

Science 10- Course Review

Unit 2-Biology KEY

Name _____

Date _____

Date due _____

The Science 10 Biology Unit covers:

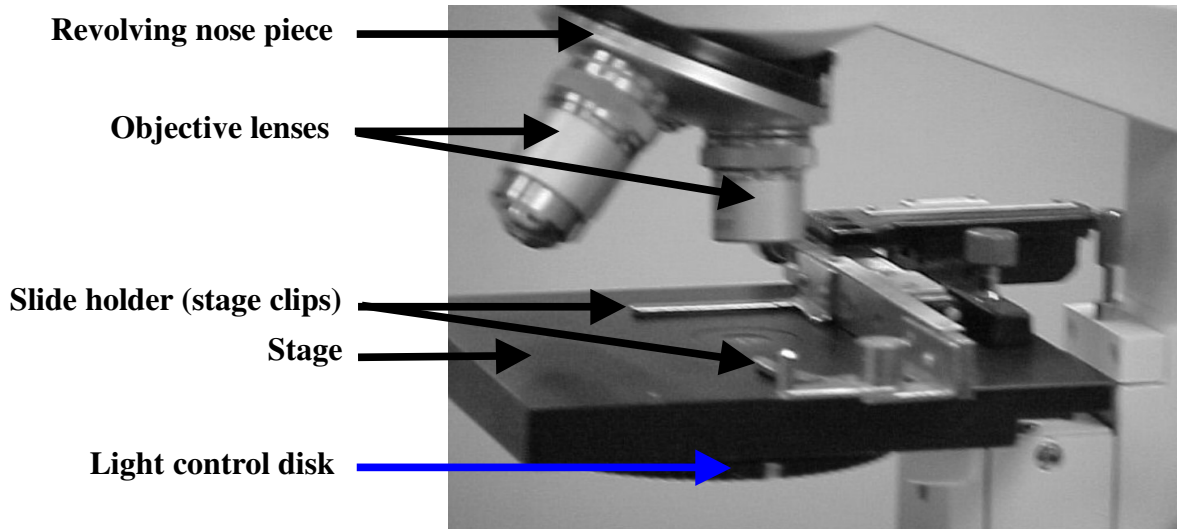
- Chapter 14-The Microscope
- Chapter 15-The Cell
- Chapter 16-Reproduction
- Chapter 17-Heredity

You can also consult the “Biology Outline” which shows all of the activities (Worksheets and Labs) If you don’t have one or if you want to view or print any of the activities, go to the Science 10 Web page at <http://sd67.bc.ca/teachers/dcolgur> and click “Science 10”

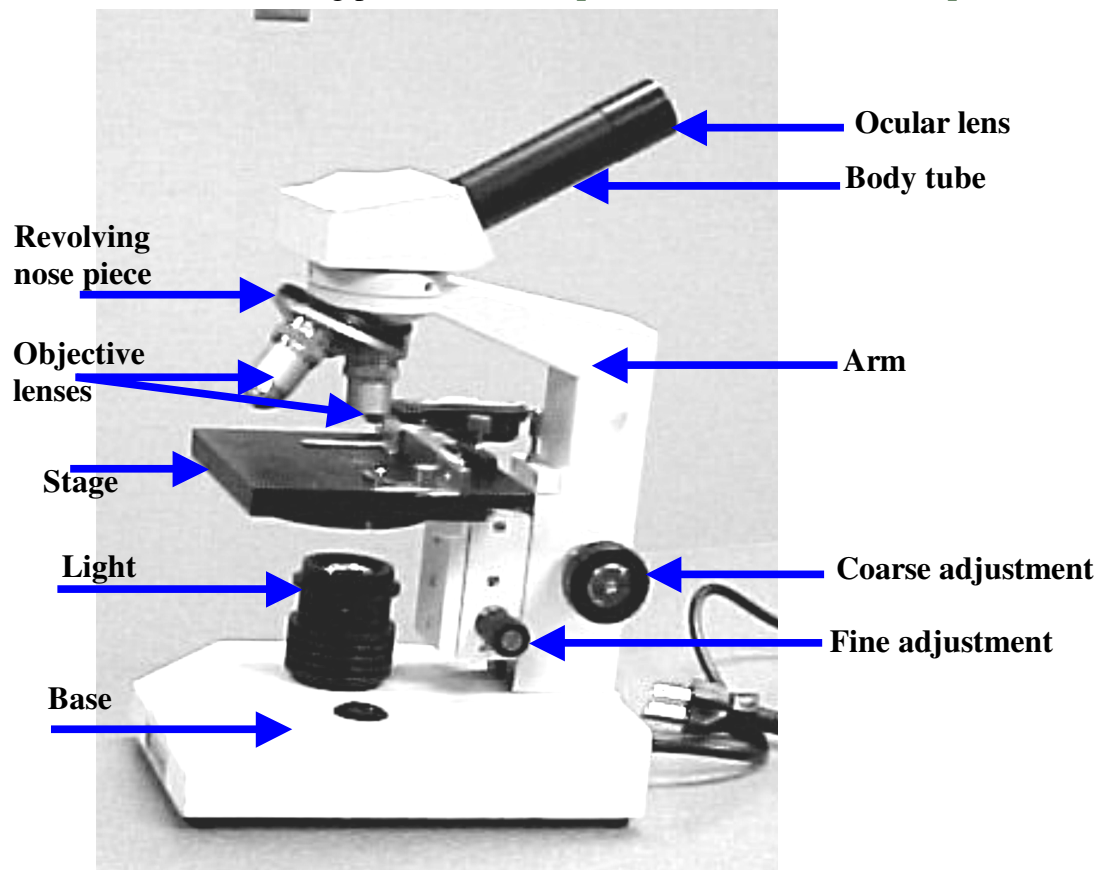
1. What happens to light when it passes through a barrier between two substances (eg. air and water)? **It is diffracted or bent**
2. The Dutch microscopist **Van Leeuwenhoek** discovered many things using a simple microscope including micro-organisms.
3. What is the main difference between a **simple** microscope and a **compound** microscope?

In a simple microscope, the light passes through one lens from the object to the viewer
In a compound microscope, the light passes through two lenses, an ocular and an objective

4. Label the parts on the following close-up of the stage of a compound monocular microscope:



5. Label each of the following parts on this **compound monocular microscope**:



6. Give the function of each of the following microscope parts: (see p. 316-318 in Text)
- a) **Ocular Lens** – magnifies image from the objective lenses
 - b) **Body Tube** – connects the ocular lens to the rest of the microscope
 - c) **Objective Lenses**- first lens to magnify the object
 - d) **Revolving Nose Piece** – allows you to select different objective lenses
 - e) **Arm** – holds the lenses and body tube
 - f) **Stage** – flat surface where the slide is placed on
 - g) **Slide Holder** – a mechanism to hold the slide in place
 - h) **Disk Diaphragm (or Light Control Disk)** – controls the light passing through the object
 - i) **Course Adjustment Knob** – Varies the distance between the objective lens and the object in order to give an approximate focus
 - j) **Fine Adjustment Knob** – Varies the distance between the objective lens and the object in order to give a precise focus
 - k) **Light** – (tough question) provides the light to see the object
7. What are two advantages of using a stereoscopic microscope rather than a monocular microscope?
- Gives a 3-D image**
- greater depth of field, allows you to see larger objects (eg. insects)**
8. Why aren't stereoscopic microscopes used for examining very small specimens?
- magnification is not high enough**

9. A particular stereo microscope has an **ocular** lens magnification of **15X** and an **objective** lens magnification of **3X**. Calculate the total magnification.
 $15 \times 3 = 45 X$
10. Explain what is meant by “**field of view**” in a microscope.
The area of the slide or object that you actually see looking in a microscope
11. When you move an object to the **right** on the stage, the image in the field of view moves to the **left** When you move an object **up** on the stage, the image in the field of view moves **down**
12. What is meant by the **depth of field**? (See p. 323 or 523 of the Text)
The thickness of an image that is in focus at any one time.
13. Which gives you a greater (better) **depth of field**, a **lower** power magnification or a **higher** power magnification?
lower power magnification
14. Give **two** advantages to viewing an object in a **lower** power magnification.
1. **greater depth of field**
 2. **easier to find and manipulate objects**
15. Write the correct formula for finding the **Actual Size** of an object under the microscope if you know the **Field Diameter** and the **number of times the object fits** in the field.

$\text{Actual Size} = \frac{\text{Field Diameter}}{\text{\# of times object fits}}$

16. The Low Power Field Diameter in a certain microscope is 4000 μm . An organism stretches $\frac{1}{4}$ of the way across the field. (ie. four organisms would fit across the field)
 Calculate the **actual size** of the organism. Show the formula in your solution.

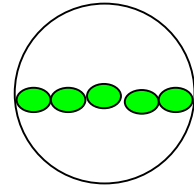
$\text{Actual Size} = \frac{\text{Field Diameter}}{\text{\# of times object fits}}$

$$AS = \frac{4000 \mu\text{m}}{4} = 1000 \mu\text{m}$$

17. Write the formula for finding “**Drawing Magnification**” if you know the **Drawing Size** in μm and the **Actual size** in μm

$$\text{Drawing Magnification} = \frac{\text{Drawing Size (in } \mu\text{m)}}{\text{Actual size (in } \mu\text{m)}}$$

18. The picture shows five organisms stretched across the High Power Field of a microscope.



The High Power Field Diameter of this microscope is $400 \mu\text{m}$.

- a) Calculate the **actual size** of one of these organisms. Show the formula in your work!

$$\text{AS} = \frac{\text{Field Diameter}}{\# \text{ of fits}} = \frac{400 \mu\text{m}}{5} = 80 \mu\text{m}$$

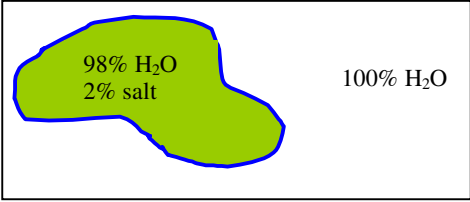
- b) Measure the length of one object in the drawing here and calculate the **drawing magnification** of this diagram. **Drawing size = $5 \text{ mm} = 5000 \mu\text{m}$**

$$\text{DM} = \frac{\text{DS}}{\text{AS}} = \frac{5000 \mu\text{m}}{80 \mu\text{m}} = 62.5 \text{ X}$$

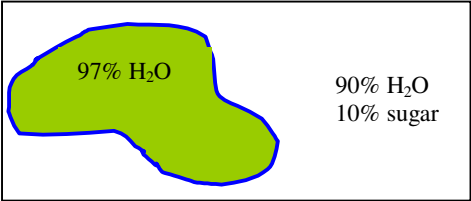
19. Given the main **function** of each of the following cell **organelles**:
- cell wall – **a non-living layer (mostly cellulose) that serves as the boundary of plant cells. Helps maintain cell rigidity.**
 - cell membrane – **thin, flexible material that surrounds the cytoplasm of every cell. Allows selective passage of materials in and out of the cell (nutrients, wastes etc.)**
 - cytoplasm – **the fluid found outside the nuclear membrane but inside the cell membrane of every cell. Contains many cell organelles.**
 - nucleus – **the control center of the cell-contains the cell’s genetic material which directs the production of enzymes needed to carry out the cell’s reactions and is involved in cell reproduction.**
 - nuclear membrane – **thin layer that surrounds the nucleus, allows passage of materials between the nucleus and the cytoplasm**

- f. chromosomes – **thread-like structures found in the nucleus of cells-made up of proteins and DNA. Contain the genetic information passed on in reproduction.**
 - g. mitochondrion – **the cell organelle where most of the reactions involving cellular respiration occurs**
 - h. endoplasmic reticulum – **cell organelles where some proteins are produced, stored and transported throughout the cell**
 - i. chloroplast – **plant cell organelle where photosynthesis takes place. It is green due to the presence of chlorophyll**
 - j. vacuole – **cell organelles used to store nutrients, wastes and water.**
 - k. ribosome – **cell organelles involved in protein synthesis.**
20. What is meant by **diffusion** as it applies to cells? **The spontaneous flow of a material from an area of higher concentration to an area of lower concentration through a membrane.**
21. What is meant by **osmosis**? **The movement of water molecules through a selectively permeable membrane from an area of higher water concentration to an area of lower water concentration.**

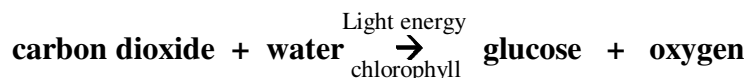
22. Inside a cell membrane there is 98% water and 2% salt, while outside the cell membrane there is pure water. Which direction will the water flow, into the cell or out of the cell?
into the cell
 What will happen to the size of this cell as this happens? **increase**



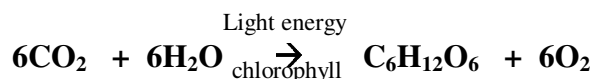
23. A cell, which has 97% water inside the cell membrane is placed in a sugar solution which is 10% sugar and 90% water. Which way will water flow, into the cell or out of the cell?
Out of the cell
 What will happen to the size of the cell as this happens? **It will shrink**



24. *Photosynthesis* occurs in the **chloroplasts** of the cell.
25. Write the *word equation* for **photosynthesis**.



26. Write the **balanced chemical equation** for **photosynthesis**.



27. Why can't *starch* molecules get through the cell membrane? **They are too large to pass through the holes in the membrane**
28. Write the simple **word equation** for **cellular respiration**.



29. Write the **balanced chemical equation** for **cellular respiration**.



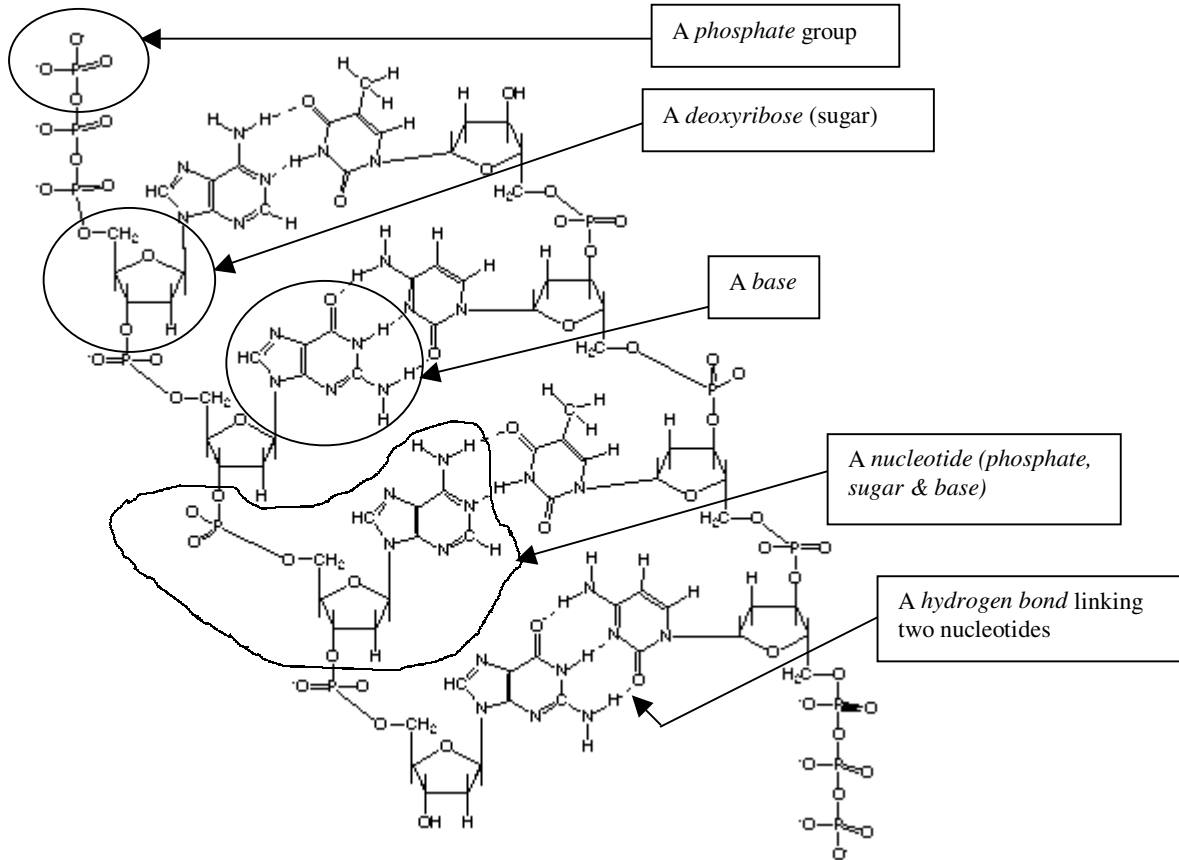
30. Cellular respiration requires a *gas* called **oxygen**

How does this gas get to every cell in the human body? **With the help of the respiratory and the circulatory system.**

31. Cellular respiration takes place in **every** cell of the body.
32. Most of the processes of cellular respiration take place in the **mitochondria** inside the cells.
33. Catalysts to speed up chemical reactions in the cells are called **enzymes**.
34. The nucleus controls the cells activities by controlling the production of **enzymes**
35. Molecules of **DNA** within the nucleus control the production of enzymes.
36. Human cells normally contain **46** chromosomes.
37. A strand of DNA is a huge chain made up of smaller molecules called **nucleotides**
38. Each nucleotide in a DNA molecule has a *base* as part of it. The four types of bases found on these nucleotides are shown by the letters **A, T, C, and G**.
39. What is meant by a *gene*? **A section of DNA which contains the coded information (instructions) for the production of a specific protein.**

40. The actual DNA structure is not really like a ladder, but like two coils wrapped around each other. This structure is called a *double helix*
41. The number and order (sequence) of bases on each *gene* determine the exact structure of the **protein** “coded” by that gene. Each chromosome contains thousands of genes, each one controlling the structure of one protein or enzyme made by the cell.
42. In the following, rather complex looking diagram showing the structure of a small piece of DNA, *circle* and clearly *label one* example of each of the following:

- A *phosphate group*
- A *deoxyribose (sugar)*
- A *base*
- A *nucleotide*
- A *hydrogen bond linking two nucleotides*

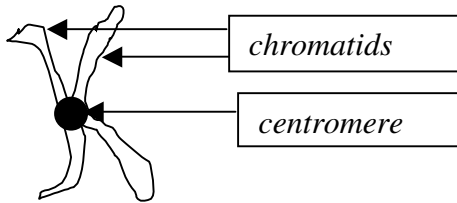


43. About how many genes are there in human DNA? **About 30 000 genes.**
44. What is meant by the **human genome project**? **A project to determine the base sequence in the entire human DNA.**

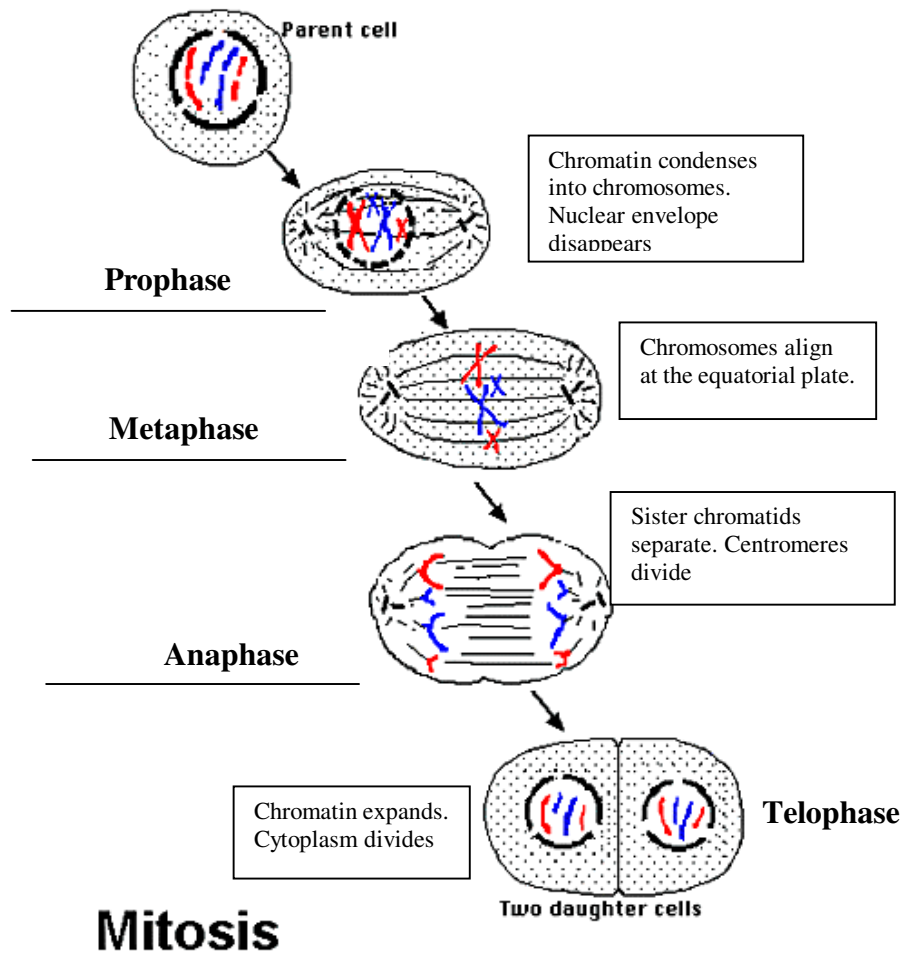
45. Name two diseases that are known to be hereditary:
Huntington's disease, hemophilia, cystic fibrosis, sickle cell anemia
46. Little bristle-like structures in microbes are called **cilia**
What are they used for? **Obtaining food, locomotion**
47. Describe *flagella* **long whip-like structures**
What are flagella used for? **Maneuvering, locomotion**
48. *Plasmodium* spends part of its life cycle in **mosquitoes** and the other part in human hosts where it ultimately infects and ruptures blood cells in large numbers. The disease it causes is called **malaria**
49. Do *bacteria* have a defined nucleus, or just DNA inside the cell?
Just DNA inside the cell.
50. *Escherichia coli* (a.k.a. *E. coli*) lives in the human **intestine** where it helps **digestion** and produces Vitamin **K**
51. What **can't** *viruses* do, that other organisms can?
Viruses can't metabolize nutrients, produce and excrete wastes, move around on their own, or even reproduce unless they are inside another organism's cells.
52. What are three human diseases that can be caused by viruses?
smallpox, flu, AIDS, certain types of cancer, and the common cold, West Nile disease, SARS
53. What are viruses like when they are outside of a cell? **inert, just mere microbial particles drifting aimlessly.**
54. What do viruses do once they get inside of a host cell? **take over its machinery to reproduce themselves**
55. A virus that can be fatal to humans and is carried by mosquitoes has recently been in the news. It seems to be making it's way into Western Canada. This virus is called the **West Nile virus.**

56. **Prions** are blamed for **bovine spongiform encephalopathy (BSE) or Mad Cow Disease** in cattle, and its human variant Creutzfeldt-Jakob disease. In which country have several people died from Creutzfeldt-Jakob disease? **Britian** How could it be transmitted from one animal to another or from animals to humans? **From infected animal based feed or from eating beef from an infected cow.**
57. The disease called *hepatitis B* is caused by a **virus** and affects which organ of the body? **The liver**
58. Viral diseases *encephalitis* and *rabies* both affect which organ? **The brain**
59. *A.I.D.S.* stands for **acquired immune deficiency syndrome** and affects the T cells in the human **immune** system.
60. If the length of one side of a cube is “s”, the formula for the total **surface area** of that cube would be :
- Surface Area = 6 x s²**
61. If the length of one side of a cube is “s”, the formula for the total **volume** of that cube would be :
- Volume = s³**
62. One side of a cube has a length of 1.5 cm.
- Calculate the **Surface Area** in cm² **Surface Area = 6 x s² = 6 (1.5)² = 13.5 cm²**
 - Calculate the **Volume** in cm³ **Volume = s³ = (1.5)³ = 3.375 cm³**
 - Calculate the **Ratio** of **Surface Area/Volume = 13.5/3.375 = 4**
63. If a cell was very large, its **Surface Area/Volume** Ratio would be quite (*high/low*) **low**
When this is true, it means that the cell (does/doesn't) **doesn't** have enough ability to absorb the nutrients it needs and to get rid of waste materials.
64. When an organism grows in size, do the number of cells increase or do the existing cells just get bigger? **Number of cells increases**
65. The phases which make up the life of a cell is called the **cell cycle**

66. Most of the cell's growth takes place during a stage called **interphase**
67. "Interphase" means between **cell divisions**
68. Draw a pair of chromosomes showing and labeling the *chromatids* and the *centromere*.



69. Label the stages of **mitosis** in the following diagram:



70. The process by which organelles in the cytoplasm divide in two is called **cytokinesis**

71. Cell division produces two new cells out of one. The new cells are called **daughter** cells.
72. Explain why chromosomes become more visible during prophase. **They coil up and become much thicker.**
73. What happens to cells during *interphase*? **Cell growth, chromosomes and centrioles duplicate**
74. What happens to the rate of cell production when an organism gets older? **Decreases**
75. What happens to cells when they form *tumors*? **Lose control of division, form lumps**
76. Tumors that stop growing *before* causing damage are said to be **benign**
77. What happens to a *malignant tumor*? **Continues to grow and spread throughout the body.** This is a disease called **cancer**
78. What is meant by *carcinogenic*? **Cancer causing**
79. Name some substances or sources of substances which are *carcinogenic*.
tobacco tars, dioxin, polychlorinated biphenyls (PCB's) etc.
80. Name and describe the three main types of *treatment* for cancer.
 1. **surgery – removing tumors**
 2. **chemotherapy – treating tumors with chemicals**
 3. **radiation therapy – killing or reducing the size of tumors with radiation**
81. What is meant by **asexual reproduction**?
Only one parent. Offspring are genetically identical to the parent
82. Briefly describe what happens in each of the following methods of asexual reproduction:
 - a) **Binary Fission –the organism splits into 2 equal-sized organisms**
 - b) **Budding-the offspring begins as a growth or bud on the parent. When it has developed enough to survive on its own, it breaks off**
 - c) **Spore Formation-the organism produces cells called spores. Each spore contains a nucleus and a small amount of cytoplasm. The spores are shed and transported. If a spore lands in a favourable environment, it will develop into a new organism**

- d) Fragmentation-**fragments of pieces of the parent's body breaks off and develops into a whole new organism**
 - e) Vegetative Reproduction-**plants send out special stems from which offspring emerge at intervals. These offspring grow their own roots and become independent plants.**
83. In general, what can be said about the offspring of asexual reproduction in relation to the parent. **They are genetically identical to the parent**
84. In evolutionary terms, what is a disadvantage of asexual reproduction?
No variation. If environment changes, the organism cannot adapt and survive
85. *Sexual reproduction* requires **two** parents. Are the offspring identical to the parents? **no**
86. Specialized cells used ONLY for sexual reproduction are called **gametes**
87. What is meant by a *karotype*? **A picture of all of the chromosomes of an individual**
88. Most human cells contain **46** chromosomes or **23** pairs.
89. What is meant by a **homologous pair** of chromosomes?
A pair of chromosomes that are similar in overall appearance and made up of the same kind of genes. One chromosome is inherited from each parent.
90. What is meant by **diploid** cells?
Cells having pairs of homologous chromosomes. (ie. the normal # of chromosomes)
91. What is meant by **haploid** cells?
Cells having only one chromosome from each homologous pair. Gametes, used for reproduction are haploid cells.
92. Cells other than gametes are (*diploid/haploid*) **diploid**
93. Gametes are (*diploid/haploid*) **haploid**
94. The process that divides the nucleus and reduces the number of chromosomes by half is called **meiosis**

95. During meiosis, one normal cell creates (1,2,3 or 4) **4** daughter cells. These daughter cells are (*diploid/haploid*) **haploid** and are called **gamete**.
96. The mature *male* gamete is called the **spermatozoon** (plural **spermatozoa**) or (*shorter word*) **sperm**
97. The mature *female* gamete is called the **ovum** (plural **ova**)
98. Which is usually larger, the male gamete or the female gamete? **Female gamete**
99. Which one is able to move around more? **The male gamete**
100. The process of the two gametes meeting successfully is called **fertilization**
101. The sperm and the ovum both contain **half** the chromosomes of a normal cell. When they meet, their nuclei fuse together so that the new cell contains **the same** number of chromosomes as a normal cell.
102. The new cell that forms when a sperm and ovum unite is called a **zygote**
103. What are *hermaphrodites*? **A species whose individuals can produce both male and female gametes**
Give an example of a species which is a hermaphrodite. **Earthworms and many plant species**
104. In what type of animals does fertilization occur *externally*? **Animals that reproduce in water.**
105. Where does the embryo develop in birds? **Outside the mother's body in a shell (egg)**
106. Where does the embryo develop in mammals? **Inside the mother's body (uterus)**
107. *Sexual reproduction* is more complicated than *asexual*. What do you think the main *advantage* of sexual reproduction is to the survival of a species. **Provides more variation in offspring so there is a greater chance of adaptation to a changing environment.**
108. On each of the homologous chromosomes, there is a gene for a certain trait.
These genes are called **alleles**
109. Alleles can either be **dominant** or **recessive**

110. A trait from a recessive allele which is present but does not show itself is said to be **hidden**
111. If the dominant and recessive allele for a trait are both present, the **dominant** allele will always express itself and it's trait will be shown.
112. An individual who has a pair of alleles that are the same type (both dominant or both recessive) is said to be **homozygous** for that gene.
113. An individual who has a pair of alleles that are different types (one dominant and one recessive) is said to be **heterozygous** for that gene.
114. When two different gametes (*one from each parent*) combine during fertilization, they each carry one allele for a particular gene (or trait). The new individual will now have **two** alleles. (One from each **parent**)
115. What is meant by the **genotype** of an individual? **The actual combination of alleles an organism possesses.**
116. What is meant by the **phenotype** of an individual? **The outward appearance of an organism. (displays the characteristics of the dominant alleles)**
117. In humans, long eyelashes (L) are dominant and short eyelashes (l) are recessive.
- a) Draw a Punnett Square showing the cross between two **heterozygous long-eyelash** parents.

		Possible gametes from Female Parent	
		L	l
Possible gametes from Male Parent	L	LL	Ll
	l	Ll	ll

- b) What fraction of the offspring should have long eyelashes? **All of them**
- c) What fraction of the offspring should have short eyelashes? **None of them**
- d) What fraction of the offspring will be **homozygous long eyelash**? **½ of them**

- e) What fraction of the offspring will be *homozygous short eyelash*? **None of them**
- f) What fraction of the offspring will be *heterozygous long eyelash*? **1/2 of them**
- g) A cross is made between two *different* parents and **all** the offspring have the genotype Ll (They are all heterozygous long eyelash.). Determine the genotypes of both parents. (Don't worry about which one is male and which one is female.)

Answer **LL** and **ll**

118. In humans, long eyelashes (L) are dominant and short eyelashes (l) are recessive.

- a) Draw a Punnett Square showing the cross between a male that is *heterozygous long eyelash* and a female who is *homozygous short eyelash*.

		Possible gametes from Female Parent	
		l	l
Possible gametes from Male Parent	L	Ll	Ll
	l	ll	ll

- b) What fraction of the offspring should have long eyelashes? **1/2 of them**
 - c) What fraction of the offspring should have short eyelashes? **1/2 of them**
 - d) What fraction of the offspring will be *homozygous long eyelash*? **None of them**
 - e) What fraction of the offspring will be *homozygous short eyelash*? **1/2 of them**
 - f) What fraction of the offspring will be *heterozygous long eyelash*? **1/2 of them**
119. In mice, gray colour (G) is dominant over white (g). A mouse from a population that *always* produces *gray* mice is mated with a *white* mouse.

- a) What is the genotype of the gray mouse? **G G**
- b) What is the genotype of the white mouse? **g g**

(This question is continued on the next page....)

- c) Fill in the following Punnett Square showing this cross:

		Possible gametes from Female Parent	
		g	g
Possible gametes from Male Parent	G	Gg	Gg
	G	Gg	Gg

- d) Describe the **phenotype** of all the first generation of mice from this cross?

All the mice are gray

- e) What is the **genotype** of each one of the offspring? **All offspring have genotype Gg**
- f) These mice are all **heterozygous**.

120. A **heterozygous gray** mouse is mated with a **white** mouse. Use the following Punnett Square to predict the possible offspring as asked below:

		Possible gametes from Female Parent	
		g	g
Possible gametes from Male Parent	G	Gg	Gg
	g	g g	g g

- a) $\frac{1}{2}$ of the offspring are gray and $\frac{1}{2}$ of the offspring are white.
- b) Are any of the offspring **homozygous gray**? **no**
- c) $\frac{1}{2}$ of the offspring are **homozygous white**.
- e) Is it possible to have a **heterozygous white** mouse? **No. The presence of the dominant G allele would make the offspring gray.**

121. In **incomplete dominance**, individuals that are **heterozygous** are **different** than each homozygous parent, instead of being like one of them.
122. In incomplete dominance, neither allele is completely **dominant**
123. In carnations, neither the allele for red flower colour nor the allele for white flower colour are dominant. If a purebred red carnation is crossed with a purebred white carnation, what are the offspring like? **They are all pink**
124. A homozygous red carnation is crossed with a pink carnation. Use the following Punnett Square to predict the possible offspring as asked below:

		Possible gametes from Female Parent	
		R	r
Possible gametes from Male Parent	R	RR	Rr
	R	RR	Rr

- a) **1/2** of the offspring are red and **1/2** of the offspring are pink.
- b) Are any of the offspring **white**? **No. Only rr would be white**
125. Two carnations are crossed and it is found that half of the offspring are pink and half are white. What are the two possible genotypes of the parents of this cross?
Rr and rr
126. A gene with more than two alleles is said to have **multiple** alleles. Even if a gene has more than two possible alleles, an individual can only possess **2 (a pair)** of these alleles -- one on each chromosome of a homologous pair.
127. There are 3 alleles that determine human blood type: I^A , I^B and i .
- a) Give two possible genotypes which would result in the person having blood type “A”
 $I^A I^A$ and $I^A i$

b) Give two possible genotypes which would result in the person having blood type ‘B’

$I^B I^B$ and $I^B i$

c) Give the genotype which would result in a person having type “AB” blood. **$I^A I^B$**

d) Blood type ‘O’ contains neither the ‘A’ nor the ‘B’ antigen. Give the genotype of blood type ‘O’ **ii**

128. What is meant by an **antigen**?

A molecule carried on the surface of a cell which stimulates the production of corresponding antibodies.

129. Should a person with blood type “A” receive a blood transfusion from a person with blood

type ‘B’? **no** Why or why not? **The person’s immune system will reject the foreign “B” antigen, causing complications.**

Could a person with blood type “A” safely receive a blood transfusion from a person with

blood type ‘O’? **yes** Why or why not? **Blood type “O” contains no antigens, so there is nothing for the immune system to react to.**

Could a person with blood type “AB” safely receive a blood transfusion from a person with

blood type ‘B’? **yes** Why or why not? **The person already possesses the “B” antigen, so it is not recognized as “foreign”**

People with which blood type are ‘universal recipients’? **Type “AB”**

People with which blood type are ‘universal donors’? **Type “O”**

130. Do genes usually act on their own, or do they usually interact with other genes?

They usually interact with other genes.

131. Is human height controlled by a simple gene, or many genes? **It is controlled by many genes.**

As well as genetics, human height is also affected by the **environment (nutrition etc.)**

132. Draw a Punnett square showing the X and Y chromosomes of a cross between a female and male human.

		Possible gametes from Female Parent	
		X	X
Possible gametes from Male Parent	X	XX	XX
	Y	XY	XY

What fraction of the offspring will be female? $\frac{1}{2}$ What fraction are male? $\frac{1}{2}$

133. Which contains more genes, the X chromosome or the Y chromosome? **The X**
134. The gene for colour-blindness is carried on the **X** chromosome. There is no matching allele on the **Y** chromosome. People with the **dominant** allele for colour vision will have **normal** colour vision, while people with only the recessive allele will be **colour blind**.
135. In order to be colour-blind, a female (with two X chromosomes) must have the **recessive** allele on both chromosomes. If she have the dominant allele on just one chromosome, she will **not** be colour-blind.
136. Males only have one X chromosome, so if they inherit the recessive allele, they **will** be colour-blind. (They do not have another X chromosome which could carry the dominant (normal colour vision) allele.
137. Characteristics which are controlled by genes on the sex (X & Y) chromosomes are called **sex-linked** traits. Since most of these traits are found on the X chromosome, they are usually exhibited by **males** who **do not** have another X chromosome which could carry a **dominant** allele to cancel the effects of a **recessive** one. Females are usually **carriers** of these traits because they have the recessive allele (which they could pass on to an offspring) on one X chromosome, but also the dominant allele on the other **X** chromosome, which cancels the effects of the recessive one. If the recessive allele is passed onto a male offspring, the male will exhibit the recessive trait.
138. What is the major symptom of **hemophilia**? **Bleeding will not stop once started. Blood fails to clot properly.**
139. Why did the Royal Family have such a high incidence of hemophilia? **Inbreeding leads to a greater chance of a recessive gene being inherited by an offspring.**