CHEMISTRY ONLINE
TUITION

Phone: +442081445350

www.chemistryonlinetuition.com

Email:asherrana@chemistryonlinetuition.com

BIOLOGY

THE CONTROL OF GENE EXPRESSION

Level & Board	AQA (A-LEVEL)
TOPIC:	GENETICS
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	6
TOTAL MARKS	46

Genetics - 1

1.

(a)

Mutation causes altered tertiary structure of viral attachment protein

Allows attachment protein to bind to receptors of other species.

(b)

1) Genetic fingerprinting.

2) Genome sequencing.

3) The polymerase chain reaction (PCR Test).

(c) Genome sequencing can help to identify genetic patterns related to the virulence of a disease, as well as genetic factors that contribute to immunity or successful vaccine response. All this information could lead to vaccines with better and more specific targets that elicit more successful protective immune responses.

OR

The scientists could identify proteins that derive from the genetic code

They could then identify potential antigens to use in the vaccine

2.

(a)

B cell antibody binds to viral specific/complementary receptor/antigen

B cell clones

Plasma cells release/produce monoclonal antibodies against the Virus

B/plasma cells produce/develop memory cells

(b) Genetic code refers to the instructions contained in a gene that tell a cell how to make a specific protein.

The genetic code is universal means that all living organisms use the same genetic code and this shows that all organisms share a common evolutionary

history. The genetic code is unambiguous. Each codon stands for (encodes) one amino acid unless it codes for a start or stops signal.

3.

(a) A genome is the complete set of genetic information in an organism. It provides all of the information the organism requires to function. In living organisms, the genome is stored in long molecules of DNA called chromosomes.

4.

(a)

They have specific tertiary structures

Complementary structure

(b) DNA, transcription factor and antibody

5.

(a) Improved diagnosis of disease.

Earlier detection of genetic predispositions to disease.

Rational drug design.

Gene therapy and control systems for drugs.

Pharmacogenomics "custom drugs"

(b) The field of computer science called bioinformatics is used to analyze whole-genome sequencing data. This involves algorithm, pipeline and software development, and analysis, transfer and storage/database development of genomics data.

OR

The main role of the clinical bioinformatician is to create and use computer programs and software tools to filter large quantities of genomic data – usually gathered through next-generation sequencing methods, such as whole genome sequencing (WGS) or whole exome sequencing.

6.

(a) DNA has helped find an evolutionary relationship between different organisms in order to create phylogenetic trees. Phylogenetic trees are used to show how an organism evolved by showing how closely related organisms are to one another. This allows scientists to study an entire group of organisms in order to make valid predictions for the future and develop new theories. Without this, we wouldn't be able to understand how some organisms are related to a specific species by looking at the similarities of the DNA sequences. The more similar the sequence of DNA the more closely related the two organisms are. This is important to be able to develop future predictions to know how this can affect the food chains and further diversification of species.

DNA screening can be used to identify any anomalies in the DNA sequence to predict possible diseases that the individual might be more likely to get. This is done using DNA probes, which can locate specific alleles on the DNA. Probes have specific bases that are complementary to the base sequence of the target allele. The probe can be fluorescent, meaning that if an individual has the mutated allele then the probe will appear fluorescent under a UV light. Without this technology and method of identifying a specific allele, the individual may not be aware that they are more at risk to developing a particular genetic disorder. Providing this information to the individual, will allow them to be more cautious and more attentive to their body and how they feel in order to identify any changes in their well-being. If any change is detected and the individual seeks help from a doctor early enough, the disease can be removed completely.

The process of introducing a foreign fragment of DNA into the genome containing the desired gene. This gene that is introduced is referred to as the recombinant gene in the technique is known as recombinant DNA technology.

Steps of making recombinant DNA :

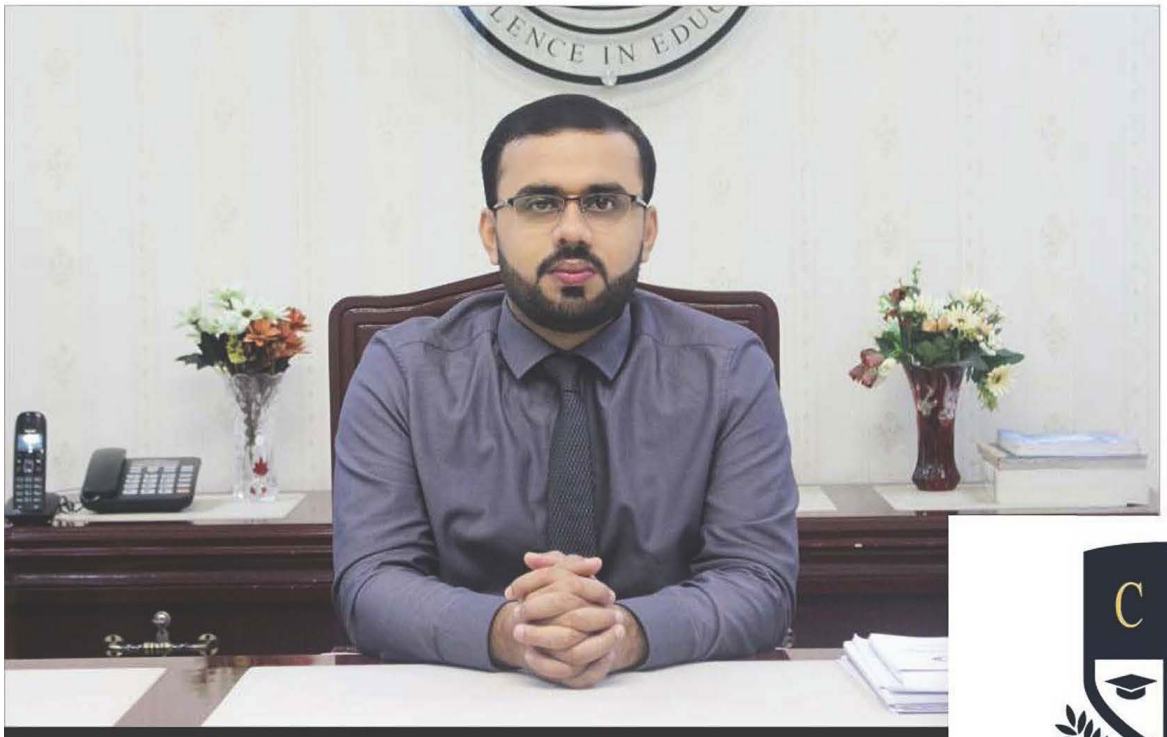
1. Isolation of DNA: Being a nucleic acid enclosed in the nucleus isolation of DNA is not an easy task, isolation of DNA is a process which is controlled by enzymes.

The plant and animal cells were treated with certain enzymes such as cellulose for plants lysozyme for bacteria and chitin for fungi are used to isolate DNA from the cells.

2. Fragmentation of DNA: The isolated and purified DNA is treated with a restriction endonuclease which cut the DNA into fragments. And the desired gene is obtained.

3. Amplification of gene of interest: Polymerase chain reaction is a process to amplify the gene once the proper gene of interest has been cut using restriction endonuclease.

Insertion of recombinant DNA into the: This is the last step in recombinant DNA technology.



DR. ASHAR RANA

CHEMISTRY ONLINE TUITION
Phone: +442081445350
www.chemistryonlinetuition.com
Email: asherrana@chemistryonlinetuition.com

- Founder & CEO of Chemistry Online Tuition Ltd.
- Tutoring students in UK and worldwide since 2008
- Chemistry, Physics, and Math's Tutor

CONTACT INFORMATION FOR **CHEMISTRY ONLINE TUITION**

- UK Contact: 02081445350
- International Phone/WhatsApp: 00442081445350
- Website: www.chemistryonlinetuition.com
- Email: asherrana@chemistryonlinetuition.com
- Address: 210-Old Brompton Road, London SW5 OBS, UK