Class Enrichment and Review Activities for April 1--9th
Mrs. Linda Henry-Biology lab

A days and B days—every other day.

Mrs. Henry can be reached at lhenry@rockwoodschools.org OR by calling the school at 814-926-4688 extension 2201. Mrs. Henry will send you an email to alert you to where the activities are on her class page. Take care and stay healthy!!

All assignments and materials for all classes are on Mrs. Henry's Google Classroom pages and attached at the bottom

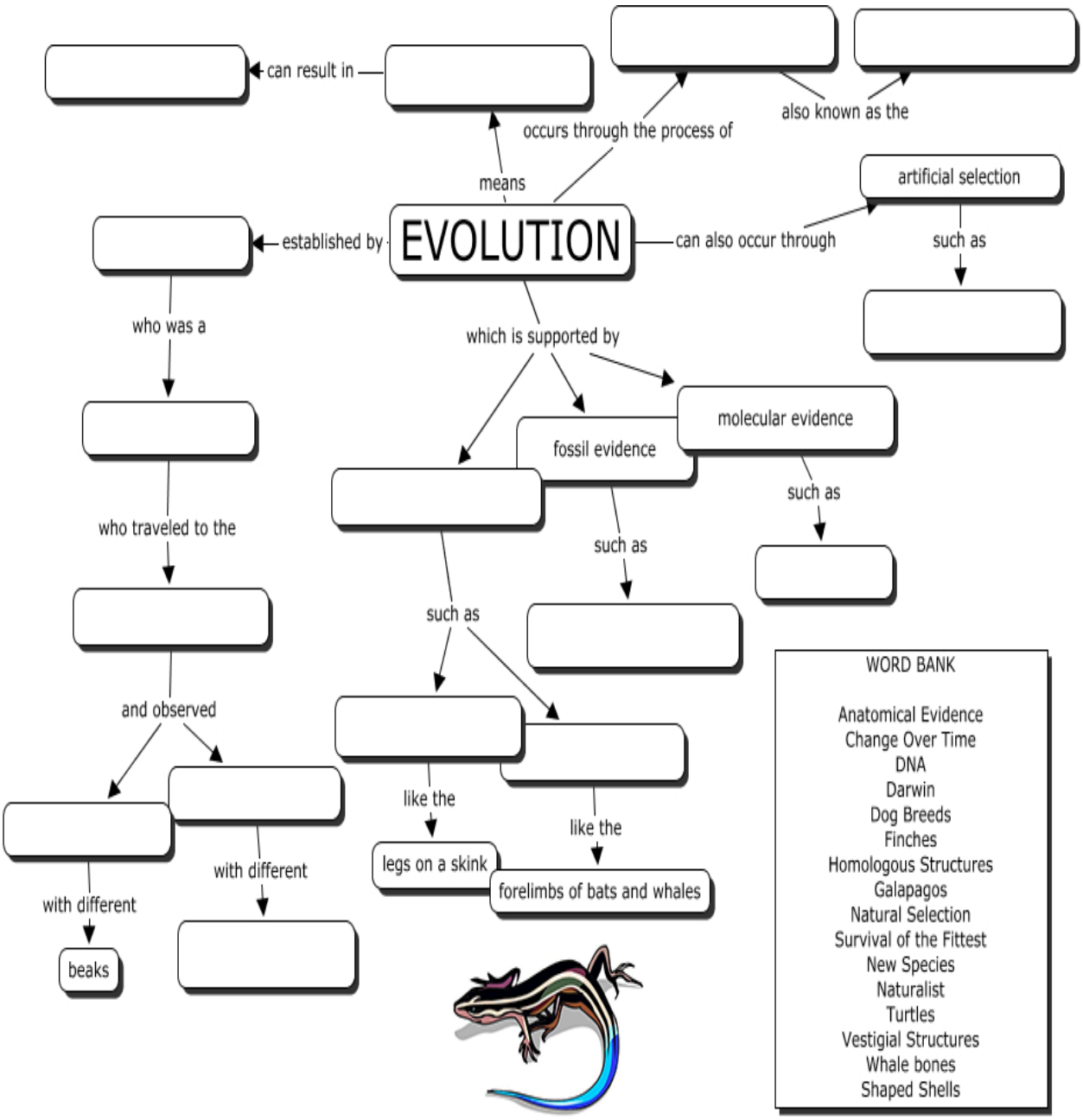
April 1 (B days) and April 2 (A days)—go to google classroom and find the Evolution concept map. Complete the labels using the word bank….

April 3, 7, 9—(B days) and April 6-8 (A days)—go to google classroom and find the "DNA student version" for the review of DNA, RNA and Protein Synthesis. Answer the multiple choice and extended response questions in the packet. There are 60 questions that will take several days to complete.

BELOW YOU WILL FIND ATTACHED DOCUMENTS FROM THE ABOVE ASSIGNMENTS FOR APRIL 1 THROUGH APRIL 9TH….

Name:_____

Evolution Concept Map



pennsylvania
DEPARTMENT OF EDUCATION

SAS Standards Aligned System

Name: **Date:**

1

When DNA separates into two strands, the DNA would most likely be directly involved in

(1) replication
(2) fertilization
(3) differentiation
(4) evolution

2

The instructions for the traits of an organism are coded in the arrangement of

(1) glucose units in carbohydrate molecules
(2) bases in DNA in the nucleus
(3) fat molecules in the cell membrane
(4) energy-rich bonds in starch molecules

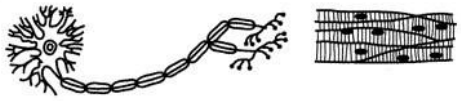
3

Which statement is true regarding an alteration or change in DNA?

(1) It is always known as a mutation.
(2) It is always advantageous to an individual.
(3) It is always passed on to offspring.
(4) It is always detected by the process of chromatography.

4

Two different types of cells from an organism are shown below.



Explain how these two different types of cells can function differently in the same organism even though they both contain the same genetic instructions. [1]

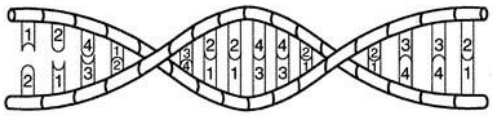
_____

_____

_____

5

The diagram below represents a section of a molecule that carries genetic information.



The pattern of numbers represents

(1) a sequence of paired bases
(2) the order of proteins in a gene
(3) folds of an amino acid
(4) positions of gene mutations

6

In the human pancreas, acinar cells produce digestive enzymes and beta cells produce insulin. The best explanation for this is that

(1) a mutation occurs in the beta cells to produce insulin when the sugar level increases in the blood
(2) different parts of an individual's DNA are used to direct the synthesis of different proteins in different types of cells
(3) lowered sugar levels cause the production of insulin in acinar cells to help maintain homeostasis
(4) the genes in acinar cells came from one parent while the genes in beta cells came from the other parent

7

Cloning an individual usually produces organisms that

(1) contain dangerous mutations
(2) contain identical genes
(3) are identical in appearance and behavior
(4) produce enzymes different from the parent

8

The chart below shows relationships between genes, the environment, and coloration of tomato plants.

Inherited Gene	Environmental Condition	Final Appearance
A	Light	Green
B	Light	White
A	Dark	White
B	Dark	White

Which statement best explains the final appearance of these tomato plants?

(1) The expression of gene *A* is not affected by light.
(2) The expression of gene *B* varies with the presence of light.
(3) The expression of gene *A* varies with the environment.
(4) Gene *B* is expressed only in darkness.

9

A sudden change in the DNA of a chromosome can usually be passed on to future generations if the change occurs in a

(1) skin cell
(2) liver cell
(3) sex cell
(4) brain cell

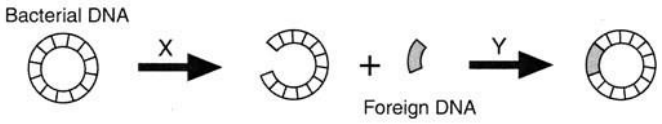
10

A change in the order of DNA bases that code for a respiratory protein will most likely cause

(1) the production of a starch that has a similar function
(2) the digestion of the altered gene by enzymes
(3) a change in the sequence of amino acids determined by the gene
(4) the release of antibodies by certain cells to correct the error

11

The diagrams below represent some steps in a procedure used in biotechnology.



Letters *X* and *Y* represent the

(1) hormones that stimulate the replication of bacterial DNA
(2) biochemical catalysts involved in the insertion of genes into other organisms
(3) hormones that trigger rapid mutation of genetic information
(4) gases needed to produce the energy required for gene manipulation

12

The photographs below show some physical similarities between John Lennon and his son Julian.

Lewis, Ricki *Life* 3rd edition WCB/McGraw Hill

Which conclusion can be drawn regarding these similarities?

(1) The DNA present in their body cells is identical.

(2) The percentage of their proteins with the same molecular composition is high.

(3) The base sequences of their genes are identical.

(4) The mutation rate is the same in their body cells.

13

The sequence of subunits in a protein is most directly dependent on the

(1) region in the cell where enzymes are produced
(2) DNA in the chromosomes in a cell
(3) type of cell in which starch is found
(4) kinds of materials in the cell membrane

14

The genetic code of a DNA molecule is determined by a specific sequence of

(1) ATP molecules
(2) sugar molecules
(3) chemical bonds
(4) molecular bases

15

The cells that make up the skin of an individual have some functions different from the cells that make up the liver because

(1) all cells have a common ancestor
(2) different cells have different genetic material
(3) environment and past history have no influence on cell function
(4) different parts of genetic instructions are used in different types of cells

16

The production of certain human hormones by genetically engineered bacteria results from

(1) inserting a specific group of amino acids into the bacteria
(2) combining a portion of human DNA with bacterial DNA and inserting this into bacteria
(3) crossing two different species of bacteria
(4) deleting a specific amino acid from human DNA and inserting it into bacterial DNA

17

Which phrase does *not* describe cells cloned from a carrot?

(1) they are genetically identical
(2) they are produced sexually
(3) they have the same DNA codes
(4) they have identical chromosomes

18

A mutation occurs in a cell. Which sequence best represents the correct order of the events involved for this mutation to affect the traits expressed by this cell?

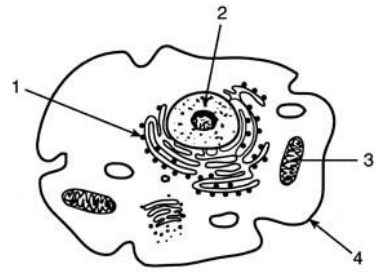
(1) a change in the sequence of DNA bases → joining amino acids in sequence → appearance of characteristic

(2) joining amino acids in sequence → a change in the sequence of DNA bases → appearance of characteristic

(3) appearance of characteristic → joining amino acids in sequence → a change in the sequence of DNA bases

(4) a change in the sequence of DNA bases → appearance of characteristic → joining amino acids in sequence

19



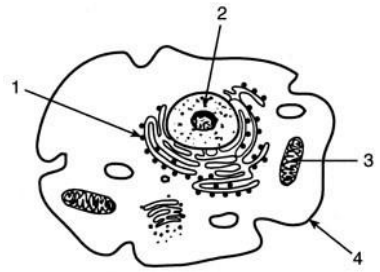
Describe how structures 1 and 2 interact in the process of protein synthesis. [1]

_____

_____

_____

20



Choose either structure 3 *or* structure 4, write the number of the structure on the line below, and describe how it aids the process of protein synthesis. [1]

Structure: _____

_____

_____

In DNA, a sequence of three bases is a code for the placement of a certain amino acid in a protein chain. The table below shows some amino acids with their abbreviations and DNA codes.

Amino Acid	Abbreviation	DNA Code
Phenylalanine	Phe	AAA, AAG
Tryptophan	Try	ACC
Serine	Ser	AGA, AGG, AGT, AGC, TCA, TCG
Valine	Val	CAA, CAG, CAT, CAC
Proline	Pro	GGA, GGG, GGT, GGC
Glutamine	Glu	GTT, GTC
Threonine	Thr	TGA, TGG, TGT, TGC
Asparagine	Asp	TTA, TTG

21

Which amino acid chain would be produced by the DNA base sequence below?

C-A-A-G-T-T-A-A-A-T-T-A-T-T-G-T-G-A

(1) Val–Glu–Phe–Asp–Thr–Asp

(2) Val–Pro–Phe–Asp–Asp–Thr

(3) Val–Glu–Phe–Asp–Asp–Thr

(4) Val–Glu–Phe–Thr–Asp–Asp

22

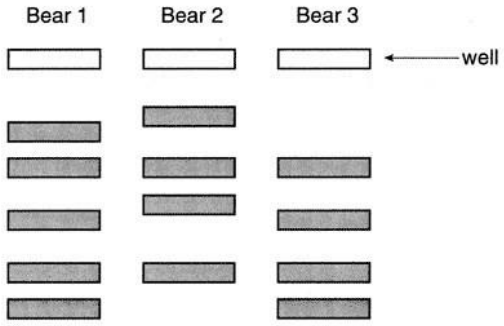
Identify one environmental factor that could cause a base sequence in DNA to be changed to a different base sequence. [1]

_____

23

Describe how a protein would be changed if a base sequence mutates from GGA to TGA. [1]

The diagram below shows the results of a test that was done using DNA samples from three bears of different species. Each DNA sample was cut into fragments using a specific enzyme and placed in the wells as indicated below. The DNA fragments were then separated using gel electrophoresis.



24

Which *two* bears are most closely related? Support your answer with data from the test results. [2]

_____

_____

25

Identify one additional way to determine the evolutionary relationship of these bears. [1]

_____

_____

26

Gel electrophoresis is used to separate DNA fragments on the basis of their

27

Identify one procedure, other than electrophoresis, that is used in the laboratory to separate the different types of molecules in a liquid mixture. [1]

28

Which statement best describes the relationship between cells, DNA, and proteins?

(1) Cells contain DNA that controls the production of proteins.

(2) DNA is composed of proteins that carry coded information for how cells function.

(3) Proteins are used to produce cells that link amino acids together into DNA.

(4) Cells are linked together by proteins to make different kinds of DNA molecules.

29

Genes involved in the production of abnormal red blood cells have an abnormal sequence of

(1) ATP molecules

(2) amino acids

(3) sugars

(4) bases

30

Down syndrome is a genetic disorder caused by the presence of an extra chromosome in the body cells of humans. This extra chromosome occurs in a gamete as a result of

(1) an error in the process of cloning

(2) an error in meiotic cell division

(3) a gene mutation

(4) replication of a single chromosome during mitosis

Base your answers to the following questions on the information below and on your knowledge of biology.

Mutations are often referred to as the "raw materials" of evolution.

31

Use appropriate letters to write a 9-base DNA sequence that could represent a portion of a gene. [1]

_____

32

Show one example of what could happen to the 9-base DNA sequence you wrote in question 57 if a mutation occurred in that gene. [1]

_____

_____

33

Asexually reproducing organisms pass on hereditary information as

(1) sequences of A, T, C, and G

(2) chains of complex amino acids

(3) folded protein molecules

(4) simple inorganic sugars

34

Which nuclear process is represented below?

A DNA molecule untwists. →	The two strands of DNA separate. →	Molecular bases pair up. →	Two identical DNA molecules are produced.

(1) recombination

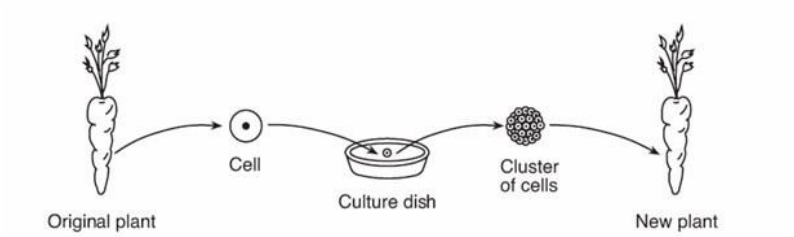
(2) fertilization

(3) replication

(4) mutation

35

The diagram below represents the cloning of a carrot plant.

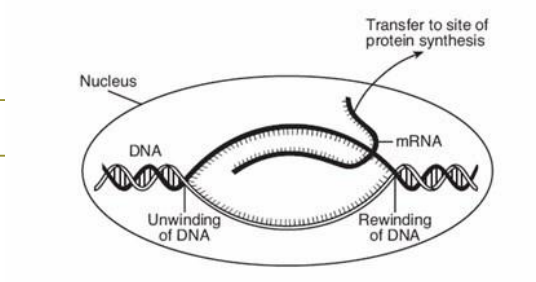


Compared to each cell of the original carrot plant, each cell of the new plant will have

(1) the same number of chromosomes and the same types of genes
(2) the same number of chromosomes, but different types of genes
(3) half the number of chromosomes and the same types of genes
(4) half the number of chromosomes, but different types of genes

36

The diagram below shows some of the steps in protein synthesis.



The section of DNA being used to make the strand of mRNA is known as a

(1) carbohydrate
(2) gene
(3) ribosome
(4) chromosome

37

A change in the base subunit sequence during DNA replication can result in

(1) variation within an organism

(2) rapid evolution of an organism

(3) synthesis of antigens to protect the cell

(4) recombination of genes within the cell

The flounder is a species of fish that can live in very cold water.

The fish produces an "antifreeze" protein that prevents ice crystals from forming in its blood. The DNA for this protein has been identified. An enzyme is used to cut and remove this section of flounder DNA

that is then spliced into the DNA of a strawberry plant. As a result, the plant can now produce a protein that makes it more resistant to the damaging effects of frost. This process is known as

(1) sorting of genes

(2) genetic engineering

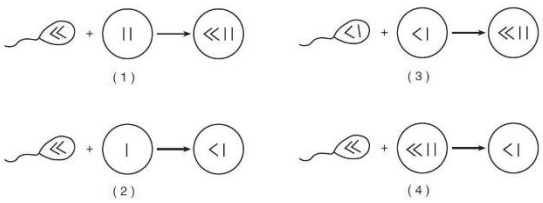
(3) recombination of chromosomes

(4) mutation by deletion of genetic material

39

The diagram below represents a nucleus containing the normal chromosome number for a species.

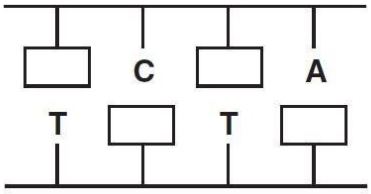
Which diagram bests illustrates the normal formation of a cell that contains all of the genetic information needed for growth, development, and future reproduction of this species?



40

The diagram below represents an incomplete section of a DNA molecule. The boxes represent unidentified bases.

38

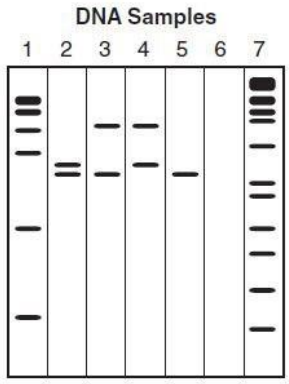


When the boxes are filled in, the total number of bases represented by the letter A (both inside and outside the boxes) will be

(1) 1 **(3) 3**

(2) 2 **(4) 4**

Base your answers to questions 65 through 67 on the diagram below and on your knowledge of biology. The diagram shows the results of a technique used to analyze DNA.



41

This technique used to analyze DNA directly results in

(1) synthesizing large fragments of DNA

(2) separating DNA fragments on the basis of size

(3) producing genetically engineered DNA molecules

(4) removing the larger DNA fragments from the samples

42

This laboratory technique is known as

(1) gel electrophoresis

(2) DNA replication

(3) protein synthesis

(4) genetic recombination

43

State one specific way the results of this laboratory technique could be used.

_____

_____

In preparation for an electrophoresis procedure, enzymes are added to DNA in order to

(1) convert the DNA into gel

(2) cut the DNA into fragments

(3) change the color of the DNA

(4) produce longer sections of DNA

45

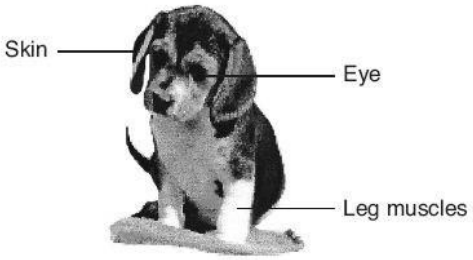
If 15% of a DNA sample is made up of thymine, T, what percentage of the sample is made up of cytosine, C?

(1) 15%
(2) 35%
(3) 70%
(4) 85%

44

46

Several structures are labeled in the diagram of a puppy shown below.



Every cell in each of these structures contains

(1) equal amounts of ATP

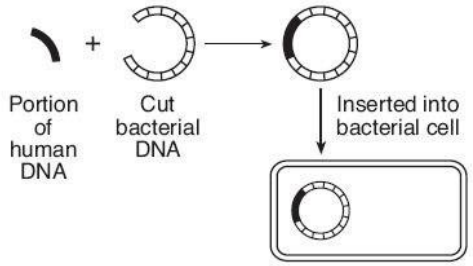
(2) identical genetic information

(3) proteins that are all identical

(4) organelles for the synthesis of glucose

47

The diagram below represents a technique used in some molecular biology laboratories.



This technique is a type of

(1) chromatography

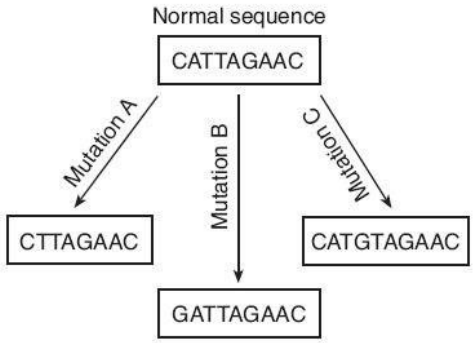
(2) gel electrophoresis

(3) direct harvesting

(4) genetic engineering

48

The diagram below shows a normal gene sequence and three mutated sequences of a segment of DNA.



Which row in the chart below correctly identifies the cause of each type of mutation?

Row	Mutation A	Mutation B	Mutation C
(1)	deletion	substitution	insertion
(2)	insertion	substitution	deletion
(3)	insertion	deletion	substitution
(4)	deletion	insertion	substitution

49

The information in the chart below represents the sex chromosome arrangement in humans and birds. Sex chromosomes contain genes involved in sex determination.

Sex Chromosomes in Animals

Animal	Female	Male
humans	XX	XY
birds	ZW	ZZ

In humans, it is the male gamete that is responsible for determining the sex of the offspring. Identify which type of gamete determines the sex of the offspring in birds. Support your answer. [1]

Type of Gamete: _____

50

The amino acid sequences of three species shown below were determined in an investigation of evolutionary relationships.

Species A:	Val	His	Leu	Ser	Pro	Val	Glu
Species B:	Val	His	Leu	Cys	Pro	Val	Glu
Species C:	Val	His	Thr	Ser	Pro	Glu	Glu

Based on these data, which *two* species are most closely related? Support your answer. [1]

Base your answers to the following questions on the information below and on your knowledge of biology.

Scientists attempted to determine the evolutionary relationships between three different plant species, A, B, and C. In order to do this, they examined the stems and DNA of these species. Diagram 1 represents a microscopic view of the cross sections of the stems of these three species. DNA was extracted from all three species and analyzed using gel electrophoresis. The results are shown in diagram 2. Based on the data they collected, they drew diagram 3 to represent the possible evolutionary relationships.

Diagram 1

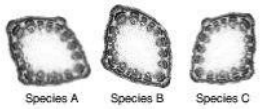


Diagram 2

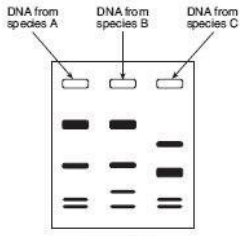
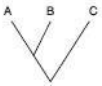


Diagram 3

Possible Evolutionary Relationships Between Species A, B, and C



51

State why the evolutionary relationships shown in diagram 3 are *not* supported by the data provided by the stem cross sections in diagram 1. [1]

_____

_____

52

Explain how the DNA banding pattern in diagram 2 supports the evolutionary relationships between the species shown in diagram 3. [1]

_____

_____

53

This technique used to analyze DNA involves the

(1) synthesis of new DNA strands from subunits

(2) separation of DNA fragments on the basis of size

(3) production of genetically engineered DNA molecules

(4) removal of defective genes from DNA

54

Explain why information obtained through DNA analysis is a more reliable indicator of evolutionary relationships than observations of stem cross sections with a microscope. [1]

_____

_____

55

A chemical known as 5-bromouracil causes a mutation that results in the mismatching of

molecular bases in DNA. The offspring of organisms exposed to 5-bromouracil can have mismatched DNA if the mutation occurs in

(1) the skin cells of the mother

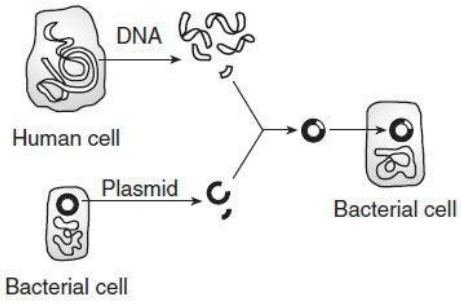
(2) the gametes of either parent

(3) all the body cells of both parents

(4) only the nerve cells of the father

56

Which set of terms correctly identifies the procedure shown in the diagram below and a substance produced by this procedure?



(1) selective breeding - growth hormone

(2) cloning - antibiotics

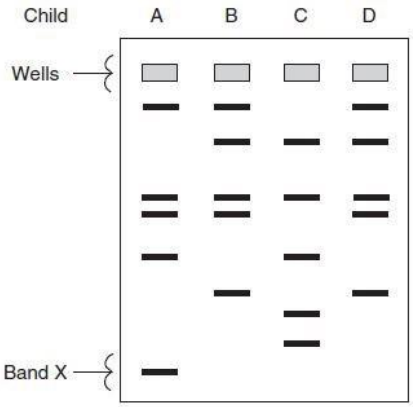
(3) genetic engineering - insulin

(4) replicating - glucose

57

Base your answers to question 63 on the information and diagram below and on your knowledge of biology.

DNA samples were collected from four children. The diagram below represents the results of a procedure that separated the DNA in each sample.



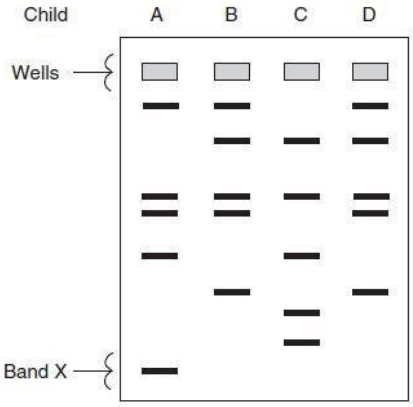
Identify the procedure used to obtain these results. [1]

_____

58

Base your answers to question 64 on the information and diagram below and on your knowledge of biology.

DNA samples were collected from four children. The diagram below represents the results of a procedure that separated the DNA in each sample.



Band X represents the

(1) largest fragment of DNA that traveled the fastest

(2) smallest fragment of DNA that traveled the fastest

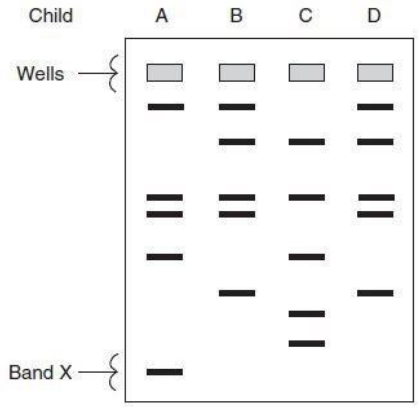
(3) largest fragment of DNA that traveled the slowest

(4) smallest fragment of DNA that traveled the slowest

59

Base your answers to question 65 on the information and diagram below and on your knowledge of biology.

DNA samples were collected from four children. The diagram below represents the results of a procedure that separated the DNA in each sample.



The DNA is most similar in which two children? Support your answer. [1]

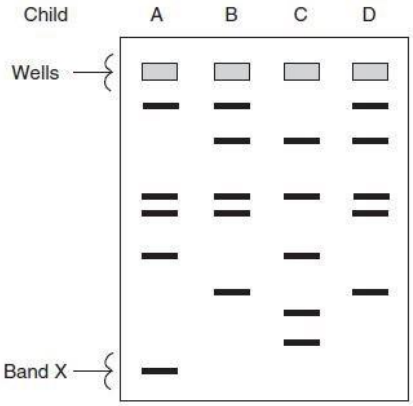
_____

_____

60

Base your answers to question 66 on the information and diagram below and on your knowledge of biology.

DNA samples were collected from four children. The diagram below represents the results of a procedure that separated the DNA in each sample.



State *one* way information obtained from this procedure can be used. [1]

_____

_____