

# Cell replication

## Question Paper

Level	Pre U
Subject	Biology
Exam Board	Cambridge International Examinations
Topic	The Cell
Sub Topic	Cell replication
Booklet	Question Paper

**Time Allowed:** 48 minutes

**Score:** /40

**Percentage:** /100

**Part - B**

- 1 A type of pheasant occurs in a range of colours, especially when bred in captivity. It may, for example, have green or purple plumage.

Sometimes when a green male is crossed with a green female all the offspring, male and female, are green. However, sometimes a green male crossed with a green female results in offspring in which the majority of the offspring are green, but in which some of the females are purple, as shown in Table 2.1.

**Table 2.1**

phenotype	number of offspring
green male	7
green female	3
purple female	4

- (a) (i) Using the results shown in Table 2.1, a geneticist proposed a hypothesis which predicted a 3:1 ratio of green:purple phenotypes. She used the  $\chi^2$  test to test her hypothesis.

Complete Table 2.2 to calculate  $\chi^2$ .

**Table 2.2**

	green plumage	purple plumage
observed (O)	7 + 3 = 10	4
expected (E)	10.5	3.5
$O - E$		
$(O - E)^2$		
$\frac{(O - E)^2}{E}$		

$\Sigma \frac{(O - E)^2}{E} = \chi^2$	
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- (ii) Draw a conclusion from your calculation in Table 2.2, given that the critical value for  $\chi^2$  at  $p = 0.05$  with one degree of freedom is 3.84. Explain why this conclusion should be treated with caution.

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- (b) Plumage colour in pheasants is sex-linked.

In birds, the sex chromosomes are referred to as W and Z, rather than Y and X as in mammals. The W chromosome has no genes that affect plumage colour. The heterogametic sex is the female, **not** the male. Thus the male has two Z chromosomes (ZZ) and the female has one W and one Z chromosome (WZ).

- (i) Use a genetic diagram to explain the results in Table 2.1.

[3]

- (ii) Using the same symbols as in (b)(i), indicate the genotypes and phenotypes of the parents which could give rise to purple male offspring.

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..... [2]

[Total: 10]



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