FORM IV – 3MYL JOINT.

SECTION A (16 Marks)

1.

(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)
C	E	C	B	D	D	A	C	A	B

2. 01@ = 10 marks

LIST A	(i)	(ii)	(iii)	(iv)	(v)	(vi)
LIST B	E	F	H	A	J	C

01@ = 06 marks

SECTION B (54 Marks)

3.

- Studying biology helps us understand ourselves better and therefore maintain our wellbeing by keeping our bodies under optimum conditions.

½ marks

- Studying biology enables us understanding better other organisms that we interact with, therefore being able to live with them in a way that would benefit us. For example, how to keep benefiting from plants in terms of food

source, medicine and environment protection.

½ marks

- Studying biology provides us with answers to questions about the nature of life, how and where did it begin.

- Knowledge of biology helps us in preventing and treating diseases so that we can stay healthy.

½ marks

- Biology helps us to attain careers such as medicine and genetic engineering. 01½ marks - Studying biology provides us with scientific skills that can enable us to conduct researches.

½ marks

4. Importance/function of blood

- Supply of oxygen to tissues
- Supply of nutrients such as glucose, amino acids, and fatty acids
- Removal of waste such as carbon dioxide, urea, and lactic acid - Body defense through circulation of white blood cells, - Coagulation to stop bleeding.
- Transport of ~~hormones~~ Any six points @1½
- Regulation of body pH
- Regulation of body temperature

- Hydraulic functions such as causing engorgement in specialized tissues resulting in an erection of that tissue; examples are the erectile tissue in the penis and clitoris .

5. Importance of mitosis:

- Iincreases the number of cells hence necessary for growth in multi-cellular organisms such as humans… 03 marks
- Production of cells identical in many respects enables repair of tissues in multicellular organism, without mitosis, an injury... 03 marks
- It enables asexual reproduction. Asexual reproduction is the major mode of reproduction in unicellular organisms but is also common in multicellular organisms such as higher plants, which enhances food production …

03 marks

6. Mechanism of hearing

- The pinna collects and directs the sound waves to the ear canal which directs the waves to the ear drum. (02 marks)
- The ear drum vibrates hence converting
- sound waves into vibrations which are transmitted to ear ossicles. (02 marks)
- In the middle ear the vibration is amplified (20 times). Vibration of the ossicles in the oval window set up vibration in the liquid of the inner ear and cochlea.

(03 marks)

- The vibrations of the endolymph stimulate the organ of corti, which sends the impulse to the brain via the auditory nerve.

(02 marks)

7. Solution:

(a) Using B to designate brown and b for blue eye colour, we know that the female is heterozygous brown-eyed, so her genotype is Bb. Her blue-eyed husband is bb. By using Punnett Squares to show the crosses (02 marks)

2 Bb:2bb

The potential genotypes are 50 % Bb, which is brown-eyed, and 50% bb, which is blue-eyed.

Brown eyes: 50 % probability (or 0.5 probability)

	B	b
b	Bb	bb
b	Bb	bb

(b) Blue eyes: 50 % probability (or 0.5 probability)

(01 mark)

(c) The gene for color blindness is found on the X chromosome, which is a sex chromosome. Females have the sex chromosomes XX, and males have XY. The Punnett Square for colourblindness will use X^b to designate the color blindness gene. Since the female is a carrier, this means she has one gene for color blindness. Females must have two genes for color blindness to actually be color blind. Males only need one, because they only have one X chromosome.

	X^b	X
X	X^b X	XX
Y	X^bY	XY

Carrier female	Colour blind male	Normal female	Normal male
X^bX	X^bY	XX	XY
25%	25%	25%	25%

This demonstrates that there is a 25 % chance of having a color blind child, which is the male with X^bY. There is a zero percent chance of having a color blind daughter, because the only options are X^bX (daughter who is a carrier), and XX (daughter who isn't a carrier). There is a 50 % chance of having a son with color blindness, because the two options are X^bY (son with color blindness), and XY (son with normal vision).

Color blindness: 25 % probability (d)

Colour blind male	Normal male
X^bY	XY
50%	50 %

(@1½ =06 marks)

Color blind males: 50% probability

8. Cross pollination…. (01 mark)

Plants have developed the following mechanism to avoid self- pollination :

- Female and male reproductive organs are on separate plants.
- Female and male reproductive organs on different flowers of the same plant.
- In bisexual flowers, male and female organs mature at different times. - Stigma appears higher than the anther in a bisexual flower. **SECTION C (30 Marks)**

9. Natural barrier and the immune system defend the body against infections and diseases. Natural barrier form the first line of defense. The components of natural barrier include the skins, mucous membrane, cilia/hair, ear wax, sweat, tears, saliva, stomach acids and urine flow. (Introduction 02 marks) Components of the natural barriers:

The skin forms a physical barrier to pathogen by preventing them from entering inside of the body.

The mucous membrane also prevents pathogen from passing through into the tissues and organs. The cilia are found along the respiratory tract and trap and prevent pathogen and dust particles from entering the system.

Earwax traps and therefore prevents dust and pathogen from entering the body through the ear. Tears have antiseptic substance that kills germs and therefore preventing them from entering the body.

Saliva has enzymes that can destroy pathogen and therefore preventing them from entering the body. Stomach acid is the acid found in the stomach; it is hydrochloric acid. The acid kill germs that have managed to enter in the stomach with food.

(Any three, 02@ =06 marks) The components of the immune system:

The white blood cells attack and destroy pathogens.

The lymph nodes trap pathogens which are then destroyed by white blood cells in the lymph Spleen filters blood by removing broken down cells. The liver keeps the body safe by removing toxins.

(Any three, 02@ =06 marks)

The bone marrow produces the white blood cells.

Total: 15marks

Tonsils and thymus also produce antibodies.

(Conclusion 1 mark)

10.

Introduction: 1½ marks)

- The three layers of muscles of the stomach wall allows it to perform the vigorous churning motions essential for efficient mechanical digestion.
- The hydrochloric acid kills bacteria that had entered with food and provide acidic medium for the enzymes in the stomach to work.
- The mucus prevents the acids and enzymes to corrode the stomach walls.
- The enzymes are pepsin and rennin which break down proteins into peptides. Rennin acts specifically on milk protein.Any five
- With its muscular lining, the stomach is able to engage in peristalsis… (Conclusion 01 mark)

11.

Introduction: Evolution is...1½ marks)

The following are used as evidences of origin of evolution:

1. Fossil record (Paleontological evidences):

Fossil are remains of the organisms that lived in ancient times. The age of a specimen can be determined by the weight of the carbon in that specimen. For example, a fossil containing 5g of carbon showing the organism had been 5600years old.

2. Cell biology:

All the cells of higher organisms show basic similarities in their structure and function i.e. all cells have DNA as carrier of genetic information. All use roughly the 20 amino acids to synthesis protein and all use the ATP as energy carrier the fact that all cells have the cell membrane, ribosome and mitochondria etc which perform similar functions indicate that all organisms had a common ancient origin.

3. Comparative embryology:

This is the branch of embryology that compares and relates the embryo of the different species. It helps to show how all organisms relate. Many living thing are compared

on whether or not organisms have a notochord and gill slits at an embryonic stages in order to determine whether they are of common ancestry.

4. Comparative anatomy:

Organisms with basic structural similarities have a common related ancenstral. Based on the structural similarity their functions anatomical studies are divided into:

Homologous structures: These are structures that perform different functions though they have similar ancestral origin. Examples : for limb structures in birds (wings) and forelimbs structures of humans….

Analogous structures: these are structures that perform similar functions though they have different ancestral origin. Examples: Wings in birds and insects…

5. Comparative physiology: Comparative physiology studies and exploits the diversity of functional characteristics of various kinds of organisms. It compares basic physiological processes like cellular respiration and muscle contraction. Because it focuses on function, comparative physiology can also be referred to as functionalanatomy.

6. Biogeographical evidence: it studies distribution of animals and plants on the earth. The evidences of evolution based on biogeography are called biogeographical evidences...

Any four 03 @ = 12 marks

7. Evidences from Genetics:

A number of mutations or sudden inheritable variations appear in organisms. They can occur in all parts of the body and in all conceivable directions. The mutations are easily observed in microorganisms such as bacteria, for example, through resistance to drugs.

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(Conclusion 01½ marks)