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| **FT/BIAK/1223/A 8-JUN-2023** | | | | | | |
| **FIRST TERM EXAMINATION (2023-24)** | | | | | | |
| **Subject: BIOLOGY(ANSWER KEY)**  **Grade: XII** | | | Max. Marks:70Time: 3 Hrs | | | |
|  | **SECTION A(Answer in italics)** | | | | | 1\*16 |
|  | The lac operon consists of | | | | | |
|  | **a.** | four regulatory genes only | | **b.** | ***one regulatory gene and three structural genes*** | |
|  | **c.** | two regulatory genes and two structural genes | | **d.** | three regulatory genes and three structural genes. | |
| **2.** | An environmental agent, which triggers transcription from an operon, is a | | | | | |
|  | **a.** | depressor | | **b.** | controlling element | |
|  | **c.** | regulator | | **d.** | ***inducer*** | |
| **3.** | In the DNA molecule, | | | | | |
|  | **a.** | the proportion of adenine in relation to thymine varies with the organism | | **b.** | ***there are two strands which run anti- parallel-one in 5' 🡪 3' direction and other in 3'🡪5'*** | |
|  | **c.** | the total amount of purine nucleotides and pyrimidine nucleotides is not always equal | | **d.** | there are two strands which run parallel in the 5' 🡪 3' direction. | |
| **4.** | ABO blood grouping is controlled by gene I which has three alleles and show co-dominance. There are six genotypes. How many phenotypes in all are possible? | | | | | |
|  | **a.** | Six | | **b.** | Three | |
|  | **c.** | ***Four*** | | **d.** | Five | |
| **5.** | In order to find out the different types of gametes produced by a pea plant having the genotype AaBb it should be crossed to a plant with the genotype | | | | | |
|  | **a.** | AABB | | **b.** | AaBb | |
|  | **c.** | ***aabb*** | | **d.** | aaBB | |
| 6. | Which of the following is a palindrome? | | | | | |
|  | **a.** | 5' – GAATAC – 3'  3' – CTTATG – 5' | | **b.** | 5' – GATATAC – 3'  3' – CTATATG – 5 | |
|  | **c.** | ***5' – GAATTC – 3'***  ***3' – CTTAAG – 5'*** | | **d.** | All of these | |
| 7 | In gel electrophoresis, DNA are forced to move towards | | | | | |
|  | **a.** | anode under magnetic field | | **b.** | cathode under magnetic field | |
|  | **c.** | ***anode under electric field*** | | **d.** | cathode under electric field | |
| 8 | The figure shows DNA separated out, removed by : | | | | | |
|  | **a.** | spooning | | **b.** | ***spooling*** | |
|  | **c.** | spilling | | **d.** | speeling | |
| 9 | 1. Suitable preservatives are added 2. These formulations need clinical trials. 3. Quality control testing is uniform for all the products.   How many of the above statements is incorrect? | | | | | |
|  | **a.** | 0 | | **b.** | ***1*** | |
|  | **c.** | 2 | | **d.** | 3 | |
| 10 | Non-transformants E.coli will- | | | | | |
|  | **a.** | Grow in ampicillin and tetracycline  both | | **b.** | Grow in ampicillin but not  tetracycline | |
|  | **c.** | Grow in tetracycline but not  ampicillin | | **d.** | ***Grow neither in tetracycline nor in***  ***ampicillin*** | |
| 11 | Represented below is the inheritance pattern of a certain type of trait in humans.  Which one of the following conditions could be an example of this pattern? | | | | | |
|  | **a.** | Phenylketonuria | | **b.** | Sickle cell anaemia | |
|  | **c.** | ***Haemophilia*** | | **d.** | Thalassemia | |
| 12 | Which one of the following conditions correctly describes the manner of determining the sex? | | | | | |
|  | **a.** | Homozygous sex chromosomes (ZZ) determine female sex in birds. | | **b.** | ***XO type of sex chromosomes determine male sex in grasshopper***. | |
|  | **c.** | XO condition in humans as found in Turner's syndrome, determines female sex. | | **d.** | Homozygous sex chromosomes (XX) produce male in Drosophila | |
|  | 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) If both Assertion and Reason are false. | | | | |  |
| **13** | Ans-a | | | | | 1 |
| **14** | Ans-d | | | | | 1 |
| **15** | **Ans-b** | | | | | 1 |
| **16** | Ans-c | | | | | 1 |
|  | **SECTION B** | | | | | 2\*5 |
| **17.** | Test cross,to determine the genotype of the unknown whether it is homozygous dominant or heterozygous dominant.(1+1) | | | | | 2 |
| **18.** | Autosomal Recessive-Parents are carriers as only few offsprings show the trait-other Offsprings either normal or carrier.(1/2\*4) | | | | | 2 |
| **19** | (a) DNA molecule  (b) mRNA transcript  (c) RNA polymers  (d) Rho factor (1/2\*4) | | | | | 2 |
| **20** | It is essential that tRNA binds to both amino acids & mRNA codon because tRNA acts as an adapter molecule with picks up a specific activated aminoacid from the cytoplasm & transferred it to the ribosomal in the cytoplasm where proteins are synthesized. It attracts itself to ribosome with the sequence specified by mRNA & finally it transmits its amino acid to new polypeptide chain.(1+1) | | | | | 2 |
| **21** | Exonucleases and endonucleases  Exonucleases remove nucleotides from the ends of the DNA.  Endonucleases cut DNA at specific sites between the ends of DNA.  **OR**  .(i) Each Restriction endonuclease functions by inspecting the length of DNA sequence & binds to DNA at the recognition Sequence.  (ii) It cuts the two strands of DNA at specific point in their sugar – phosphate backbone.  (1+1) | | | | | 2 |
|  | **SECTION -C** | | | | | 3\*7 |
| **22.** | The inheritance of flower colour in snapdragon or Antirrhinum majus is an example of incomplete dominance. When a cross was made between a red flowered plant & a white flowered plant, the F1hybrid was pink i-e-an intermediate between red & white which means that both red & white are incompletely dominant. When F1 individuals was self – pollinated, the F2 generation consists of red, pink & white flower appears in ratio 1:2:1 respectively. | | | | | 3 |
| **23.** | When alleles express themselves equally,. Blood group AB.(1)  **OR**  1)sterile female ,2)poorly developed breast 3)short stature. 4) small uterus(2) | | | | | 3 |
| **24.** | (i) Chemical treatment and exposure to cold and high temp.(42°C) alternatively. (Bacterial cell)  (ii) Biolistics or gene gun. (Plant cell)  (iii) Micro-injection. (animal cell) Explanation(1+1+1) | | | | | 3 |
| **25.** | (a) Insertional inactivation  (b) b-galactosidase.  (c) Selection of recombinants due to inactivation of antibiotics requires simultaneous plating on two plates having different antibiotics. Explanation (1+1+1) | | | | | 3 |
| **26** | Francis Crick postulated tRNA as an adapter molecule. (1) It has amino acid binding site  at 3’ end.(2)It has anticodon to recognize the codon on mRNA for the amino acid.  1+2 | | | | | 3 |
| **27** | (i) Transcription level, Processing level, Transport of mRNA to cytoplasm, Translation  level. (ii) Gene i .  ½\*4+1 | | | | | 3 |
| **28** | DNA fingerprinting can sort out this dispute of maternity.  The steps of this technique are:  Step I The technique involves Southern blot hybridization using radiolabeled VNTR as a probe.  Step II The methodology includes.  (i)DNA is isolated and digested by the restriction endonucleases.  (ii)DNA fragments are separated by electrophoresis.  (iii) Separated DNA fragments are transferred to synthetic membranes like nitrocellulose or nylon.  (iv) Hybridization using labelled VNTR probe.  (v)Hybridized DNA fragments are detected by autoradiography. (2+1) | | | | | 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. | a) Downs syndrome  b) Aneuploidy  **OR**   1. Short stature and stunted growth.   Fold of the skin above the eye, slanted eyes.  Protruding furrowed tongue, flattened nose.  Mental retardation.  Cardiac deformities.  Single transverse palm crease and hand is broad and short.  Poor muscle tone and excessive flexibility (any two)   1. It is also called trisomy 21.Extra chromosome 21 due to non disjunction/ the father's sperm or the mother's egg cell contains the extra chromosome. | | | | | 4 |
| 30 | 1. To separate DNA fragments 2. DNA fragments being negative charged move towards anode and get separated according to size through sieving effect provided by agarose gel.   **OR**  b) Fig -11.3  c)The separated DNA bands are cut out from the agarose gel and extracted from the gel piece. This step is known as elution. | | | | | 4 |
|  | **SECTION -E** | | | | | 3\*5 |
| **31** | a)Hershey Chase (1)  b) The experiment began with the culturing of viruses in two types of medium. One set of viruses (A) was cultured in a medium of radioactive phosphorus whereas another set (B) was cultured in a medium of radioactive sulfur. They observed that the first set of viruses (A) consisted of radioactive DNA but not radioactive proteins. This is because DNA is a phosphorus-based compound while protein is not. The latter set of viruses (B) consisted of radioactive protein but not radioactive DNA.  The host for infection was E.coli bacteria. The viruses were allowed to infect bacteria by removing the viral coats through a number of blending and centrifugation.(2)  **Observation:**E.coli bacteria which were infected by radioactive DNA viruses (A) were radioactive but the ones that were infected by radioactive protein viruses (B) were non-radioactive.(1)  **Conclusion:** Resultant radioactive and non-radioactive bacteria infer that the viruses that had radioactive DNA transferred their DNA to the bacteria but viruses that had radioactive protein didn’t get transferred to the bacteria. Hence, DNA is the genetic material and not the protein.(1)  **OR**  a,b-Meselson and Stahl Experiment was an experimental proof for semiconservative DNA replication. In 1958, Matthew Meselson and Franklin Stahl conducted an experiment on E.coli which divides in 20 minutes, to study the replication of DNA.(1+1)  c-Experiment  15N (heavy) and 14N (normal) are two isotopes of nitrogen, which can be distinguished based on their densities by centrifugation in Caesium chloride (CsCl). Meselson and Stahl cultured E.coli in a medium constituting 15NH4Cl over many generations. As a result, 15N was integrated into the bacterial DNA. Later, they revised the 15NH4Cl medium to normal 14NH4Cl. At a regular interval of time, they took the sample and checked for the density of DNA.  Observation  Sample no. 1 (after 20 minutes): The sample had bacterial DNA with an intermediate density. Sample no. 2 (after 40 minutes): The sample contained DNA with both intermediate and light densities in the same proportion.(2 Marks)  d)Taylor and collegues on *Viccia faba (* ½+1/2) | | | | | 5 |
| **32** | a-Sickle cell anemia (1)  b-No, Autosome linked(1)  c- Sickle-cell anemia is a type of autosomal recessive genetic disorder, which is caused by the presence of a mutated form of hemoglobin, hemoglobin S (HbS). Sickle cell disease (SCD) causes significant morbidity and mortality and is mainly caused when the glutamic acid of hemoglobin molecules is replaced by valine.(2)  d-25%(1)  **OR**  a-(3 marks)    b-Controlled crosses not possible ,Several generations can be represented easily using symbols(any two)-2 marks | | | | | 5 |
| **33** | (i) Temperature, pH, susbtrates, salts, vitamins and oxygen.(any 2-1 mark)  (ii) (a) simple stirredtank bioreactor(2 marks)    (iii) The stirrer facilitates even mixing and oxygen availability throughout simplestirred tank bioreactor, whereas in case of sparged stirred-tank bioreactor, air is bubbled throughout the reactor for proper mixing.(1+1)  **OR**  (a) Denaturation - Heat denatures DNA to separate complementary strands.  (b) Annealing : Primers hybridises to the denatured DNA strands.  (c) Extension : Extension of primers resulting in synthesis of copies of target DNA sequence. Enzyme Tag polymerase is isolated from the bacterium Thermusaquaticus. This enzyme induces denaturation of double stranded DNA at high temperature.  **(3+2)** | | | | | 5 |

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