Sem : IV

Paper I: Molecular Genetics, Biostatistics, Eco-diversity and Conservation

I. Choose the correct answer

1. The opposite of totipotency is [C]
a. Explant b. Callus c. Plasticity d. Node

2. The phenomenon of mature cells reverting to meristematic state to produce callus is [A]
a. Dedifferentiation b. Regeneration c. Redifferentiation d. Morphogenesis

3. Proteomics on the whole can be divided into [D]
a. Functional b. Structural c. Differential d. all

4. the steps in proteomic analysis are [D]
a. purification b. separation c. identification d. all

5. PCR is the process
(A) to amplify a stretch of amino acid sequences
(B) to amplify a stretch of nucleic acid sequences
(C) to cleave a stretch of long nucleotide sequences
(D) to amplify a stretch of deoxy ribo nucleotide sequences

6. The positive square root of mean of deviations of individual values of a data series from the arithmetic mean of the series [A]
a. Standard deviation b. Mean deviation c. Mode d. Median

7. $P(A \cup B)=P(A)+P(B)-P(A \cap B)$ [A]
a. Addition rule b. Multiplication rule c. Subtraction rule d. Division rule

8. Word is a word processing program and PowerPoint is presentation software, Users generally use [D]
a. create letters, forms, mailings and reports. b. creates presentations c. text-based documents d. all

9. As an interdisciplinary field of science, that combines biology, computer science, information engineering, mathematics and statistics to analyze and interpret biological data [A]
a. bioinformatics b. Biotechnology c. Nanotechnology d. Biochemistry

10. The collection and analysis of biodiversity data, such as taxonomic databases, or microbiome data [A]
a. Biodiversity informatics b. Ontologies and data integration c. biological sequence analysis
d. Next Generation Sequencing

11. English scientist Tim Berners-Lee is credited with inventing the ---------- while working for CERN on March 12, 1989
a. World Wide Web b. Bioinformatics c. Next Generation Sequencing d. Nanotechnology

12. Hypertext Markup Language (HTML) is the standard markup language for
a. creating web pages and web applications b. Bioinformatics c. Next Generation Sequencing d. databases

II. Fill in the Blanks

1. Plasmid are circular DNA molecules that exist independently of chromosomal DNA and can replicate autonomously.

2. The aim of restriction mapping is to locate the restriction sites of a given enzyme on a DNA molecule.

3. Double digest and partial digest are two well-studied techniques for restriction mapping.

4. Restriction fragment length polymorphism (RFLPs) obtained from restriction digests, are proving to be very valuable genetic markers in two areas of study: human gene mapping and forensics i.e. DNA fingerprinting

5. DNA fingerprinting is based on sequence polymorphisms, slight sequence differences (usually single base-pair changes) between individuals.

6. Proteomics is the total protein content of cell or that of an organism, helps to understand the structure and function of different proteins.

7. Sir Alec Jeffreys (1985-86) invented the DNA fingerprinting technique at Leicester University, United Kingdom.

8. The measure of dispersion is standard deviation which was first worked out by Karl Pearson

9. Variance (S^2) = $\Sigma d_i^2 / n - 1$

10. The standard deviation of the means is commonly termed as standard error and is equal to $SE = SD/\sqrt{n}$. It is a quantity which can be calculated directly from standard deviation of the sample and the sample size.

11. The unpaired 't'- test, data of independent observations are made on individuals of two different or separate groups or samples drawn from two populations or same population.

12. The symbol of chi-square is x^2, The test is used when the data fit into the yes or no, or change or no change categories.

13. The Multiplication Rule states that the probability that AA and BB occur is equal to the probability that AA occurs times the conditional probability that BB occurs, given that we know AA has already occurred. This rule can be written: $P(A \cap B) = P(B) \cdot P(A|B)$

1. What are the properties of a good vector for recombinant DNA transfer?
Ans: An ideal vector should have the following characteristics:
- Autonomously replicating i.e. it should have ori (origin of replication) region.
- Presence of at least one selectable marker
- Presence of a screening marker (β-galactosidase, GFP etc.)
- Presence of unique restriction enzyme site.
- Have multiple cloning sites (MCS)
- Small in size and easy to handle.
- Relaxed control of replication to obtain multiple copies.
- Presence of appropriate regulatory elements for expression of foreign gene.
- High copy number

2. DNA fingerprinting
The procedure for creating a DNA fingerprint consists of first obtaining a sample of cells, such as skin, hair, or blood cells, which contain DNA. The DNA is extracted from the cells and purified. In Jeffreys's original approach, which was based on restriction fragment length polymorphism(RFLP) technology, the DNA was then cut at specific points along the strand with proteinsknown as restriction enzymes. The enzymes produced fragments of varying lengths that were sorted by placing them on a gel and then subjecting the gel to an electric current(electrophoresis): the shorter the fragment, the more quickly it moved toward the positive pole (anode). The sorted double-stranded DNA fragments were then subjected to a blotting technique in which they were split into single strands and transferred to a nylon sheet. The fragments underwent autoradiography in which they were exposed to DNA probes—pieces of synthetic DNA that were made radioactive and that bound to the minisatellites. A piece of X-rayfilm was then exposed to the fragments, and a dark mark was produced at any point where a radioactive probe had become attached. The resultant pattern of marks could then be analyzed.

3. Short Cut Method for Calculating Standard Deviation

1. Any value of an unclassified series or mid-value of any class in case of classified series is treated as assumed mean (A).
2. The deviation (dx) of individual item or class is calculated by subtracting the assumed mean from the individual data (in case of unclassified series) or mid-value (^Q of each class (in case of classified series) dX = X – A.
3. The deviation values are squared to get dx^2 and then for ungrouped data and for classified data separate formulae are used to calculate standard deviation

4. What is the difference between MS word and MS PowerPoint?
1.Ms-word is a word processing program....you use it for many reasons which include letter writing....to writing a novel... Ms-powerpoint is a presentation program...you use it to make presentations in your office or any school assignment.
2. Ms-powerpoint requires a computer and the presentation generally is done via a projector. but the Ms-word is a simple word processing software (and you have seen hard-copy outputs of novels and letters, haven't you?)
3. using Word to create a graphical presentation is much more difficult than creating the presentation in PowerPoint
4.Users generally use Microsoft Word when they need to create letters, forms, mailings and reports. Users utilize PowerPoint when they need to create presentations for business meetings, seminars, workshops or training.
5.Word features tools like mail merge, document review, and a spelling and grammar checker. PowerPoint features design templates, custom animations and presentation timing rehearsal

5. Uses of the Internet in our Daily Life
1. Internet in Students daily life
Students have a free platform to learn throughout their lifetime. People in the age group 18 to 35 are among the most frequent users of the Internet today and these people are mostly students from all over the world. They are using the Internet to learn new skills and even acquire degrees in professional online courses.
2. Internet to increase the speed of daily tasks
Our routine is initiated by the Internet. It is the first thing in the morning we do- see our notifications and emails. The Internet has made human life so much easier, now the biggest and toughest tasks are done in minutes.
3. Internet for business promotion and innovation
We also use the Internet to promote our business. We can sell our products by using various e-Commerce solutions on the Internet. E-commerce is booming on the Internet and we can see new services and creative business starting up every single day, which in turn is creating jobs and thereby reducing unemployment.
4. Internet for shopping in our daily life
Shopping has become a hassle-free task now and almost anybody can order products online after comparison with other websites. The boom and the resultant competition in online shopping business are evident. Shopping sites are more interesting because of huge discounts different companies are offering customers.
5. Internet for research and development
The pace of work towards innovation and quality of research is developed by Internet tools. It is not tough to the research on the Internet. From small business owners to big universities everyone is getting the benefits of the Internet for research and development. Data analysis, data entry, data research, data management etc. services are in demand.
6. Internet provide us quick and free communication
The Internet is undoubtedly the most effective and far-reaching communication tool we have at present. Communication on the Internet is free and fast. We all are connected with each other on various computers and IP. Skype, chat messengers, social media is common for personal and professional purposes.
7. Internet by working remotely and providing business services
As the newer generations start to log into the Internet there are possibilities of completely new business and jobs. Nowadays the Internet is widely used in making money. If you have talent, then you can earn money by sitting at home on the Internet.
Thousands of freelancer or professionals are doing this on a daily basis to earn more than their bread and butter cost. Facebook business pages, Google AdWords, Paytm, blogs, YouTube channels, Amazon and other affiliate marketing methods etc. are various tools used to make money by providing things of value to Internet users.
8. Internet in Money Management

The use of the Internet is not limited to only earning money, it can also be used to manage money. We can now see hundreds of websites, apps, and other tools that help us in handling daily transactions, transfers, management, budget planning etc. and this trend is growing steadily.

9. Uses of the Internet in Everyday Politics

Internet is a great tool for politicians to connect with people. The uses of Internet are not only in personal and business life but it is common now in politics. Politicians are using various methods to influence people and youth on social media to favor their party. They are also using it to criticize other political parties.

10. Internet for Teaching and Sharing Knowledge with others

The Internet is a very important tool for educators. The Internet and its application is user-friendly and make students life easy. A teacher can use YouTube channels to teach students around the world.

11. Solving problems of others by the use of internet

You can determine the importance of internet that it is most used today to solve the problems of others. Online forms, social groups are the platform in which you can provide a solution.

12. Internet in Cashless Economy

The Internet is very useful for economic development. The use internet banking, mobile banking, and e-wallets also help at some point to decrease corruption in India or in any nation.

13. Internet in environmental development

The Internet can play very important role in Environmental development. We can use Internet tools such as social media and blogs by promoting environment development activities.

14. Internet for parents

Not all parents are computer and the internet literate. But the internet literate people can use the internet to guide their kids. They can analyze the content on the internet better than students.

15. Internet in Tour and Travel

Uses of Internet in tour and travelling are highly effective. We now search on Google before visiting the places. We booked our tour by the use of the Internet. We can read blogs about tour and travel experiences and tips. Tour and travelling service providers and companies are using innovative ways and marketing campaigns to attract people to their website to book the tour package.

16. Government policies and schemes are easily accessible by the use of Internet

17. Invention Engine

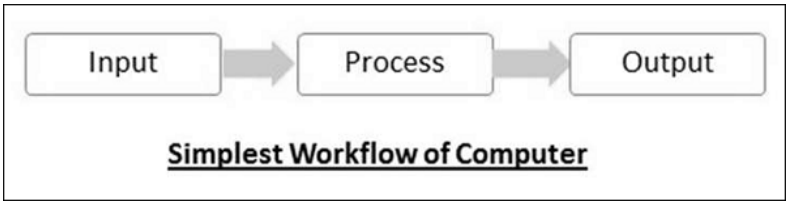
Such as machine learning, cloud computing, business intelligence, internet of things, automation and artificial intelligence tools and services evolution never possible without the Internet.

6. Introduction to computer

Computer is an electronic device that receives input, stores or processes the input as per user instructions and provides output in desired format.

Input-Process-Output Model

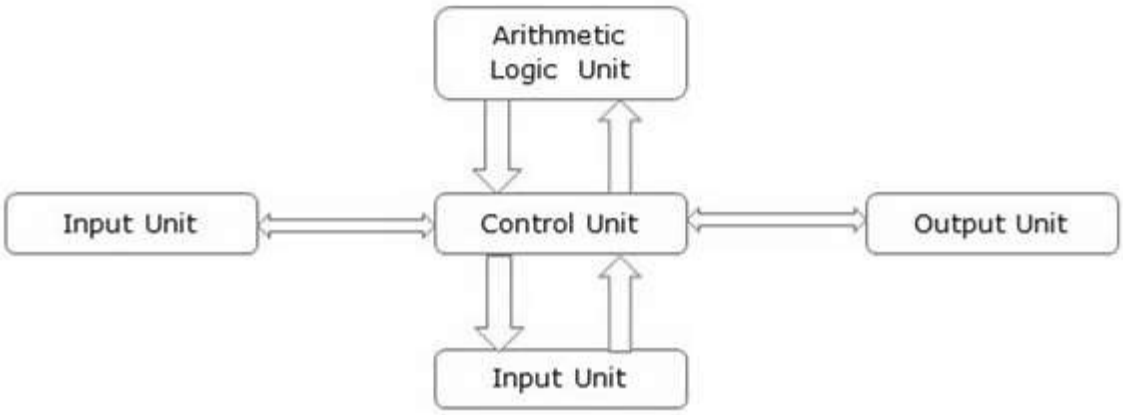
Computer input is called **data** and the output obtained after processing it, based on user's instructions is called **information**. Raw facts and figures which can be processed using arithmetic and logical operations to obtain information are called **data**.



The processes that can be applied to data are of two types −

- **Arithmetic operations** − Examples include calculations like addition, subtraction, differentials, square root, etc.
- **Logical operations** − Examples include comparison operations like greater than, less than, equal to, opposite, etc.

The corresponding figure for an actual computer looks something like this −



The basic parts of a computer are as follows –

- **Input Unit** – Devices like keyboard and mouse that are used to input data and instructions to the computer are called input unit.
- **Output Unit** – Devices like printer and visual display unit that are used to provide information to the user in desired format are called output unit.
- **Control Unit** – As the name suggests, this unit controls all the functions of the computer. All devices or parts of computer interact through the control unit.
- **Arithmetic Logic Unit** – This is the brain of the computer where all arithmetic operations and logical operations take place.
- **Memory** – All input data, instructions and data interim to the processes are stored in the memory. Memory is of two types – **primary memory** and **secondary memory**. Primary memory resides within the CPU whereas secondary memory is external to it.

Control unit, arithmetic logic unit and memory are together called the **central processing unit** or **CPU**. Computer devices like keyboard, mouse, printer, etc. that we can see and touch are the **hardware** components of a computer. The set of instructions or programs that make the computer function using these hardware parts are called **software**. We cannot see or touch software. Both hardware and software are necessary for working of a computer.

Characteristics of Computer

- **Speed** – Typically, a computer can carry out 3-4 million instructions per second.
- **Accuracy** – Computers exhibit a very high degree of accuracy. Errors that may occur are usually due to inaccurate data, wrong instructions or bug in chips – all human errors.
- **Reliability** – Computers can carry out same type of work repeatedly without throwing up errors due to tiredness or boredom, which are very common among humans.
- **Versatility** – Computers can carry out a wide range of work from data entry and ticket booking to complex mathematical calculations and continuous astronomical observations. If you can input the necessary data with correct instructions, computer will do the processing.
- **Storage Capacity** – Computers can store a very large amount of data at a fraction of cost of traditional storage of files. Also, data is safe from normal wear and tear associated with paper.