

## Default Question Block

### Blue Skin

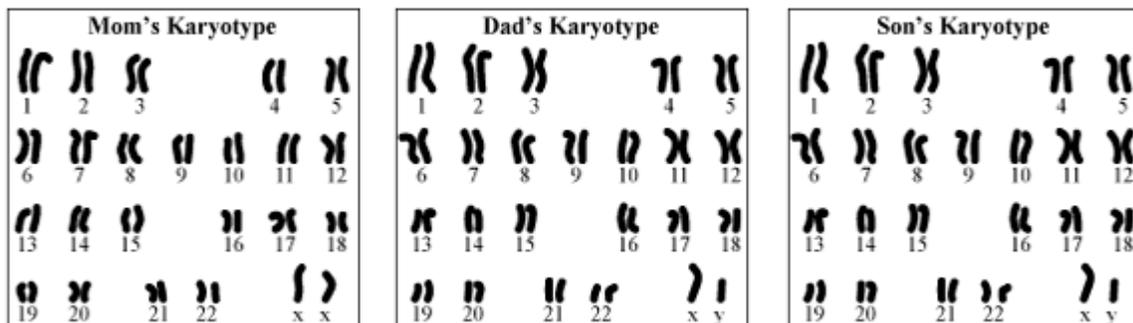
#### Grade 8

State Student ID

Use the information provided in any part of this task to answer the questions.

A boy is born with blue skin, which surprises his doctors. The doctors have to figure out what caused his blue skin so they know how to treat him. After interviewing the parents, the doctors rule out environmental factors. They conduct genetic testing to determine the cause.

The diagram shows the karyotypes, pictures of an individual's chromosomes, for the mom, the dad, and the son.



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### Question 1

Which statement explains why the pattern of chromosomes occurs in pairs?

- A) All of the son's chromosomes came from his dad.
- C) Each pair of chromosomes came from one parent.
- B) All of the son's chromosomes came from his mom.
- D) One chromosome in each pair came from his mom, and one came from his dad.

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### Question 2

What does the pattern of chromosomes among the mom, the dad, and the son allow you to conclude?

- A) The chromosomes are similar, so there is a mutation of the whole chromosome.
- B) The chromosomes are different, so there is a mutation of the whole chromosome.
- C) The chromosomes are similar, so there is not a mutation of the whole chromosome.
- D) The chromosomes are different, so there is not a mutation of the whole chromosome.

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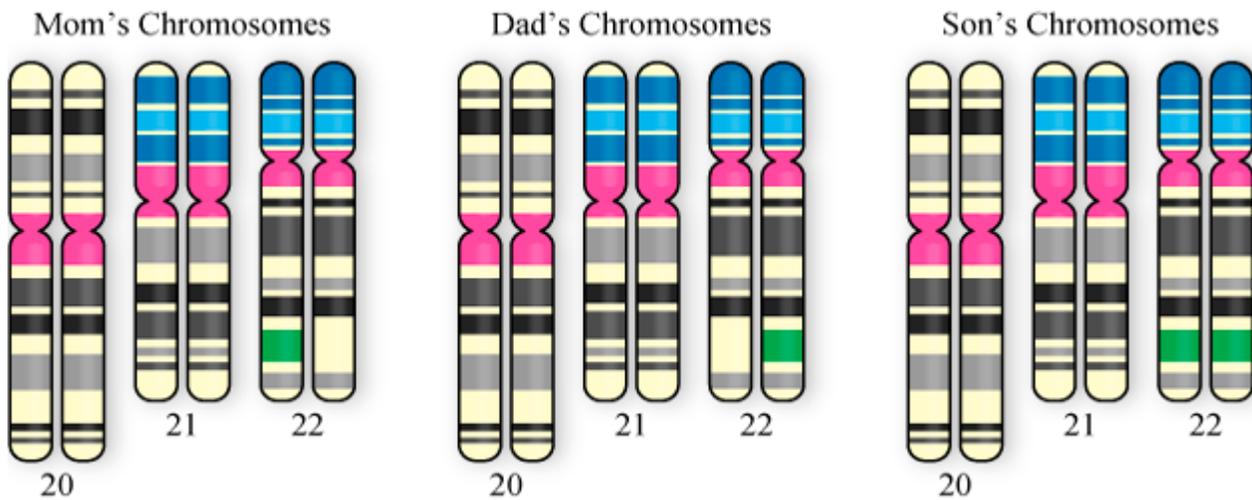
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Doctors examine the karyotypes carefully. The diagram shows a detailed analysis of chromosome 20, 21, and 22 for the mom, the dad, and the son. Only the son has the blue-skin condition.



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### Question 3

**This question has two parts. Answer Part A, then answer Part B.**

#### Part A

Based on the patterns observed in the karyotypes, make a claim about the location of the blue-skin mutation.

- A) It is in the top half of chromosome 20.
- B) It is in the pink region of chromosome 20.
- C) It is in the blue region of chromosome 22.
- D) It is in the green region of chromosome 22.

## Part B

Select all the statements that support the claim in Part A.

- A) The pink region in all three people is the same.
- B) The blue region in all three people is the same.
- C) The son has a green region on each chromosome.
- D) The mom has a green region on only one chromosome.
- E) The chromosomes of all three people are the same length.
- F) Each person has a green region on at least one of their chromosomes.

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### Question 4

Use the karyotypes to describe the patterns of alleles for the mom, the dad, and the son.  
Enter the genotype for each individual in the box.

#### Alleles

N – allele for non-blue skin

n – allele for blue skin

Mom

Dad

Son

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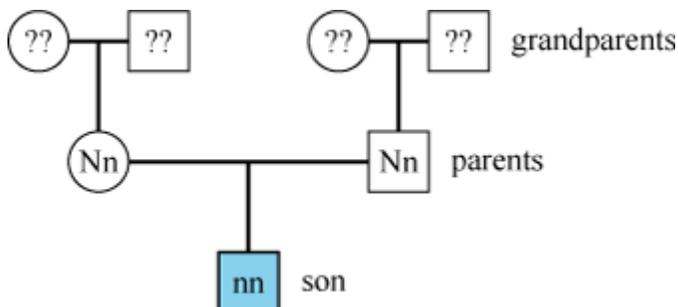
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## Question 5

The pedigree chart represents the family of the blue-skinned boy. The squares represent males, and the circles represent females. The parents did not have blue skin.



Which statement BEST describes the genetics of the son's grandparents?

- A) Both grandparents on one side must have blue skin.
- B) One of the grandparents on each side must have blue skin.
- C) One grandparent on each side must have the blue skin allele.
- D) Both grandparents on one side must have the blue skin allele.

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Genetic testing reveals the cause of the blue skin is a mutation in one of the genes on chromosome 22. The recessive condition is called methemoglobinemia. In this condition, the hemoglobin proteins are changed. The changed hemoglobin in the blood binds too tightly to oxygen and cannot release oxygen to the cells. The lack of oxygen makes the skin appear blue.

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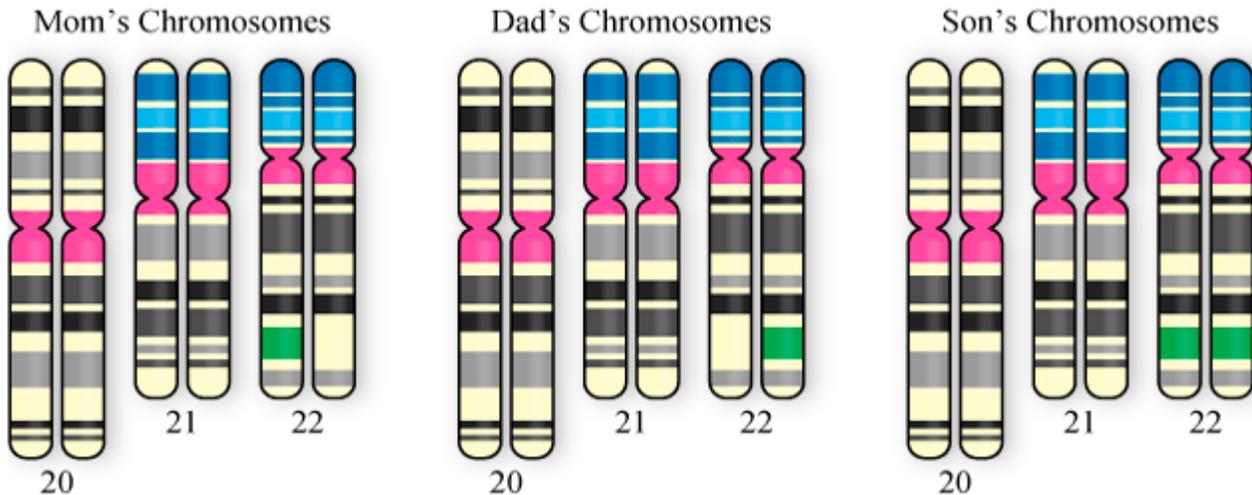
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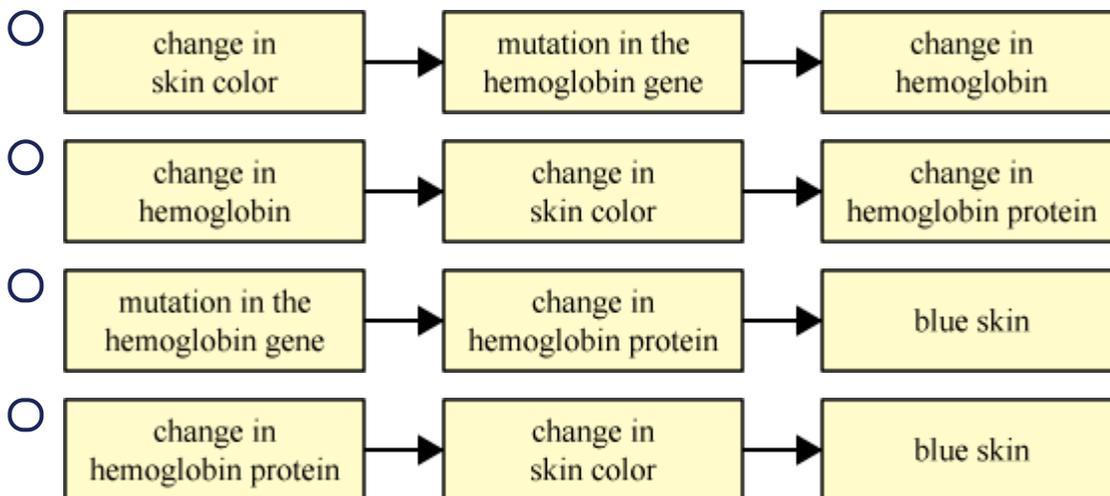
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Doctors examine the karyotypes carefully. The diagram shows a detailed analysis of chromosome 20, 21, and 22 for the mom, the dad, and the son. Only the son has the blue-skin condition.



### Question 6

Which model best explains the relationship between the blue-skin trait, the gene, and the protein?



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## Question 7

**This question has two parts. Answer part A, then answer part B.**

The son's parents want to know how this mutation is going to affect their son.

Read the paragraph and identify the evidence to support a claim that the blue-skin mutation is harmful, beneficial, or neutral.

Select the statements you want to choose, then select the green box.

### Part A

Test results showed the son has methemoglobinemia, which is caused by an atypical Hemoglobin carries oxygen in the blood to the tissues.

This condition was inherited through a recessive gene that was passed on by both parents. The hemoglobin protein binds too tightly to oxygen and does not release oxygen. This lack of oxygen makes the skin appear blue.

The entire body is not usually blue.

The condition is usually focused on only one small area of the body.

A few cases have large parts of the body covered, but these are rare.

The condition does not affect only skin color.

A person with the condition might also get tired easily, feel dizzy, or faint.

Rarely, the lack of oxygen may cause seizures or other serious medical issues.

### Part B

Select the word you want to choose, then select the green box.

Based on the statements, the mutation could be harmful, beneficial, neutral.

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## Student Feedback

### Feedback Question #1

How interesting was the task you just completed?

1 star is not interesting and 5 stars is very interesting.

### Feedback Question #2

How difficult was the task as a whole?

1 star is not difficult and 5 stars is very difficult.

### Feedback Question #3

Please rate the difficulty **to understand how to respond to each question.**

1 star is not difficult and 5 stars is very difficult.

Question 1

Question 2

Question 3

Question 4

Question 5

Question 6

Question 7

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