyed the heavy isotope.
c) It allowed the DNA with ^{14}N to settle down.
d) It separated the DNA with nitrogen isotopes based on densities.

Questions No. 13 to 16 consist of two statements – Assertion (A) and Reason (R). Answer these questions by 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 (A): Finger-like projections appear on the trophoblast called chorionic villi after implantation. 1
Reason (R): Chorionic villi are surrounded by the uterine tissue and maternal blood.

14 Assertion (A): Tropical latitudes have greater biological diversity then temperate latitudes. 1
Reason (R): Tropical regions remain relatively undisturbed for millions of years.

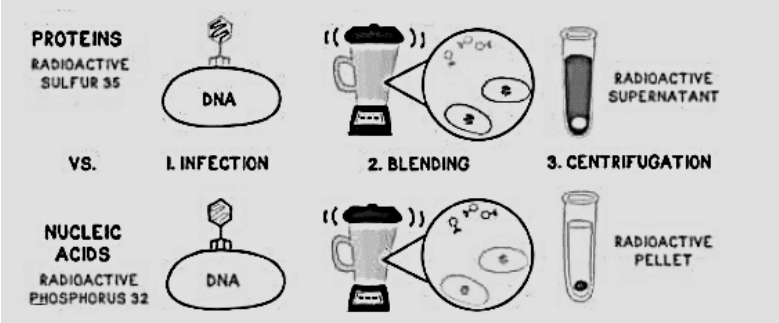
15 Assertion (A): Predation is an interspecific interaction with a feeding strategy. 1
Reason (R): Predator and their prey maintain fairly stable population through time and rarely one Population become abundant or scarce

16 Assertion (A): An organ transplant patient if not provided with cyclosporin A may reject the transplanted organ. 1
Reason (R): Cyclosporin A inhibits activation of T-cells and interferes with destruction of non-self-cells.

SECTION B

17 Read the text carefully and answer the questions: 2

In 1952, Alfred Hershey and Martha Chase took an effort to find the genetic material in organisms. Their experiments led to an unequivocal proof to DNA as genetic material.



Hershey and Chases's experiments:

a) Why did they use two types of culture media to grow viruses?
b) What was the need for using a blender and later a centrifuge during their experiments?
c) State the conclusion drawn by them after the experiments.

18 Rinku with a circular DNA contains sequence 2

5' → GGAATTCC → 3'
3' → CCTTAAGG → 5'

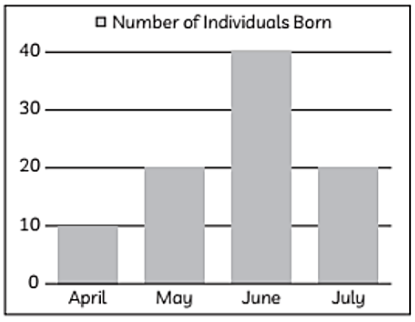
She wishes to add a new segment of DNA into it.

a) Identify the technology she planned.
b) Suggest the specific enzyme to make a cut in the DNA with above sequence.
c) How this enzyme identifies the sequence?
d) Draw the cut ends of the DNA with sequence.

OR

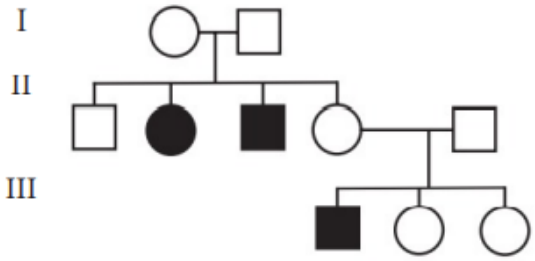
a) What is role of cry II Ab and cry I Ab?
b) Write the name of an organism from which Specific Bt toxin gene was isolated.
c) What are Cry proteins?

19 Study the graph given below and answer the following questions: 2



a) Calculate the birth rate for April if the number of individuals born last year were 1000.
b) What could be the probable reasons for increase and decline of individuals in the month of June and July respectively?

20 Study the given pedigree chart and answer the question that follow. 2



(a) Is the trait recessive or dominant?
(b) Is the trait sex-linked or autosomal?
(c) Give the genotypes of the parents in generation I and of their third and fourth child in generation II.

21 A person claimed that he has seen sounds, heard colours and smell's light. 2
(i) What could be the possible reason?
(ii) Name two chemicals responsible for this condition.
(iii) Mention any one source for these chemicals

SECTION C

22 A village health worker was taking session with women. She tells the women that one has to be very careful while using oral pills as method of birth control. Wrong usage can actually promote conception. 3
a) Analyze the statement and compare the merits and demerits of using oral pills and surgical methods of birth control.
b) Village women was confused as to how a thin metallic copper loop can provide protection against pregnancy. Justify the use explaining the mode of action of IUDS.

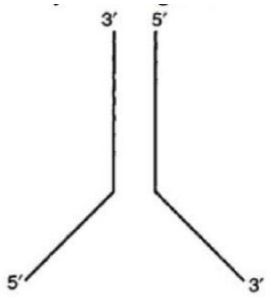
23 Certain attributes of innate immunity are given in the table below. Identify A, B, C, D, E and F respectively in it. 3

Sr. No.	Type of barrier	Example of the barrier	Function
(i)	A	B	Prevent microbial growth
(ii)	C	Polymorpho nuclear leucocytes	D
(iii)	Cytokine	E	F

24 In the 1950s, there were hardly any mosquitoes in Delhi. The use of pesticide DDT on standing water killed their larvae. It is believed that now there are mosquitoes because they evolved DDT resistance through the interaction of mutation and natural selection. Explain the steps of evolution in mosquitoes and write the name of this type of natural selection. 3

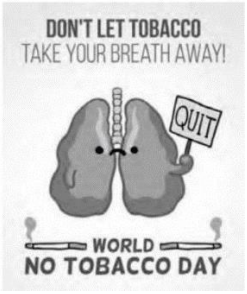
OR

Study the image below and answer the questions:



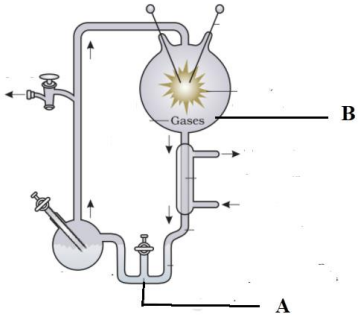
a) Identify the structure shown above. Redraw the structure with its missing parts and label all its parts.
b) Write the source of energy for this replication and list the enzymes involved in this process.

25 World No Tobacco Day is observed around the world every year on 31 May. 3



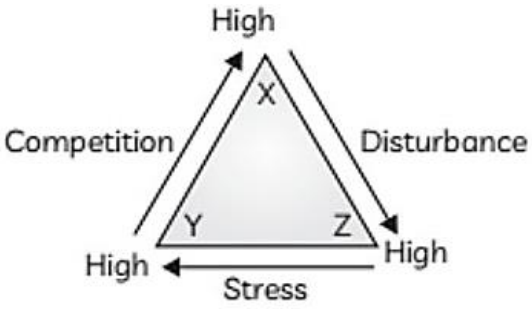
a) Why is tobacco harmful for the health? Write any four points.
b) Why do sports persons often fall a victim to cocaine addiction?

26 The figure given below represents Miller's apparatus used for his experiment. 3



i. Write the names of different gases contained and the conditions set for the reaction in the flask.
ii. Name the chemicals found in the samples drawn from 'A'.
iii. How did this experiment support evolution?

27 During a lesson on various environmental factors, a teacher draws a diagram that shows the historical strategies for three plant species (X, Y, and Z) along three axes: the intensity of interspecies competition, the degree of habitat disturbance, and the intensity of environmental stress. In habitats with high interspecies competition but low disturbance and stress, species X thrives. In environments with high environmental stress but low intraspecies competition, species Y thrives. In environments with little environmental stress, species Z can grow. 3



a) What are the environmental stresses that restrict production?

b) Comment on the impact of high stress and high disturbance on the growth rate of plant.

c) In what kind of environment plant 'X' can be found?

d) Identify what type plants are 'X', 'Y' and 'Z'.

28 Study the flow chart given below. Name the hormones involved at each stage and explain their functions. 3

Hypothalamus

↓

Pituitary

↓

ovary

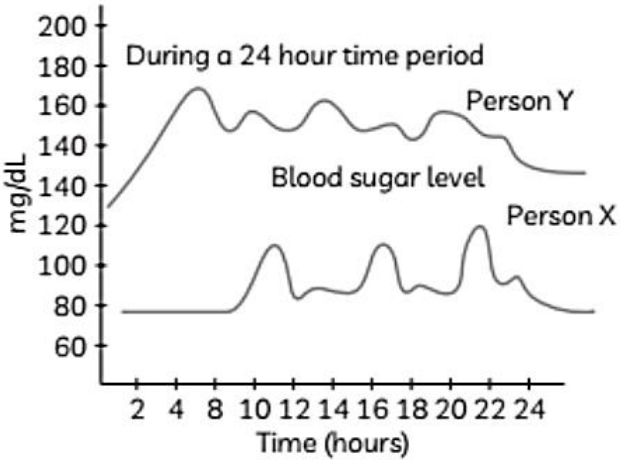
↓

Pregnancy

SECTION D

Q.no 29 and 30 are case-based questions. Each question has subparts with internal choice in one subpart

29 The given graphs show fluctuations in blood sugar of person X and Y during a 24-hour time period. 4



Based on the above information, answer the following questions.

a) Write the name of the disease from which Person Y is suffering?

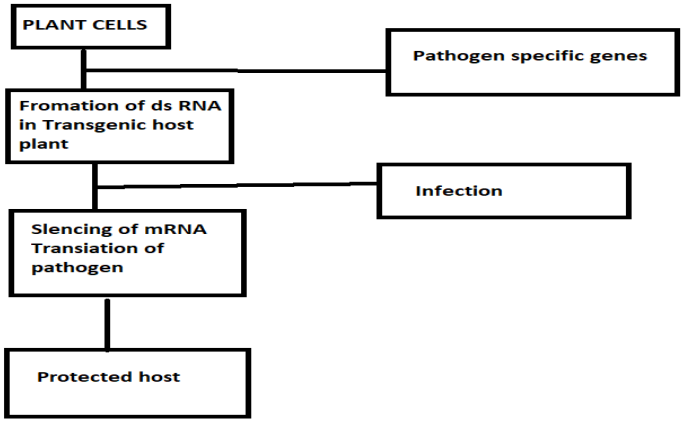
b) What causes weakness in person Y?

c) What do you understand about person X from the above graph?

OR

c) What is the difference between the disease in person Y and type II diabetes

30 Study the given Flow chart: 4



i) Write the name of the above mention defence mechanism and in which plant it has been done?
ii) Write the biological name of the pathogen and vector used in this technique.
iii) Pest-specific genes are introduced into the plants to develop resistance in plants against pest. Explain the events that occur in plant to develop resistance.

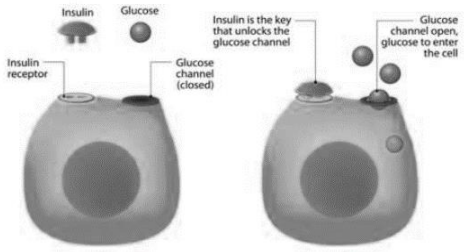
OR

iii) How this technique is used in producing pest-resistant plants?

SECTION E

31 a) What is a bioreactor, explain its use? 5
b) Draw a labelled diagram of a sparged stirred-tank bioreactor.
c) How does simple stirred type bioreactor differ from sparged stirred tank bioreactor?

OR

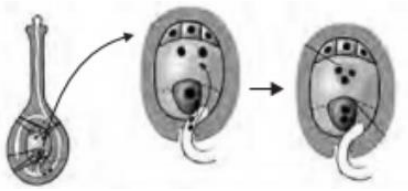


Insulin is a hormone created by your pancreas that controls the amount of glucose in your bloodstream at any given moment. It also helps store glucose in your liver, fat, and muscles. Finally, it regulates your body's metabolism of carbohydrates, fats, and proteins. Sound important? That's because it is.

a) Name the source from which insulin was extracted earlier. Why is this insulin no more in use by diabetic people?
b) Explain the process of synthesis of insulin by Eli Lilly company. Name the technique used by the company.
c) How is the insulin produced by human body different from the insulin produced by the above-mentioned company?

32 a) Can a plant flowering in Mumbai be pollinated by pollen grains of the same species growing in New Delhi? Provide explanations to your answer. 5
b) What is the fate of haploid megaspores formed by the megaspore mother cell in an angiosperm plant?

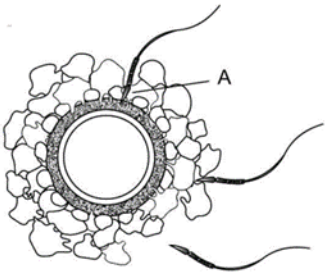
c) Shipra was studying for her NEET exam. She saw the following figure:



But she was unable to understand the events that happened during the double fertilization. Explain the process.

OR

a) One of the sperms is observed to penetrate 'A' of the ovum, as shown in the above diagram. Name 'A'.
b) How is only one of the millions of sperms able to do so?
c) Where exactly in the Fallopian tube does this occur?
d) Explain the events thereafter up to morula stage.
e) Why sperm cannot reach ovum without seminal plasma?
f) Why all copulations do not lead to fertilisation and pregnancy?



33 Mr. Oberoi angrily says to his daughter not to marry Mohan since their family is known to inherit haemophilia. The daughter objected to her father's order. Mr. Oberoi was adamant and threatened also. Mr. Oberoi's daughter explained the biological interpretation of his fear and convinced her father. 5

(a) Briefly discuss the inheritance pattern of haemophilia.
(b) Mohan was not haemophilic though his father is haemophilic. Explain the condition of Mohan by considering following three conditions of his mother:
  (i) Normal mother
  (ii) Carrier mother
  (iii) Haemophilic mother
(c) Is there any chance of birth of a haemophilic child if Mr. Oberoi's daughter marries Mohan (non-haemophilic)

OR

Study the schematic representation of the genes involved in the lac operon given below and answer the questions that follows:

p	i	p	o	z	y	a

a) Identify and name the regulatory gene in this operon. Explain its role in "switching off" the operon.
b) Why is lac operon's regulation referred to as negative regulation?
c) Name the inducer molecule and the products of the genes 'z' and 'y' of the operon. Write the functions of these gene products.