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A2 Biology OCR

Unit F215: Control, genomes and environment

Module 2.3 Genomes and gene technologies

Answers

1. (i) plasmid cut by restriction enzyme;
at specific sequence;
same enzyme as used to cut (insulin) gene;
sticky ends / described;
ref. complementary sticky ends;
ligase seals (sugar-phosphate) backbone / AW; max 4

(ii) *credit any two from the following*:

1 antibiotic resistance (gene) introduced and survivors have plasmid;

2 fluorescent marker (gene) introduced and glowing bacteria have plasmid;

3 identify bacteria producing insulin using antibodies; 2

[6]

2. *referring to pig insulin:*
ethical / religious, reasons;
incompatibility / lack of tolerance / immune response; ora
not exactly the same as / less effective than, human insulin; ora

referring to human insulin from bacteria:
engineered insulin is cheaper; ora
greater supply of engineered insulin; ora 1

[1]

3

(i) endonuclease;
cuts DNA;
with sticky or blunt ends;
at, palindromic/AW/specific/4 to 6 base pair/restriction, site;
from bacteria;
for cutting ‘phage DNA; max 3

(ii) 2 sources DNA;
ref. sticky ends;
complementary binding;
H-bonds between bases;
A to T and C to G;
nicks in sugar-phosphate backbone sealed/AW;
by ligase; max 4

[7]

4

max 7 for the process of genetic engineering
max 2 for the advantages

1 identify / find, gene (for insulin) / length of DNA coding for insulin;

2 obtain / isolate / extract,
gene / length of DNA (for insulin); obtain / isolate / extract,
mRNA (for insulin);

3 restriction enzyme / named e.g.; reverse transcriptase;

4 cut plasmid; cut plasmid;

5 use same restriction enzyme; use restriction enzyme / named e.g.;

6 ref to, complementary ends / sticky ends / described;

7 insert, gene / AW, into plasmid;

8 recombinant DNA;

9 plasmid uptake by bacteria;

10 identify those bacteria that have taken up the plasmid;

11 provide with, raw materials / nutrients;

12 fermenter / bioreactor;

13 bacteria produce insulin;

14 extract and purify / downstream processing;

15 AVP; **e.g.**. detail of uptake by bacteria
method of identifying those that took up plasmid
PCR
ligase *7 max*

16 advantage 1; e.g. more reliable supply

17 advantage 2; greater / faster, production
overcomes ethical problem described
less risk of disease
less risk of, rejection / side effects
human insulin so more effective 8 max

QWC – clear, well organised using specialist terms;
award QWC mark if four of the following are used 1

gene	plasmid
restriction enzyme	complementary
named e.g. of a restriction enzyme	sticky end
reverse transcriptase	recombinant DNA
fermenter / bioreactor	

[9]

5

(i) 4 - 6 base pairs;

palindromic / AW;
specific sequence; max 2

(ii) yes, same sticky ends / sticky ends shown; GATC / CTAG
complementary (bases);
hydrogen bond;
A with T;
C with G; max 3

(iii) two correct cuts;

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G| A T T C A G A A T T T C G| A A T C
C T A A |G T C T T A A A G C T T A |G
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1

[6]

6

1 restriction enzyme to cut gene from genome;
2 and, plasmid / artificial chromosome / DNA of vector;
3 same restriction enzyme;
4 if cut with sticky ends then join;
5 if cut with blunt ends then, sticky ends / nucleotides, added; **R** bases
6 with C bases one end and G bases other;
7 requires terminal transferase;
8 (DNA) ligase needed to seal nicks in DNA backbone;
9 ref to join phosphate - sugar / adds phosphate;
10 DNA may be produced by reverse transcriptase;
11 from mRNA;
12 single strand made double stranded by DNA polymerase;
13 wanted DNA replicated by polymerase chain reaction (PCR);
14 using, DNA polymerase with high optimum temperature /*Taq* polymerase;
15 AVP;
max 8

QWC - clear, well-organised answer using specialist terms; 1
award QWC mark if three of the following are used

endonuclease
terminal transferase
reverse transcriptase
(DNA) ligase
DNA polymerase
PCR
correct use of nucleotide and base
sticky ends
blunt ends [9]

7

(i) ref to, rDNA / recombinant DNA;
restriction enzyme(s);
cut DNA at specific site(s);
detail site(s);
ref to viral DNA and, human DNA / DNA of gene;
ref to sticky ends;
complementary binding;
detail of binding; A = T / C ≡ G / hydrogen bonds
ligase to seal 'nicks' in (sugar-phosphate) backbone; max 4

(ii) has effect when added to genome;
not masked;
no need to, remove / inactivate, recessive / mutant, allele; max 2

[6]