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| **PB1/BIQP/1223/A 23-NOV-2023** | | | | | | | |
| **PRE-BOARD EXAMINATION - I (2023-24)** | | | | | | | |
| **Subject: BIOLOGY**  **Grade: XII** | | | Max. Marks:70Time: 3 Hrs | | | | |
| **Name:** | | | | | **Section:** | **Roll No:** | |
| ***General Instructions:***   * *This question paper consists of 9 printed pages.* * *All answers to be written in the answer sheet provided.* * All questions are compulsory. * *The question paper has five sections: Section A, Section B, Section C, Section D and Section E.* * *There are 33 questions in the question paper.* * *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 study questions of 4 marks each.* * *Section E has 3 Questions of 5 marks each.* * *Wherever necessary, neat, and properly labeled diagrams should be drawn.* | | | | | | | |
|  | **SECTION A** | | | | | | 1\*16 |
|  | Observe the following graph. The TFR (total fertility rate) is declining in our country. Which of the following is a reason for infertility in India?    Fig: Fertility rate across India from 2011 to 2021(number of children born per woman) | | | | | | |
|  | **a.** | Psychological problems | | **b.** | Immunological problems | | |
|  | **c.** | Congenital problems | | **d.** | All the above | | |
| **2.** | Which one of the following groups includes all STDs? | | | | | | |
|  | **a.** | AIDS, syphilis, cholera | | **b.** | HIV, malaria, trichomoniasis | | |
|  | **c.** | Gonorrhea, hepatitis B, chlamydiosis | | **d.** | Hepatitis-B, hemophilia, AIDS | | |
| **3.** | The image below shows the DNA fingerprinting evidence obtained from a crime scene by the forensic department.    Who is most likely guilty of the crime? | | | | | | |
|  | **a.** | Suspect 1 | | **b.** | Suspect 2 | | |
|  | **c.** | Suspect 3 | | **d.** | The DNA fingerprint of the criminal is not there. | | |
| **4.** | The flowchart given below represents the life cycle of malarial parasite. Complete the flow chart and answer the following.    (a) Which species of malarial parasite causes malignant (most serious) malaria?  (b) Can you suggest 2 methods to control malaria? | | | | | | |
|  | **a.** | 2 = Heart, 4 = RBC. (a) Plasmodium vivax. (b) Mosquito control: i. Avoid stagnation of water. ii. Use mosquito nets. | | **b.** | 2 = Heart, 4 = Liver. (a) Plasmodium vivax. (b) Avoid contact with patient, Use clean drinking water and food. | | |
|  | **c.** | 2 = Liver, 4 = RBC. (a) Plasmodium falciparum. (b) Mosquito control: i. Avoid stagnation of water. ii. Use mosquito nets. | | **d.** | 2 = Liver, 4 = Heart. (a) Plasmodium falciparum. (b) Avoid contact with patient, Use clean drinking water and food. | | |
| **5.** | Consider the following statements:  i) Glomus absorbs phosphorous from soil and passes to the plant.  ii) Azospirillum & Azotobacter are biocontrol agents.  iii) Primary sewage treatment is also known as biological treatment.  iv) In sewage treatment, both aerobic and anaerobic bacteria take part.  Of these, select the correct statements. | | | | | | |
|  | **a.** | ii & iii | | b. | i & iv | | |
|  | **c.** | i & ii | | **d.** | iii & iv | | |
| 6. | An infection occurs when a microorganism enters a person's body and causes harm. The microorganism uses that person's body to sustain itself, reproduce, and colonize. Various microorganisms cause severe diseases and symptoms.  Period from the entrance of pathogens into the body and their multiplication  showing initial symptoms of | | | | | | |
|  | **a.** | Infection period | | **b.** | Incubation period | | |
|  | **c.** | Infestation period | | **d.** | All are incorrect | | |
| 7 | Recombinant DNA technology is based on the cutting and ligation of DNAs of two  different organisms. The r- DNA is transformed into a suitable host.  i- The r-DNA molecule can be produced in the absence of the following | | | | | | |
|  | **a.** | E. coli | | **b.** | Restriction endonuclease | | |
|  | **c.** | DNA Ligase | | **d.** | DNA | | |
| 8 | The given figure represents the maturation of pro-insulin into insulin. Identify product A. | | | | | | |
|  | **a.** | Polypeptide chain A | | **b.** | Polypeptide chain B | | |
|  | **c.** | Polypeptide chain C | | **d.** | Pro-hormone | | |
| 9 | The fitness of one organism overpowers the presence and fitness of another. These  organisms of the same or different species, living in the same or different communities  share similar resources. What is the interaction between species in which the fitness of  one overpowers the presence and fitness of another called? | | | | | | |
|  | **a.** | Competition | | **b.** | Parasitism | | |
|  | **c.** | Commensalism | | **d.** | Predation | | |
| 10 | Which of the following refers to the damage of the liver due to alcohol | | | | | | |
|  | **a.** | Carcinogen | | **b.** | Cirrhosis | | |
|  | **c.** | Damage of nervous system | | **d.** | Both b and c | | |
| 11 | Analyze the relationship between the first two words and fill the fourth place.  Homology: Divergent evolution.  Analogy: ………………. | | | | | | |
|  | **a.** | Convergent evolution | | **b.** | Adaptive radiation | | |
|  | **c.** | Parallel evolution | | **d.** | Coevolution | | |
| 12 | Genetic drift is the change in frequency of an existing gene variant in the  population due to random chance. Genetic drift operates only in\_\_\_\_\_\_\_ | | | | | | |
|  | **a.** | Small population | | **b.** | Large population | | |
|  | **c.** | It is hypothetical word and never happens | | **d.** | The statement is incorrect as it always remains constant in a population | | |
|  | *Question No. 13 to 16 consists 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: In Ophrys one petal of the flower bears an uncanny resemblance to the female bee.  Reason: Two closely related species competing for the same resource can coexist simultaneously. | | | | | | 1 |
| **14** | Assertion: The uptake of DNA during transformation is an active, energy requiring process.  Reason: Transformation occurs in only those bacteria, which possess the enzymatic machinery involved in the active uptake and recombination. | | | | | | 1 |
| **15** | Assertion: Curd is more nutritious than milk.  Reason: LAB present in curd checks the growth of disease- causing microbes. | | | | | | 1 |
| **16** | Assertion (A): An orchid growing on a mango branch is an example of commensalism.  Reason (R): Orchids and mango trees mutually benefit from this interaction. | | | | | | 1 |
|  | **SECTION B** | | | | | | 2\*5 |
| **17.** | The following is the sequence of ovarian events in the human female- Which hormone is responsible for development from q to e?    i-Which hormone is responsible for development from q to e?  ii- Identify the role of g and mention its role. | | | | | | 2 |
| **18.** | The ABO blood group antigens are encoded by one genetic locus, the ABO locus,  which has three alternatives (allelic) forms—A, B, and O. A child receives one of the  three alleles from each parent, giving rise to six possible genotypes and four possible.  blood types (phenotypes). The genotype is indicative of the protein type that is found.  in the RBCs (red blood cells).  i- How is it possible for a child to have a blood group O if the parent’s blood group A  and B?  ii- In which condition only offspring with blood group O will be produced. | | | | | | 2 |
| **19** | A virus with RNA instead of DNA as its genetic material is known as a retrovirus. It  uses an enzyme to become part of the host cell’s DNA.    i- Give an example of a pathogenic retrovirus.  ii- Retrovirus are RNA viruses. Name the process and enzyme which help these to  make DNA. | | | | | | 2 |
| **20** | 1. In electrophoresis why do fragments separate in different bands? 2. Name the substance used as the medium / matrix in gel electrophoresis. Mention its source. | | | | | | 2 |
| **21** | The diagrams represent the operation of natural selection on different traits.    i- Why graph C shows a marked difference from graph A.  ii- What is the significance of Directional Selection? | | | | | | 2 |
|  | **SECTION -C** | | | | | | 3\*7 |
| **22.** | In flowering plants, the anther contains sporogenous tissues. These tissues divide and  form plant gametes. Identify the types of division and nature of ploidy in the following.  cases-  (a) the cell division for the formation of microspore tetrad.  (b) the ploidy of the cells of tetrad?  (c) Name all the haploid cells present in an unfertilized mature embryo-sac of a flowering plant. Write the total number of cells in it. | | | | | | 3 |
| **23.** | Infertility is when people cannot conceive after a period of regular coitus without the  use of birth control. The source indicates that worldwide, 8–12% of couples experience fertility problems, and 40–50% of cases may stem from factors that affect males. ARTs may become very significant to treat such problems.  a- What is ART?  b- Identify the following techniques.  i- Transfer of an ovum collected from a donor into the fallopian tube of another female who is unable to produce.  ii- The process in which sperm is directly injected into the ovum. | | | | | | 3 |
| **24.** | Central dogma reveals the basic steps involved in protein synthesis. DNA is the main  material that replicates and transcribes the mRNA. Ribosomes (larger and smaller  subunits) play an important role in polypeptide formation.    i- Label A, B, C, D, and E in the following diagram.  ii- Name the factor which is necessary for the start of the process.  iii- What process is required for the maturation of the ‘c’? | | | | | | 3 |
| **25.** | Stanley Miller and Harold C. Urey (1953) tried to recreate the conditions that might have  existed in the primitive atmosphere. For that, they had prepared the apparatus i.e., glass tubes and glass chambers which were fitted tightly as shown in the diagram.  .     1. What was the mixture of gases used in chamber marked A?   b) At what conclusion did Miller arrive after his experiment?  c)The category of molecules produced by the Miller-Urey experiment was\_\_\_\_\_\_? | | | | | | 3 |
| **26** | Some important drugs are isolated by using microbes. One such drugs is used in lowering.  cholesterol. The chemical structure of the statin is given below.    i-Name the organism which is used in the production of statin.  ii.Give another example of a product that is synthesized by microorganisms and used in  medical science.  iii.In which part of plant nicotine is formed?  OR  a. Name the disease caused by *Haemophilus influenzae*  b. Name the organ infected and the effect of infection.  c. Write about the symptoms of the disease. | | | | | | 3 |
| **27** | A cloning vector is a small piece of DNA that can be stably maintained in an organism,  and into which a foreign DNA fragment can be inserted for cloning purposes. A large  number of cloning vectors are available, and choosing the vector may depend upon a  number of factors, such as the size of the insert, copy number and cloning method.    i- What does Eco RI represent?  ii- Why ampR is used in this?  iii- What is rop? | | | | | | 3 |
| **28** | In India the term Biogas was popularized by Jashbhai Patel. Biogas plants are reliable sources of decentralized renewable energy for heating and cooking. Sometimes it  is also used for lighting bulbs for domestic use.    i- Label a, b, and c in the given diagram.  ii- What is the use of ‘c.’  iii- Methane gas is most predominant gas in biogas. How it is produced | | | | | | 3 |
|  | **SECTION -D** | | | | | | 4\*2 |
|  | Q. No. 29 and 30 are case-based questions which has 3 subparts with internal choice in one subpart. | | | | | |  |
| 29. | Read the following and answer questions given below from (i) to (v)  Pollen grains are generally spherical shaped, and each is surrounded by two layers – exine and intine. Exine is made up of sporopollenin which is resistant to high temperatures and strong acids and alkali. Sporopollenin remains absent at germ pores. Pollen grains are well preserved as fossils because of the presence of sporopollenin. The inner wall of pollen grain is intine. The pollen grains are mainly shed at 2-celled stage- vegetative cell and generative cell when they are matured. Pollen grains of many species cause severe allergies and bronchial afflictions, leading to chronic respiratory disorders. It is mentioned that Parthenium or carrot grass that came into India as contaminant with imported wheat, has become ubiquitous in occurrence and causes pollen allergy. However, pollen grains are rich in nutrients which are used in pollen tablets as food supplements. In western countries, large number of pollen products in the form of tablets and syrups are available in the market which are claimed to increase the performance of athletes and race horses.  i)The outer layer of the pollen grain is exine. In spite of exine, we can see pollen tubes emerging from the outer layer of the pollen grain. How does it happen?  ii) Pollen allergy is common in many people during spring, summer and fall as plants release tiny pollen grains in tremendous quantity. Mention 2 common diseases associated with pollen allergy?  (iii) Which plant from the list does not cause pollen allergy?  (a) Chenopodium  (b) Rose  (iv) The function of germ pore in pollen grain is  (a) Emergence of radicle  (b) Absorption of water for seed germination  (c) Initiation of pollen tube  (d) All of these  (v) Pollen allergy is common in many people during spring, summer and fall as plants release tiny pollen grains in tremendous quantity. Which of the following is not associated with pollen allergy?  (a) Sneezing, stuffy nose and watery, eyes  (b) Asthma, bronchitis  (c) Cough, itchy nose, roof of mouth or throat  (d) Fever, diarrohea and vomiting | | | | | | 4 |
| 30 | If in a population of size 'N', the birth rate is represented as 'b' and the death rate as 'd', the increase or decrease in 'N' during a unit time period 't' will be dN/dt = (b - d) x N  The equation given above can also be represented as dN/dt = r x N, where r = (b - d).  (a) What does 'r' represent in the above?  (b) Write anyone the significance of calculating 'r' for any population.  (c) In a pond there are 100 frogs. 20 more were born in a year. Calculate the birth rate of this population.  (d) If 'N' is the population density at the time 't', write the population density at the time 't + l'. | | | | | | 4 |
|  | **SECTION -E** | | | | | | 3\*5 |
| **31** | The given diagram is related to the oogenesis process in human females.     1. Label ‘A’, ‘B’ and ‘C’ in the diagram. Write the significance of ‘C’. 2. How many ova will be produced in one cycle if 12 oogonia are involved in the process? 3. Why is fetal life shown in the diagram while ovum release is related with the puberty period?   **OR**  With the help of a labeled diagram describe the structure of mammary gland the characteristic of all female mammals. | | | | | | 5 |
| **32** | Explain the packaging of DNA helix.   1. In Prokaryotes 2. In Eukaryotes   **OR**   1. A molecule that can act as a genetic material must fulfill certain criteria. Which are they? 2. The genetic material should be stable enough not to change with different stages of life cycle, age or with change in physiology of the organism. Comment on the stability of genetic material and prove that DNA is a better genetic material.   c)Which experiment is an additional proof for the stability of DNA. | | | | | | 5 |
| **33** | a-Give a brief description of the role of DNA-dependent DNA polymerase.  b- Why Okazaki fragments are formed in short fragments?  c- Write two roles of dNTPs.  **OR**  DNA fingerprinting is used in a variety of situations, such as criminal investigations, other forensic purposes, and paternity testing. In these situations, one aims to “match” two DNA fingerprints with one another, such as a DNA sample from a known person and one from an unknown person. (Source: National Human Genome Research Institute)    i)What does ‘A’ represent?  ii)What is the basis of DNA fingerprinting?  iii) What is the use of autoradiography in DNA fingerprinting?  iv) Of the total base sequence present in humans   1. 99.9% of all human beings are identical. 2. % of all human beings are identical. 3. 100 % different 4. No difference is observed till no   **v**) List the various markers that are used in DNA fingerprinting. | | | | | | 5 |

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