Dawood Public School
Course Outline 2019-20
Cambridge O Level Biology 5090
Grade IX

Months	Syllabus Break down	Reference Book
August	Cell structure and Organization	Biology by Lam Peng Kwan Chapter 2 D.G Mackean Chapter 1
	Diffusion and Osmosis	Biology by Lam Peng Kwan Chapter 3 D.G Mackean Chapter 4
September	Enzymes	Biology by Lam Peng Kwan Chapter 4 D.G Mackean Chapter 2
	Plant Nutrition	Biology by Lam Peng Kwan Chapter 7 D.G Mackean Chapter 5
October	Plant Nutrition	Biology by Lam Peng Kwan Chapter 7 D.G Mackean Chapter 5
	Animal Nutrition	Biology by Lam Peng Kwan Chapter 5 & 6 D.G Mackean Chapter 10 & 11
November	Revision	Past papers
December	MID-YEAR EXAMINATION	
January	Transport in flowering plants	Biology by Lam Peng Kwan Chapter 9 D.G Mackean Chapter 6 & 7
February	Transport in humans	Biology by Lam Peng Kwan Chapter 8 D.G Mackean Chapter 12
March	Respiration	Biology by Lam Peng Kwan Chapter 10 D.G Mackean Chapter 13
April	Revision	Past papers
May	FINAL EXAMINATION	

1. ASSESSMENT AT A GLANCE

All candidates enter for **three** papers – Papers 1 and 2 and Paper 6.

Paper1: Multiple Choice	1 hour
40 compulsory multiple-choice questions. The questions involve four response options. 40 marks	

Paper 2: Theory	1 hour 45 minutes
The paper has three sections. Section A has 50 marks and consists of a small number of compulsory, structured questions. Section B has 20 marks and consists of two compulsory questions. Each question is worth 10 marks. Section c carries 10 marks and candidate must choose **one** from a choice of two questions. 80 marks	

Paper:6 Alternate to Practical	1hour
A written paper of questions designed to test past experience of practical work. 40 marks	

2. SYLLABUS AIMS:

The aims provide the educational purposes of following a course in this subject. Some of these aimsare reflected in the assessment objectives; others are not because they cannot readily be translated intoobjectives that can be assessed. The aims are not listed in an order of priority.
The aims are to:

- Provide, through well designed studies of experimental and practical biological science, a worthwhile educational experience for all students, whether or not they go on to study science beyond this leveland, in particular, to enable them to acquire sufficient understanding and knowledge tobecome confident citizens in a technological world, able to take or develop an informed interest inmatters of scientific import;
- Recognize the usefulness, and limitations, of scientific method and to appreciate its applicability inother disciplines and in everyday life;
- Be suitably prepared and stimulated for studies beyond Cambridge O Level in pure sciences, inapplied sciences or in science-dependent vocational courses.
- Develop abilities and skills that
- Are relevant to the study and practice of science;
- Are useful in everyday life;
- Encourage efficient and safe practice;
- Encourage effective communication.
- Develop attitudes relevant to science such as
- Concern for accuracy and precision;
- Objectivity;
- Integrity;
- Enquiry;
- Initiative;
- Inventiveness.
- Stimulate interest in and care for the local and global environment.
- Promote an awareness thatthe study and practice of science are co-operative and cumulative activities that are subject to social, economic, technological, ethical and cultural influences and limitations;
- The applications of science may be both beneficial and detrimental to the individual, the community and the environment;
- Science transcends national boundaries and that the language of science, correctly and rigorously applied, is universal.

AUGUST

1. Cell structure and organization

Biology by Lam Peng Kwan Chapter 2 (pages no: 12-22)
D.G Mackean Chapter 1 (pages no: 2-10)

Content

1.1 Plant and animal cells
1.2 Specialized cells, tissues and organs

Learning outcomes

Candidates should be able to:

- Examine under the microscope an animal cell (e.g. from fresh liver) and a plant cell (e.g. from Elodea,a moss, onion epidermis, or any suitable, locally available material), using an appropriate temporary staining technique, such as iodine or methylene blue
- Draw diagrams to represent observations of the plant and animal cells examined above
- Identify, from fresh preparations or on diagrams or photomicrographs, the cell membrane, nucleus and cytoplasm in an animal cell
- Identify, from diagrams or photomicrographs, the cellulose cell wall, cell membrane, sap vacuole, cytoplasm, nucleus and chloroplasts in a plant cell
- Compare the visible differences in structure of the animal and the plant cells examined
- State the function of the cell membrane in controlling the passage of substances into and out of the cell
- State the function of the cell wall in maintaining turgor (turgidity) within the cell
- State, in simple terms, the relationship between cell function and cell structure for the following:
  - Absorption – root hair cells
  - Conduction and support – xylem vessels
  - Transport of oxygen – red blood cells
- Identify these cells from preserved material under the microscope, from diagrams and from photomicrographs
- Differentiate cell, tissue, organ and organ system as illustrated by examples covered in sections 1 to 12, 15 and 16

2. Diffusion and osmosis

Biology by Lam Peng Kwan Chapter 2 (pages no: 24-39)
D.G Mackean Chapter 4 (pages no: 26-34)

Content

2.1 Diffusion
2.2 Osmosis
2.3 Active transport

Learning outcomes

Candidates should be able to:

- Define diffusion as the movement of molecules from a region of their higher concentration to a region of their lower concentration, down a concentration gradient
- Define osmosis as the passage of water molecules from a region of higher water potential to a region of lower water potential, through a partially permeable membrane
- Describe the importance of a water potential gradient in the uptake of water by plants and the effects of osmosis on plant and animal tissues
- Define active transport as the movement of ions into or out of a cell through the cell membrane, from a region of their lower concentration to a region of their higher concentration against a concentration gradient, using energy released during respiration
- Discuss the importance of active transport as an energy-consuming process by which substances are transported against a concentration gradient, as in ion uptake by root hairs and glucose uptake by cells in the villi.

SEPTEMBER

3. Enzymes

Biology by Lam Peng Kwan Chapter 4 (pages no: 41-54)
D.G Mackean Chapter 2 (pages no: 14-18)

Content

3.1 Enzyme action
3.2 Effects of temperature and pH

Learning outcomes

Candidates should be able to:

- Define catalyst as a substance that speeds up a chemical reaction and is not changed by the reaction
- Define enzymes as proteins that function as biological catalysts
- Explain enzyme action in terms of the 'lock and key' hypothesis
- Investigate and describe the effects of temperature and of pH on enzyme activity.

4. Plant nutrition

Biology by Lam Peng Kwan Chapter 7 (pages no: 102--117)
D.G Mackean Chapter 5 (pages no: 35-48)

Content

4.1 Photosynthesis
4.2 Leaf structure
4.3 Mineral nutrition

Learning outcomes

Candidates should be able to:

- Understand that photosynthesis is the fundamental process by which plants manufacture carbohydrates from raw materials
- Investigate the necessity for chlorophyll, light and carbon dioxide for photosynthesis, using appropriate controls
- State the equation (in words or symbols) for photosynthesis
- Investigate and state the effect of varying light intensity, carbon dioxide concentration and temperature on the rate of photosynthesis (e.g. in submerged aquatic plants)
- Understand the concept of limiting factors in photosynthesis
- Describe the intake of carbon dioxide and water by plants
- Understand that chlorophyll traps light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent storage
- Explain why most forms of life are completely dependent on photosynthesis
- Identify and label the cuticle, cellular and tissue structure of a dicotyledonous leaf, as seen in cross section under the microscope, and describe the significance of these features in terms of function, i.e:
  - Distribution of chloroplasts – photosynthesis
  - Stomata and mesophyll cells – gas exchange
  - Vascular bundles – transport
- Understand the effect of a lack of nitrate and magnesium ions on plant growth.

OCTOBER

5. Animal nutrition

Biology by Lam Peng Kwan chapter 5 (page no: 56-81) & Chapter 6(pages no: 83-97)
D.G Mackean chapter 10 (page no: 86-96) & Chapter 11(pages no: 97-107)

Content

5.1 Nutrients

5.2 Diet
5.3 World food supplies
5.4 Human alimentary canal
5.5 Chemical digestion
5.6 Absorption and assimilation

Learning outcomes
Candidates should be able to:

- List the chemical elements that make up:
  - Carbohydrates
  - Fats
  - Proteins
- Describe tests for:
  - starch (iodine in potassium iodide solution)
  - reducing sugars (Benedict's solution)
  - Protein (biuret test)
  - Fats (ethanol emulsion test)
- List the principal sources of, and describe the dietary importance of carbohydrates, fats, proteins, vitamins (C and D only), mineral salts (calcium and iron only), fibre (roughage) and water
- Name the diseases and describe the symptoms resulting from deficiencies of vitamin C (scurvy),vitamin D (rickets), calcium (rickets) and iron (anemia)
- Understand the concept of a balanced diet
- Explain why diet, especially energy intake, should be related to age, sex and activity of an individual
- State the effects of malnutrition in relation to starvation, heart disease, constipation and obesity
- Discuss the problems that contribute to famine (unequal distribution of food, drought and flooding, increasing population)
- Identify the main regions of the alimentary canal and the associated organs: mouth (buccal) cavity, salivary glands, esophagus, stomach, duodenum, pancreas, gall bladder, liver, ileum, colon, rectum and anus
- Describe the main functions of these parts in relation to ingestion, digestion, absorption, assimilation and egestion of food, as appropriate
- Identify the different types of human teeth and describe their structure and functions
- State the causes of dental decay and describe the proper care of teeth
- Describe peristalsis
- Explain why most foods must be digested
- Describe:
  - Digestion in the alimentary canal
  - The functions of a typical amylase, protease and lipase, listing the substrates and end-products
- Describe the structure of a villus, including the roles of capillaries and lacteals
- Describe the significance of villi in increasing the internal surface area
- State the function of the hepatic portal vein as the route taken by most of the food absorbed from thesmall intestine
- State:
  - That large molecules are synthesized from smaller basic units:
  - glycogen from glucose
  - proteins from amino acids
  - lipids (fats and oils) from glycerol and fatty acids
- The role of the liver in the metabolism of glucose and amino acids
- The role of fat as a storage substance
- The formation of urea and the breakdown of alcohol occur in the liver.

NOVEMBER

Revision for Midterm Examination

DECEMBER

Midterm Examination

JANUARY

6. Transport in flowering plants

Biology by Lam Peng Kwan Chapter 9 (pages no: 144-160)
D.G Mackean Chapter 6 (pages no: 50-58) &Chapter 7 (pages no: 59-66)

Content

6.1 Water and ion uptake
6.2 Transpiration and translocation

Learning outcomes

Candidates should be able to:

- Relate the structure and functions of root hairs to their surface area and to water and ion uptake
- State that transpiration is the evaporation of water at the surfaces of the mesophyll cells followed by the loss of water vapour from the leaves through the stomata
- Describe:
  - How water vapour loss is related to cell surfaces, air spaces and stomata
  - The effects of air currents (wind), and the variation of temperature, humidity and light intensity on transpiration rate
  - How wilting occurs
- Investigate, using a suitable stain, the pathway of water in a cut stem
- Explain the movement of water through the stem in terms of transpiration pull
- Identify the positions of xylem and phloem tissues as seen in transverse sections of unthicken, herbaceous, dicotyledonous roots, stems and leaves
- State the functions of xylem and phloem.

FEBRUARY

7. Transport in humans

Biology by Lam Peng Kwan Chapter 8 (pages no: 121-142)
D.G Mackean Chapter 12 (pages no: 108-122)

Content

7.1 Circulatory system

Learning outcomes

Candidates should be able to:

- Describe the circulatory system as a system of tubes with a pump and valves to ensure one-way flow of blood
- Describe the double circulation in terms of a low-pressure circulation to the lungs and a high pressure circulation to the body tissues and relate these differences to the different functions of the two circuits
- Name the main blood vessels that carry blood to and from the heart, lungs, liver and kidneys
- Describe the structure and function of the heart in terms of muscular contraction and the working of valves
- Compare the structure and function of arteries, veins and capillaries
- Investigate and state the effect of physical activity on pulse rate
- Describe coronary heart disease in terms of the occlusion of coronary arteries and state the possible causes (diet, stress and smoking) and preventive measures
- Identify red and white blood cells as seen under the light microscope on prepared slides, and in diagrams and photomicrographs
- List the components of blood as red blood cells, white blood cells, platelets and plasma
- State the functions of blood:
  - Red blood cells – hemoglobin and oxygen transport
  - White blood cells – phagocytosis, antibody formation and tissue rejection

- Platelets – fibrinogen to fibrin, causing clotting
- Plasma – transport of blood cells, ions, soluble food substances, hormones, carbon dioxide, urea, vitamins and plasma proteins

- Describe the transfer of materials between capillaries and tissue fluid

MARCH

8. Respiration

Biology by Lam Peng Kwan Chapter 10 (pages no: 162-181)
D.G Mackean Chapter 13 (pages no: 123-130)

Content

8.1 Aerobic respiration
8.2 Anaerobic respiration
8.3 Human gas exchange

Learning outcomes

Candidates should be able to:

- Define respiration as the release of energy from food substances in all living cells
- Define aerobic respiration as the release of a relatively large amount of energy by the breakdown of food substances in the presence of oxygen
- State the equation (in words or symbols) for aerobic respiration
- State the uses of energy in the human body: muscle contraction, protein synthesis, cell division, active transport, growth, the passage of nerve impulses and the maintenance of a constant body temperature
- Define anaerobic respiration as the release of a relatively small amount of energy by the breakdown of food substances in the absence of oxygen
- State the equation (in words or symbols) for anaerobic respiration in humans and in yeast
- Describe the effect of lactic acid production in muscles during exercise
- Know the percentages of the gases in atmospheric air and investigate and state the differences between inspired and expired air
- Investigate and state the effect of physical activity on rate and depth of breathing
- Identify on diagrams and name the larynx, trachea, bronchi, bronchioles, alveoli and associated capillaries
- State the characteristics of, and describe the role of, the exchange surface of the alveoli in gas exchange
- Describe the role of cilia, diaphragm, ribs and intercostal muscles (external and internal) in breathing.

APRIL

Revision for Final term

MAY

Final Examination

Resource list:

Author	**Title and Date**	**Publisher**	ISBN
Ian J Burton	The Cambridge Revision Guide GCE O Level Biology (2000)	Cambridge University Press http://uk.cambridge.org/education/international/cie	0521648467
Mary Jones	O Level Biology (2003)	Oxford University Press http://www4.oup.co.uk	0195799828

Mary Jones & Geoff Jones	Biology: International Edition for IGCSE and O Level (2002)	Cambridge University Press http://uk.cambridge.org/education/international/cie	0521891175
D.G. Mackean	IGCSE BIOLOGY (2002)	John Murray http://www.johnmurray.co.uk	0719580536
Ron Pickering	Fundamental Biology(2012)	Oxford University Press http://www.oup.co.uk	9780199128204

Useful websites available

http://www.cellsalive.com CELLS alive
http://www.bbc.co.uk/schools/gcsebitesize/biology/ GCSE BITESIZE revision in biology
http://www.schoolscience.co.uk School science Applications of science