Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) 1. No (functional) cones
OR
Only rods;

2. Cones are connected to a single neurone
OR
Several rods connected to a single neurone;
Accept correct reference to retinal convergence
Accept 'bipolar/nerve cell' for neurone
Accept 'many' 2 or more for 'several'

3. (Cones) Separate (sets of) impulses to brain
OR
(Rods) Single (set of) impulse/s to brain;
Accept 'optic nerve' for brain
Reject 'signals', 'messages' for 'impulses'
Accept 'action potential'

3

(b) 1. Correct answer in range 42 – 44% = 2 marks;;

2. Incorrect answer but shows that understanding that 2pq = heterozygous/carriers = 1 mark;
Accept 1 – (p^2 + q^2)
Accept understanding of 2pq by using calculation involving 2 × two different numbers

2

(c) 1. (Gene/allele) is on the X chromosome;

2. Females require two alleles/females can be heterozygous/carriers **and** males require one allele;
Reference to allele is essential but only required once
*Reference to females **and** males required*
Reject dominant allele

2

(d) 1. Green sensitive pigment/cones non-functional
OR
Cones that detect green light non-functional;

2. Three different types of pigment/cone;

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3. Other/different colours ('seen') due to stimulation of more than one cone/pigment;

1, 2 and 3. Reject reference to 'green cones'/ 'blue cones / 'red cones' but once only

1, 2 and 3. Reject reference to 'green pigment'/ 'blue pigment/ 'red pigment but once only and only if 'green cones' etc, (see above) has not been rejected.

3

(e) 1. (iPS cells) divide;

2. (iPS cells) develop/differentiate into (green sensitive) cones;

Accept 'produce'/'specialise' 'turn in to' / 'genes switched on' / 'turned on' for 'develop' but ignore 'grow'

Reject develop into 'green cones'/blue' cones'/'red cones'

Ignore develop/differentiate into (blue/red sensitive) cones;

Reject reference to develop in to 'green pigment'/ 'blue pigment/ 'red pigment

2

(f) 1. (Use of iPS cells) long-term;

Accept 'gene therapy short-term' or 'only two years'

Accept 'permanent'

2. (Use of iPS cells) less chance of rejection/immune response;

3. (Use of iPS cells) single treatment;

Accept 'gene therapy 'regular/frequent treatment''

4. Harm/side effects from using viruses (in gene therapy);

3 max

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Q2.

(a) 1. Restriction endonucleases/enzymes;

2. (Cut DNA) at specific <u>base</u> sequences/pairs

OR

(Cut DNA) at recognition/restriction sites;
Accept 'at palindromic sequences'

2

(b) 1. (For) primers;

2. (To produce) a complementary base sequence

OR

(Primers provide starting sequence) for DNA/taq polymerase

OR

(Primers) stop (original) DNA strands re-joining;

2

(c) Correct answer of 1.35×10^{16} = **2 marks**

OR

Correct answer of 1.36×10^{16} (due to rounding at an earlier stage of the calculation) = **2 marks**

OR

Correct answer of 1.4×10^{16} = **2 marks**;;

Incorrect answer but shows 2^{50} = **1 mark**;
Ignore any numbers after 1.35.

2

(d) 1. Number of nucleotides/repeats/bases

OR

Length/mass;
Accept weight for mass.
Ignore 'short' on its own.
Accept number of base pairs.
Ignore density/size.

2. (Negative) charge;
Accept 'polarity'.
Reject positive (charge).

2

[8]

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