BIO-COMPARE COMPILATION

BIOLOGY FORM 4 AND FORM 5

BIOLOGY UNIT

MRSM TRANSKRIAN

A+ BIOLOGY FOR MY TEACHER AND ME

BIOLOGY FORM 4

CHAPTER 2

Similarities and differences between animal cell and plant cell

PLANT CELL	ANIMAL CELL
SIMILARITIES	
• Both cells are made of nucleus, cytoplasm, plasma membrane, Golgi apparatus, mitochondrion, endoplasmic reticulum and ribosomes.	
DIFFERENCES	
PLANT CELL	**ANIMAL CELL**
Has a fixed shape	Does not have a fixed shape
Has a cell wall	Does not have a cell wall
Has chloroplasts	Does not have chloroplasts
Has a large vacuole	No vacuole /if present, it is small
Stores carbohydrate in the form of starch	Stores carbohydrate in the form of glycogen
Does not have a centriole	Has centriole

CHAPTER 3

Similarities and differences between passive and active transports

PASSIVE TRANSPORT	ACTIVE TRANSPORT
SIMILARITIES	
• Both involved moving a substance across a membrane • Both occurs through a selectively permeable membrane	
DIFFERENCES	
PASSIVE TRANSPORT	**ACTIVE TRANSPORT**
Energy is not required	Requires energy
Occurs following the concentration of the gradient	Occurs against the concentration of the gradient
Occurs until a dynamic equilibrium is achieved	There are accumulation and disposal of molecules or ions

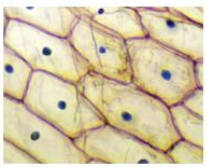
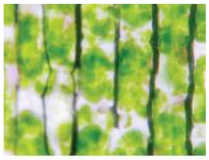
Differences between simple diffusion, facilitated diffusion and osmosis.

SIMPLE DIFFUSION	FACILITATED DIFFUSION	OSMOSIS
The random movement of molecules or ions down concentration gradients (from a region of higher concentration to a region of lower concentration) until equilibrium is achieved	Movement of hydrophilic molecules or ions (water –soluble molecules or lipid insoluble molecules) down concentration gradient (from a region of higher concentration to a region of lower concentration) through carrier proteins and pores protein	Movement of water molecules from a region of low solute concentration (high water concentration) to a region of high solute concentration (low water concentration) across a semi-permeable membrane

The effect of hypotonic, hypertonic, and isotonic solution on red blood cells

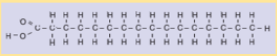
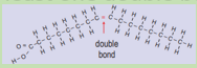
HYPOTONIC SOLUTION	ISOTONIC SOLUTION	HYPERTONIC SOLUTION
		
• The solution is hypotonic than red blood cell • Water diffuses into the cells by osmosis • The cell expands • The plasma membrane bursts and the content of the cell are released into the surrounding • The condition is known as haemolysis	• The solution is isotonic to the red blood cells • Water diffuses out and into by osmosis the cell at equal rates • The cell retains its normal shape	• The solution is hypertonic than red blood cells • Water diffuses out of the cells by osmosis • The cell shrinks • The cell undergone crenation

The effect of hypotonic, hypertonic, and isotonic solution on plant cells

HYPOTONIC SOLUTION	ISOTONIC SOLUTION	HYPERTONIC SOLUTION
		
• The solution is hypotonic than cell sap of plant cells • Water **diffuses into** the vacuole **by osmosis** • Vacuole expands and plasma membrane pushed towards the cell wall • The cell becomes turgid • Plant cell do not burst because cell wall is rigid and strong • Turgor pressure is important to pant cells because it gives support and maintain shape	• The solution is isotonic to the cell sap of plant cells. • Water **diffuses out and into** the cell **by osmosis at equal rates** • The cell **become flaccid**	• The solution is hypertonic than cell sap of plant cells • Water **diffuses out** of the vacuole **by osmosis** • Vacuole and cytoplasm will shrink, causing plasma membrane pulls away from the cell wall • The phenomenon is called **plasmolysis** • Plasmolysis causes leaves and stem bend downwards and wilt • Plasmolysed plant cells can regain their turgidity if the cells are returned to a hypotonic solution. The cell undergone **deplasmolysis**

CHAPTER 4

Similarities and differences between saturated fats and unsaturated fats

Saturated fats	Unsaturated fats
SIMILARITIES	
• Both consist of carbon, hydrogen and oxygen elements • Both contain glycerol and fatty acids. • Both contain nonpolar molecules.	
DIFFERENCES	
Saturated fats	**Unsaturated fats**
Fatty acids only have single bonds between carbon. 	Fatty acids have at least one double bond between carbon. 
Do not form chemical bonds with additional hydrogen atoms because all bonds between carbon atoms are saturated	Double bonds can still receive one or more additional hydrogen atoms because carbon atoms are unsaturated
Exist in solid form at room temperature	Exist in liquid form at room temperature.
Source: butter and animal fat	Source: olive and fish oil

CHAPTER 6

The differences between mitosis and cytokinesis in animal cells and plant cells

ANIMAL CELLS	PLANT CELLS
Plasma membrane constrict in middle cell between two nuclei.	Vesicles formed combine to form cell plates at centre cell
Microfilament at point constriction will contract	Cell plates surrounded by new plasma membrane
Cell will constrict until split to form two daughter cells.	New cell wall substance formed among spaces cell plates.
	Cell plates expand outwards until combine with plasma membranes
	Cellulose fibre produced by cell to strengthen new cell walls
	Two daughter cells formed has diploid condition.

Similarities and differences between mitosis and meiosis

MITOSIS	MEIOSIS
SIMILARITIES	
• Both are nuclear division • Both involves prophase, metaphase, anaphase and telophase • Replication of DNA occurs during interphase before both divisions • Duplication of chromosomes occurs only once before both divisions	
DIFFERENCES	
MITOSIS	**MEIOSIS**
Mitosis occurs in somatic cells	Meiosis occurs in germ cells (cells produce gametes)
For growth and asexual reproduction	To produce gametes for sexual reproduction
Synapsis, crossing over and independent assortment do not occur	Synapsis, crossing over and independent assortment occurs
Cytokinesis occur once	Cytokinesis occur twice
Number of daughter cells formed is two	Number of daughter cells formed is four
Chromosomal number of daughter cells is diploid	Chromosomal number of daughter cells is haploid
Genetic constituent of daughter cells are same as their parent cell	Genetic constituent of daughter cells are different with parent cell

Similarities and differences between Meiosis I and Meiosis II

MEIOSIS I	MEIOSIS II
SIMILARITIES	
• Both are nuclear division • Spindle formation and the breaking down of nuclear membrane and nucleoli occur during prophase of both process • Nuclear membrane and nucleoli are re-formed during telophase of both process	
DIFFERENCES	
MEIOSIS I	**MEIOSIS II**
Interphase occurs prior to Meiosis I	Interphase does not occur prior to Meiosis II
Replication of DNA and duplication of chromosomes occurs	Replication of DNA and duplication of chromosomes does not occur
Crossing over occurs	Crossing over does not occur
During metaphase I, **homologous** chromosomes arrange themselves at the equator	During metaphase I, chromosomes arrange themselves at the equator
Chromosomal number is halved	Chromosomal number is maintained
Splitting of centromeres does not occurs	Splitting of centromeres occurs
The cells is haploid at the end of Meiosis I	The cells is haploid throughout Meiosis II
Number of cells formed at the end is two	Number of cells formed at the end is four

CHAPTER 7

Comparison between aerobic respiration and fermentation

AEROBIC RESPIRATION	FERMENTATION
SIMILARITIES	
• Both process involves the breakdown process of glucose and its conversion to chemical energy • Both process begins in the cytoplasm • Both process occurs in yeast, bacteria, animals and plants • Both process produces chemical energy in the form of ATP • Both process begins with glycolysis when glucose is converted to pyruvate	
DIFFERENCES	
AEROBIC RESPIRATION	**FERMENTATION**
The breakdown process of glucose is completed in the presence of oxygen.	The breakdown process of glucose is incomplete without oxygen or limited oxygen conditions.
Occurs in cytoplasm and mitochondrion	Occurs in cytoplasm
Produces water.	Does not produces water.
Glucose is oxidised completely into carbon dioxide and water	Glucose is not oxidised completely into ethanol and carbon dioxide or lactic acid
One molecule of glucose generates 2898 kJ of energy	One molecule of glucose generates 210 kJ (alcohol fermentation) or 150kJ (lactic acid fermentation) of energy

CHAPTER 8

Similarities and differences between the respiratory structures of humans and animals

SIMILARITIES				
• All respiratory structures have a large ratio of total surface area to volume for an efficient exchange of respiratory gases. • All respiratory structures are thin and this makes the diffusion of respiratory gases much faster. • All respiratory structures are moist and this allows respiratory gases to dissolve in them. • The respiratory structure is complete with a network of blood capillaries (except insects), that allows for efficient transport of respiratory gases.				
DIFFERENCES				
CHARACTERISTICS	INSECTS	FISH	FROGS	HUMANS
Respiratory Structure	Tracheole	Filament and lamella	Skin and lungs	Alveolus
Adaptation To Achieved Large TSA/V To Respiratory Structure	Large number of tracheoles	Large number of filaments and lamellae	The surface in lungs is folded Overall skin surface	Large number of alveoli

Comparison between breathing mechanisms in humans and animals

SIMILARITIES				
• Humans and animals have special muscular structures to expand and contract the respiratory cavity. • The breathing mechanism involves changes in the volume and pressure in the respiratory cavity				
DIFFERENCES				
CHARACTERISTICS	INSECTS	FISH	FROGS	HUMANS
Respiratory Aperture	Spiracle	Mouth & Operculum	Nostrils	Nostrils
Structures That Helps Breathing	Thorax, abdomen	Operculum and muscular floor of buccal cavity	Muscular buccopharyngeal wall	Diaphragm, ribcage and intercostal muscles
Breathing Mechanism	Assisted by the contraction and relaxation of abdominal muscles	Assisted movements of the floor of the buccal cavity and operculum	Assisted by rapid movement of the buccopharyngeal cavity floor and elasticity of the lungs	Assisted by contraction and relaxation intercostal muscles & diaphragm muscles, the movement rib cage upward & outward, downward and inward

CHAPTER 10

Similarities and differences between circulatory systems in complex multicellular organisms

SIMILARITIES				
• The circulatory system is found in all multicellular organisms. • The circulatory system consists of a heart to pump blood or haemolymph (in insects). • The circulatory system functions to transport nutrients and wastes • The heart has valves that ensure blood flows in one direction.				
DIFFERENCES				
ORGANISMS	INSECTS	FISH	FROGS	HUMANS
Types of circulatory system	Open blood circulatory system	Closed blood circulatory system	Closed blood circulatory system	Closed blood circulatory system
Number of circulations	-	Single (blood flows in the blood vessel and through the heart once in a complete circulation)	Double (blood flows in the blood vessel and through the heart twice in one complete circulation)	Double (blood flows in the blood vessel and through the heart twice in one complete circulation)
Number of heart cavities	The heart is made up of many cavity segments	Two (one atrium and one ventricle)	Three (two atria and one ventricle)	Four (two atria and two ventricles)
Separation of oxygenated blood and deoxygenated blood	-	-	Incomplete (some oxygenated blood is mixed with the deoxygenated blood in the ventricle)	Complete (oxygenated blood does not mix with deoxygenated blood in the ventricle)

Differences between arteries, capillaries and veins

ARTERY	CAPILLARIES	VEINS
Wall is thick, muscular and elastic	Wall is as thick as one cell, not muscular and not elastic	Wall is thin, less muscular and less elastic
Small lumen	Very tiny lumen	Large lumen
No valve except for semilunar valve at the base of the aorta and at the base of the pulmonary artery	No valve	Contain valves to maintain one-way flow of blood
Blood pressure is high	Blood pressure is low	Blood pressure is very low
Flow the blood from the heart to the entire body	Flow the blood from the artery to the vein	Flow the blood from the whole body to the heart

Comparison between lymph and tissue fluid

LYMPH	TISSUE FLUID
SIMILARITIES	
• Both contain plasma without the plasma proteins, erythrocytes and platelets	
DIFFERENCES	
LYMPH	**TISSUE FLUID**
Higher content of fat and fat-soluble substances	Low content of fat and fat-soluble substances
High content of lymphocytes	Low content of lymphocytes

Comparison between lymph and blood

LYMPH	BLOOD
SIMILARITIES	
• Both contain all the contents of plasma such as nutrients, hormones, enzymes, cellular wastes, respiratory gases and leucocytes.	
DIFFERENCES	
LYMPH	**BLOOD**
Does not contain plasma protein, erythrocyte and platelet	Contains plasma proteins, erythrocytes and platelets

CHAPTER 11

Comparison between artificial active immunity and artificial passive immunity

ACTIVE IMMUNITY	PASSIVE IMMUNITY
SIMILARITIES	
• Protects the body from infectious diseases • Involves interaction between antibodies and antigens	
DIFFERENCES	
ACTIVE IMMUNITY	**PASSIVE IMMUNITY**
Immunity acquired through vaccine injection	Immunity acquired through antiserum injection
Injected substances is vaccine which a suspension of pathogens that are weakened, dead or non-virulent.	Injected substances is antiserum is a serum that contains specific antibodies
Purpose of injection is for prevention	Purpose of injection is for treatment or when immediate protection is required
Does not give immediate protection	Give immediate protection
Immunity lasts for a long period of time	Immunity is temporary and does not persist
Vaccine injection is administered before being infected	Antibody injection is given in advance if there is a high risk of infection or immediately after being infected by a disease
Antibodies are produced by the lymphocytes	Antibodies are obtained from antiserums
Must be given to boost the level of antibodies above the level of immunity as a protection against the disease	s only given when the antibody level in the blood drops below the level of immunity and the patient is still infected by the disease

CHAPTER 12

Differences between sensory neurone, relay neurone and motor neurone

SENSORY NEURONE	RELAY NEURONE	MOTOR NEURONE
Long dendrites	Short dendrites	Short dendrites
Short axon	Short or long axon	Long axons
Present in the dorsal root of the spinal nerve.	Nerve fibres found in the central nervous system.	Can be found in the ventral root of the spinal nerve.
The cell body is found in the dorsal root ganglion.	The cell body can be found in clusters in the grey matter of the central nervous system.	The cell body is present in the grey matter of the spinal cord.
Carries nerve impulses from the sensory organ receptors to the central nervous system.	Connects the sensory neurone to the motor neurone	Receives nerve impulses from the relay neurone of the central nervous system and sends nerve impulses to effectors such as muscles or glands to produce the appropriate response.

Comparison between voluntary action and involuntary action

VOLUNTARY ACTION	INVOLUNTARY ACTION
Similarity	
Both actions involve stimulation, impulse, neurone and an effector organ.	
Differences	
VOLUNTARY ACTION	**INVOLUNTARY ACTION**
Actions that we are conscious of and done on our own will	Actions that occur automatically and occurs without us being conscious
Involves the somatic nervous system	Involves the autonomous nervous system
Controlled by the cerebral cortex	Controlled by the medulla oblongata and hypothalamus
Involves the reaction of the skeletal muscles	Involves the reaction of the smooth muscle and glands

Similarities and differences between the nervous system and the endocrine system

NERVOUS SYSTEM	ENDOCRINE SYSTEM
SIMILARITIES	
• Contains target tissues or organs • Produces a response to a stimulus • Functions to regulate all activities of the body	
DIFFERENCES	
NERVOUS SYSTEM	**ENDOCRINE SYSTEM**
It is made up of a network of millions of neurones	Consists of ductless endocrine glands
The duration of the effect is short	The duration of the effect is long
Signal is in the form of electrical impulses through neurones	Signal is delivered by organic chemical substances, which are hormones, through blood flow
Nerve response is quick and immediate	The response is slow and prolonged
The effect of an impulse produces the response of an organ	The effect of hormones produces responses in several organs

CHAPTER 14

Similarities and differences between the types of vertebrae.

CERVICAL VERTEBRAE	THORACIC VERTEBRAE	LUMBAR VERTEBRAE
SIMILARITIES		
All vertebrae have spinous and transverse processes, centrum (except the atlas vertebra) and neural canal.		
DIFFERENCES		
CERVICAL VERTEBRAE	**THORACIC VERTEBRAE**	**LUMBAR VERTEBRAE**
Short spinous process	Long spinous process	Short spinous process
Wide and short transverse process	Long transverse process	Short transverse process
Small centrum	Medium-sized centrum	Large centrum
A pair of transverse foramina	No transverse foramen	No transverse foramen

CHAPTER 15

Comparison between spermatogenesis and oogenesis

Spermatogenesis	Oogenesis
Similarities	
• Both are the processes of gametogenesis that take place in the **reproductive organs**. • Produce **gametes** that are **haploid** which are involved in fertilisation.	
Differences	
It takes place in the testis.	It takes place in the ovaries.
Spermatogonium (diploid) produces four sperms (haploid) after meiosis.	Oogonium (diploid) only produces one functional secondary oocyte (haploid) and three non-functioning polar bodies after meiosis.
Sperms are smaller and made up of the midpiece, head and tail.	Secondary oocytes are large and spherical in shape.
After meiosis I, two secondary spermatocytes are produced.	After meiosis I, one secondary oocyte and one polar body is produced.
Meiosis is completed.	Meiosis II is only completed when a sperm fertilises the secondary oocyte.
Spermatids undergo differentiation to become sperms.	Secondary oocyte does not undergo differentiation.
The production of sperm is continuous from puberty until old age.	The production of the secondary oocyte is not continuous. It starts in the female foetus and remains dormant when the baby is born. The process continues once the female reaches puberty and stops during menopause.
Millions of sperms are formed every day.	Only one secondary oocyte is released from the ovaries at every menstrual cycle.

Differences between identical and fraternal twins

Identical twins	Fraternal twins
Product of fertilisation of one ovum and one sperm forming one zygote.	Product of fertilisation of two sperms and two ova forming two zygotes.
Embryo divides into two.	Embryo does not divide into two.
One placenta is shared between two foetus.	Each foetus has its own placenta.
The genetic makeup and physical appearances of these twins are similar as they are from the same zygote.	The genetic makeup and physical appearances of these twins are different as they are from two different zygotes.
The sex of both twins is the same.	The sex of both twins may be the same or different.

BIOLOGY FORM 5

CHAPTER 1

Comparison between primary growth and secondary growth in eudicots

SIMILARITIES	
• Both growth can increase the size of the plants permanently	
• Both growth occur in woody plants	
• Both growth involve cell division by mitosis	
DIFFERENCES	
PRIMARY GROWTH	**SECONDARY GROWTH**
Involved apical meristem	Involved lateral meristem (vascular cambium and cork cambium)
Occurs on stem and roots in younger regions of the plant	Occurs when primary growth has ceased on mature stems and roots
Growth occurs longitudinally	Growth occurs radially
Increase the length of stems and roots of plant	Increase the thickness or circumference of stems and roots of plant
Epidermis, cortex and primary vascular tissues (primary xylem and primary phloem) will formed	Bark, periderm (cork cambium and cork tissues), lenticels and secondary vascular tissues (secondary xylem and secondary phloem) will formed
Do not have woody tissues	Have woody tissues
Thin bark	Thick bark
Absence of annual growth rings	Presence of annual growth rings

CHAPTER 2

Comparison between light-dependent and light-independent reactions

LIGHT-DEPENDENT REACTIONS	**LIGHT-INDEPENDENT REACTIONS**
SIMILARITIES	
Both catalaysed by enzyme Both process take place in chloroplast	
DIFFERENCES	
LIGHT-DEPENDENT REACTIONS	**LIGHT-INDEPENDENT REACTIONS**
Produce ATP	Use ATP molecules
Occurs at thylakoids	Occurs at stroma
Reaction substance is water	Reaction substance is carbon dioxide
Oxygen and water molecules are produced	Glucose is produced
Process involved is photolysis of water	Process involved is reduction of carbon dioxide

Comparison between photosynthesis and respiration

PHOTOSYNTHESIS	RESPIRATION
SIMILARITIES	
Both processes take place in living organisms Both processes involve the uptake and release of gases	
DIFFERENCES	
PHOTOSYNTHESIS	**RESPIRATION**
Occur in green plants and photosynthetic bacteria	Occurs in all living organisms
Happens in the cells containing chlorophyll	Happens in all cells
Anabolism process happens, which is the synthesis of glucose using carbon dioxide and water	Catabolism process happens, which is the breakdown of glucose to produce energy
Occurs in chloroplast	Occurs in mitochondria
Reaction substances are carbon dioxide and water	Reaction substances are oxygen and glucose
Glucose is produced	Energy is produced
Oxygen and water are by-products	Carbon dioxide and water are by-products
Light energy is absorbed and converted into chemical energy	Chemical energy is converted to ATP and heat energy is released
Reaction needs light	Reaction does not need light

CHAPTER 4

Comparison between Guttation and Transpiration

GUTTATION	TRANSPIRATION
SIMILARITIES	
• Both processes occur through the leaf. • Both processes cause permanent water loss from the plant.	
DIFFERENCES	
GUTTATION	**TRANSPIRATION**
Guttation happens at night and early morning.	Transpiration happens on hot and windy days.
Guttation only happens in herbaceous plants	Transpiration happens in all plants
Water is released in the form of water droplets.	Water is released as water vapour
Water is released through a special structure at the end of the leaf veins.	Water is released through stomata.
Guttation happens when root pressure is high.	Transpiration is controlled by the stomatal opening and closing.
Guttation releases water that is rich in minerals.	Transpiration releases pure water.

CHAPTER 6

Comparison between the male and female flower part

MALE FLOWER PART	FEMALE FLOWER PART
SIMILARITIES	
• Both produce gametes • Both are located at the flower's organ	
DIFFERENCES	
MALE FLOWER PART	**FEMALE FLOWER PART**
Consists of stamen	Consists of carpel
Has filament and anther	Has stigma, style and ovary
Produces pollen grains	Produces embryo sac
Projecting out from the base of the ovary	Located in the middle part of the flower

CHAPTER 12

Comparison between Continuous and Discontinuous Variation

CONTINUOUS VARIATION	DISCONTINUOUS VARIATION
SIMILARITIES	
Shows differences in characteristics among individuals of the same species	
DIFFERENCES	
CONTINUOUS VARIATION	**DISCONTINUOUS VARIATION**
No obvious differences in characteristics	Obvious and distinct differences in characteristics
Presence of intermediate characteristics	No intermediate characteristics
Graph with normal distribution	Graph with discrete bars
Characteristic is controlled by many genes	Characteristic is controlled by one single gene
Influenced by environmental factors	Not influenced by environmental factor
Can be measured (quantitative)	Cannot be measured (qualitative)