



BIOLOGY 2020

Unit 3

Key Topic Test 2 – Nucleic acids and Proteins

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

SOLUTIONS

SECTION A: Multiple-choice questions (1 mark each)

Question 1

Answer: A

Explanation:

Amino acids are the monomers of proteins

Question 2

Answer: A

Explanation:

Universal means that DNA is found in all living organisms. Degenerate means that there is more than one triplet code or codon for each amino acid. This is also referred to as redundant.

Question 3

Answer: D

Explanation:

DNA is coded in groups of 3 called triplets, RNA the group of 3 is a codon and in tRNA an anticodon.

Question 4

Answer: B

Explanation:

The proteome is all the proteins expressed by a cell, tissue or organism

Question 5

Answer: D

Explanation:

Tertiary structures are made from secondary structures and so have the same features such as beta pleated sheets in a 3D shape and form disulphide bonds when the 3D shape is formed. 2D shapes do not form functional proteins

Question 6

Answer: C

Explanation:

Protein functional diversity refers to the large range of roles that functional proteins perform in an organism.

Question 7

Answer: C

Explanation:

Condensation reactions occur when monomers such as amino acids or sugars are joined together. R groups do not participate in condensation reactions, OH groups do

Question 8

Answer: B

Explanation:

Quaternary structures occur when two or more polypeptide chains join

Question 9

Answer: B

Explanation:

DNA and RNA molecules are both found in the cytosol of prokaryotes as no nucleus is present to separate the two. Only RNA contains introns and exons

Question 10

Answer: D

Explanation:

A is incorrect as splicing does not occur in prokaryotes. B is incorrect as exons are not removed from pre-mRNA during splicing. C is incorrect as mRNA has a poly A tail and methyl cap added not the other way around. D is correct as pre-mRNA has to be changed to leave the nucleus for translation.

Question 11

Answer: D

Explanation:

A is incorrect as tRNA does not undergo a condensation reaction, B is incorrect as tRNA has anticodons, C is incorrect as tRNA picks up amino acids not mRNA.

Question 12

Answer: B

Explanation:

A is incorrect as tRNA and rRNA are not found in the nucleus, B is incorrect as only mRNA has introns removed and D is incorrect as all are found in both prokaryotes and eukaryotes.

Question 13

Answer: C

Explanation:

The degenerate triplet code means that a single change like a point mutation may not influence the amino acid that is translated as more than one triplet codes for an amino acid

Question 14

Answer: C

Explanation:

Alternate splicing can result in multiple proteins being made from one gene as different combinations of exons are spliced together. D is incorrect as exons from other genes are not used when splicing

Question 15

Answer: D

Explanation:

tRNA delivers a specific amino acid to the complementary mRNA codon after which a condensation reaction occurs to join the polypeptide

SECTION B: Short-answer questions

Question 1

a. RNA splicing/RNA processing

1 mark

b.

Label	Structure
B	Exons
C	Introns
D	Methyl cap
E	Poly A tail

4 marks

c. Structure C is removed as introns are non-coding sections of DNA (1) that are not expressed to make a protein (1)

2 marks

d. Both structures are added to protect the mRNA from degradation from enzymes in the cytosol

1 mark

e. Mature mRNA

1 mark

f. Inside the nucleus

1 mark

g. The mRNA leaves the nucleus enters a ribosome to begin translation

1 mark

h. Alternate splicing means that different forms of mRNA are generated from the same gene (1) As the mRNA is made different exons are spliced together (1) which code for different amino acids resulting in different 3D protein structures (1)

3 marks

Question 2

a. Transcription (1) Nucleus (1)

2 marks

b. Condensation reaction

1 mark

c. DNA – Double stranded, contains deoxyribose sugar, contains thymine
RNA – Single strand, contains ribose sugar, contains uracil

3 marks

d. The RNA is pre-mRNA (1) which has not gone through RNA splicing where introns are removed, and exons are spliced together to be ready for translation into a protein (1)

2 mark

Question 3

- a. Condensation polymerisation 1 mark
 - b. A = Anticodon, B = Ribosome, C = Codon 3 marks
 - c. Ser and Asp 2 marks
 - d. More than one codon codes for the same amino acid (1) eg GAU and GAC both code for Asp 2 marks
- Total 45 marks