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1. Griffith's based his 'transforming principle' experiment on earlier experiments by Avery, MacLeod and McCarty. True or False

2. In the Watson and Crick structural model of DNA the base pairs are orientated parallel to the length of the helix. T/F

3. Avery, MacLeod and McCarty used DNAse, RNAse and Protease to treat cell lysates in their experiments; how did they demonstrate that carbohydrates were not the transforming principle.

    3.1 DNAse-treated samples did not transform Streptococcus pneumoniae 'R' strain cells, but RNAse and Protease-treated samples did.

    3.2 Protease-treated samples did not transform Streptococcus pneumoniae 'R' strain cells, but DNAse and RNAse-treated samples did.

    3.3 RNAse-treated samples did not transform Streptococcus pneumoniae 'R' strain cells, but DNAse and Protease-treated samples did.

4. In double stranded DNA molecule, how are the orientations of the two strands depicted?

    4.1 A

    4.2 With one end of the double stranded DNA molecule marked with the first strand's 3'-OH group and the second strand's 5'-P group, and the other

end marked with the first strand's 5'-P group and the second strand's 3'-OH group.

4.3With one end of the double stranded DNA molecule marked with each strand's 3'-OH groups and the other end marked with their 5'-P groups.

5. Early biochemists could not isolate pure DNA from cells without including some protein and thought that:

DNA and proteins were found in the same sub-compartment of c	
	DNA formed the link between many different proteins.
	DNA extraction procedures resulted in some level of protein contamination.
	DNA linked protein subunits to produce functional enzymes.
	DNA linked proteins of the same class.

6.Chargaff's rules state that the molar ratio of Adenine in DNA equals that of Thymine, and the molar ratio of Cytosine equals that of Guanine. True/False

7. Levene suggested that DNA was comprised of a series of tetranucleotides containing each of the four bases, Adenine, Cytosine, Guanine and Thymine. True/ False

8. Mendel's Law of Segregation states that the alleles separate during gamete formation, and gametes only contain one allele for each gene. True/False

9. Mendel's Law of Segregation was important when it was first proposed but is now seen as racist. True/False

10.During the termination of translation, what binds the 'A' site?

The Stop anticodon.	
	The Release factor.
	The Rho subunit.
	The Completion ('C') site.

11. In the 'glove' model of ribosome shuffling, what do the A, P and E sites represent when filled by charged amino acids?

The thumb moving between three positions.	
	The knuckles.
	The fingers.

12.The Central Dogma of Molecular Biology describes how genetic information is converted into RNA and then into proteins which express phenotype. True/False

13. How many reading frames could a section of double-stranded encode? One, two, four,six,eight.

14. At the level of tertiary structure, sections of the peptide interact with

Other proteins.

	Sections of other peptides.
	Other sections of the peptide.
	The amino acids within that section.

15. What links tRNAs with their cognate amino acids?

Aminoacyl tRNA synthase.	
	Aminoacyl tRNA polymerase.
	Aminoacyl tRNA ligase.

16. Genes have a number of additional DNA sequences outside of the ‘coding sequence’ which are used in the control of gene expression. True/False

17. Translational recoding involves using the reverse strand of a gene sequence to produce a different protein. True/False

18. Amino acids in proteins interact with one another at a number of different levels; what characterises quaternary structures?

Interactions between sections of amino acids within the same or in different peptides.	
	Interactions between amino acids within small sections of the peptide.
	Interactions between sections of amino acids in

19. During DNA replication, DNA Polymerase continuously synthesizes new DNA:

From both parental strands but in opposite directions, with ligase repairing any breaks.	
	Alternating from one parental strand to the other to produce a single new continuous strand.
	From one parental strand, and discontinuously from the other, with the short fragments ligated together into a second, continuous strand.
	Discontinuously from both parental strands, with the short fragments ligated together to produce two

20. In Meselson and Stahl's DNA replication experiment, 14N and 15N radioisotopes were used to:

	Produce light and heavy DNA which could be differentiated by centrifugation.
	Produce light and heavy DNA which could be differentiated by the radio-active decay of the light
	Produce light and heavy DNA which could be differentiated by cell buoyancy differences.

21. The nucleosome consists of four different histone subunits (H2A, H2B, H3 and H4), a section of DNA wrapped around these, and a final locker histone (H1) to keep the DNA in place. True/False

22.Classical 'chromosomes' which can be observed at low magnification have the following features:

A pinched-in ‘waist’ referred to as the centromere and extended ‘arms’ that terminate in telomers, and a banding pattern reflecting differences in heterochromatin	
	A pinched-in ‘waist’ referred to as the centromere consisting of heterochromatin at the centre of extended ‘arms’ and ‘legs’ consisting of telomer
	A pinched-in ‘waist’ referred to as the centromere at the centre of short extended ‘arms’ and longer ‘legs’ which have alternating telomers and either

23. DNA Primase produces a RNA primer for:

Protein synthesis by ribosomes.	
	RNA synthesis by RNA Polymerase.
	DNA synthesis by DNA Polymerase.

24. The isolation of high-quality DNA from cells is important for many molecular biology, diagnostic and forensic tests because:

DNA is an acid which must be neutralised before any further experimentation is possible.	
	DNA is often bound by proteins etc., in cells, which may interfere with the test.
	DNA needs to be preserved in specialised buffers.

25. Vectors used in gene cloning include a multiple cloning site which allow the efficient insertion of a DNA fragment using Restriction enzymes and Ligase. T/F

26. DNA ladders used in gel electrophoresis are based on:

The Watson and Crick crystal structure.	
	A collection of fragments with known lengths.
	A long piece of DNA with missing phospho-ribose links which allow it to fall into a series of smaller
	Chargaff's base-pairing rules.

27. During normal gel electrophoresis, DNA has a negative charge and moves:

More quickly with increasing size, as this means it has more negative charge-points.	
	More slowly with increasing size, as longer molecules are more easily entangled in the gel matrix.
	More quickly with increasing size, as longer molecules cannot enter small pores in the gel where
	More slowly with increasing size, as charge is correlated with length.

28. What are restriction enzymes?

RNA endonucleases.	
	RNA exonucleases.
	DNA exonucleases.
	DNA endonucleases.

29. If a circular plasmid has one recognition site for one restriction enzyme and two sites for a second restriction enzyme, how many pieces of DNA would be produced after a double-digestion? One, two, three, four, five

30. If a circular plasmid has two recognition sites for a restriction enzyme, how many pieces of DNA would be produced after digestion? One, two, three, four or five

31. Could partial (incomplete) digestion of a 2.7 kb PCR product expected to produce fragments of 0.2, 1.0 and 1.5 kb explain a digestion pattern of 0.2, 1.0, 1.2 and 1.5 kb? Yes/NO

32. Could partial (incomplete) digestion of a 2.7 kb PCR product expected to produce fragments of 0.2, 1.0 and 1.5 kb explain a digestion pattern of 0.1 and 2.6 kb? Yes/NO

33. In order to determine the size of an unknown DNA fragment by gel electrophoresis, what is needed?

Random fragment library.	
	Indication of the time spent electrophoresing.
	Markers indicating positive and negative electrodes.
	DNA ladder of known sizes for comparison.

34. In order to determine the size of an unknown fragment of DNA using a DNA ladder and gel electrophoresis, how is the standard curve produced?

By plotting the distance moved by each of the known fragments (in mm) in the DNA ladder against their size	
	By plotting the distance moved by the unknown fragment (in mm) against its expected size (in kb).

35. What effect does increasing the gel matrix concentration have on the separation of DNA fragments by gel electrophoresis?

Small fragments very close in size are separated out further but larger fragments are not separated as much.	
	Larger fragments become more widely-spaced on the gel but smaller fragments tend to concentrate at the leading edge of the gel front.
	Gel matrix concentration has little effect on the migration of DNA fragments during gel electrophoresis; changing the voltage has a greater

36. Can the size of DNA fragments be determined using capillary electrophoresis when each separate DNA sample must be run one after the other, rather than at the same time?

Yes, because DNA fragments will always move in the same direction in an electrical field.	
	No, because the DNA ladder must be run at the same time as the unknown samples.
	No, because cleaning between runs will affect the gel matrix and the following run will be under slightly

	Yes, if each run is for the same length of time and at the same voltage.

37. Can the polymerase chain reaction (PCR) be modified to allow amplification of the target sequence if the primers do not perfectly base-pair with the template DNA? No/Yes

38. In designing oligonucleotide primers for the polymerase chain reaction (PCR) it is important to orientate the primers such that

One binds the DNA template strand facing downstream with the 5'-P and the other binds the template strand facing upstream with the 3'-OH.	
	One primer is on either end of the target sequence with the 3'OH ends of each facing inwards.
	The reverse primer is positioned immediately behind the forward primer in the 5'-3' direction to completely cover the target sequence.
	One binds the DNA template strand facing downstream with the 3'-OH and the other binds the template strand facing upstream with the 5'-P.

39. Next generation sequencing (NGS) technologies have dramatically changed the way DNA sequence information can be used in personalised medicine, because:

	Much longer section of DNA can be sequenced compared to the old-fashioned Sanger method.
	NGS equipment can be run directly by computers without the need for technicians.
	DNA sequencing has become a high-throughput technology reducing costs and improving efficiency.
	DNA can now be purified from simple blood samples using one-step isolation procedures.

40. The polymerase chain reaction (PCR) is a method which amplifies specific DNA sequences by extending each two-fold in every cycle. True/False

41. Mutations which effect enzymatic residues in a protein may have a significant impact on activity, but mutations elsewhere in the protein never have a significant impact, so long as the protein is still expressed. True/False

42. Can a frameshift mutation in the coding region of a gene result in an insertion of one or more amino acids in the expressed protein? No/Yes

43. Delbrück and Lauria, Newcombe, and Lederberg and Lederberg undertook experiments which demonstrated that mutations (mutants) occurred in bacterial populations before they were selected for, and that natural selection worked on bacteria in the same way it was known to act on more complex organisms. False/ True.

44. Loss-of-function mutations in the coding region of a gene are caused by point mutations or a deletion effecting several codons, but never by truncation of the coding region. True/False

45. If a locus only has two alleles and the frequency of the first is 0.30, what is the frequency of the second?

0.30.	
	0.40.
	0.50.
	0.60.
	0.70.

46. Mutation of the stop codon at the end of the coding region of a gene can never result in longer proteins while mutation of an internal codon into a stop codon will result in a shorter, truncated protein. True/False

47. A frameshift mutation in the coding region of a gene may result in a hybrid protein in which the section after the frameshift has a completely new sequence of amino acids compared to the original peptide. True/False

48. In a forensic investigation, do common haplotypes make the identification of criminals more certain than rare haplotypes or harder? Less certain/more certain

49. In a two allele locus (p, q), what is the implication of finding that there are no pq genotypes in a population?

The Hardy-Weinberg Equilibrium holds; either p or q alleles must be at very low frequencies.	
	The Hardy-Weinberg Equilibrium holds; pp and qq individuals are phenotypically identical.
	The Hardy-Weinberg Equilibrium does not hold; pq individuals cannot be distinguished from either pp or qq individuals by phenotypic observation.
	The Hardy-Weinberg Equilibrium does not hold; there must be some sort of restraint or selection against pq

50. If you were a criminal and concerned about leaving trace DNA evidence at the scene of a crime, would you rather have a very common allele haplotype or a very rare one to avoid prosecution? Common/Rare