**Science 30 Unit A BIOLOGY Workbook KEY**

1. Make a sketch of a heart (7 marks)
2. Label all the chambers, blood vessels and valves in the heart (5 marks)
3. Indicate which side is oxygenated and which is deoxygenated. (1 mark)
4. Using arrows indicate the direction the blood flows. (1 mark)



1. Complete the following table on major blood vessels of a human. (3 marks)

|  |  |  |
| --- | --- | --- |
| **Major blood vessels of the body** | **Function (job)** | **Structures that help it do its job**  |
| **arteries/arterioles/aorta** | **blood away from heart** | **thick/elastic walls** |
| **capillaries** | **exchange gases** | **thin walls/single file blood** |
| **veins/venules/vena cava** | **blood towards heart** | **Valves, thin/nonelastic walls** |

1. List the blood vessels in the correct order for the pathway of blood in the: (3 marks)

a. body circulation: the aorta 🡪 **arteries\_\_\_\_\_\_\_** 🡪 arteriole 🡪 body **capillaries** 🡪 **venules** 🡪 veins 🡪 vena cava

b. pulmonary circulation: the right ventricle 🡪**pulmonary artery (NO O2)**🡪 lung **capillaires** 🡪 **pulmonary vein** 🡪 the left atrium

1. Complete the following table on the four components of the blood (4 marks)

|  |  |  |
| --- | --- | --- |
| **Major component of the blood** | **Function (job)** | **Structures that help it do its job** |
| White blood cells (WBC) | fight disease | (developed) nucleus |
| Red blood cells (RBC) | carry oxygen (O2) | hemoglobin/iron |
| Platelets | clot the blood (scab) | fibers (fibrogen) |
| Plasma | carries proteins etc | fluids (water) |

1. Medical Procedures:
2. Resting average systolic & diastolic blood pressure values are: **120mmHg/80mmHg**
3. List the steps taken to measure blood pressure.

**Step 1: Tightly place a cuff with a stethoscope above the elbow. (0.5 mark) Pump up the cuff to about 180 mmHg.**

**Step 2: Slowly release the pressure until you hear a thumping sound (needle moves) (This is systolic blood pressure.)**

**Step 3: Continue to release the pressure until the thumping sound stops (needle stops moving) (This is diastolic blood pressure.)**

1. Resting average heart rate is **72 beats per minute**
2. How do you measure heart rate (pulse)?

**Measure the heart rate by placing a finger on the artery in the wrist or in the neck and counting the beats.**

1. Complete the following experimental design (4 marks)

**Problem**: What affect does jogging 30 minutes every day for a month have on average systolic & diastolic blood pressure?

**Variables (2 marks for this part)**

**Manipulated Variable**: (**amount of ) exercise**

**Responding Variable**: **average systolic and diastolic blood pressure**

**2 Controlled**: **age, sex & weight of participants, type of exercise**

**Procedure or Experimental Design**: (Tell us how you are going to test this problem. Include the variables in your design, be specific, include a control group if possible and have large sample sizes.) (2 marks for this part)

**1) Find 100 healthy 18 year old males that are 150lbs, 5 feet 10 inches tall. Measure their systolic and diastolic BP using a sphaghnanometer**

**2) Have 50 individuals run on a tredmil for 30 minutes each day for a month. Have 50 individuals do not exercise for a month**

**3) Measure the systolic and diastolic BP again**

**4) Compare the results between those that exercised and those that did not.**

1. Describe the causes of the following circulatory diseases:

**Arteriosclerosis: caused by deposits of fat and cholesterol in arteries; symptoms are restricted blood flow which leads to organ failure such as coronary heart disease (angina).**

**heart attack: caused by damage to the heart muscle or lack of oxygen delivered to the heart through coronary arteries.**

**stroke: caused by ruptured artery in the brain (high BP).**

**aneurisms: bulging or weakness in wall of artery or vein.**

**septal defects: caused by a weak wall or a hole in the wall of the septum.**

**high blood pressure: caused by stress, poor diet, lack of exercise and heredity.**

**low blood pressure: caused by internal bleeding, hormone imbalance.**

1. Describe how one of the following circulatory technologies works and what it helps improve/study:

**artificial heart valves: heart valves (ball and cage) that repair defective heart valves**

**stethoscope: heart sounds travel through the receiver into the ears; detects heart conditions and heart rate.**

**pace maker: keeps the rhythm of the heart the same by sending small electrical currents into the heart muscles**

**sphygmomanometer: measures BP by placing a strap around the upper arm, cutting off circulation and the listening for a tapping sound when the circulation is slowly returned**

1. Describe how the following pathogens affect health: (Be specific) (2 marks)
2. parasites (malaria): **introduced by a vector (mosquitoes) into a host and invade cells (red blood cells swell and rupture)**
3. bacteria (E. coli): **found in soil, water and living things; cause diarrhea, vomiting, nausea and fever**
4. viruses (AIDS) : **very small no living organism that injects DNA material into a host causing death to the host cell. Kill Helper T**
5. fungi (athletes foot): **organism that lives of decaying organisms; live on the decaying skin of your foot causing itching**
6. Describe the main body organ and three body secretions that prevent pathogens from entering body tissues. (2 marks)

**Skin is the main organ; saliva, sweat, tears, stomach acid, mucus & sneezing(need 3) are body secretions that prevent pathogens from entering**

1. A bacterium enters into a human body. Describe or draw the immune response steps in order. Include the names and roles of the 5 cells/components and 2 proteins involved. (4 marks)

**Bacterium enters the body (1) 🡪 Macrophage engulfs (2) 🡪 Help T recognize and send message(3,4&5)🡪B-cells make antibodies(6) and Killer–T cells attack(10) 🡪 Memmory B & T cells remember (11) 🡪 Suppressor-T cells stop the attack (12)**

1. Identify the specific term that fits the following descriptions. (2 marks)

**Autoimmune, diabetis, MS**  a disease where the WBC attacks their own

**AIDS (HIV)**  a disease where helper-T cells are destroyed

**Infection, bacteria, pathogen** indicated by a high white blood count

**Antibiotics/antibody**  a chemical used to slow down bacteria.

1. Describe what a vaccine is and how it defends against a virus. (2 marks) **vaccine is a dead or harmless antigen(1 mark) that is injected into the body. It stimulates the immune system - production of antibodies and memory cells.(1 mark)**
2. Chromosome behavior during
3. MITOSIS: Describe OR draw and label what happens to the chromosomes at each of the five stages of mitosis. (5 marks)



 **chromosomes double 🡪 line up in middle 🡪 split into two🡪 2 daughter cells form**

1. MEIOSIS: Indicate **three** ways that the meiosis is different than mitosis (3 marks)
* **Meiosis produces gametes/sex cells (sperm and egg) vs body cells**
* **Meiosis divides twice vs mitosis once**
* **Meiosis produces 4 daughter cells NOT 2**
* **Meiosis goes from diploid (pairs) to haploid (single chromosomes)**
* **Meiosis has 23 chromosomes (not 46)**
1. FERTILIZATION: Describe what happens to the chromosomes during fertilization.

**The egg and sperm join and the chromosome number doubles (goes from haploid to diploid**

1. Explain, with the aid of a Punnett square the inheritance of the following three crosses. (6 marks):
2. Red eyes in fruit flies is X-linked recessive (Xr). A male with red eyes mates with a female that is homozygous dominant with white eyes. Predict the genotype ratio of the four offspring.

|  |  |  |
| --- | --- | --- |
|  | **Xr** | **Y** |
| **XR** | **XRXr** | **XRY** |
| **XR** | **XRXr** | **XRY** |

**Genotypes are 50 % (2/4) XRXr and 50% (2/4)XRY**

1. Short wings in fruit flies is Autosomal recessive (f). Two heterozygous flies mate. Predict the phenotypic ratio of the offspring.

|  |  |  |
| --- | --- | --- |
|  | **F** | **f** |
| **F** | **FF** | **Ff** |
| **f** | **Ff** | **ff** |

**Phenotypic ratio – Long wings: Short wings (3 to 1)**

1. No hair in fruit flies is recessive (h). If 50% of the offspring have no hair and one of the parents has no hair, then what is the genotype of the other parent.

|  |  |  |
| --- | --- | --- |
|  | **? = H** | **? = h** |
| **h** | **Hh** | **hh** |
| **h** | **Hh** | **hh** |

**The genotype of the parent is Hh (heterozygous) (look at ? above)**

1. Draw a DNA strand with four different base pairs. Label the sugar – phosphate backbones. Name the amino acid made from the first three bases on the ***left or top*** DNA strand. (4 marks total)

Sugar phosphate backbone; **Amino acid: STOP**

1. Explain what happens during the general process of DNA replication. (1 mark)

**During DNA replication the DNA unzips, new nucleotides join both sides of the DNA and two identical strands of DNA are formed**

1. What are two roles of proteins in the human body? (1 marks)

**ROLES: enzyme (amylase), structural (keratin), transport (channel proteins), hormone (insulin), contractile (actin & myosin in muscles), defensive (antibody), energy (casein), catalyst**

1. Describe the cause and the affect **one** of the following diseases has on the human body. (2 marks)

*sickle-cell anemia:* ***autosomal recessive – causes red blood cells to be curved***

*hemophilia:* ***X-linked recessive – NOT able to clot the blood***

*Huntington’s disease;* ***autosomal dominant – brain degeneration***

*cystic fibrosis:* ***autosomal recessive on chromo 7 – mucus build up in the lungs.***

1. Describe how two of the following genetic engineering technologies work

**gene therapy: the desired gene is placed into a harmless virus; the virus in injected into the organism; the virus places the gene into the cells of the organism. Eg) gene for cystic fibrosis is replaced**

**gene splicing (recombinant DNA): the unwanted gene is cut out of the DNA. The desired gene is inserted into the DNA forming recombinant DNA. The gene for making insulin is placed into bacteria.**

**development of genetically modified organisms: A desired gene is obtained from one organism and placed into the DNA of another organism. Eg) frost resistant from a fish into a tomato**

**DNA fingerprinting: The DNA is removed from a suspect and cut up. Copies are made of the cut up pieces and placed onto gel; electricity separated the pieces of DNA forming bands; bands are matched to the DNA from the crime scene.**

1. Describe how bacteria and viruses become resistant based on: (2 marks)
	1. Mutations: **The DNA changes which allow the bacteria/virus to survive. If the mutation is passed onto the offspring they become resistant.**
	2. Plasmid transfer: **The transfer of DNA molecules from one bacteria to another through circular DNA plasmids**
	3. Transformation: **the transfer of free DNA fragments from one organism to another**
	4. Natural selection: **The bacteria/viruses that have traits that help them in their environment, will survive and pass the trait onto their offspring**