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| **ANSWER KEY-PRE BOARD 1 EXAMINATION (2023-24)** | | | | | |
| **Subject: BIOLOGY**  **Grade: XII** | | Max. Marks:70Time: 3 Hrs | | | |
| **Name:** | | | **Section:** | **Roll No:** | |
|  | **SECTION A** | | | | 1\*16 |
|  | d. Decrease sex drive | | | | |
| **2.** | a is false, b is true | | | | |
| **3.** | a. The given diagram is in presence of lactose | | | | |
| **4.** | c.*Streptococcus pneumoniae* infects respiratory passage. | | | | |
| **5.** | d.*Saccharomyces cerevisiae*: Ethanol | | | | |
| 6. | c.While growing, microbes consume the major part of the organic matter in the  effluent. This significantly elevates the BOD (biochemical oxygen demand) of the effluent. | | | | |
| 7 | c.replicate inside bacterial cell autonomously | | | | |
| 8 | b.Human protein enriched milk (2.4 g/l) | | | | |
| 9 | d.Both A and B | | | | |
| 10 | d.(I), (III) and (IV) | | | | |
| 11 | a. Darwin | | | | |
| 12 | d. Everybody believes Lamarck’s conjecture today. | | | | |
| **13** | a) Both A and R are true, and R is the correct explanation of A. | | | | 1 |
| **14** | b) Both A and R are true, and R is not the correct explanation of A. | | | | 1 |
| **15** | c) A is true but R is false. | | | | 1 |
| **16** | d) Both A and R are false. | | | | 1 |
|  | **SECTION B** | | | | 2\*5 |
| **17.** | Name any two parts of a fallopian tube and write the function of each part.  The oviducts (fallopian tubes), uterus and vagina constitute the female accessory ducts. Each fallopian tube is about 10-12 cm long and extends from the periphery of each ovary to the uterus. The part closer to the ovary is the funnel-shaped infundibulum. The edges of the infundibulum possess finger-like projections called fimbriae, which help in  collection of the ovum after ovulation. The infundibulum leads to a wider part of the oviduct called ampulla. The last part of the oviduct, isthmus has a narrow lumen, and it joins the uterus. (Any two parts-1, two functions-1) | | | | 2 |
| **18.** | Mendel conducted artificial pollination/cross pollination experiments using several true-breeding pea lines. What do you mean by true breeding pea lines? How many true breeding pea plant varieties did Mendel select?  A true breeding line is one that, having undergone continuous self-pollination, shows the stable trait inheritance and expression for several generations. Mendel selected 14 true-breeding pea plant varieties, as pairs which were similar except for one character with contrasting traits.(1+1) | | | | 2 |
| **19** | Innate immunity consist of four types of barriers.Explain.  Innate immunity consist of four types of barriers. These are —  (i) Physical barriers : Skin on our body is the main barrier which prevents entry of the micro-organisms. Mucus coating of the epithelium lining the respiratory, gastrointestinal and urogenital tracts also help in trapping microbes entering our body.  (ii) Physiological barriers : Acid in the stomach, saliva in the mouth,tears from eyes–all prevent microbial growth.  (iii) Cellular barriers : Certain types of leukocytes (WBC) of our body like polymorpho-nuclear leukocytes (PMNL-neutrophils) and monocytes and natural killer (type of lymphocytes) in the blood as well as macrophages in tissues can phagocytose and destroy  microbes.  (iv) Cytokine barriers : Virus-infected cells secrete proteins called interferons which protect non-infected cells from further viral infection.(1/2\*4) | | | | 2 |
| **20** | With the help of a diagram describe polymerase chain reaction.  (1/2\*4) | | | | 2 |
| **21** | Evolution is not a directed process in the sense of determinism. It is a stochastic process  based on chance events in nature and chance mutation in the organisms. Give examples to prove these statements.  Excess use of herbicides, pesticides, etc., has only resulted in selection of resistant varieties in a much lesser time scale. This is also true for microbes against which we employ antibiotics or drugs against eukaryotic organisms/cell. Hence, resistant organisms/cells are appearing in a time scale of months or years and not centuries. These are examples of evolution by anthropogenic action.  This also tells us that evolution is not a directed process in the sense of determinism. It is a stochastic process based on chance events in nature and chance mutation in the organisms.(1+1) | | | | 2 |
|  | **SECTION -C** | | | | 3\*7 |
| **22.** | With the help of a diagram describe the structure of a mature pollen grain.    Pollen grains are generally spherical measuring about 25-50 micrometers in diameter. It has a prominent two-layered wall. The hard outer layer called the exine is made up of  sporopollenin which is one of the most resistant organic material known. Pollen grain exine has prominent apertures called germ pores where sporopollenin is absent.The inner wall of the pollen grain is called the intine. It is a thin and continuous layer made up of  cellulose and pectin. The cytoplasm of pollen grain is surrounded by a plasma membrane. When the pollen grain is mature it contains two cells, the vegetative cell and generative  cell . The vegetative cell is bigger, has abundant food reserve and a large irregularly shaped nucleus. The generative cell is small and floats in the cytoplasm of the vegetative cell. It is spindle shaped with dense cytoplasm and a nucleus. (Diagram-1,Explanation any 4 points-2 marks) | | | | 3 |
| **23.** | a. Expand and explain VD.  b. Name any two RTI  c. Write any two principles which can be followed to prevent Sexually transmitted diseases.   1. Veneral Diseases-Diseases or infections which are transmitted through sexual intercourse are collectively called venereal diseases (VD)(1/2+1/2) 2. Gonorrhoea, syphilis,genital herpes, chlamydiasis, genital warts, trichomoniasis, hepatitis-B,AIDS(any two-1 mark) 3. (i) Avoid sex with unknown partners/multiple partners.   (ii) Always use condoms during coitus.  (iii) In case of doubt, one should go to a qualified doctor for early detection and get complete treatment if diagnosed with disease.(any 2-1 mark) | | | | 3 |
| **24.** | Based on his observations on monohybrid crosses Mendel proposed two general rules to consolidate his understanding of inheritance in monohybrid crosses. Name and define the laws.  These rules are called the Principles or Laws of Inheritance: the First Law or Law of Dominance and the Second Law or Law of Segregation.  1 Law of Dominance  (i) Characters are controlled by discrete units called factors.  (ii) Factors occur in pairs.  (iii) In a dissimilar pair of factors one member of the pair dominates  (dominant) the other (recessive).  The law of dominance is used to explain the expression of only one of the parental characters in a monohybrid cross in the F1and the expression of both in the F2  . It also explains the proportion of 3:1 obtained at the F2  2. Law of Segregation  This law is based on the fact that the alleles do not show any blending and that both the characters are recovered as such in the F2 generation though one of these is not seen at the F1 stage. Though the parents contain two alleles during gamete formation, the factors or alleles of a pair segregate from each other such that a gamete receives only one of the two factors.(11/2+11/2) | | | | 3 |
| **25.** | Name and explain the phenomenon depicted by the following picture. Write one more example for the same.    This process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation. Darwin’s finches represent one of the best examples of this phenomenon. Another example is Australian marsupials. A number of marsupials, each  different from the other evolved from an ancestral stock, but all within the Australian island continent.(1+1+1) | | | | 3 |
| **26** | 1. Name the disease caused by *Haemophilus influenzae* 2. Name the organ infected and the effect of infection. 3. Write about the symptoms of the disease.   a.Haemophilus influenzae are responsible for the disease pneumonia.(1)  b.It infects the alveoli (air filled sacs) of the lungs. As a result of the infection, the alveoli  get filled with fluid leading to severe problems in respiration.(1/2+1/2)  c.The symptoms of pneumonia include fever, chills, cough and headache. In severe cases,  the lips and finger nails may turn gray to bluish in colour.(1/2+1/2)  **OR**  Give a diagrammatic representation of the stages of life cycle of plasmodium. | | | | 3 |
| **27** | There are three basic steps in genetically modifying an organism. Which are they?  (i) identification of DNA with desirable genes;  (ii) introduction of the identified DNA into the host;  (iii) maintenance of introduced DNA in the host and transfer of the DNA  to its progeny.(1+1+1) | | | | 3 |
| **28** | Penicillin was the first antibiotic to be discovered, and it was a chance discovery.   1. Describe why it is called a chance discovery. 2. Who established the full potential of penicillin as an effective antibiotic?   a. Alexander Fleming while working on Staphylococci bacteria, once observed a mould growing in one of his unwashed culture plates around which Staphylococci could not grow. He found out that it was due to a chemical produced by the mould and he named it Penicillin after the mould Penicillium notatum. (1+1)  b. Its full potential as an effective antibiotic was established much later by Ernest Chain and Howard Florey.(1/2+1/2) | | | | 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. | Based on the following three cases of a phenomenon answer the following questions.      CASE 1 CASE 2 CASE 3   1. Name and define the phenomenon depicted in the diagram.   Types of pollination (Autogamy, geitonogamy, xenogamy), Transfer of pollen grains from anther to stigma. (1)  b. Differentiate between any two of the three cases.  Autogamy-Pollen transfer within one flower, Geitonogamy-pollen transfer between flowers of the same plant, Xenogamy-Pollen transfer between flowers of different plants (any two comparison-2 marks)  c. What do you mean by outbreeding devices?  Outbreeding devices prevent the occurrence of self-fertilization in plants. (1)  **Or**  c. Write any two outbreeding devices found in plants.  Unisexual flowers/self-incompatibility(any two)(1) | | | | 4 |
| 30 | For human population, the age pyramids generally show age distribution of males and females in a diagram. The shape of the pyramids reflects the growth status of the population. Study the 3 representative figures of age pyramid relating to human population given below and answer the following question:   1. Mention the names given to the 2 kinds of age profiles (i), and (ii).   i-Expanding,ii-Stabilizing,   1. Which one of these pyramids shows a declining population? Why?   iii-Declining, A population with large number of older individuals than younger  ones is likely to decline since older individuals do not take part in reproduction. (1+1)   1. Which one of these is ideal for a population?   Stable (1)  OR  c. Define an age pyramid?  If the age distribution (per cent individuals of a given age or age group) is plotted for the population, the resulting structure is called an age pyramid (1) | | | | 4 |
|  | **SECTION -E** | | | | 3\*5 |
| **31** | With the help of a labeled diagram describe the structure of mammary gland the characteristic of all female mammals.  A functional mammary gland is characteristic of all female mammals. The mammary glands are paired structures (breasts) that contain glandular tissue and variable amount of fat. The glandular tissue of each breast is divided into 15-20 mammary lobes containing clusters of cells called alveoli (Figure 3.4). The cells of alveoli secrete milk, which is stored in the cavities (lumens) of alveoli. The alveoli open into mammary tubules. The tubules of each lobe join to form a mammary duct. Several mammary ducts join to form a wider mammary ampulla which is connected to lactiferous duct through which milk is sucked out.  (3+2)    **OR**  Draw and explain the structure of human sperm. Ensure to label at least six parts.    It is a microscopic structure composed of a head, neck, a middle piece and a tail.A  plasma membrane envelops the whole body of sperm. The sperm head contains an elongated haploid nucleus, the anterior portion of which is covered by a cap-like structure, acrosome.The acrosome is filled with enzymes that help fertilisation of the ovum. The middle piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitate sperm motility essential for fertilisation (3+2) | | | | 5 |
| **32** | Explain the packaging of DNA helix   1. In Prokaryotes 2. In Eukaryotes 3. In prokaryotes, such as, E. coli, though they do not have a defined nucleus, the DNA is not scattered throughout the cell. DNA (being negatively charged) is held with some proteins (that have positive charges) in a region termed as ‘nucleoid’. The DNA in nucleoid is organised in large loops held by proteins(2) 4. In eukaryotes, this organisation is much more complex. There is a set of positively charged, basic proteins called histones. A protein acquires charge depending upon the abundance of amino acids residues with charged side chains. Histones are rich in the basic amino acid residues lysine and arginine. Both the amino acid residues carry positive charges in their side chains. Histones are organised to form a unit of eight molecules called histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome (Figure 5.4 a). A typical nucleosome contains 200 bp of DNA helix. Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin, threadlike stained (coloured) bodies seen in nucleus. The nucleosomes in chromatin are seen as ‘beads-on-string’ structure(3)   **OR**   1. A molecule that can act as a genetic material must fulfill certain criteria. Which are they?   A molecule that can act as a genetic material must fulfill the following criteria: (i) It should be able to generate its replica (Replication). (ii) It should be stable chemically and structurally. (iii) It should provide the scope for slow changes (mutation) that are required for evolution. (iv) It should be able to express itself in the form of 'Mendelian Characters’.(2)   1. 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.   This now can easily be explained in light of the DNA that the two strands being complementary if separated by heating come together,when appropriate conditions are provided. Further, 2'-OH group present at every nucleotide in RNA is a reactive group and makes RNA labile and easily degradable. RNA is also now known to be catalytic, hence reactive.Therefore, DNA chemically is less reactive and structurally more stable when compared to RNA. Therefore, among the two nucleic acids, the DNA is a better genetic material.(2)   1. Which experiment is an additional proof for the stability of DNA.   Griffith Experiment(1) | | | | 5 |
| **33** | Plants, bacteria, fungi and animals whose genes have been altered by manipulation are called Genetically Modified Organisms (GMO). Mention the ways by which GM plants have been useful.  Genetic modification has: (i) made crops more tolerant to abiotic stresses (cold, drought, salt, heat). (ii) reduced reliance on chemical pesticides (pest-resistant crops). (iii) helped to reduce post harvest losses. (iv) increased efficiency of mineral usage by plants (this prevents early exhaustion of fertility of soil). (v) enhanced nutritional value of food, e.g., Vitamin ‘A’ enriched rice. In addition to these uses, GM has been used to create tailor-made plants to supply alternative resources to industries, in the form of starches, fuels and pharmaceuticals. Some of the applications of biotechnology in agriculture that you will study in detail are the production of pest resistant plants, which could decrease the amount of pesticide used. Bt toxin is produced by a bacterium called Bacillus thuringiensis (Bt for short). Bt toxin gene has been cloned from the bacteria and been expressed in plants to provide resistance to insects without the need for insecticides; in effect created a bio-pesticide. Examples are Bt cotton, Bt corn, rice, tomato, potato and soyabean etc.(5\*1)  **OR**   1. Insulin used for diabetes was earlier extracted from pancreas of slaughtered cattle and pigs. What was the issue associated with this insulin? 2. How did we overcome this issue? Explain with supportive diagram. 3. Insulin from an animal source, though caused some patients to develop allergy or other types of reactions to the foreign protein.(1) 4. Genetically engineered Insulin(1)   Insulin consists of two short polypeptide chains: chain A and chain B, that are linked together by disulphide bridges (Figure 12.3). In mammals, including humans, insulin is synthesized as a pro-hormone (like a pro-enzyme, the pro-hormone also needs to be processed before it becomes a fully mature and functional hormone) which contains an extra stretch called the C peptide. This C peptide is not present in the mature insulin and is removed during maturation into insulin. The main challenge for production of insulin using rDNA techniques was getting insulin assembled into a mature form. In 1983, Eli Lilly an American company prepared two DNA sequences corresponding to A and B, chains of human insulin and introduced them in plasmids of E. coli to produce insulin chains. Chains A and B were produced separately, extracted and combined by creating disulfide bonds to form human insulin.(2)  (1) | | | | 5 |