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| **PREBOARD 1 EXAMINATION SET 2 ANSWER KEY (2022-23)** | | | | | | | |
| **Subject: BIOLOGY**  **Grade: XII** | | | Max. Marks:70Time: | | | | |
| **Name:** | | | | | **Section:** | **Roll No:** | |
| ***General Instructions:*** | | | | | | | |
|  | **SECTION A** | | | | | | 16 |
|  | If Meselson and Stahl's experiment is continued for sixth generations in bacteria, the ratio of Heavy strands 15N/15N :Hybrid15N/14N : light 14N/14N containing DNA in the sixth generation would be | | | | | | |
|  | **a.** | 1:1:1 | | **b.** | 0:1:7 | | |
|  | **c.** | 0:1:15 | | **d.** | **0:1:31** | | |
| **2.** | What are minisatellites ? | | | | | | |
|  | **a.** | 10-40 bp sized small sequences within the genes | | **b.** | Short coding repetitive region on the eukaryotic genome | | |
|  | **c.** | **Short non-coding repetitive sequence forming large portion of eukaryotic genome** | | **d.** | Regions of coding strands of the DN | | |
| **3.** | The human chromosome with the highest and least number of genes in them are respectively | | | | | | |
|  | **a.** | Chromosome 21 and Y | | **b.** | *b*) Chromosome 1 and X | | |
|  | **c.** | **Chromosome 1 and Y** | | **d.** | Chromosome X and Y | | |
| 4 | In a cereal grain, the single cotyledon of embryo is represented by | | | | | | |
|  | **a.** | coleoptile | | **b.** | coleorhiza | | |
|  | **c.** | s**cutellum** | | **d.** | hypocotyl | | |
| 5 | There is a restriction endonuclease called**BamHI** . What does “am” part in it stand for? | | | | | | |
|  | **a.** | **amyloliquefaciens** | | **b.** | amylose | | |
|  | **c.** | amide | | **d.** | ampicillin | | |
| 6 | A cross is made between tall pea plants having green pods and dwarf pea plants having yellow pods. In the F2 generation, out of 80 plants how many are likely to be tall plants? | | | | | | |
|  | **a.** | 15 | | **b.** | 20 | | |
|  | **c.** | 45 | | **d.** | **60** | | |
| 7 |  | Peptide A and peptide B is linked by how many disulphide linkages in insulin . | | | | | |
|  | **a.** | 1 | | **b.** | **2** | | |
|  | **c.** | 3 | | **d.** | 4 | | |
| 8 |  | Identify the correct statement from the following | | | | | |
|  | **a.** | High levels of estrogen triggers the ovulatory surge. | | **b.** | Spermiation is the process of the release of sperms from prostrate glands | | |
|  | **c.** | Sperms released from seminiferous tubules are non-motile. | | **d.** | **Progesterone level is high during the post ovulatory phase of menstrual cycle** | | |
| 9 |  | DNA fragments are visualized by staining DNA with | | | | | |
|  | **a.** | **ethidium bromide** | | **b.** | Methylene bromide | | |
|  | **c.** | Chromogenic substrate | | **d.** | Acetocarmine | | |
| 10 |  | . Diagram  Description automatically generated | | | | | |
|  | **a.** | **FSH and estrogen** | | **b.** | LH and FSH | | |
|  | **c.** | ACTH and LH | | **d.** | Progesterone and LH | | |
| 11 | From the sexually transmitted diseases mentioned below, identify the one which does not  specifically affect the sex organs | | | | | | |
|  | **a.** | Syphilis | | **b.** | **AIDS** | | |
|  | **c.** | Gonorrhea | | **d.** | Genital warts | | |
| **12** | Study the pedigree chart given below. What does it show? | | | | | | |
|  | **a.** | **Inheritance of a condition like phenylketonuria as an autosomal recessive trait.** | | **b.** | The pedigree chart is wrong as this is not possible. | | |
|  | **c.** | Inheritance of a recessive sex-linked disease like haemophilia | | **d.** | Inheritance of a sex-linked inborn error of metabolism like phenylketonuria. | | |
|  | **Assertion :** When the two genes in a dihybrid cross are situated on the same chromosome, the proportion of parental gene combinations is much higher than nonparental type.  Reason: Higher parental gene combinations can be attributed to crossing over between two genes. Mark the correct choice as: (a) If both Assertion and Reason are true and Reason is the correct explanation of Assertion. (b) If both Assertion and Reason are true but Reason is not the correct explanation of Assertion. (c) If Assertion is true but Reason is false. (d) If both Assertion and Reason are false. | | | | | | |
| **13** | Assertion : hypocotyl develops into radicle on root tip.  Reason : A monocot embryo consist of two cotyledons. (B) | | | | | | |
| **14** | Assertion : The endometrium undergoes cyclical changes during the menstrual cycle.  Reason : Perimetrium contracts strongly during delivery of the baby. (C ) | | | | | | |
| **15** | Assertion : IUT is the transfer of embryo with more than 8 blastomeres into the uterus.  Reason : IUT is a very popular method of forming embryos *in vivo*. ( C ) | | | | | | |
| **16** | Assertion : Stem cells are undifferentiated biological cells found in multicellular organisms.  Reason :They are obtained from only umbilical cord blood just after birth. (C) | | | | | | |
|  | **SECTION B ( 2 marks each )** | | | | | | |
| **17** | In *Drosophila* a yellow bodied white eyed female was crossed with brown bodied red eyed male.  The F1 progeny produced, when intercrossed, it was observed that the F2 phenotypic ratio of  *Drosophila* deviated significantly from Mendel’s 9 : 3 : 3 : 1. The genes for eye colour and body  colour are closely located on the ‘X’ chromosome, showing linkage and therefore, these are  inherited together. Recombinants were formed due to crossing over but at low percentage.(1/2 mark each for the points ) | | | | | | |
| **18** | (*a*) Light pollen grains/Pollen grains more in number/well exposed stamen/feathery and sticky  stigma/Numerous flowers are packed into an inflorescence. (*Any two*) 1  (*b*) Yes. ½  Viability of wheat pollen grain is only 30 minutes and so it is stored in pollen bank for a long  period of time for later use. ½ | | | | | | |
| **19** | Endometrium is the inner layer of uterus. It assists in cyclic changes during menstruation and implantation of embryo. 1  Myometrium is the middle layer of uterus. It consist of smooth muscles and thus assists in  contractions of the uterus during parturition. 1 | | | | | | |
| **20** | Zygote intra fallopian transfer technique (ZIFT) is a technique of *in vitro* fertilisation wherein the zygote or early embryo having up to 8 blastomeres is transferred into the fallopian tube to complete its further development 1  Intra uterine transfer (IUT) technique is different from ZIFT as the embryos with more than 8  blastomeres are transferred into the uterus in IUT.**1** | | | | | | |
| **21** | 1. Gel electrophoresis.1 2. DNA fragment of size 500 bp migrates faster as movement depends on the molecular weight, lesser the weight, faster the movement.1   OR  Eukaryotic cells have no restriction enzymes as the DNA molecules of eukaryotes are heavily methylated (1). It is present in prokaryotic cell (like bacteria) where these act as defense mechanism to restrict the growth of bacteriophages(1) | | | | | | |
|  | **SECTION C (3 marks each )** | | | | | | |
| **22** | This change is called transformation.1/2  When live S-type cells were injected into mice, they died due to pneumonia and When live R-type cells were injected into mice, they survived.1/2  When heat-killed S-type cells were injected into mice, they survived and there were no symptoms of pneumonia.1/2  When heat-killed S-type cells were mixed with live R-type cells and injected into mice, they died due to unexpected symptoms of pneumonia and live S-type cells were obtained from mice.1/2  He concluded that heat-killed S-type bacteria caused a transformation of the R-type bacteria into  S-type bacteria but he was not able to understand the cause of this bacterial transformation.1/2  He further stated that some ‘transforming principle’ transferred from heat killed S strain, enabled R strain to synthesize a smooth polysaccharide coat and become virulent. But biochemical nature of genetic material was not defined from his experiments.1/2 | | | | | | |
| **23** | 1. Axial position ½   Chart, radar chart  Description automatically generated( 2 +1/2 ) | | | | | | |
|  |  | | | | | | |
| **24** | An extra-chromosomal DNA which delivers gene of interest into variety of plants and act as  cloning vector is called *Ti* plasmid.1  They are present in *Agrobacterium tumifaciens. Ti* plasmid ½  vectors are used for genetic transformation in many dicot plants. The tumour inducing (*Ti*)  plasmid of *Agrobacterium tumifaciens* has been modified into a cloning vector which is no more  pathogenic to the plants but is still able to use the mechanisms to deliver genes of interest into a  variety of plants 11/2 | | | | | | |
| **25** | (*a*) Cleistogamous flowers do not open. Therefore, the pollens have to land on the stigma of the  same flower. This ensures autogamy.1  (*b*) Advantage: Self-pollination is assured, thus ensuring seed formation. 1  Disadvantage: Least variations observed and it leads to inbreeding depression 1 | | | | | | |
| **26** | *a*) Parthenocarpic fruits are formed when ovary develops into fruit without fertilisation. 1  Apomictic seeds are formed when formation of seeds take place without fertilisation. 1  (*b*) To maintain hybrid characters (year after year in a desired plant) and to avoid buying hybrid  seeds every year (expensive seeds) farmers prefer using apomictic seeds. 1  OR  See the source image3 | | | | | | |
| **27** | Chorionic villi appear after implantation on the trophoblast. 1  The trophoblast layer of the blastocyst get attached to the endometrium and the inner cell mass  gets differentiated as the embryo. After attachment the uterine cell divides rapidly and covers the  blastocyst. As a result the blastocyst becomes embedded in the endometrium of the uterus.2 | | | | | | |
| **28** | *Saheli*” contains a non-steroidal preparation and is a once-a-week pill, with high contraceptive  value and very less side-effects. Therefore, it is considered an improved form of contraceptive pills. (any three 1 ½ )  Oral pills inhibit ovulation and implantation, as well as, alter the quality of cervical mucus to prevent or retard entry of sperms.1  Thus, fertilisation and further pregnancy is prevented ½ | | | | | | |
|  | **SECTION D (4 marks each )** | | | | | | |
| **29.** | a) Genetically engineered human insulin is prepared by using E. coli. With the help of rDNA technology, insulin producing gene from human is transferred into E. coli bacteria which produce human insulin or Humulin for clinical use.  b) Reverse transcription is used to prepare cDNA in insulin preparation. The enzyme used here, Reverse transcriptase is used to create cDNA libraries from mRNA.  c) Insulin obtained from genetically engineered organism is more useful because it provides unlimited quantity of insulin at a time without the risk of transmission of animal diseases through insulin.  d) In mammals, including humans, insulin is synthesized as a prohormone which contains an extra stretch called the C-peptide. This C-peptide is present in immature insulin and absent in mature insulin.  OR  (e)The main challenge to produce insulin using recombinant DNA technology is getting insulin assembled into a mature form. | | | | | | |
| **30.** | i) ICSI 1  ii) AI 1  iii) *a*) Female partner is often blamed due to following reasons:(any two ) 1  (*i*) Social mind set  (*ii*) Inequality of sexes  (*iii*) Lack of awareness/male dominated society.  (*iv*) Awareness is to be created that abnormality can occur in both male and females and  infertility issues with suitable examples  (*v*) Mutual respect towards both the partners in case of the problem and to find the remedy  from medical experts  (*vi*) Educate them to find the reason and not believe in superstitions. (*Any two*)  (*b*) Infertility is caused due to physical abnormality in reproductive system, congenital,  immunological or psychological problems. 1 | | | | | | |
|  | **SECTION E (5 marks each )** | | | | | | |
| **31.** | |  |  |  | | --- | --- | --- | | **Mendelian inheritance,** | **polygenic inheritance** | **pleitropy** | | One gene controls one trait/character/phenotype (1) | Two or more genes influence the expression of one trait/character/phenotype (1) | One genes controls the  expression of more than one  traits/characters/phenotypes (1) | | (*b*) Human height or skin colour are examples of polygenic inheritance. Height trait is controlled by at least three gene pairs. Additive effect of alleles contributes to the phenotypic expression of the trait. The more is the number of dominant alleles, more pronounced is the phenotypic expression or more is the height. The recessive alleles are less pronounced in the phenotypic expression.(2) | | |   OR  **Symptoms of haemophilia:** Patient continues to bleed through a minor cut as the patient does not possess natural phenomenon of blood clotting. (1)  **Symptoms of sickle-cell anaemia:** Erythrocytes lose their circular shape and become sickleshaped.  As a result, the cells cannot pass through narrow capillaries. Blood capillaries are clogged  and thus affects blood supply to different organs. (1)   |  |  |  | | --- | --- | --- | |  | **Haemophilia** | **Sickle-cell anaemia** | | i | It is a sex-linked recessive disorder ½ | It is an autosomal linked recessive trait. ½ | | ii | The gene for haemophilia is located on  X-chromosome | The disease is controlled by a single pair of allele  HbA and HbS ½ | | iii | More males suffer from haemophilia than females because in males single gene for the defect is able to express. Females suffer from this disease only in homozygous condition,  *i.e*., XcXc. | Only the homozygous individuals for HbS, *i.e*.,  HbS HbS show the diseased phenotype.  1 | | iv | The defective alleles produce non-functional protein which later form a non-functional cascade of proteins involved in blood clotting. | Due to point mutation Glutamic acid (Glu) is  replaced by Valine (Val) at sixth positions of beta  globin chain of haemoglobin molecule 1 | | | | | | | |
|  |  | | | | | | |
| **32.** | *i*) *i* gene is the regulatory gene and codes of repressor which acts as inhibitor as inhibits the  transcription of structural genes. ½  The repressor of the operon is synthesised from the *i* gene. The repressor protein in the  absence of an inducer (lactose or allolactose) binds to the operator region of the operon and  prevents RNA polymerase from transcribing the structural genes. Thus ‘switching off’ the  operon.(1 ½ )  (*ii*) Regulation by *lac* operon is referred to as negative regulation because the repressor binds to  the operator for ‘switching off’ the operon. (1/2 )  (*iii*) Lactose or allolactose acts as an inducer. Gene *z* codes for β-galactosidase (*gal*) enzyme which  breaks lactose into galactose and glucose. Gene *y* codes for permease, which increases the  permeability of the cell to lactose. (2 1/2 )  OR  (*a*) They worked with bacteriophage because when it attacks a bacteria it only inserts its genetic  material in its body.1  (*b*) They grew some viruses on a medium that contained radioactive phosphorus and some others  on medium that contained radioactive sulphur. Viruses grown in the presence of radioactive  phosphorus contained radioactive DNA but not radioactive protein because DNA contains  phosphorus but protein does not. Similarly, viruses grown on radioactive sulphur contained  radioactive protein but not radioactive DNA because DNA does not contain sulphur.1  (*c*) Blender was used to agitate the bacteria to remove the viral coats from them. Centrifuge was  used to separate virus particle from the bacteria. 1  (*d*) Bacteria which was infected with viruses that had radioactive DNA were radioactive,  indicating that DNA was the material that passed from the virus to the bacteria. Bacteria that  were infected with viruses that had radioactive proteins were not radioactive. This indicates  that proteins did not enter the bacteria from the viruses. DNA is therefore the genetic material  that is passed from virus to bacteria. 2 | | | | | | |
|  |  | | | | | | |
| **33** | Ovulation :Rapid release of luteinising hormone ruptures Graafian follicle and release ovum (ovulation). 1  Pregnancy : Corpus luteum secretes large amount of progesterone hormone that is essential for  maintenance of the endometrium required for implantation of blastocyst leading to  pregnancy. 1  Placenta produces several hormones like human chorionic gonadotropin (hCG), human  placental lactogen (hPL). Relaxin is also produced during later phase of pregnancy. Level of  other hormones like estrogens, progestogens, cortisol, prolactin and thyroxine also increases  which is essential for supporting foetal growth, metabolic changes in mother and maintenance  of pregnancy. 1  Parturition signals originate from the fully developed foetus and the placenta induce mild  uterine contractions which triggers release of oxytocin from pituitary. Oxytocin acts on the  uterine muscle causing stronger uterine contractions. 1  Mammary glands undergo differentiation during pregnancy and produce milk by lactation.  Secretion and storage of milk occurs under influence of hormone. Prolactin secreted by anterior  lobe of pituitary. Ejection of milk is stimulated by oxytocin from posterior lobe of pituitary. 1    a)   |  |  |  |  | | --- | --- | --- | --- | |  |  | Hormone secreted | Their functions | | i) | Corpus luteum | 1. Progesterone | Essential for maintaining endometrium  for implantation of fertilised ovum. It  also inhibits release of FSH. (1) | |  | By placenta | Human Placental Lactogen | Stimulates the growth of the mammary  glands during pregnancy (1/2 ) | |  |  | hCG (Human chorionic  gonadotropin) | Maintains corpus luteum in pregnancy  and stimulates release of progesterone (1/2 ) | | ii) | During follicular  phase | 1. LH  2. FSH | Stimulates follicular development as  well as secretion of estrogen by growing  follicles. (1) | |  | During parturition  . | Oxytocin | Leads to contraction of smooth muscles  of myometrium of the uterus during child  birth (1) |   (*b*) (*i*) During pregnancy  (*ii*) During menstruation. (1) | | | | | | |
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