



STUDENT NAME

---

IB BIOLOGY STUDY  
WORK BOOK

All Classes Due Date: May 05th, 2015, or Earlier NO EXCEPTIONS OR  
EXTENSIONS  
LATE SUBMISSIONS WILL BE ASSESSED AT 80 % FOR BOTH INFORMAL  
AND FORMAL GRADING

After school hours will be everyday 2:30 pm – 4:30 pm May 01, 2015

Students are encouraged to form study groups

PDF Version 2013 Edition of Oxford IB Biology Course Companion is available on my  
Wiki

Answer submissions:

Cannot be typed or cut and paste

Handwriting must be legible to avoid the risk of point deduction

Score Rubric Available at the end of workbook.

HAPPY STUDYING !!!

Ms. Scott IB Biology Senior Year 2015, North Mecklenburg High  
School

sheenan.scott@cms.k12.nc.us

## Junior Level Biology Review

1. What element makes all things “organic?” \_\_\_\_\_

*Compare the structure and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids*

2.

Macromolecules	Function	Elements	Subunits	Structure
Carbohydrates				Hand Draw Structures Separate Sheet
Proteins				Hand Draw Structures Separate Sheet
Lipids				Hand Draw Structures Separate Sheet
Nucleic Acids				Hand Draw Structures Separate Sheet

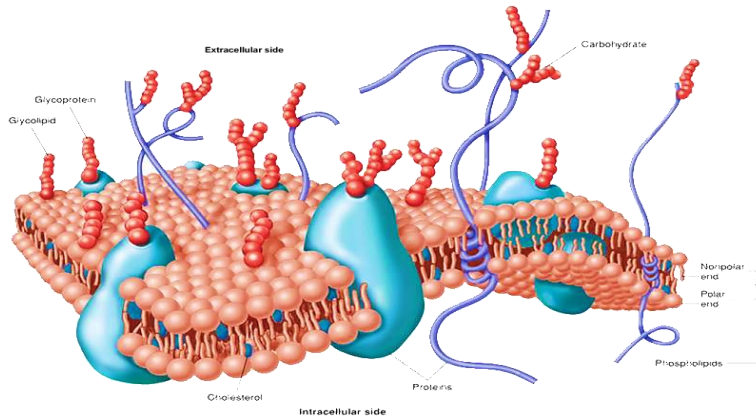
## Cell Theory and Organelles

3. What are the three parts of cell theory?

- 
- 
-

The diagram below shows many proteins and other molecules embedded in a cell membrane

4. What is the function of the **cell membrane**?



5. Put the following in order from smallest to largest:

6. What structures produce hormones? What is the function of hormones?

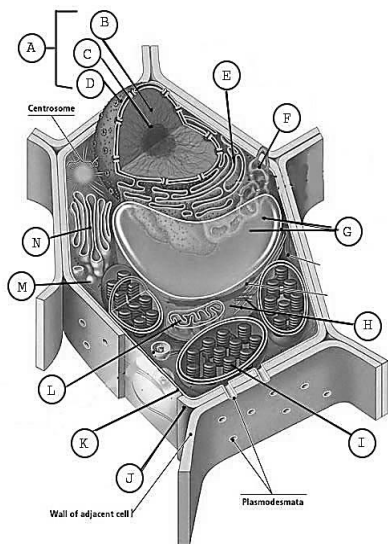
7. How do hormones travel throughout a body?

8. What is a **feedback mechanism**?

Fill in this chart. Also give the letter or number of the part as seen in the diagrams below

Cell Part and Letter	Structure Description	Function	Letter/Number
Nucleus			
Plasma Membrane			
Cell wall			
Mitochondria			
Vacuoles			
Chloroplasts			
Ribosomes			

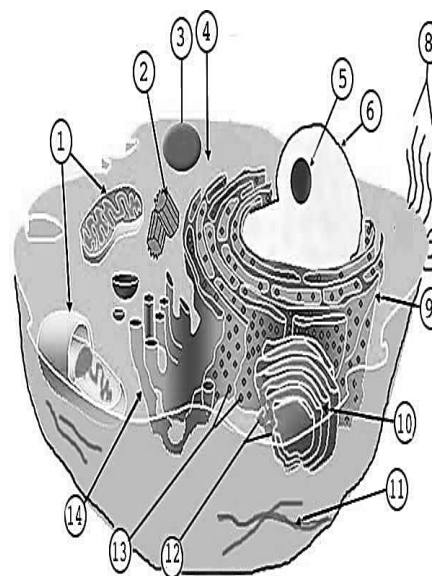
**TEK B.4 A - compare and contrast prokaryotic and eukaryotic cells**



9. Which cell is the plant cell (left or right)?

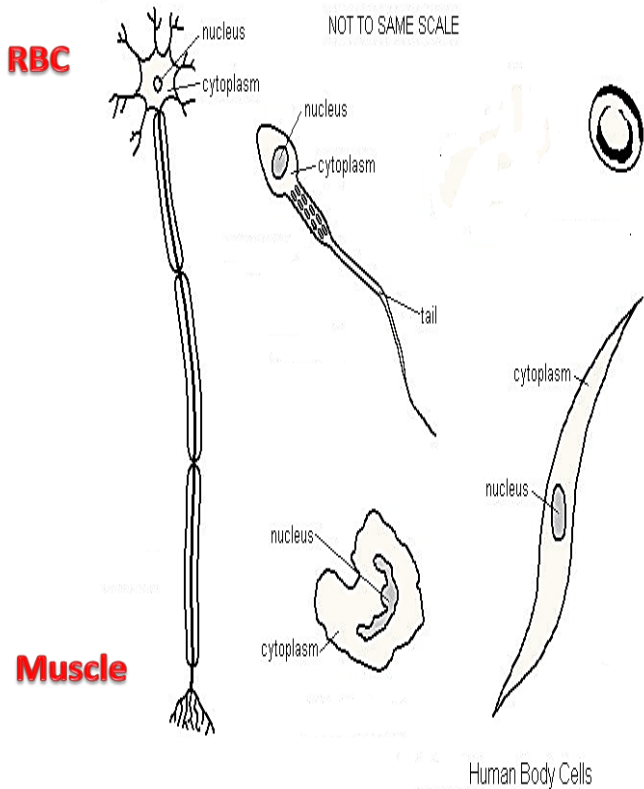
10. Which structures are found **only** in the plant cell?

11. Which structures are found **only** in the animal cell?

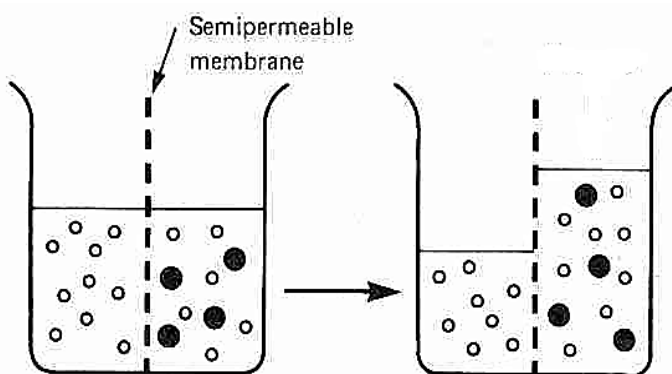


Below are a variety of cells from the human body.

12. Label these cells. (red blood cell, sperm cell, white blood cell, muscle cell, nerve cell)



13. Which cell is adapted for movement? What structure makes this movement possible?
14. What organelle is very plentiful in these cells in order to provide the energy for movement?
15. Which cell is involved in the immune system?
16. Which cell helps in movement of bones?
17. Which cell is adapted for transmitting messages?



Explain what has happened in the diagram to the left.

18. Why did the large dark molecules NOT move to the left?
19. If the dark molecule is starch, where is the starch concentration greatest (left or right)?

- 
20. If the white molecule is water, where is the water concentration greatest at first?
21. In osmosis, water moves from an area of \_\_\_\_\_ to an area of \_\_\_\_\_ concentration. (higher/lower)
22. If the dark molecules could move, in what direction would they move? Why?
23. In diffusion, molecules move from an area of \_\_\_\_\_ to an area of \_\_\_\_\_ concentration. (higher/lower)
24. Which way **water** will move in each of the following situations:
- a. Salt inside the cell 65% and outside the cell 40%.
  
  
  - b. Sugar inside the cell 27% and outside 80%.
25. What is **homeostasis**?

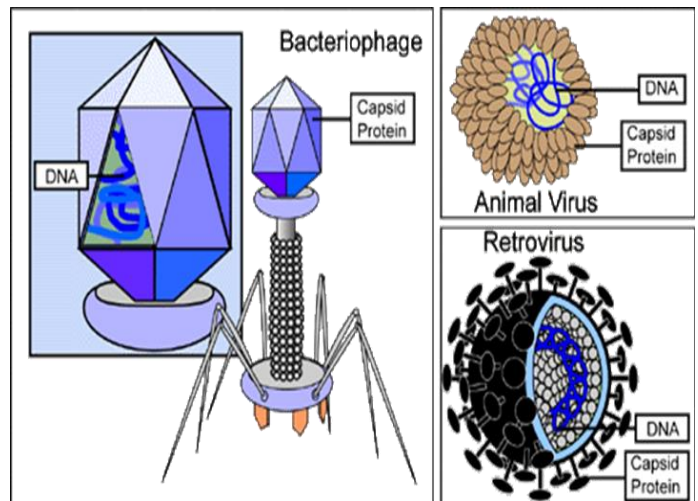
**Comparison of active and passive transport**

	PASSIVE TRANSPORT	ACTIVE TRANSPORT
Requires energy?		
Low to high concentration or high to low concentration?		
Examples @ least 3		

**Viruses:**

26. Describe the basic structure of a virus. What is it made of?

27. Viruses have two pathways they can take to reproduce.



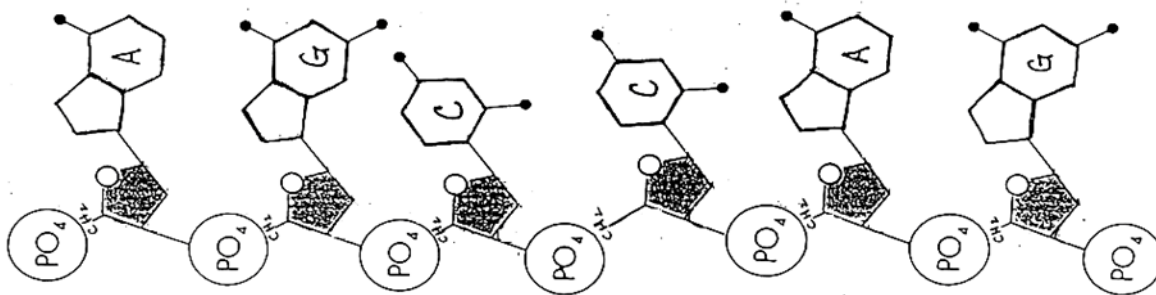
28. Give 3 examples of diseases that are caused by viruses.

- 
- 
- 

Below is a strand of DNA.

29. DNA in the cells exists as a double helix – what needs to be added to it to make it a double helix?

Give the complementary nucleotide sequence.



30. Describe the structure of DNA.

- What are the black pentagons?
- What are the nitrogen bases?
- What weak bonds hold the complementary bases together?
- What types of organisms have DNA?

### Transcription, Translation, Protein Synthesis

31. If the strand of DNA above undergoes transcription, what will the sequence of the mRNA be?



32. After translation, what would the amino acid sequence be for this section of mRNA? (read from right to left)

**Serine - Glutamine**

		Second base of codon								
		U	C	A	G					
First base of codon	U	UUU	Phenylalanine phe	UCU	Serine ser	UAU	Tyrosine tyr	UGU	Cysteine cys	U
		UUC		UCC		UAC		UGC		C
		UUA	Leucine leu	UCA		UAA	STOP codon	UGA	STOP codon	A
		UUG		UCG		UAG		UGG	Tryptophan trp	G
	C	CUU	Leucine leu	CCU	Proline pro	CAU	Histidine his	CGU	Arginine arg	U
		CUC		CCC		CAC		CGC		C
		CUA		CCA		CAA	Glutamine gin	CGA		A
		CUG		CCG		CAG		CGG		G
	A	AUU	Isoleucine ile	ACU	Threonine thr	AAU	Asparagine asn	AGU	Serine ser	U
		AUC		ACC		AAC		AGC		C
		AUA		ACA		AAA	Lysine lys	AGA	Arginine arg	A
		AUG	Methionine met (start codon)	ACG		AAG		AGG		G
G	GUU	Valine val	GCU	Alanine ala	GAU	Aspartic acid asp	GGU		U	
	GUC		GCC		GAC		GGC	Glycine gly	C	
	GUA		GCA		GAA	Glutamic acid glu	GGA		A	
	GUG		GCG		GAG		GGG		G	

33. Compare RNA and DNA in the following table.

	RNA	DNA
Sugars		
Bases		
Strands		
Where In Cell		
Function		

34. What kind of bond holds the amino acids together in the protein that is formed?

**Cell Cycle**

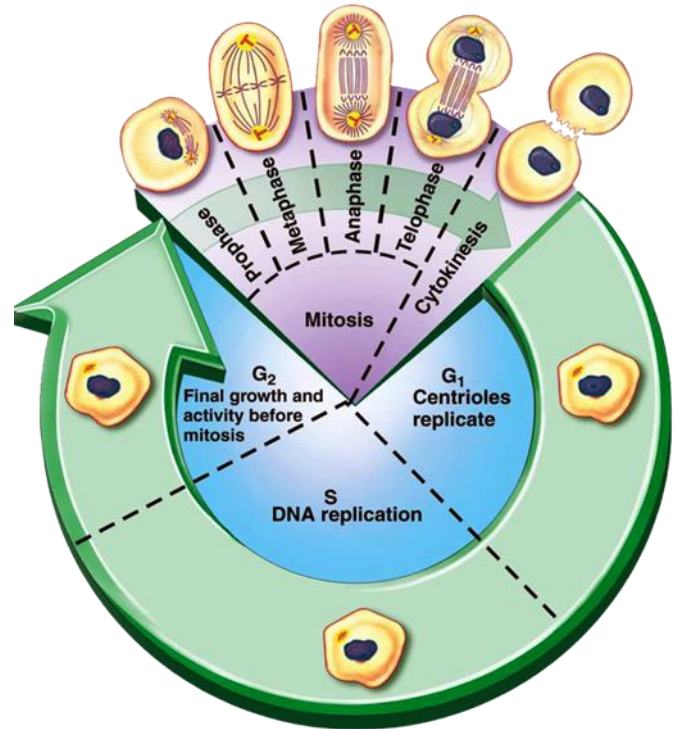
Look at the diagram of the cell cycle.

35. When does the replication of DNA occur? What is this phase called?

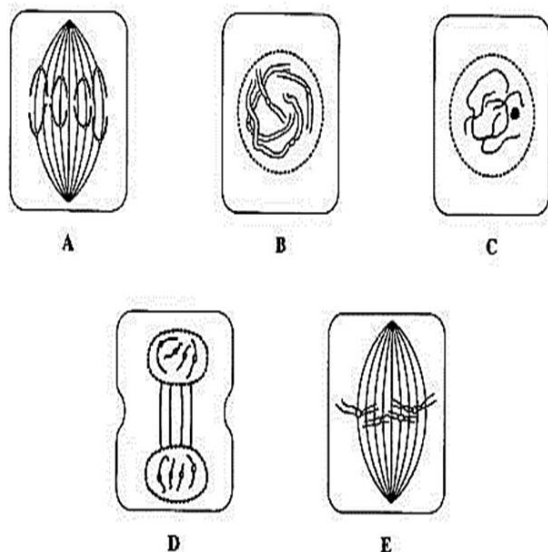
36. What do G1 and G2 represent?

37. What stage does the cell spend most of its life in?

38. What is cancer? What causes cancer?



39. Put the following stages of mitosis (cell division) in order. Then Name them.



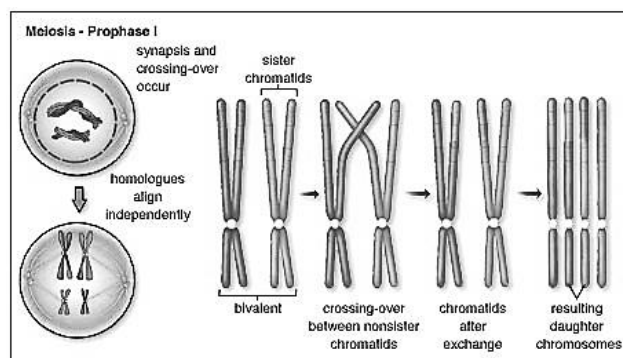
1st: \_\_\_ called - \_\_\_\_\_  
 2nd: \_\_\_ called \_\_\_\_\_  
 3rd: \_\_\_ called \_\_\_\_\_  
 4th: \_\_\_ called \_\_\_\_\_  
 5th: \_\_\_ called \_\_\_\_\_

40. Complete the following Chart of Mitosis and Meiosis.

	MITOSIS	MEIOSIS
Type of reproduction (Asexual or sexual)		
Chromosome number of mother cell (1N=haploid or 2N=diploid)		
Chromosome number of daughter cells (1N=haploid or 2N=diploid)		
Number of cell divisions		
Number of cells produced		
When does replication happen?		
<b>SOURCES OF VARIATION</b> (Pages 144-147)		
Crossing over		
Random assortment of chromosomes (independent assortment)		
Gene mutations		
Fertilization		

41. What does Diploid mean?

42. What does Haploid mean?



1. Describe the 2 mechanisms during Meiosis that contributes to genetic Variation/Variety.

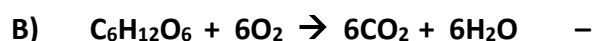
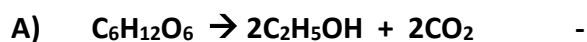
a. Crossing over:

b. Independent Assortment

43. What are the reactants and products for each of these?

Process	Reactant	Product	Locations
Photosynthesis			
Cellular Respiration (Aerobic)			
Cellular Respiration (Anaerobic)			

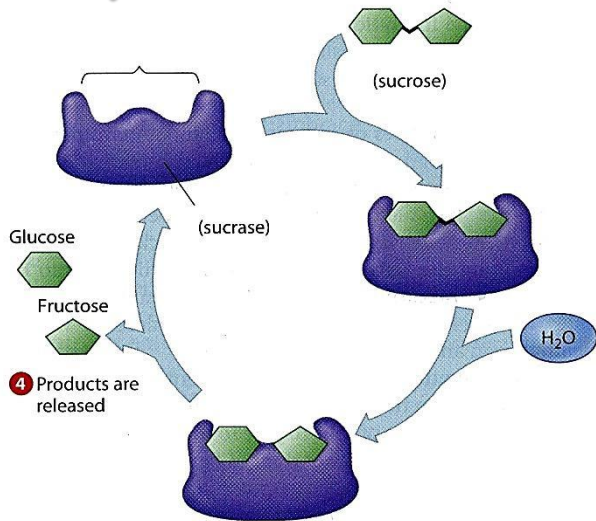
44. Label each of the equations as *photosynthesis*, *aerobic respiration* or *anaerobic respiration*. Then label each of the following molecules in these equations (*water, glucose, oxygen, carbon dioxide, ethyl alcohol*)





45. Which of the above reactions is photosynthesis? (A, B or C?)
46. Which of the above reactions is fermentation (anaerobic cellular respiration)? (A, B or C?)
47. Which of the above reactions is cellular respiration (aerobic)? (A, B or C?)
48. Which reaction requires chlorophyll? (A, B or C)
49. Which reaction requires light (A, B or C)
50. What is the light used for?
51. Which organisms carry out process A?
52. Which organisms carry out process B?
53. Which organisms carry out process C?
54. Which process uses chloroplasts in eukaryotes?
55. Which process uses mitochondria in eukaryotes?
56. What is the function of enzymes in cells? (Or, what is a **catalyst**?)
57. How do extreme pH and temperature extremes affect enzymes? Graph required

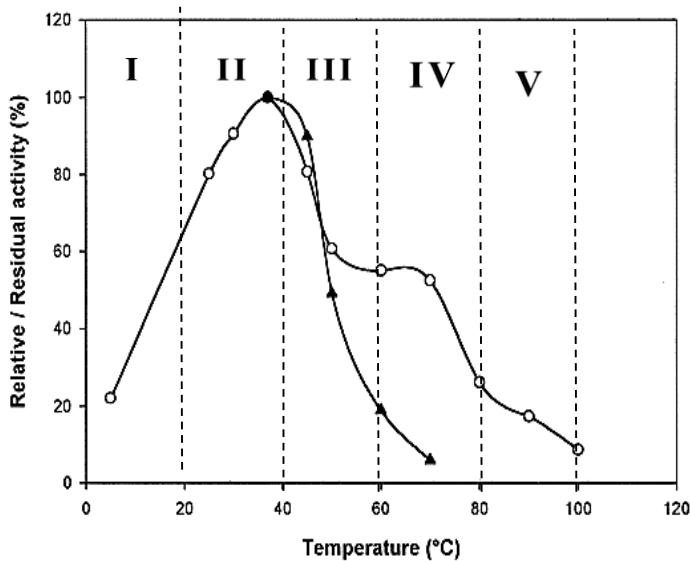
### Enzyme –Substrate



58. Label the picture of the following enzymatic reaction:  
*Substrate, Product(s), Enzyme-substrate complex, Enzyme*

59. All (save for a few) enzymes end in what suffix?

60. Using the graph at right, at what temperature is the best for this enzyme to work?



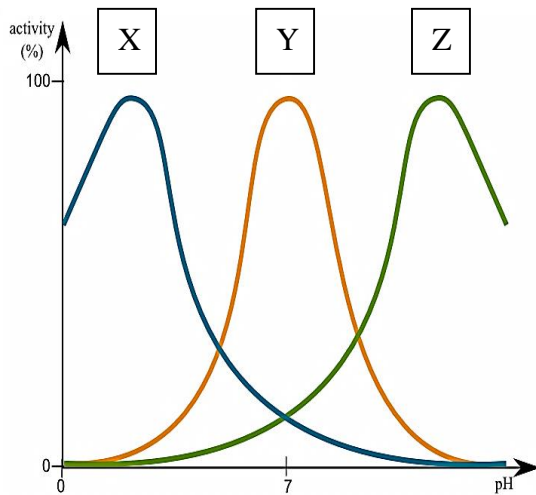
61. At which numeral (I, II, III, or IV) does this particular start to denature?

62. Which enzyme (X, Y, or Z) would be used in:

Acidic Conditions?

Basic Conditions?

Neutral Conditions?



63. What pH is the optimum for activity for  
X -                      Y -                      Z -

64. What does it mean when a trait is **dominant**?

65. What does it mean when a trait is **recessive**?

66. In the Punnett square to the left,  $G = tall$  and  $g = short$ . Give the parents genotypes.

67. Give the phenotype for the parents.

68. What are the genotypes and phenotypes of the offspring?

69. What is the genotypic ratio of the offspring?

	<b>G</b>	<b>g</b>
<b>G</b>	<b>GG</b>	<b>Gg</b>
<b>g</b>	<b>Gg</b>	<b>gg</b>

70. What is the phenotypic ratio of the offspring?

71. What does it mean if a trait is **codominant**?

**Blood type**

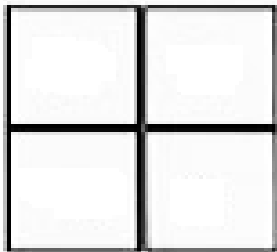
72. The table below shows the genotypes that result in four different blood types in humans.

Genotype	Blood Type
$I^A I^A, I^A i$	A
$I^B I^B, I^B i$	B
$I^A I^B$	AB
ii	O

- A. Based on the information in the table, describe the alleles  $I^A$  and  $I^B$ ?
- B. What are the possible genotypes of the offspring from a homozygous A female and a male with blood type O?

What cross would produce an offspring with AB blood?

73. If a woman with type A blood has a child with a man with type B blood and their first child has type O blood, give the genotypes of the woman and the man and do the cross. (Alleles are  $I^A$ ,  $I^B$ , and i)



- a. What are the odds that they will have a child with type O blood again?
- b. What are the odds that they will have a child with homozygous type A blood?
- c. What are the odds that they will have a child with type AB blood?

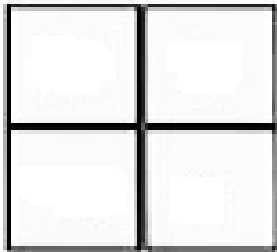


**Sex Chromosomes**

74. What are the sex chromosomes in males? \_\_\_\_\_ In Females? \_\_\_\_\_

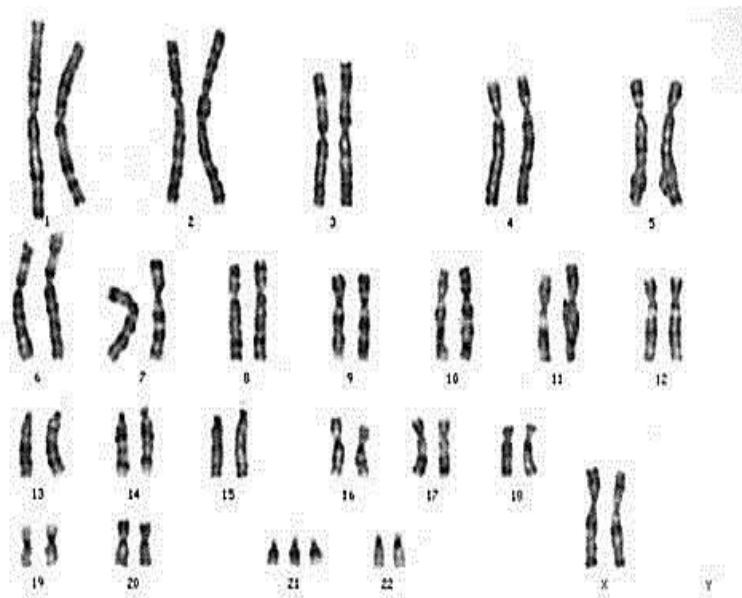
75. **Colorblindness & hemophilia** are sex-linked traits. What chromosome location (#) are these genes found?

a. Cross a female who is a carrier for hemophilia with a normal male.



Provide Cross Example:

- b. What are the odds that they will have a child with hemophilia?
- c. What are the odds that they will have a daughter with hemophilia?
- d. What are the odds that they will have a daughter who is a carrier for hemophilia?



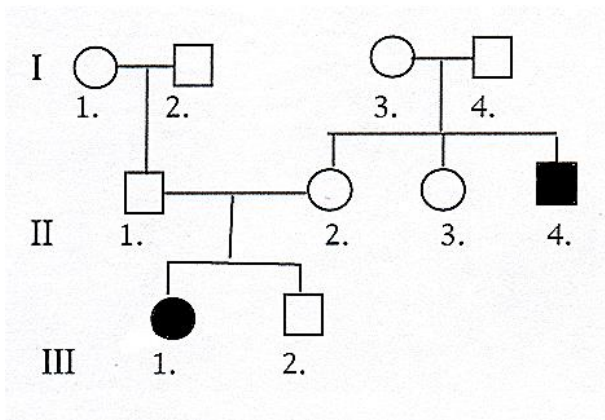
73. Why are males more likely to show this type of disorder? (Who (mother/father) is likely to give them the bad gene?) **Karyotype** What is the gender of the person whose karyotype is shown to the left?

74. What is the disorder that this person has?

75. What are some of the characteristics of this type of disorder?

Some of the most common characteristics of people with Down syndrome include:

Pedigrees



76. Using A,a, what is the genotype of person II-4?

77. What is the genotype of person I3 (using A or a)?

***Double check your learning, solve the following genetics problem:***

78. A brown mink crossed with a silver-blue mink produced all brown offspring. When these F<sub>1</sub> mink were crossed among themselves they produced 47 brown animals and 15 silver-blue animals (F<sub>2</sub> generation). Determine all the genotypes and phenotypes, and their relative ratios, in the F<sub>1</sub> and F<sub>2</sub> generations.

First define alleles:

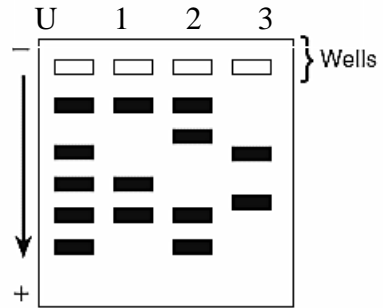
Parental (P) Cross

Brown x Silver/blue - BB x bb


F<sub>2</sub> Generation

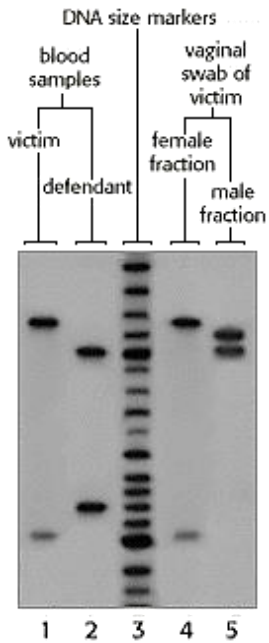
Punnett Square Illustrating F<sub>1</sub> Generation Cross:


The four wells represented in the diagram were each injected with fragments that were prepared from DNA samples using identical techniques.



78. A DNA gel electrophoresis test was run right. Determine which was a match to the unknown (U) sample.

79. Describe genetic engineering and what effects does it have on new species?



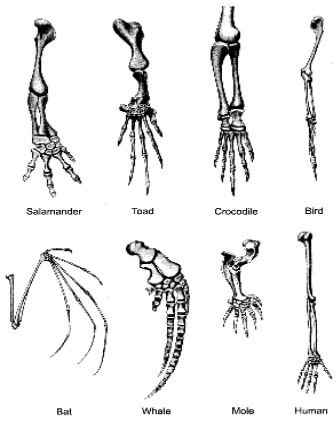
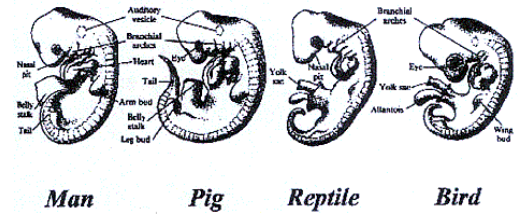
To the left is an electrophoresis gel, showing evidence from a case.

80. Could the defendant be the murderer? (Y/N)  
Explain your answer –

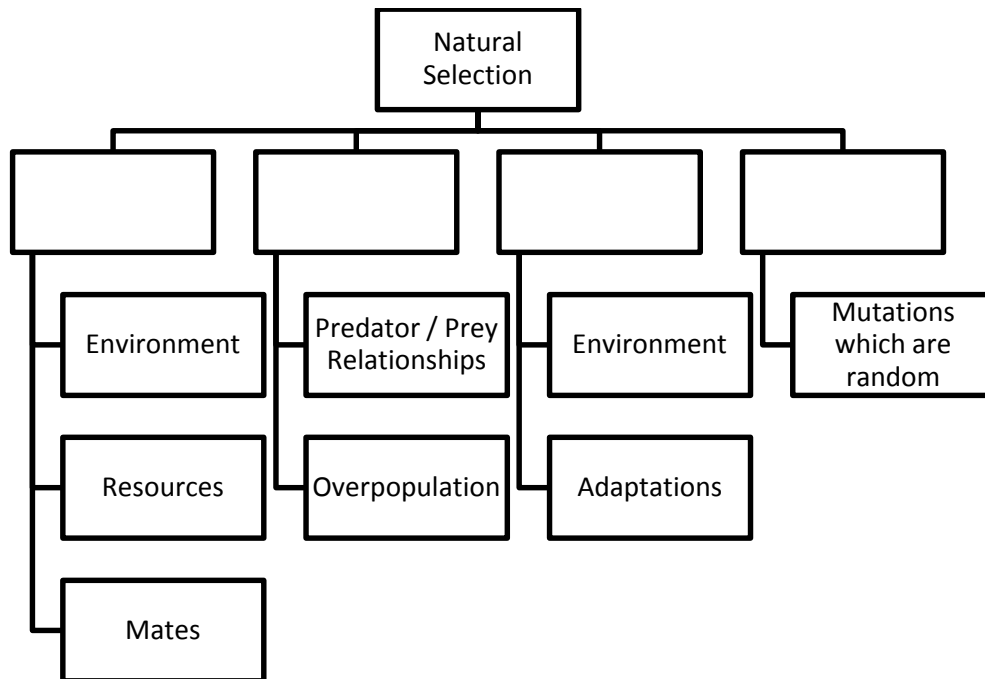
**Evolution**

80. What does the diagrams right tell us about the evolution of a species from a common ancestor?

Figure 2: Homologous Similarity Among Vertebrate Embryos



81. Differentiate between gradualism, uniformitarianism and punctuated equilibrium.



82. Place the following terms in the chart above : **Variation, Competition, Population, Fitness**

83. Which of the following provides the most convincing evidence that two different animal species evolved from a common ancestor? **Why?**

- A. They live in similar environments.
- B. They have similar adult body shapes.
- C. They have similar methods of locomotion.
- D. They show similar features in embryonic development.

84. The smooth-skinned, leaf-tailed gecko lives on Madagascar, an island off the coast of Africa. The gecko hunts at night and sleeps on trees by day. The color and pattern of the gecko's body resembles leaves. Identify which of the following statements **best** explains how the gecko's unique body color and pattern evolved? **Why?**

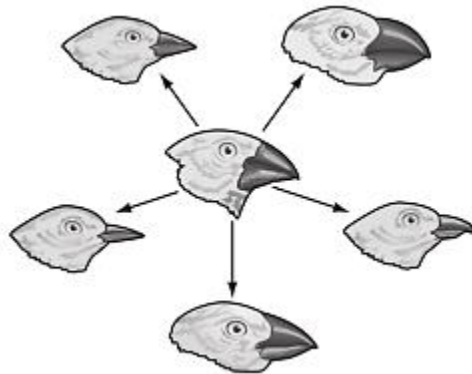
- A. All the geckos needed to look like leaves in order to live in trees and therefore acquired the necessary trait.
- B. Individuals with bodies that looked the most like leaves interbred only with other green or brown lizard species.
- C. Gene sequences of all the geckos mutated to produce the leaf appearance when ancestral geckos moved from mud to trees.
- D. Individuals with bodies that looked the most like leaves were better able than other individuals to avoid predators and passed on the trait. – Adaptations you **ALREADY** have! You **DONT** produce or aquire them

85. In the early 1900s, California citrus growers sprayed their trees with cyanide gas to kill scale insects. By 1914, some scale insects were surviving the spraying, and eventually the whole population showed resistance to cyanide. Which of the following statements best explains how resistance to cyanide spread in the scale insect population? Where does this fit in the idea of natural selection?

- A. Insects with a resistance gene survived the first cyanide sprayings and passed the gene to their offspring. – Survival of the fittest
- B. Insects without a resistance gene underwent mutation upon contact with the cyanide to acquire resistance.
- C. Predators put greater selection pressure on insects with a resistance gene than on insects without a resistance gene.
- D. Parasites infecting the insect population carried the trait from insects with a resistance gene to insects without a resistance gene.

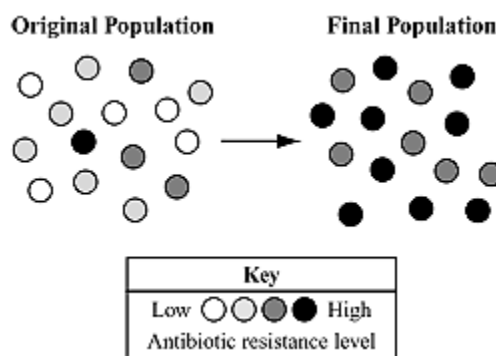
86. Turtles are classified in the order *Testudines*. Some turtles are aquatic and others are terrestrial. Aquatic turtles have webbed feet and short claws, but terrestrial turtles do not. Which of the following statements **best** explains why aquatic turtles and terrestrial turtles are classified in the same order but have such different feet? How does this play into natural selection?
- A. Aquatic turtles evolved from fish, and terrestrial turtles evolved from reptiles.
  - B. Aquatic turtles and terrestrial turtles have similar body plans, but they grow at different rates.
  - C. Aquatic turtles interbred with different species, and terrestrial turtles bred only within their own species.
  - D. Aquatic turtles and terrestrial turtles evolved from a common ancestor, but they have adapted to different environments. They already had the necessary adaptation for the environment they were in. They were were better able to compete, breed, populate, and survive.

87. The diagram below shows many finch species that originated from a single ancestral finch species in the Galápagos Islands.



What **best** explains why many different finch species originated from the single ancestral species?

88. Antibiotic resistance can vary within a population of bacteria. The diagram below represents the changes in a population of bacteria as a result of exposure to an antibiotic over time.



The changes in the population are most likely the result of ... **natural selection. Those able to withstand the antibiotics survived. Those that couldn't...didn't.**

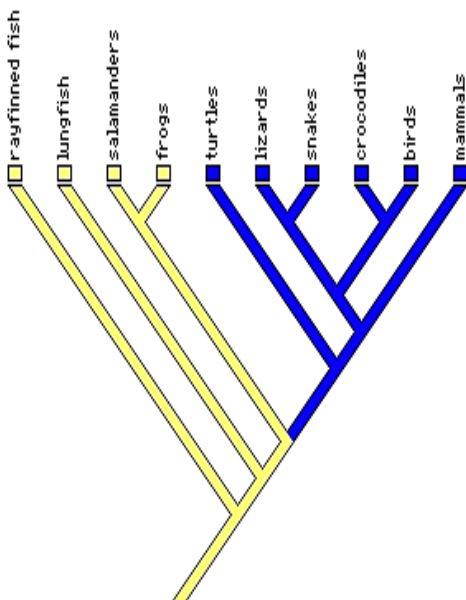
89. Natural Selection produces changes in \_\_\_\_\_ not \_\_\_\_\_.

90. What is a **vestigial structure**? Name a few in humans.

91. Discuss the steps in Darwin’s theory of evolution by natural selection.

- a. Populations of organisms have many genetic variations. Where do these come from?
  
- b. Those organisms with adaptations that better fit them to an environment will survive, reproduce and pass on their genes. What does it mean to be “**fit**” to an environment?
  
- c. The next population will have a high frequency of the genes that have been selected for. Why will the frequency of selected genes increase?

92. What happens when pesticides and antibiotics are used and how does it relate to evolution?



93. Why is the current classification system continually undergoing change?

86. What are the three **domains** proposed above the kingdom level?

94. What is the current seven-level classification system? (DKPCOFGS)

95. To the left is a **phylogenetic tree** of some organisms. According to this tree, which pairs of organisms are most closely related?

96. Which organism is most closely related to the ray finned fish?

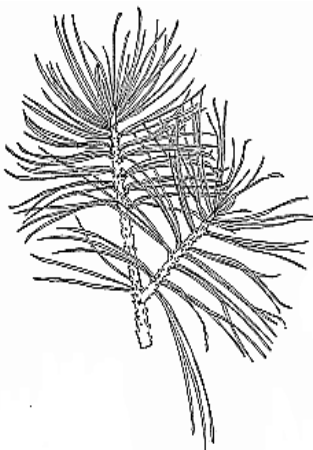
97. Which organisms are the mammals most closely related to?

98. Fill in the following chart with the characteristics of the various kingdoms.



	ARCHAEA	EUBACTERIA	PROTISTA	FUNGI	PLANTAE	ANIMALIA
Eukaryotic or prokaryotic						
Multicellular or single-celled						
Sexual or asexual reproduction						
Autotrophic or heterotrophic						
Aerobic or anaerobic						
Cell walls or no cell walls						

Use the following dichotomous key to identify the tree branch to the left.



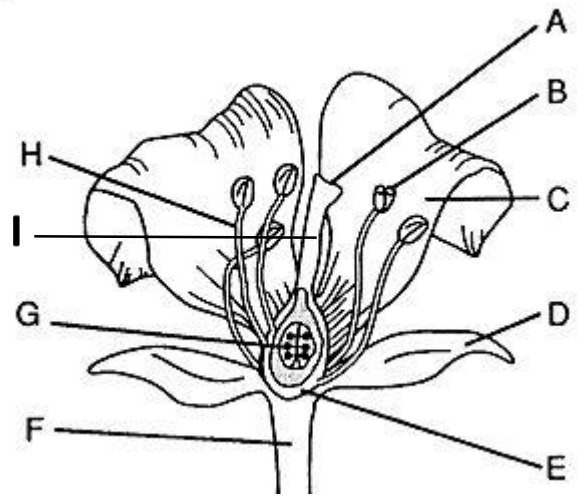
1. a. leaf is needle-like....go to 2  
b. leaf is broad..... go to 5
2. a. needles are short ....go to 3  
b. needles are long.....go to 4
3. a. underside of needles green...hemlock  
b. underside of needles silver ..balsam
4. a. 3 needles in bundle....pitch pine
5. a. edge of leaf round...go to 6  
b. edge of leaf serrated...go to 7
6. a. minty odor..... wintergreen  
b. no minty odor.....laurel

99. Branch Identity?

100. What am I? -

101. Label the following parts on the flower and give their functions:

- Stigma -
- Style -
- Ovary -
- Petal -
- Sepal -
- Anther -
- Filament -
- Carpel -



102. In the following chart, explain the symbiotic relationships.

Relationship	Definition	Example
Mutualism		
Commensalism		
Parasitism		

**Predator-Prey Relationships**

103. In the graph below, which organism is the prey

104. Which is the predator?

105. Which population increases (or falls) first and why?  
106. Which population increases (or falls) second and why?

107. Why are **predator/prey relationships** important in an ecosystem?

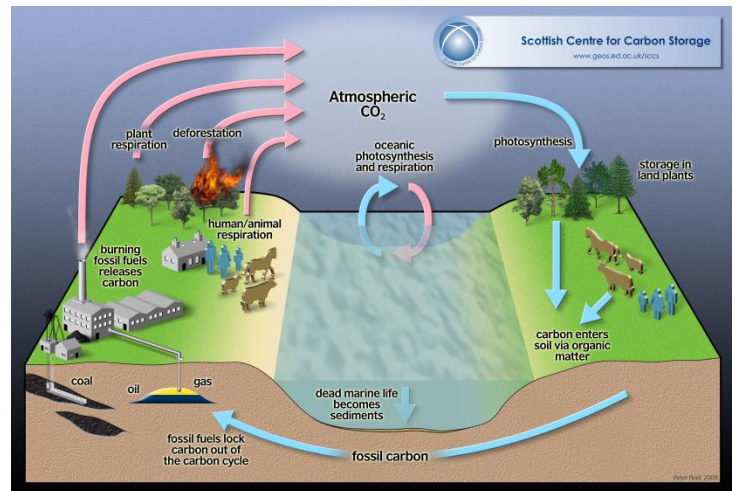


**Biotic and Abiotic Factors**

108. List at least 3 **biotic factors** in an environment.  
109. List at least 3 **abiotic factors** in an environment.  
110. Give an example of how biotic & abiotic factors act together to limit population growth and affect carrying capacity.

**Carbon Cycle**

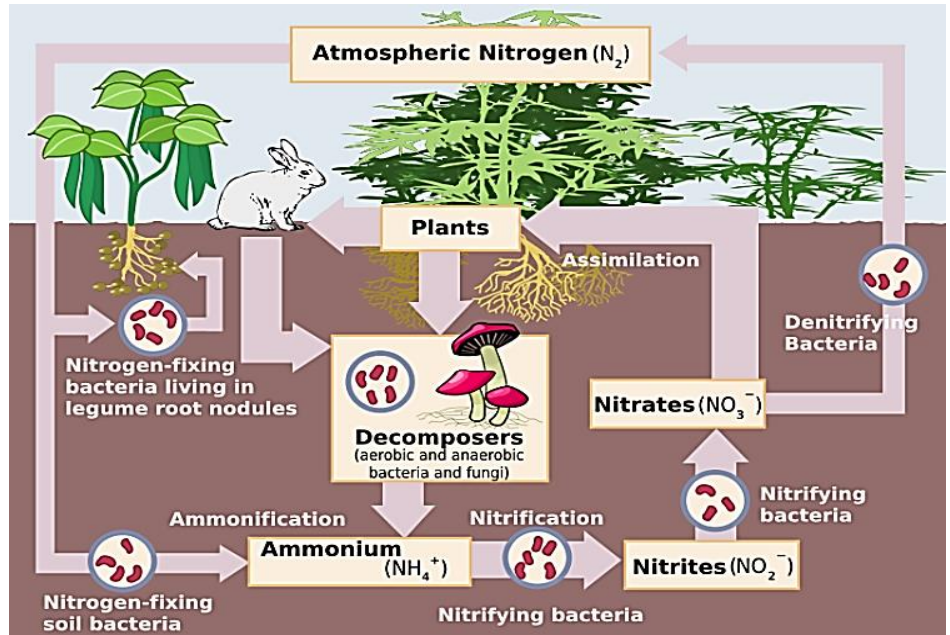
111. Which process(es) put carbon dioxide into the atmosphere?  
112. Which process(es) take carbon dioxide out of the atmosphere?



**Nitrogen Cycle**

113. What roll do bacteria play in the nitrogen cycle?

114. Where can you find the bacteria in the nitrogen cycle? (2 places)



**Food Webs**

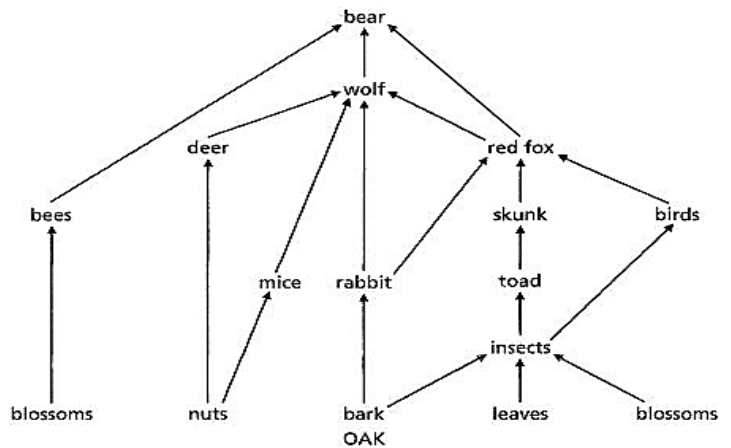
115. What are the **producers** in this food web?

116. What are the **primary consumers** (herbivores) in this food web?

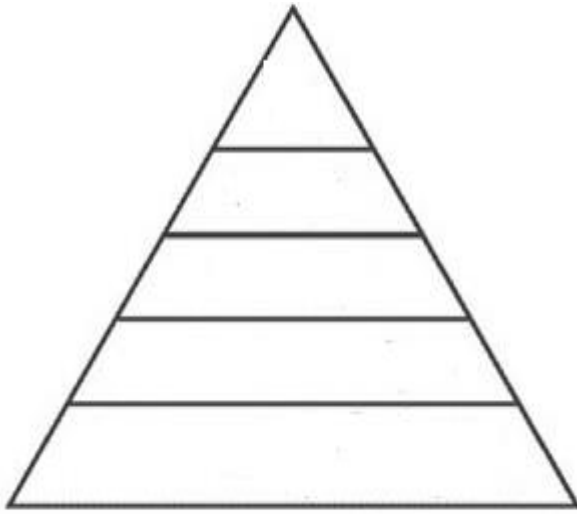
117. What are the **secondary consumers** in this food web?

What are the **highest level consumers** in this food web?

119. How does energy move through a food web?



**Label both biomass, energy, and trophic levels**



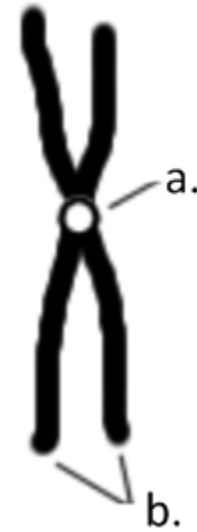
120. Where is the most energy in this pyramid?
121. Where is the least energy in this pyramid?
122. What happens to energy as it moves through the food chain/web?
123. Assume there are 10,000 kcal of energy in the leaves? Estimate the amount of energy in each of the other levels of the energy pyramid.

124. What percent of energy is lost?
125. How much is passed on?
126. What is the ultimate source of energy for this food web?
127. Define *the following*:

Chromosome	
Gene	
Allele	
Gene locus	
Genome	
Chromatid	
Mutation	
Haploid	
Diploid	

128. State the components of a chromosome.
- DNA &
129. State the number of chromosomes present in a single human diploid
- 

130. Identify structures a. and b. on the line drawing of a chromosome in shown to the right.
- a.
- b.



cell.  
prophase

131. Give two examples of genes and some of their possible alleles.

Gene	Possible alleles
Eye colour	Blue, brown, green, hazel

132. List factors that increase the chance of a genetic mutation.
- - 
  -

133. Transcribe and translate these sections of a gene:

<p style="text-align: center;">CCT GAG GAG GGA CTC CTC</p>	sense anti-sense	<p style="text-align: center;">CCT GTG GAG GGA CAC CTC</p>
	mRNA	
	amino acid	

134. Distinguish between the two DNA strands above in terms of:
- a. DNA *base sequence*.
-

b. Amino acid sequence in the resulting polypeptide.

- 

135. Compare the following types of *base-substitution mutation*.

	Silent mutation	Mis-sense mutation	Nonsense mutation
Number of bases substituted	1		
Effect on polypeptide			Stop codon produced early – polypeptide shortened
Example illness		Sickle cell disease	

Describe the effects of sickle cell disease on sufferers in terms of:

a. Hemoglobin production

- 

b. Symptoms and mortality

- 

136. Identify parts of the world where a single sickle cell ( $Hb^s$ ) allele could be beneficial

- 

Explain your answer

- 

137. Define *evolution*.

- 

138. Outline how mutations lead to *evolution by natural selection*.

- 
- 
- 
-

- 
- 

139. Outline how the spread of the sickle cell gene is an example of natural selection in action.

- 
- 
- 

140. How could this be an example of a **correlation** which has a strong element of **causality**?

- 

141. The *polymerase chain reaction (PCR)* is used where DNA samples are too small to be useful.

a. State the purpose of PCR in labs and investigations.

- 

b. Identify the cellular process which PCR mimics.

- 

c. State the role of high temperatures in PCR.

- 

d. State the role of complementary base pairing in PCR.

- 

e. Describe why it is called a *chain reaction*.

145. State two main uses of **DNA profiling** by electrophoresis.

- 
- 

146. State some other names for DNA profiling.

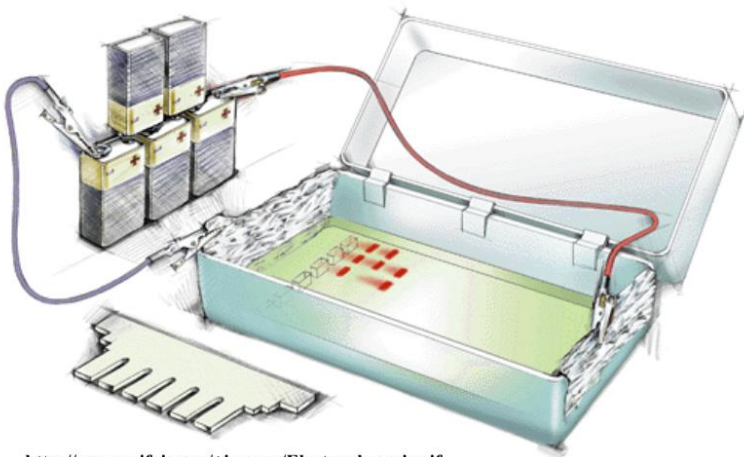
- 
-



147. State the roles of the following components of gel electrophoresis:

Restriction enzymes	
Gel	
Electric current	
Fluorescent DNA markers	

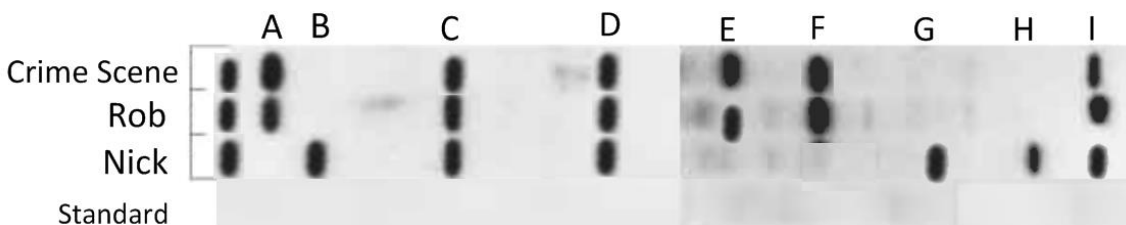
148. Annotate the image below to outline briefly how gel electrophoresis works, including how the size of fragments affects their position on the final gel.



<http://www.scifair.org/+images/Electrophoresis.gif>

149. Use the gel electrophoresis results below to answer these questions.

In this case, a DNA sample was taken from a cigarette found at a crime scene (smoking in a no-smoking zone):



- a. State the process used to amplify the small amounts of DNA collected at the crime scene to an amount big enough to be used in DNA profiling.

•

- b. Deduce which criminal, Rob McCarr or Nick Allott, left their dribbly cigarette-end at the crime scene. Explain your answer.
- Criminal:
  - Explanation:
- c. Draw bands to show where the *standard* fragments would be observed. State the role of the standard fragment.
- 
- d. Outline the evidence in the DNA profile that suggests Nick and Rob are related.
- 
150. Describe the *Human Genome Project*.
- 
151. Outline the goals of the HGP (<http://www.beep.ac.uk/content/187.0.html> ).
- - 
  - 
  - 
  -
152. Look at some of the HGP resources at <http://www.genome.gov/25019885>
- a. Describe the role of *E. coli* in the HGP.
- 
- b. Explain how differently-coloured nucleotides were used in sequencing the genes.
- 
- c. Explain why the information collected was stored in public databases.
- 
153. Outline how the HGP developed knowledge in the following fields:  
Evolutionary research
-

Medicine

- 

Bioinformatics

- 

Ethical, Legal and Social Issues (ELSI)?

- 

154. Genetically modified organisms (GMOs) are created using gene transfer.

a. Outline *gene transfer*.

- 
- 
- 
- 

b. Explain how the *universality of the genetic code* is central to gene transfer applications.

- 
- 
- 
- 

c. Define *transgenic organism*.

- 

d. State the role of the following in gene transfer:

*Restriction enzymes*

- 

*E. coli plasmids*

- 

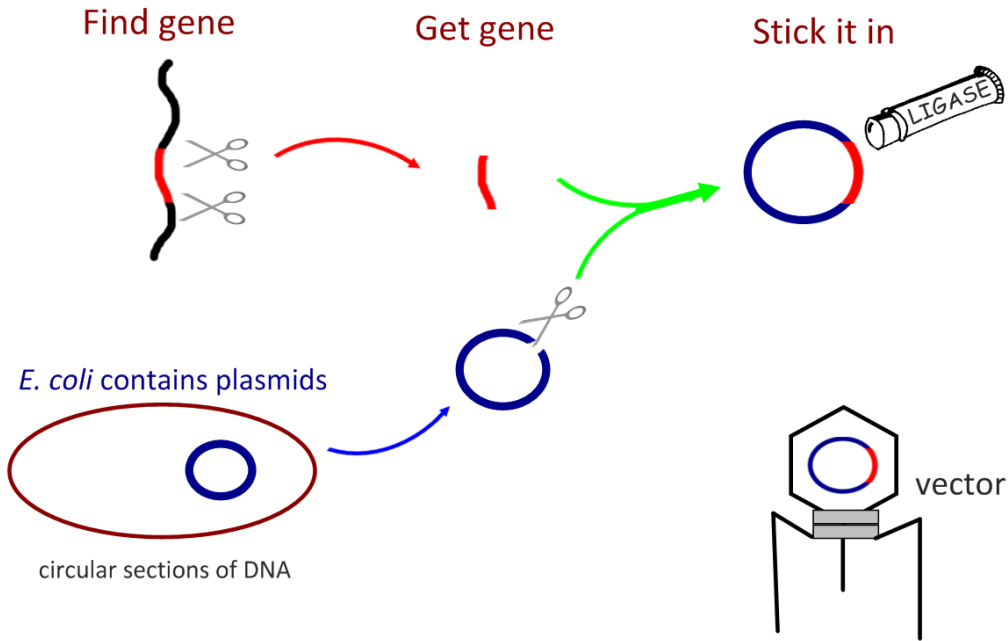
*Ligase*

- 

*Vector*

- 

e. Annotate the diagram below to outline the process of gene transfer:



f. Explain how gene transfer is used in *industrial production of insulin*.

- 
- 
- 
- 
- 
- 

155. Outline the use of gene transfer in gene therapy to treat SCID.

a. SCID is...

b. Gene therapy can treat SCID by...

156. Give three examples of **genetically modified** (GM) plant crops and the effects of their new genes.

	<b>New properties</b>	<b>Advantages</b>
<b>'Golden Rice'</b>		

157. Outline how genetically modified sheep can help hemophiliacs.

- 
- 
- 
- 

158. Discuss the benefits and potential dangers of one type of genetic modification used in agriculture. Suggest why some groups are protesting GM (genetically modified) foods or crops?

- 
- 
- 
- 
- 

159. Define *clone*.

- 

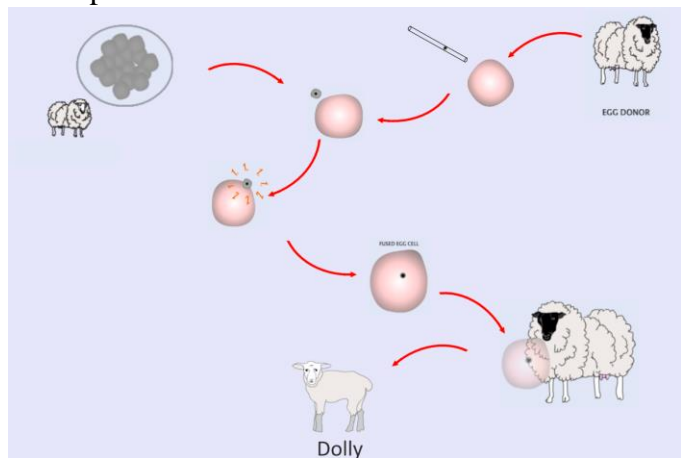
160. Give three examples of *naturally occurring* clones.

- 
- 
- 

161. Dolly the Sheep was produced by cloning using a differentiated nucleus.

- a. Define *differentiated nucleus*.
  -
- b. Suggest why the differentiated nucleus taken from an udder cell.
  -
- c. Suggest one reason why Dolly died younger than normal, but of age-related illnesses.
  -
- d. Outline the method used to clone Dolly the Sheep.

- 
- 
- 
- 
- 



162. Distinguish between *reproductive cloning* and *therapeutic cloning*.
  - Reproductive =
  - Therapeutic =
163. State some of the medical applications and benefits of therapeutic cloning.
  - 
  -

164. Discuss the ethical considerations of therapeutic cloning in humans.

Advantages:	
Disadvantages:	



Human Health & Physiology 6 (SL)

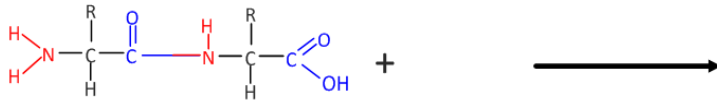
1. Define *enzyme*.
2. Define *substrate*.
3. Define *macromolecule*.
4. Distinguish between *catabolic* and *anabolic* metabolic reactions.
5. Explain why digestion of large food molecules is essential.
6. Complete the table to show the substrate, product and enzyme of digestion of these food macromolecules:

	Carbohydrates	Lipids (fats)	Proteins
Type of Enzyme	carbohydrase		
Example of enzyme			trypsin
Product(s)			
Source of enzyme		pancreas	
Optimum pH			

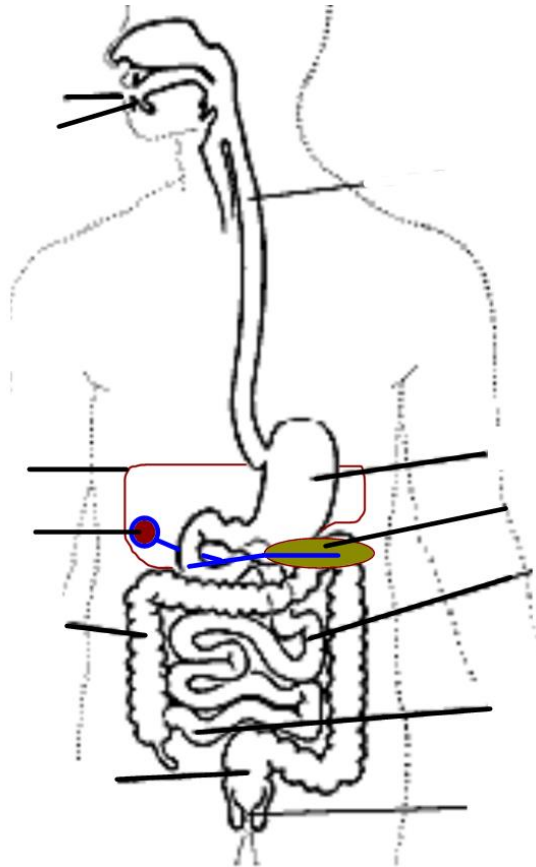
7. Where might one find an enzyme with an optimum pH of 2?
8. Outline how the following factors affect the rate of an enzyme-catalysed reaction:
  - a. Substrate concentration
  - b. pH
9. Explain the need for enzymes in digestion, with a focus on temperature and energy.  
A graph showing the difference between a catalysed and uncatalysed reaction is useful.



10. Digestion of large food molecules is through enzyme-assisted hydrolysis.  
 Complete the equation below to show hydrolysis of a dipeptide.



11. Label the diagram of the human digestive system below.  
 Annotate each structure with its function and describe how it carries out this function.



12. The stomach is extremely acidic.
- What is this acid? What the function of this acid?
  - What part of the stomach aids mechanical digestion? How?
  - Which enzyme is released by the stomach? Where from? How is it controlled?
13. Much digestion and absorption occurs in the small intestine.
- How is the acidic chyme neutralized in the small intestine?
  - What feature of the ileum wall allows for greater absorption of food molecules?
  - By which mechanism is the bolus of food moved along the intestines?
14. In the space below, draw and label a single intestinal villus.  
Include epithelial cells, lacteal and capillaries.  
Explain the significance of the structures of the villus in absorption of digested food molecules.
15. Distinguish between *ingestion*, *digestion*, *absorption*, *assimilation*, *egestion* and *excretion*.

*Ingestion*  
*Digestion*  
*Absorption*  
*Assimilation*

*Egestion*  
*Excretion*

16. Distinguish between the small and large intestines in terms of structure and function.

17. What substances are egested as faeces?

18. How can a high-fibre diet promote intestinal health?

Digested food molecules are carried in the blood around the body.

19. Other than digested food molecules, what other substances are transported in the blood?

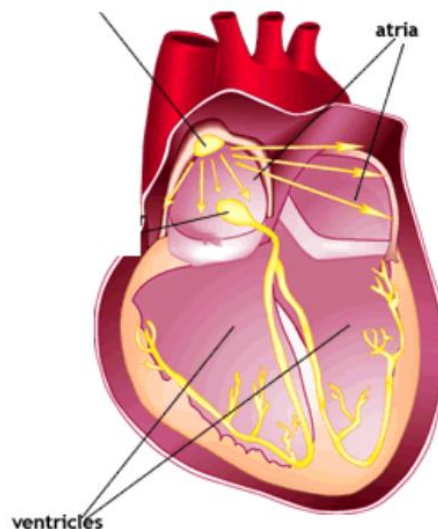
20. What are the functions of the following components of blood:

Plasma  
Platelets  
Erythrocytes  
Leukocytes

21. Draw and label a simple diagram of the heart showing:

Right and left atria and ventricles, atrio-ventricular and semi-lunar valves, aorta, pulmonary artery, pulmonary vein, vena cava and cardiac muscle.

22. Where is the cardiac muscle thickest? Why?
23. Distinguish between *oxygenated* and *deoxygenated* blood.
24. Outline the journey of a single red blood cell taking one full circuit of the transport system, starting and finishing at the liver. You could use a flow chart/cycle for this.
25. Why is the flow of blood described as *double circulation*?
26. What is a *myocyte*?
27. Explain the *myogenic origin* of the heartbeat.



28. Name and label the parts of the heart responsible for initiation and propagation of the heart beat.

29. What is meant by the term *indefatigable*?

30. Complete a flow chart to show how heart rate changes with exercise.

Include the roles of the blood, medulla oblongata, nerves, SA node and the Vagus nerve.

31. What is the effect of the hormone adrenalin?

32. Compare the structure and functions of these blood vessels:

	<b>Artery</b>	<b>Capillary</b>	<b>Vein</b>
Diagram (labeled, cross section)			
Function			
Travels...	From...	Through ...	To ...
How is structure related to function?			

33. Distinguish between ventilation, gas exchange and *respiration*.
34. Capillaries deliver deoxygenated blood to and carry oxygenated blood from the alveoli of the lungs. Draw a simple diagram to show the flow of blood and gas exchange at the alveolus.
35. What structural adaptations of alveoli suit them to their function of gas exchange?
36. By which two methods is a concentration gradient of CO<sub>2</sub>/O<sub>2</sub> maintained at the alveolus?
37. Draw and label a simple human ventilation system, including:  
Mouth/nose, trachea, bronchi, bronchioles, alveoli, lungs, ribs, intercostal muscles and diaphragm.

38. Complete the table below to show the events of ventilation (breathing):

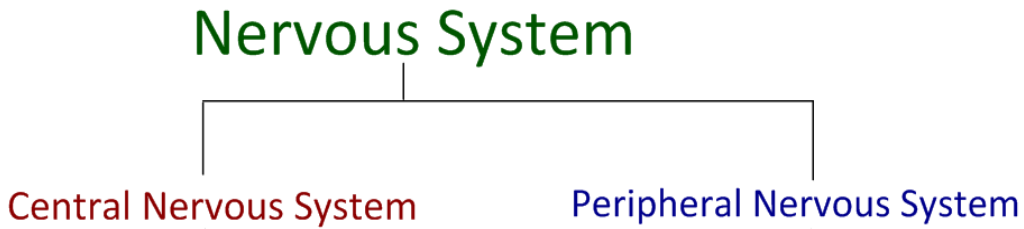
	Inhalation	Exhalation
--	------------	------------

Diaphragm		
Abdominal muscles	relax	
External intercostals muscles		
Internal intercostals muscles		
Lung Volume		
Air pressure in lung		increases
Movement of Air		

39. Control of ventilation rate, like the heart rate, is via the autonomic nervous system. Under exercise, there is more CO<sub>2</sub> in the blood.

- a. At which part of the brain is this increased CO<sub>2</sub> detected?
  
- b. What is the effect of this on breathing rate?

40. Extend the organizational chart below to show some components of the central and peripheral nervous systems.



41. Draw a simple diagram of a motor neuron (nerve cell), including:

Cell body, nucleus, dendrites, axon, terminal branches, motor end plates, myelin sheaths, Nodes of Ranvier and the direction of the nerve impulse.

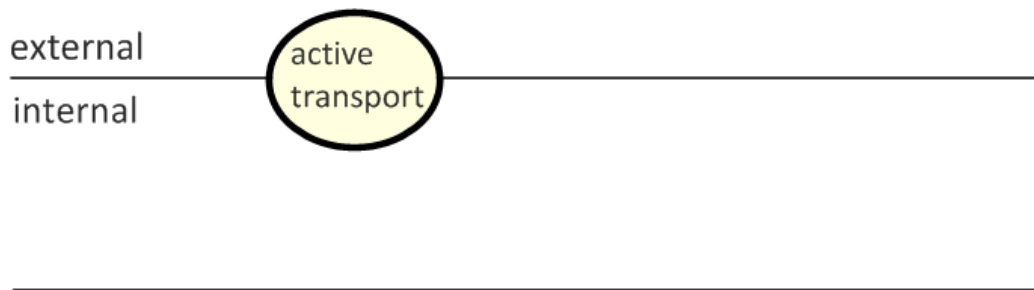
42. Describe the journey of a nerve impulse in the reflex arc, from the stimulus to the effector.

43. Define *resting potential*.



44. Define *action potential*.

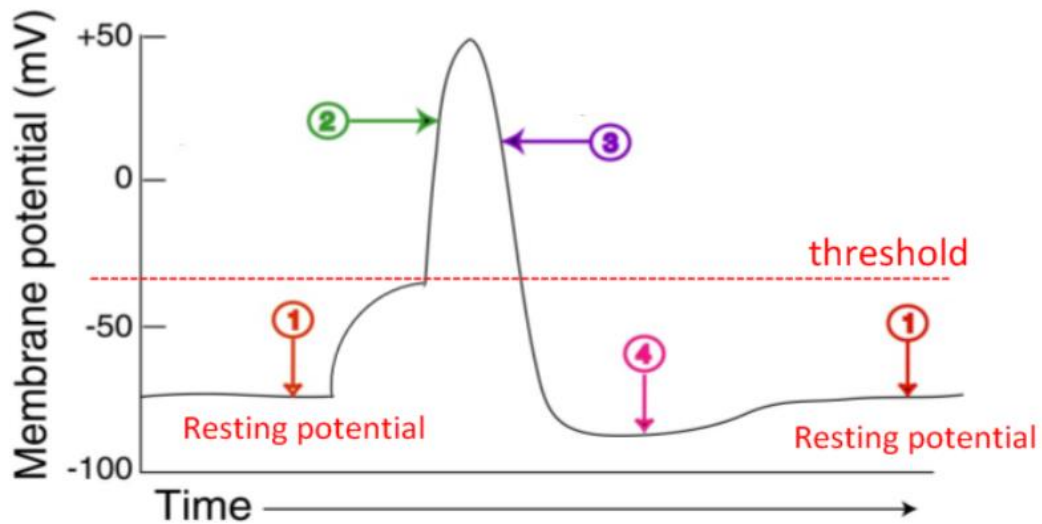
45. Complete the diagram below to show *why the resting potential of a neuron is negative*.



46. Define *depolarization*.

47. Define *repolarisation*.

48. Annotate the graph below to explain what is happening in each stage of an action potential (AP).  
Include the movement of ions into and out of the cell and how this occurs.



49. What is the importance of the refractory period in propagation of an action potential?

50. What is the importance of these membrane proteins in nerve impulses?

Sodium-potassium pump

Sodium channel

Potassium channel

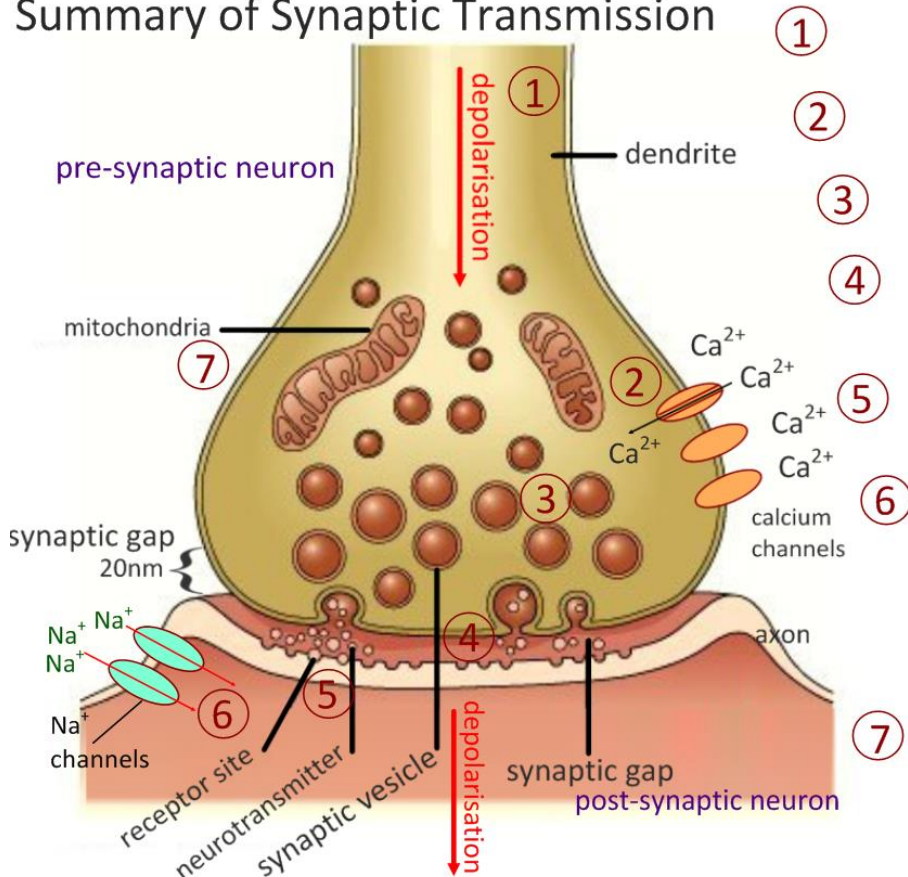
51. Define *synapse*.

When an AP reaches the terminal end of a neuron, it is converted from an electrical signal to a chemical message for synaptic transmission.

52. What form does this 'chemical message' take?

53. Complete the summary of synaptic transmission below:

### Summary of Synaptic Transmission



<http://universe-review.ca/I10-40-synapse.jpg>

54. Neurotransmitters are specific to their receptors.  
What does this mean?

55. Some drugs act as competitive inhibitors to neurotransmitters.  
What would be the effect of this?

56. Distinguish between *nerves* and *hormones*.

	<b>Nerves</b>	<b>Hormones</b>
Route	Direct from coordinator to effector	Through: From: To:
Signal type		Chemical
Time to take action		longer
Duration of effects		

57. The endocrine system is responsible for hormone-mediated communication within the body. Which endocrine glands are mostly responsible for:

Control of blood sugar

Control of body temperature

Initiation of puberty

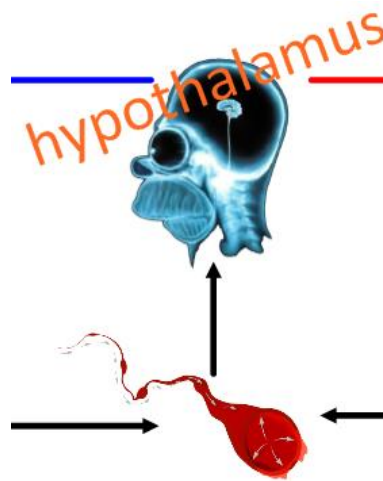
Production of sex cells

58. Draw a simple flow chart to show how the endocrine system functions based on stimulus, hormone secretion and negative feedback control.

59. Define *homeostasis*.

60. List five factors that are maintained through homeostasis.

61. Complete the flow chart below to show how the hypothalamus controls body temperature through hormones. What are the body's responses?



62. Blood glucose levels are maintained by hormones produced in the pancreas. Complete the table to show glucoregulation.

	High Blood Sugar	Low Blood Sugar
The pancreas contains...	_____ cells...	_____ cells...
...which secrete...		
... carried in blood to....	&	
... causing conversion of..		
... to ...		
<b>Overall effect:</b>	Glucose removed from blood	Glucose released into blood

63. Diabetes mellitus is a disease in which regulation of blood glucose is difficult.  
There are two types of diabetes (Type I and Type II)  
Distinguish between them in terms of action, age of onset and risk factors.

**Type I:**

**Type II:**

64. Suggest reasons why incidence of diabetes is increasing globally.

65. Diabetes has a strong hereditary link.  
Name two other disorders which can be inherited, and state the cause.

1:

2:

66. Cancers (tumours) are not inherited, nor are they pathogenic.  
What is a tumour?

67. Define *pathogen*.

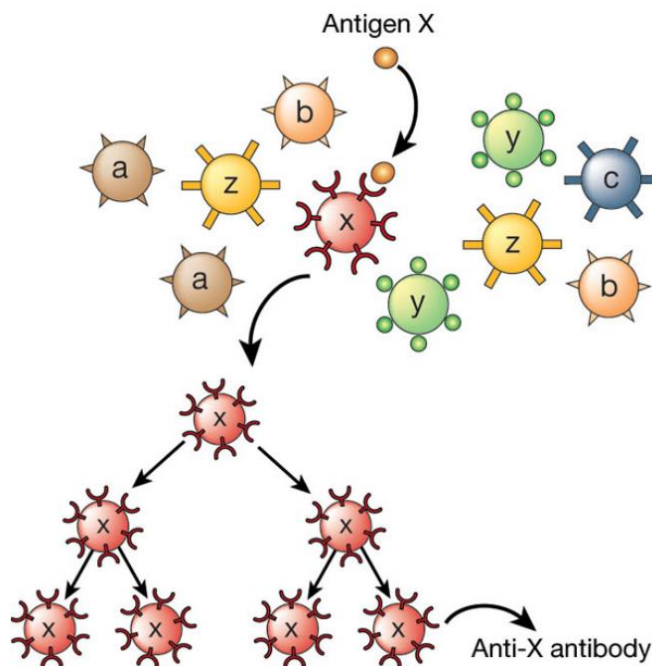
68. Give named examples of the four types of pathogen.

- 
69. List five methods by which pathogens can be *transmitted*.
70. Explain why antibiotics are not effective against viruses.
71. Distinguish between *bacteriocidal* and *bacteriostatic* antibiotics.
72. Outline the emergence of Multiple-Resistant bacteria as a result of overuse of antibiotics and subsequent evolution by natural selection.
73. How do the skin and mucous membrane act as the body's primary defense against infection?
74. What is the role of the following types of cells in defense against infectious diseases?
- Phagocytes (macrophages)
  - B-cells
  - T-cells
75. Draw a diagram to show how a phagocyte engulfs a pathogen by phagocytosis.

What is the role of *lysozymes* in this process?

76. Distinguish between *antigens* and *antibodies*.

77. Annotate the diagram to explain how *clonal selection* leads to *antibody production*.



78. Define *HIV*

79. Define *AIDS*

80. Distinguish between HIV and AIDS.

81. Explain the effects of HIV on the immune system.



---

82. Discuss the cause, transmission, social and economic impacts of HIV.

83. How might HIV/AIDS affect developed nations differently to developing nations such as regions of Africa?

84. List three other diseases that can be sexually transmitted and their effects.

85. Human Pappiloma Virus (HPV) is a pathogen that has been linked to cervical cancer.

a. How might a virus lead to cancer?

b. How could the following protect the reproductive health of women?

The HPV vaccine

Regular cervical smear tests

86. Draw and label the female reproductive system, including:  
Vagina, cervix, uterus, endometrium, fallopian tubes, ovaries. Include also the bladder and urethra.  
Annotate the diagram with the function of each part.

87. A typical menstrual cycle lasts around 28 days and is controlled by hormones.  
Name the origin and state the main functions of these hormones:

Follicle stimulating hormone (FSH)

Luteinising hormone (LH)

Oestrogen

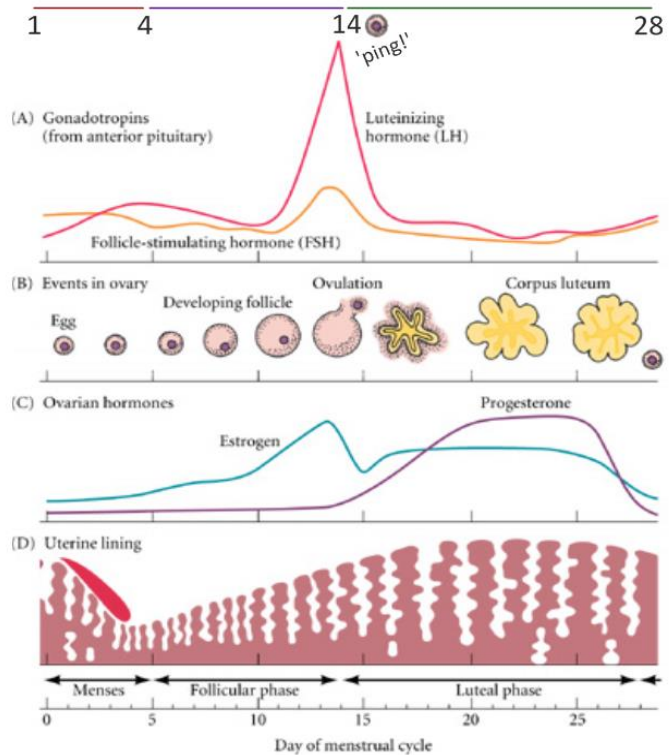
Progesterone

88. The chart below shows hormonal changes during the menstrual cycle. Describe the events occurring at:

1-4 days

5-14 days

14-28 days



<http://8e.devbio.com/images/ch19/11.HMEM.01.thumb.jpg>

89. During which days of the cycle is a woman:

- Most likely to conceive?
- Least likely to conceive?

90. Distinguish between *fertilisation* and *pregnancy*.

91. If a fertilised egg implants onto the endometrium, a hormone called HCG is released. This causes progesterone levels to remain high, inhibiting FSH and LH.

- What are two benefits of maintaining high progesterone levels during pregnancy?
- What immune system molecule is used in pregnancy test kits?

92. Another hormone, oxytocin, is essential in childbirth.

a. What is its role?

b. In what way is the action of oxytocin different to other forms of hormonal control?

93. Draw and label the male reproductive system, including:

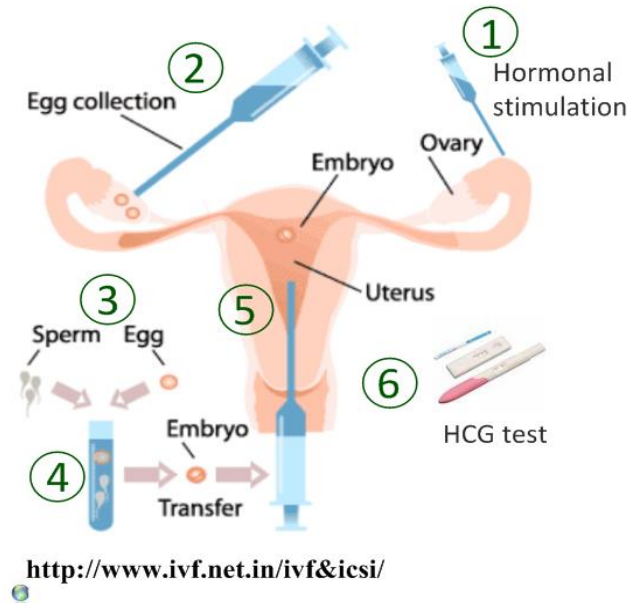
Testis, epididymis, sperm duct, seminal vesicle, prostate gland, urethra, penis and bladder.

Annotate the diagram with the function of each part.

94. What are three functions of testosterone in males?

95. IVF (in-vitro fertilisation) is a reproductive technology that allows those with reproductive problems to conceive and have a normal pregnancy.

*Annotate the diagram below with steps of IVF.*



**96. Discuss the ethical implications of IVF.**

Consider human rights, morality and religion, safety, cost, psychological effects, effects on others, economic cost, research and other points of view you feel are appropriate.

Arguments for IVF:

Neurobiology and Behavior Option E (SL)

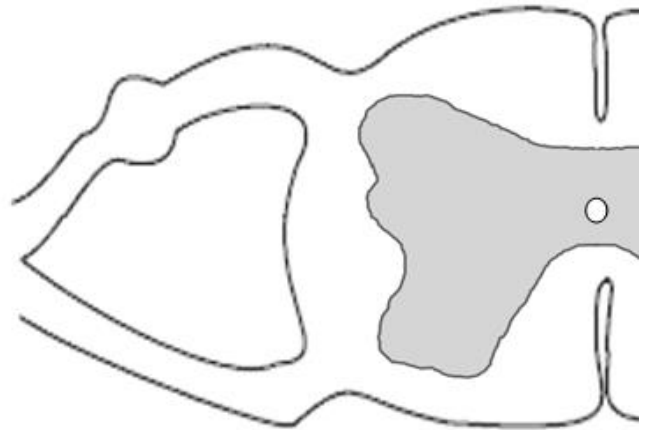
E1 Stimulus and Response

1. Define the following:

Stimulus	<i>A change in internal or external environment that is detected and elicits a response. (1)</i>
Response	
Reflex	

2. Label the structures of the spinal vertebra shown in the image (including ventral and dorsal roots)

a. Draw the reflex arc for pain withdrawal on top of the diagram. *Label white and grey matter, spinal cord, spinal nerves, receptor cell, sensory neuron, relay neuron, motor neuron.*



b. Explain the roles of the following in the animal response to stimulus.

Receptors	
Sensory Neurons	
Relay neurons	
Motor neurons	
Synapses	
Effectors	

- c. Explain the advantages of the pain reflex being mediated by the spinal column rather than being a learned, brain-mediated response.

.....  
 .....  
 .....  
 .....

3. State another term for *Fixed Action Pattern*.

.....

4. Fixed action patterns are not learned – they are genetic in basis, can be inherited and are therefore subject to mutation, variation and natural selection.

- a. Explain how natural selection affected the migratory patterns of *Sylvia atricapilla*.

Common name	
Original fixed action pattern	
Alternate behaviour	
Advantage to individuals	
Effect on natural selection	
Experimental evidence	





b. Explain how natural selection has affected the fixed action patterns of one other species.

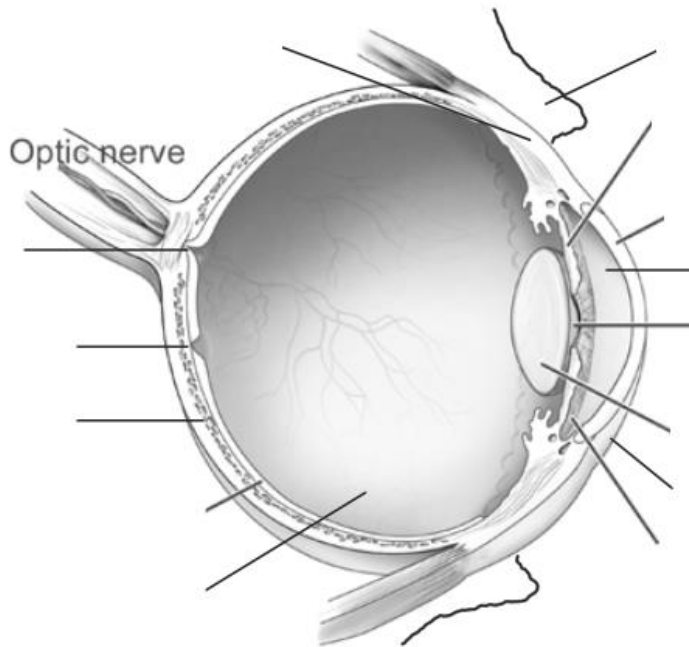
Name (latin & common)	
Original fixed action pattern	
Alternate behaviour	
Advantage to individuals	
Effect on natural selection	
Experimental evidence	

## E2 Perception and Stimuli

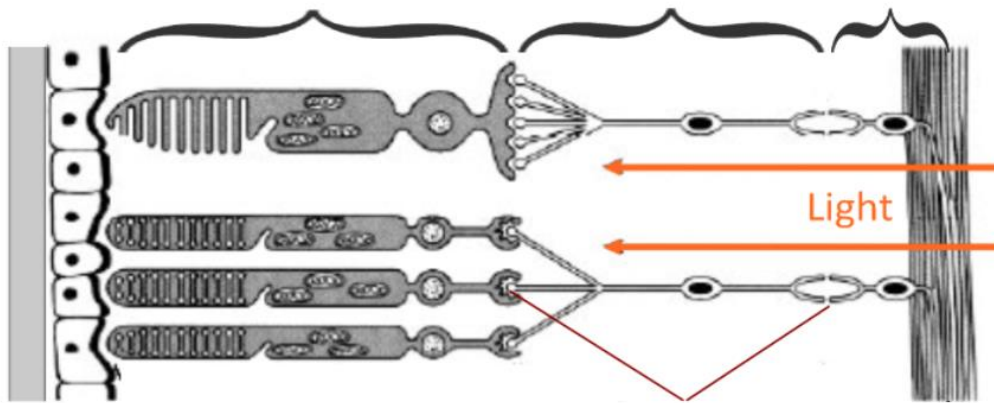
1. Complete the table below to outline four main types of receptors and the stimuli they detect:

Receptor	Stimulus	Examples
<i>Mechanoreceptor</i>	<i>Pressure Texture Vibration</i>	<i>Touch, pain and tension in skin Touch receptors in skin Inner ear for hearing and balance (2)</i>
<i>Thermoreceptor</i>		
<i>Chemoreceptor</i>		
<i>Photoreceptor</i>		

2. Label the structures of the human eye with their names and functions:



3. Label the section of the retina below:



4. Annotate the diagram below to outline how light stimulus is received by the photoreceptor and converted to an action potential:



<http://www.biologymad.com/resources/eye.swf>

5. Compare rod and cone cells:

	Rod cells	Cone cells
Light brightness		
Diversity of cells		
Wavelength sensitivity		
Impulse: neuron ratio		
distribution		

6. **Explain** how visual stimuli are processed in the eye and brain, with reference to the following stages (you can draw or find images to help, if you wish):

a. Image focusing and inversion in the cornea and retina

b. Visual fields

c. Contralateral processing and the role of the chiasma

d. The role and location of the visual cortex in the brain

e. Edge enhancement and 'filling in' of the blind spot

7. Label the diagram with the structures of the ear, and use the diagram to explain how sound is perceived by the ear.

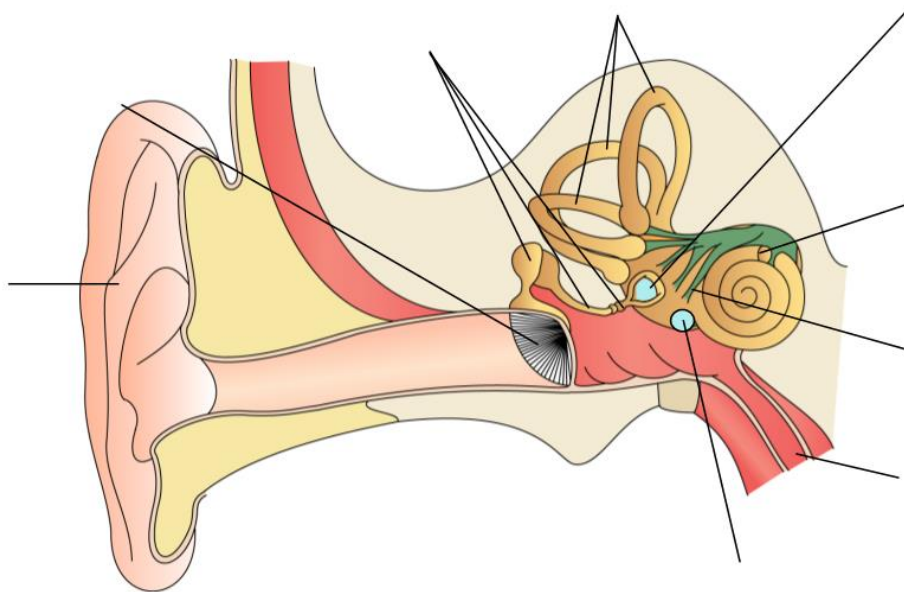


image from SMART Gallery

## E1 Stimulus and Response

1. Distinguish between innate and learned behaviour:

	<b>Innate</b>	<b>Learned</b>
Basis/ foundation?	<i>Genetic (predetermined)</i>	<i>Based on experience. (3)</i>
Modification by the individual?		
Variation within population?		
Effect of environment		
Effect of <b>natural selection</b>		
Human examples		
Non-human examples		

2. Outline *taxis* and *kinesis* as examples of **innate** behaviours:

<b>Taxis</b>		
Definition:		
Positive:		Negative:
Phototaxis	Chemotaxis	Thermotaxis
e.g.	e.g.	e.g.

<b>Kinesis</b>	
Definition:	
Positive:	Negative:
Orthokinesis	Klinokinesis
e.g.	e.g.

3. Outline an investigation into orthokinesis and klinokinesis of *Porcello scaber* (woodlouse).

Independent variable:

Dependent variable – Orthokinesis:

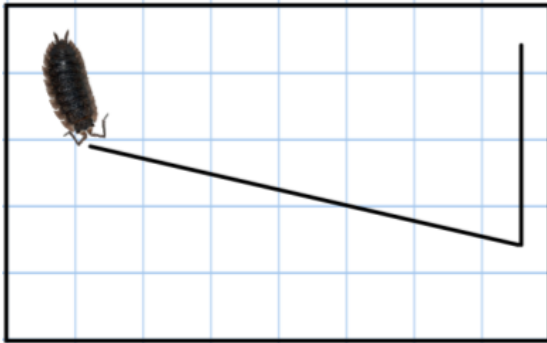
Klinokinesis:

Controlled variables:

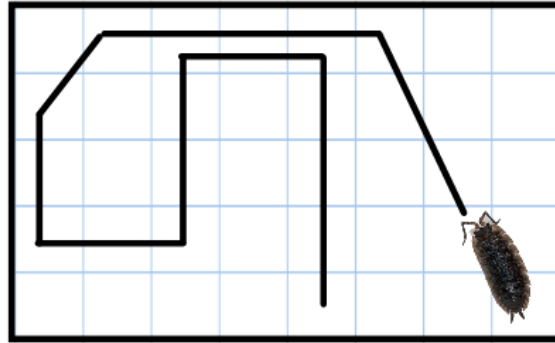
Method for collecting sufficient relevant data:

4. The images below show the results of an investigation into orthokinesis and klinokinesis in *P. scaber*.

Cold (10°C)



Warm (25°C)



- a. Calculate klinokinetic and orthokinetic values for each environment.
  
  
  
  
  
  
  
  
  
  
- b. Compare data collected from the cold and warm environments.
  
  
  
  
  
  
  
  
  
  
- c. Conclude on your results in terms of survival and reproduction.
  
  
  
  
  
  
  
  
  
  
5. Explain how innate behaviours are the product of *natural selection*.
  
  
  
  
  
  
  
  
  
  
6. Define *learning*.
  
  
  
  
  
  
  
  
  
  
7. Discuss how the process of learning can improve chances of survival, with reference to non-human examples.
  
  
  
  
  
  
  
  
  
  
8. Distinguish between these methods of associative learning:

*Classical conditioning*

*Operant conditioning*

*Imprinting*

9. Outline Pavlov's experiments into classical conditioning, with reference to the terms *unconditioned stimulus*, *conditioned stimulus*, *unconditioned response* and *conditioned response*.

10. **Birdsong** is in part innate and in part learned behaviour.

a. Outline the function of birdsong with regard to *sexual selection*.

b. Distinguish between the innate and learned components of birdsong development.

Innate (*template song*)

Learned

c. Explain how *imprinting* is vital in the learned part of birdsong development.

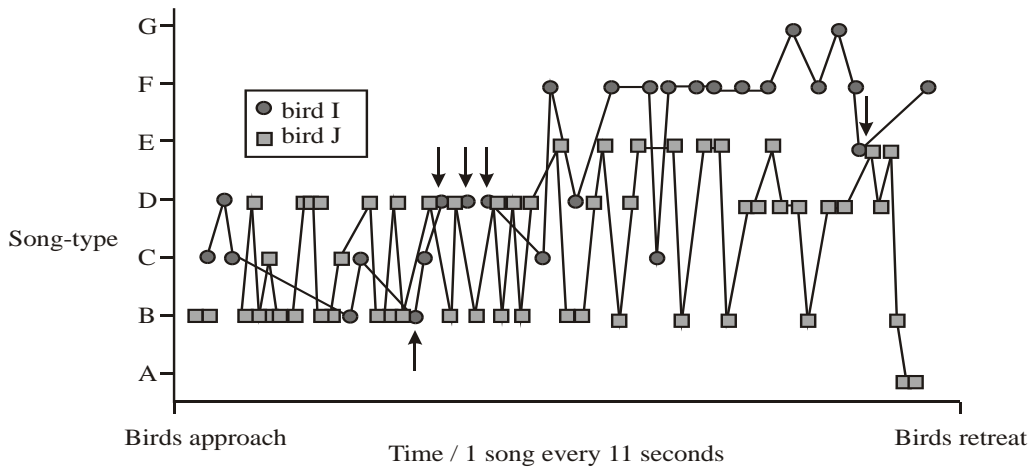
d. Birds raised in captivity are not exposed to adult songs or regional dialects of their own songs. Explain why they will not be reproductively successful if released into the wild.

e. Suggest methods by which captive-reared birds might acquire fully-formed, regional adult birdsongs with help from their human keepers.



Questions 12 and 13 taken from the QuestionBank CD Rom.

11. Banded wrens (*Thryothorus pleurostictus*) are known to sing actively in defence of their territories during the breeding season. Males possess over twenty different song-types. When two males approach each other near a boundary they engage in counter-singing and some song-types will be shared. The following diagram shows the pattern of song-types used during an interaction between two males at their territorial boundary in the Guanacaste Conservation Area, Costa Rica. The arrows indicate when both males sang identical song-types in succession. The interaction ended without a fight when the males retreated from the boundary.



a. Identify which song-types are shared between both males.

.....

(2)

b. Describe the changes in the song-type pattern during the entire interaction.

.....  
 .....  
 .....

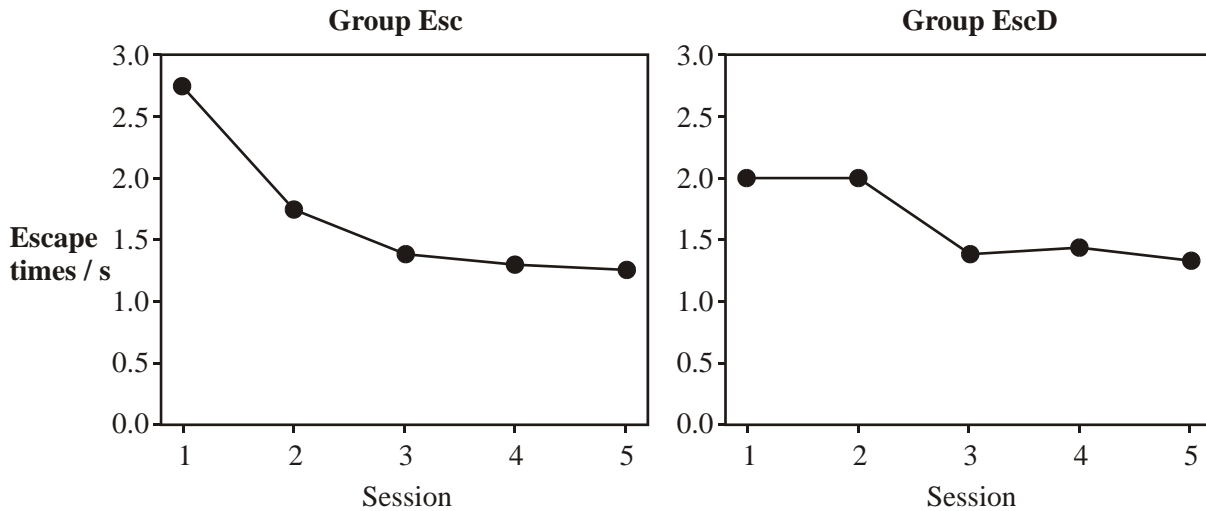
(2)

c. Deduce how a male banded wren can communicate aggressive behaviour.

.....  
 .....

(2)  
(Total 6 marks)

12. Two groups of 15 rats were trained to escape from an electric shock that was applied to one compartment of their cages. For one group (labelled EscD) the shock coincided with switching off the light, resulting in darkness in that compartment. The training was repeated for five sessions. The graphs below show the mean results for the two groups.



[Source: K. Zielinski and Savonenko, (2000), *Acta Neurobiol. Exp.*, **60**, pages 457-465]

(a) (i) Calculate the difference in escape times in session 1 between the two groups.

.....  
.....

(1)

(ii) Suggest a reason for the difference.

.....  
.....

(1)

(b) (i) Compare the changes in escape times over the five sessions between the two groups.

.....  
.....  
.....

.....

(2)

(ii) Deduce, giving a reason, which group shows more evidence of learned behaviour.

.....

.....

(1)

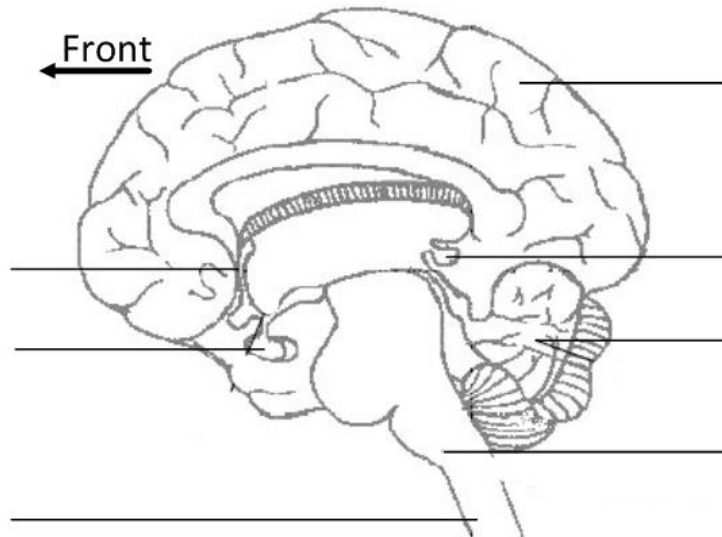
(c) If the researchers were to continue their experiments with the group Esc and apply the same experimental conditions as for the group EscD, predict what would happen to the escape times for the group Esc.

.....

.....

### E5 The Brain (HIGHER LEVEL)

1. Label the regions of the brain, including the function of each:



2. Discovery of the functions of parts of the brain is due to a number of areas of research over the last couple of centuries. Outline each of the methods below and explain what they have told us about the brain.
- a. fMRI**
- i. Define *fMRI*.
  - ii. Outline how fMRI works.
  - iii. Outline an experiment that shows how fMRI has been used to determine the function of a brain region.
- b. Brain Lesion studies**
- i. Define *lesion*.
  - ii. Outline the effects of lesions on brain function.
  - iii. Outline the famous discovery of *Broca's area* and its importance in language development.
- c. Animal experimentation**
- Outline the following examples of animal experiments into brain function:
- i. Dissection and comparative anatomy
  - ii. Removal of brain regions (causing lesions), e.g. Flouren's experiments
  - iii. Electrical stimulation of brain regions, e.g. Ferrier's experiments

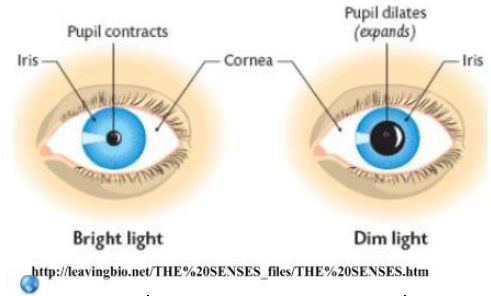
The *Central Nervous System (CNS)* consists of the brain and spinal cord. Peripheral nerves make up the *peripheral nervous system*, which is divided into the *autonomic* and *somatic* systems.

3. Distinguish between the *autonomic* and *somatic* nervous systems.

4. The autonomic nervous system is further divided into the sympathetic, parasympathetic and enteric nervous systems.
- Distinguish between the overall functions of the *sympathetic* and *parasympathetic* systems.
  - The sympathetic and parasympathetic systems can regulate heart rate, blood flow to the gut and control of the iris, among other functions.

Complete the table below, outlining these functions:

	Sympathetic		Parasympathetic	
Neurotransmitters			Acetylcholine (Ach)	
Nerve pathways	Sympathetic nerves			
Heart rate	Stimulus: Elevated CO <sub>2</sub> levels in blood		Stimulus:	
	Receptors: Chemoreceptors in medulla oblongata		Receptors:	
	Action	Effect	Action	Effect
	Stimulates SA node	Increases heart rate		
Blood flow to gut	Stimulus:		Stimulus:	
	Receptors:		Receptors:	
	Action	Effect	Action	Effect
			Relaxes blood vessels to gut	Increases blood flow to gut, allowing for 'rest and digest'
Iris control	Stimulus:		Stimulus:	
	Receptors:		Receptors:	
	Action	Effect	Action	Effect



--	--	--	--	--

5. Explain the *pupil reflex* as a response to bright light:

Stimulus:

Receptor:

Sensory neuron:

Relay neurons:

Motor neurons:

Effector muscles:

Effect:

6. The pupillary response can be used to determine brain death.

a. Distinguish between *cardiac* and *brain death*.

b. Explain why the pupillary response is a good indicator of brain death, with reference to the functions of the medulla oblongata.

c. Discuss the ethical considerations regarding diagnosis of death and of organ donation.

7. Pain is an unpleasant or aversive sensation associated with an action which causes the body harm or trauma.

a. What is a function of pain in terms of survival?

b. Outline the *pain pathway*:

Stimulus:

Receptors:

Sensory neurons:

Function of the brain:

c. Endorphins are protein-based molecules that can block pain impulses.

i. State why this might be useful in survival.

ii. Explain the effect of endorphins on synaptic transmission in the brain.

iii. Suggest a method by which pain-related brain regions can be identified.

iv. Suggest reasons why morphine is a highly effective painkiller and can be used in cases of serious injury.

---

E6 Further Studies in Behavior (HIGHER LEVEL)

1. Define *colony*.

.....  
.....

2. State the linnean name for the honeybee and give its phylum.

Name:

Phylum:

3. Describe the social structure of a honeybee colony:

Queen:

Workers:

Drones:



4. Colonies are examples of *eusocial* behavior in animals. Describe the social structure of another, vertebrate (non-human), species that lives in colonies.

Species name:

5. Using *Apis mellifera* as an example, outline how natural selection can act on the colony level in social organisms.

6. Define *altruism*.

.....  
.....

7. Outline how altruistic behavior is the result of natural selection.

8. Distinguish between *kin selection* and *reciprocal altruism*.

9. Discuss the evolution of *kin selection* in ants.

10. Discuss the evolution of *reciprocal altruism* in vampire bats.

11. Define *foraging*.

.....  
.....

12. Outline *optimal foraging theory*.

13. Outline how foraging behaviours are subject to natural selection.

14. Outline how Bluegill sunfish adjust their prey selection to optimize foraging.

15. Outline how one other named species adjusts *patch residence time* to optimize foraging.

16. Define *mate selection*.

17. Explain how mate selection can lead to *exaggerated traits* through natural selection in animals, using one physical and one behavioural example in named species.

	<b>Behavioural</b>	<b>Physical</b>
Example species		
Trait		
Explanation		

18. Describe *rhythmical behaviour* in animals.

19. Outline one animal example for each of these types of rhythmical behavior:

a. Lunar cycles

b. Seasonal variations

c. Circadian (diurnal) rhythms

20. Discuss the possible impacts of humans on natural rhythmical behavior in animals.

### Microbes and Biotechnology (F)

1. Outline the classification of living organisms into three domains.

2. Explain the reasons for the reclassification of living organisms into three domains.





13. Outline the use of viral vectors in gene therapy.

14. Discuss the risks of gene therapy.

15. Explain the use of *Saccharomyces* in the production of beer, wine and bread.

16. Outline the production of soy sauce using *Aspergillus oryzae*.

17. Explain the use of acids and high salt or sugar concentrations in food preservation.

18. Outline the symptoms, method of transmission and treatment of one named example of food poisoning.

19. List six methods by which pathogens are transmitted and gain entry to the body.
  
  
  
  
  
  
  
  
  
  
20. Distinguish between *intracellular* and *extracellular* bacterial infection using *Chlamydia* and *Streptococcus* as examples.
  
  
  
  
  
  
  
  
  
  
21. Distinguish between *endotoxins* and *exotoxins*.
  
  
  
  
  
  
  
  
  
  
22. Evaluate methods of controlling microbial growth by irradiation, pasteurization, antiseptics and disinfectants.
  
  
  
  
  
  
  
  
  
  
23. Outline the mechanism of the action of antibiotics, including inhibition of synthesis of cell walls, proteins and nucleic acids.
  
  
  
  
  
  
  
  
  
  
24. Outline the lytic life cycle of the influenza virus.



- 
25. Define *epidemiology*.
26. Discuss the origin and epidemiology of one example of a pandemic.
27. Describe the cause, transmission and effects of malaria, as an example of disease caused by a protozoan.
28. Discuss the prion hypothesis for the cause of spongiform encephalopathies.
29. Define the terms *photoautotroph*, *photoheterotroph*, *chemoautotroph* and *chemoheterotroph*.
30. State one example of a photoautotroph, photoheterotroph, chemoautotroph and chemoheterotroph.
31. Compare photoautotrophs with photoheterotrophs in terms of energy sources and carbon sources.
32. Compare chemoautotrophs with chemoheterotrophs in terms of energy sources and carbon sources.

33. Draw and label a diagram of a filamentous cyanobacterium.

34. Explain the use of bacteria in the bioremediation of soil and water.

Score Rubric

Subjects	Points Values	Section Grades	
		Informal (Completion)	Formal (Accuracy)
Study Guide Printed Out in Binder and Brought to Class*	50	/20	/30
Student Script (No Typing or Cut & Paste)*	100	/30	/70
Junior Year IB Biology	150	/50	/100
Human Health and Physiology	150	/50	/100
Neurobiology and Behavior (E)	150	/50	/100
Microbes and Biotechnology (F)	150	/50	/100
Total	750pts	/250	/500

\*Take note of the following

- No Print out of Study Guide and Binder – **30pt** deduction
- Not in students script (legible handwriting) and it is cut and paste – **50pt** deduction for each from Informal and Formal Grade