30-12-2017

Biology – XII
Marking Scheme of Practice test - III

SECTION A

1. DNA is acidic so negatively charged whereas histone proteins are positively charged in a nucleosome.
2. Sporopollenin is the most resistant organic material present on the outer layer. The name of the outer layer of pollen is called exine.
3. Stanley Miller created the conditions for source of energy by passing high voltage electric current in a flask with gases CH_4, H_2, NH_3 and water vapour at 800°C.
4. The phenotypic ratio of progeny of heterozygous individual for any two traits with double recessive individual will be 1:1:1:1. The term is test cross.
5. (*a*) The drug used to prevent the rejection of the organ are immuno suppresants. Example: cyclosporins.
   (*b*) Extracted from fungus **Trichoderma polysporum**.

SECTION B

6. Name of causative agent–

   Pneumonia – (*a*) Streptococcus pneumoniae

   (*b*) Ringworm is the disease

   (*c*) **Wuchereria bancrofti** causes filariasis

   (*d*) Malaria is the disease caused by **Plasmodium**.

7.

Heterosis	Inbreeding
Which is also referred to Hybrid Vigour is called Heterosis. It is a phenomena in which an individual arises with better qualities of parents present in a hybrid. The hybrid is stronger, resistant to diseases and more productive. Cross pollination/out crossing leads to hybrid vigour.	When selfing or inbreeding is continued for many generations between animals of the same breed for 4-6 generations it reduces fertility and productivity. This is called inbreeding depression and is opposite of heterosis or hybrid vigour. Inbreeding is helpful only to create pure line in any animal. It also exposes harmful genes which can be removed by selection.

8. The correct sequence is

   C – Foreign DNA is selected.

   D – Restriction enzymes are used to cut both foreign DNA as well as vector plasmid DNA.

A – The plasmid DNA is ligased to foreign gene by DNA ligase enzyme.

B – The recombinant DNA is transferred to host cell to produce multiple copies of recombination.

9. (*a*) Stenohaline (*b*) Ecology (*c*) Diapause (*d*) Adaptations

OR

The 4 adaptations in xerophytic plants are

(*a*) Presence of spines – The leaves get modified into spines to reduce transpiration

(*b*) Sunken stomata – In deep pits create a humid atmosphere around the stomata so transpiration gets reduced.

(*c*) Special photosynthetic pathway CAM which enables stomata to remain closed during the day.

(*d*) Flattened stems i.e. phyloclade help to perform photosynthesis as they are green. These stems also store water.

10. In the diagram labelling is as below:

a – connective having vascular tissue

b – sporogenous tissue

c – middle layer

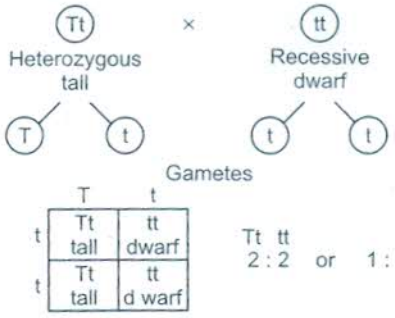
d – tapetum

SECTION C

11.

(*a*)	**Production**	**Decomposition**
	The process by which solar energy gets trapped and converted to chemical energy by green plants to produce food from inorganic materials.	The breakdown of complex organic material present in waste and dead bodies by the action of enzymes into simpler forms by bacteria and fungi.
(*b*)	**Food Chain**	**Food Web**
	A sequential unidirectional flow of energy along the different trophic levels is called food chain. An organism can be part of only one trophic level.	An inter connection of different food chains in an ecosystem through which energy gets transferred is called a food web. one organism can occupy different trophic levels.
(*c*)	**Primary Productivity**	**Secondary Productivity**
	It is the amount of biomass or organic matter produced per unit area in a period of time by plants during photosynthesis. It depends on plant species of a particular area and also environmental factors, nutrients etc.	It is the rate of formation of new organic matter by consumers when they depend upon the available biomass as a result of primary production.

12. The importance of a test cross is that it enables to determine the genotype of F_1 individual whether it is a hybrid or pure. In case of hybrid the result of test cross is always 1:1.



13. a, b, c and d are as follows:

(*a*) Antigen binding site (*b*) Light chain

(*c*) Heavy chain (*d*) Structure of antibody molecule

The importance of antibody (protein molecule) in immune response is that they are produced by B-cell lymphocytes and as they are of different types IgA, IgM, IgE, IgD and IgG they act in a particular manner against the pathogen present in our blood and thereby increase our immunity.

14. DNA — GTG CAT TCA GCA TGA ATG TAC

(*a*) Coding strand — CAC GTA AGT CGT ACT TAC ATG

(*b*) In RNA— CAC GUA AGU CGU ACU UAC AUG

(*c*) anticodons for amino acids

GUG CAU UCA GCA UGA AUG UAC

15.

	DNA	RNA
(*i*)	Deoxyribonucleic acid is double stranded and helically coiled with antiparallel arrangement of the two strands.	Ribonucleic acid is single stranded.
(*ii*)	The nitrogenous bases forming nucleotides are adenine, thymine, guanine and cytosine.	The nitrogenous base forming nucleotides are adenine, uracil, guanine and cytosine.
(*iii*)	The pentose sugar is deoxyribose i.e. it does not have –OH at carbon –2 position. This makes DNA more stable.	The pentose sugar is ribose that means it has – OH group at carbon–2 position. Due to this RNA is unstable.

16. (*a*) The importance of emasculation (removal of anthers) is that it prevents self pollination of the selected flower, so that it can be dusted with desired pollen.

(*b*) Bagging technique also prevents contamination from undesired pollen as once the desired pollen is dusted, the selected flower is covered with paper bag so that no unwanted pollen may reach the stigma.

17. Restriction enzymes are those enzymes which can cut the DNA into small fragments at a particular sequence which is palindromic i.e. it reads the same on both strands of DNA. Restriction enzymes can be exonucleases or endonucleases, and are derived from bacteria. They are named in a particular manner in which

First letter (Capital) denotes genus of bacterium

Second two letters (small) denotes the species bacterium

Then the letter denotes strain and Roman numeral the sequence of its extraction.

e.g. EcoRI E stands for **Escherichia**
co stands for coli
R for strain Ry
I number one (Roman numeral)

18. (*a*) **Single Cell Protein** – SCP is an alternate source of proteins for animal and human nutrition. In this alga **Spirulina** or **Methylophilus methylotrophus** are grown in waste water rich in starch, molasses etc and it produces food rich in protein, minerals, fats etc.

(*b*) **Natural Selection** is a process in which nature selects the more strong variants in a highly reproducing population which competes for survival. The selected variants multiply and give rise to new species.

(*c*) **Test tube babies** – Due to introduction of **in vitro** fertilisation of an ovum from a female donor sperms received from male donor a zygote is formed in laboratory in hygienically controlled conditions. This zygote is allowed to multiply to form a 8–16 celled morula which is then transferred to female recipient's oviduct or uterus so that is gets implanted.

19. Sickle cell anaemia gene is not eliminated from the population because it makes these persons more strong and immune to malaria as the **Plasmodium** cannot complete its life cycle in sickle cell shaped erythrocytes. The shape becomes sickle shaped due to defective haemoglobin which arises as a single base change at 6th position of amino acid in β-chain where instead of glutanic acid, valine gets incorporated.

OR

6 genotypes arise in human blood groups due to dominance, codominance and multiple allelism. Human blood groups are controlled by gene I^A, I^B and I^o or i. of which I^A and I^B are codominant when present together and are dominant when present with recessive allele I^o/i.

		Phenotype
I^AI^A pure	I^AI^o heterozygous	A
I^BI^B pure	I^BI^o heterozygous	B
I^AI^B pure	codominant alleles	AB
I^oI^o or ii	recessive pure	O

20. (*a*)

Conformers	Regulators
These are organisms who cannot maintain constant internal environment and hence their body temperature change according to external environment e.g. Reptiles, amphibians.	The ability to maintain homeostasis such as constant body temperature, constant osmotic concentration etc. through physiological and osmotic concentration changes. e.g. Birds and mammals

(*b*) Cyanobacteria are biofertilise, some can convert atmospheric N_2 to ammonia like *Anabaena* whereas most blue green algae add organic matter to the soil and increase its fertility.

21. **Flocs** – masses of bacteria associated with fungal like filaments to form mesh like structures due to overgrowth of useful aerobic microbes.

Primary sludge – All the grit, soil and small pebbles which settle down and can be removed by sedimentation is called **Primary sludge**.

Activated sludge –When the bacterial flocs are allowed to sediment from the effluent once the BOD of waste water has been reduced significantly.

Anaerobic sludge digesters are tanks where anaerobic bacteria digest the bacteria and fungi present in sludge, and produce mixture of gases such as CH_4, H_2S and CO_2.

22. **Diaphragms** – prevent the sperm to be able to reach the ovum by acting as physical barrier.

Intrauterine devices – prevent implantation of blastula.

Oral pills – help in keeping level of progesterone high so that ovulation does not occur.

Sterilisation – permanent method of contraception as vas deferens is cut and tied in males and oviduct is cut and tied in females.

SECTION D

23. (*a*) I will take up a drive to reduce, reuse and recycle the wastes generated due to polythene industry by creating awareness amongst the people.

(*b*) Ahmed Khan is keenly involved by converting plastic into polyblend.

(*c*) Polyblend is a mixture of recycled plastic waste which is mixed with bitumen.

This will be used to lay roads so that water repelling properties of bitumen will increase the life of roads three times.

The entire drive will be spread to all states of India so that the roads will be more stronger with a longer life.

SECTION E

24. The basic tools used in recombinant DNA technology or genetic engineering are :

(*a*) **Restriction Enzymes** (or restriction endonucleases) are enzymes which cut the DNA at specific locations which are polindromic in nature. e.g. EcoRI cuts the DNA at –GAATTC–
–CTTAAG–

These are called molecular scissors.

(*b*) **DNA ligase** is an enzyme which is used to ligate the alien DNA to plasmid DNA. This is also called molecular glue.

(*c*) **Vectors** are those bacteriophages, yeast artificial chromosomes or plasmids which have the ability to replicate within bacterial cells independent of the control of chromosomal DNA.

(*d*) **Competent host** is a cell which can readily pick up the recombinant DNA either by heat shock treatment or by gene gun directly in which cells are bombarded with high velocity micro particles of gold or tungsten coated with DNA.

OR

The **features of cloning vectors are**

(*a*) **Origin of replication** 'Ori' – is a segment on plasmid from where the replication starts and any piece linked to this sequence can be made to replicate. It is also important for controlling high number of copies of target DNA.

(b) **Selectable marker** – helps in identifying and eliminating non-transformants and allows growth of transformants. Gene encoding resistance to antibiotics like chlorophenicol, ampicillin, tetracycline etc. are used as selectable markers as normal *E. coli* does not possess resistance to any antibiotics.

(c) **Cloning sites** – generally single recognition site is commonly used for ligating the alien DNA. The alien DNA is ligated at a restriction site present in one of the two antibiotic resistance gene. Insertional inactivation occurs when an insert or alien DNA is ligated at this site because then this enzyme is unable to develop the blue colour in presence of chromagenic substance. This helps in identifying them from those colonies which do not have insert as such colonies will develop blue colour.

(d) **Vectors for cloning genes in plants and animals** – Just like retroviruses in animals have the ability to transform normal cells into cancerous cells, similarly a bacterium **Agrobacterium tumefaciens** acts like natural genetic engineer because it has T_1 DNA tumour inducing plasmid DNA which causes development of tumour in plants. This T_1 plasmid has been modified as á cloning vector when it is not pathogenic and instead is capable of delivering genes of our interest into a variety of plants.

25. The scientists who gave operon concept are Francois Jacob and Jacques Monod.

Importance of

(a) **Inducer** – the substrate lactose itself is inducer and it regulates switching on and off of the operon for the enzyme beta-galactosidase.

(b) **Structural gene** –There are three structural genes, gene z, y and a. Gene *z* codes for beta galactosidase; gene *y* codes for permease which increases the permeability of cell to β-glactosidase, gene *a* codes for transacetylase. The function of β-galactosidase is to hydrolyse the disaccharide lactose to glucose and galactose, its monomeric units.

(c) **Repressor protein** – produced by i gene. The repressor protein represses the operon.

Promoter gene – releases RNA polymerases for the synthesis of mRNA which is polycistronic i.e. the single stretch of m-RNA has sequence for the synthesis of all the three enzymes.

OR

The steps in the DNA fingerprinting are as follows:

(a) Isolation of DNA.

(b) Digestion of DNA by restriction endonucleases.

(c) Separation of DNA fragments by electrophoresis.

(d) Transferring of separated DNA fragments to synthetic membrane such as nitro cellulose or nylon.

(e) Hybridisation with the help of VNTR Variable Number Tandem Repeat probes.

(f) Detection of hybridised DNA fragments by auto radiography.

DNA fingerprinting helps in solving problems related to dual parentage and criminal cases because just like fingerprints are specific for an individual, similarly DNA finger printing involves identifying difference in some specific regions in DNA sequence called repetitive DNA. Since DNA from every tissue such as blood, hair follicle, skin, bone, saliva, sperm shows some degree of polymorphism–they can be definitely used in identification in forensic medicine. Further more the polymorphisms are inherited by the offspring from their parent, it forms the basis of paternity testing in case of disputes.