OCR GCSE 21ST CENTURY BIOLOGY B · J257

BIOLOGY



EXAM QUESTION PACK

B1.2 HOW IS GENETIC INFORMATION INHERITED? (FOUNDATION)

SCORE	PERCENTAGE
/62	%

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1. In humans, sex is determined by chromosomes.

Write down the combination of sex chromosomes in the body cells of females and males.

Females _____ Males _____

[1]

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2.

(i) Some human diseases are not caused by microorganisms, they are inherited. Cystic fibrosis is an example of a disease that is inherited. It is caused by a recessive allele.

Cystic Fibrosis alleles F = dominant f = recessive

Which of the following genotypes would result in the person being affected by cystic fibrosis?

Put a tick (✓) in the correct box.

FF ☐

Ff ☐

fF ☐

ff ☐

[1]

(ii) Two parents have a genotype Ff.

Work out the probability of them having a child with cystic fibrosis.

		Mother	
		F	**f**
Father	**F**		
	f		

Probability _____

[2]

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3(a). Albinism is an inherited condition where affected people are unable to make a pigment called melanin. Skin, hair and eyes may all be affected and the person will be very pale skinned with white-blonde hair and possibly red eyes.

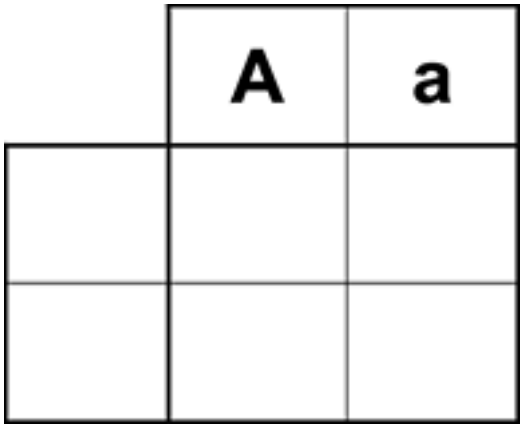
Esther and Simon's daughter, Livvy, has albinism.

Esther and Simon are both heterozygous (carriers).

Complete the Punnett square below to show how Esther and Simon passed the alleles for albinism to Livvy.

Use **A** to represent the allele for normal melanin production and **a** to represent the allele for albinism.

Livvy's genotype is aa.



[2]

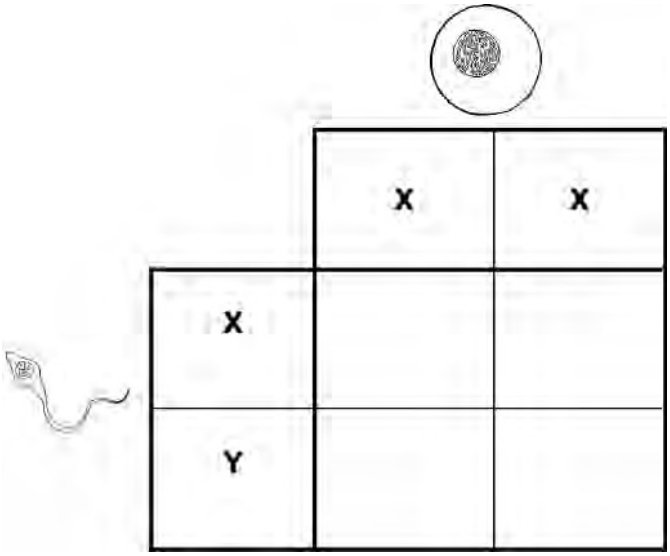
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(b). In humans, sex chromosomes determine gender.

Esther and Simon are having another child.

Use the diagram below to show the probability of Esther and Simon's second child being a boy.



Probability _____

[2]

(c). Use the example of the inheritance of albinism to describe the difference between **homozygous** and **heterozygous**.

_____

_____

_____

_____ [2]

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4(a). Jane goes to her doctor to have a genetic test.



The doctor finds that Jane has a faulty allele.

Women with this faulty allele are at greater risk of cancer.

The doctor tells Jane there is an 87% chance she will develop breast cancer.

(i) What is the **probability** that Jane will develop breast cancer?

Draw a (ring) around the correct answer.

1 in 87 0.13 0.87 87

[1]

(ii) What would it mean for Jane if her probability of developing breast cancer was 1?

---

[1]

(b). Jane could have major surgery to reduce her risk of developing breast cancer.

The surgery would remove tissue from Jane's body.

What must she consider when deciding whether or not to have the surgery?

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[3]

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(c). Jane can never be free from the risk of cancer.

Suggest why.

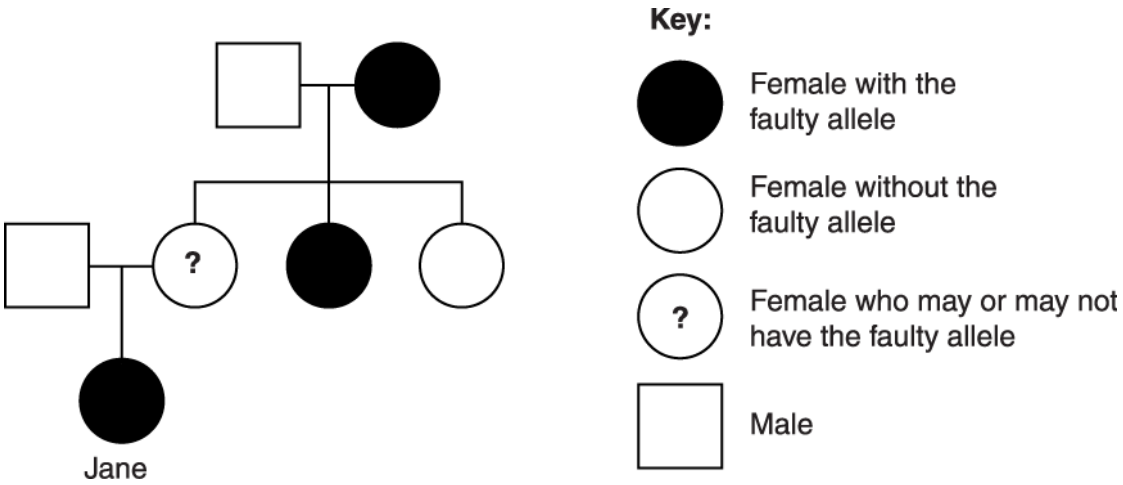
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[1]

(d). Jane's doctor looks at information about the allele and at part of Jane's family tree.

Information about the allele:

The normal allele can become faulty during a person's life. This happens in one person out of every 1000.



The doctor concludes that Jane's mother probably has the faulty allele.

What evidence supports this conclusion?

Your answer should include evidence from the family tree and from the information about the allele.

---

[2]

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5. Which cells in a human usually contain **pairs** of chromosomes?

Put a tick (?) in the box next to the correct answer.

all human cells	☐
human body cells	☐
human egg cells	☐
human sperm cells	☐

[1]

6. Ali and Mary do not have cystic fibrosis, but their baby does.

What does this tell us about Ali and Mary's genes for this disorder?

---

[1]

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7(a). Steve and Jane are expecting a baby.

Jane's sex chromosomes are XX.

Complete the Punnet square to show the possible combinations of sex chromosomes in their baby.

		Jane	
		X	X
Steve			

[2]

(b). Steve and Jane already have two baby boys.

Steve says there is a higher chance that the new baby will be a girl.

Explain why Steve is wrong.

---

[2]

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8. Poppy is two years old.

Her mother is pregnant with another baby.

The new baby has the same father as Poppy.

However, the new baby will look different to Poppy and to both of her parents.

Explain why.

The quality of written communication will be assessed in your answer.

---

[6]

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9. Every person has two alleles for a gene.

These alleles can be dominant or recessive.

Draw **one** straight line from each **pair of alleles** to the **characteristic** that the person would have.

Pair of alleles	**Characteristic**
two dominant alleles	the dominant characteristic
one dominant and one recessive allele	the recessive characteristic
two recessive alleles	

[2]

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10(a) Write down the combination of sex chromosomes in the body cells of human males and females.

.

males _____ females _____

[1]

(b).

(i) In the UK, the expected ratio of male to female births is 1 : 1.

2000 babies are born at one hospital in a year.

How many of these would you expect to be female?

answer = _____ [1]

(ii) In another country, the ratio of males to females born is 1.2 : 1.

1000 females are born in a day.

Calculate how many males you would expect to be born on the same day.

Show your working.

answer = _____ [2]

(iii) Suggest why the ratio of males to females born in some countries is 1.2 : 1.

_____

_____

_____ [2]

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11(a) Cystic fibrosis is an inherited disorder.

.

Sharon and Eric are both carriers for cystic fibrosis.

Sharon is pregnant. Eric is the father of the baby.

(i) Complete the diagram to show the possible combinations of alleles for their baby.

Key

T = normal allele
t = cystic fibrosis allele

		Sharon	
		T	.....
Eric	T		
	.....		

[2]

(ii) Calculate the probability that the baby will have cystic fibrosis.

probability of baby having cystic fibrosis = _____ [1]

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(b). Sharon and Eric discuss whether to have their fetus (unborn baby) tested.

This is what they discuss.

A The results of the test might not be accurate.
B The test will enable us to plan treatment if the fetus has cystic fibrosis.
C Cystic fibrosis is a serious disease.
D We would rather not know whether our baby has cystic fibrosis.
E The test is painful for the mother.

Sharon and Eric decide to have their fetus tested.

Use the ideas of benefit and risk to suggest why they made that decision.

---

[2]

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12. Cystic fibrosis and Huntington's disease are genetic disorders in humans.

They are inherited in different ways.

Explain how they are inherited, including genetic diagrams in your answer.

You must include a key for the symbols you use.



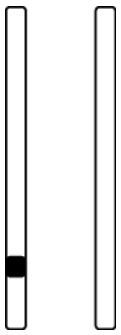
The quality of written communication will be assessed in your answer.

[6]

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13. The gene that controls polydactyly is shown on one of the chromosomes below.

(i) Draw the gene in the correct position on the second chromosome of the pair.



[1]

(ii) What is the maximum number of alleles one person can have for this gene?

Put a ring around the correct answer.

0 1 2 23 46

[1]

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14. A difference between humans is whether they are male or female.

A student looks at a Punnett square that shows inheritance of sex.

		female	
		X	X
male	X	XX	XX
	Y	XY	XY

The student makes these two conclusions.

1. Out of 100 babies born, 50 will be male and 50 will be female.
2. If a mum and dad have two girls there is a 25% chance that the next baby will be a boy.

State whether the conclusions are correct and explain your answer.

[3]

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15. Jack dislikes the taste of sprouts. He thinks they taste bitter. His partner Nina loves the taste of sprouts.

Jack reads that a gene affects how people taste sprouts. There are several variants of this gene.

An individual with the dominant variant, T, can taste a bitter substance in sprouts.

(i) Jack is homozygous for this gene.

What is Jack's genotype?

Tick (✓) **one** box.

TT ☐

Tt ☐

tT ☐

tt ☐

[1]

(ii) Jack wants to know if any of his children will be able to taste the bitter substance.

Nina has the genotype tt.

Complete the Punnett square to show the possible genotypes of any children Jack may have with Nina.

[2]

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(iii) What is the probability that any children born will be able to taste the bitter substance.

Probability = ---------- [1]

(iv) Jack and Nina have two children, one boy and one girl.

Describe how sex is determined in humans.

---[2]

(v) Jack and Nina do not want any more children.

They have considered different forms of contraception.

Suggest a form of contraception that would be suitable for them and justify your choice.

---[2]

END OF QUESTION PAPER

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