**Name:**

|  |  |
| --- | --- |
| 2.1.1 The Microscope | **Objectives** |
|  | 1. Identify the parts of a light microscope 2. Give the function of each part of the light microscope 3. Describe how to use a light microscope 4. Distinguish between the light and the Electron Microscope 5. Calculate magnification |

|  |  |
| --- | --- |
| 2.1 Cell Structure | 1. Identify the parts of a plant cell as seen under light microscope 2. Identify the parts of an animal cell as seen under light microscope 3. Give the function of each of the following parts:   Cell wall, cell membrane, nucleus, cytoplasm, vacuole and chloroplast |
| 2.1.3 | 1. Identify the ultra structure and give the function of each of the following cell parts:   Cell membrane, mitochondrion, chloroplast, nucleus, nuclear pores, ribosome and DNA   1. Draw the ultra structure of the mitochondrion and the chloroplast |
| 2.1.4H | 6. The existence and definition of prokaryotic and eukaryotic cells |

*ME - Be familiar with and use the light microscope*

*ME - Use of light microscope to prepare and examine plant and animal cells*

**Light microscope**

* **Eyepiece**

This lens magnifies the image e.g. 10X.

* **Objective lenses**

Magnify the image. Low power (x4), medium power (x10), high power (x40). Total magnification = Eyepiece (x10) x objective lens (x40) =. 10 x 40 = 400.

* **Body tube/barrel**

Holds the eyepiece at one end and the revolving nosepiece (objective lenses) at other end.

* **Revolving nosepiece**

Holds and positions the objective lenses.

* **Coarse focus wheel**

Used for initial focussing with low and medium power.

* **Fine focus wheel**

Sharpens the focus after coarse adjustment. Focus the high power objective with this wheel only.

* **Stage**

Platform on which slide is placed. Slide is kept in place by clips. Keep dry.

* **Condenser**

Focuses light onto slide.

* **Diaphragm**

Controls amount of light passing to the slide.

* **Light source**

Electric bulb or reflecting mirror.

* **Arm**

Joins the body tube to the base of the microscope

A **simple microscope** uses one lens to magnify an object e.g. a magnifying glass. A **compound microscope** uses two or more lenses to magnify an object (multiply the eyepiece and objective lens for total magnification)

**Electron microscope** – electrons focussed using magnets onto specimen. As electrons are invisible, image is shown on TV screen, or micrograph.

Resolution – light waves cannot pass through a space that is smaller than 200nm. EM can distinguish parts that are only 1nm apart because electrons have a smaller wavelength.

|  |  |
| --- | --- |
| **Light Microscope** | **Electron Microscope** |
| Uses light rays & focuses them with ≥ 2 convex lenses to illuminate an object. | Uses a beam of electrons & focuses them with electromagnets to illuminate an object. |
| Magnifies up to 1400X | Magnifies up to 500,000 X |
| Low resolution (up to 200 nm) | High resolution (up to 1 nm) – ‘cos beam of electrons has a much smaller wavelength than light. |
| It reveals nucleus, cell organelles, cell walls, vacuoles and chromatin | Reveals details of cell organelles & cell structure such as cilia, flagella & membranes |
| Portable & relatively inexpensive | Not portable & very expensive |
| Can examine living tissue (thin) | Objects dead (in a vacuum) |
|  | Image = photomicrograph – a grainy black & white picture |

**Transmitting Electron Microscope (TEM)**

Sends electrons through objects and reveals the most detail. The TEM uses electromagnets as lenses to focus and magnify the image by bending the paths of the electrons.

**Scanning Electron Microscope (SEM)**

Photographs reflected electrons from surfaces and reveals 3D structures. The surface is usually coated with a thin film of gold.

The cell

All organisms (living things) are made of cells. The cell is the smallest unit of living mater that exhibits the characteristics of life.

There are two cell types:

**eukaryotic** – have a and membrane-enclosed nucleus and organelles e.g. plant cell, animal cell, fungi, amoeba.

p**rokaryotic** – do not have a membrane-enclosed nucleus or organelles e.g. bacteria.

Procaryotes have a single, circular chromosome of DNA & ribosomes and are very small.

Basic cell structure is revealed by the light microscope (≈1000x) e.g. nucleus, cell membrane, cytoplasm, cell wall, chloroplast, vacuole.

Cheek cell(animal cell) Onion cell(Plant cell)

Cell organelles are generally colourless and must be stained to see them e.g. iodine for onion cells and methylene blue for cheek cells.

The electron microscope is used to show the ultrastructure of cells. If gives a high level of magnification (> 500,000x) making the detailed structure of organelles visible.

**Cell ultra structure**

**Plant cell** **Animal cell**

Cell organelles

**Plasma (cell) membrane** (7.5 nm thick)

**Structure**:

The cell membrane is a fluid **phospholipid bilayer** coated and embedded with **protein.**

Protein gives elasticity and lipid allows fat-soluble molecules to enter. There are temporary pores throughout the membrane.

**Function:**

* **Holds in cell contents** - thus giving shape, support (provided by proteins) and protection.
* **Controls entry and exist of molecules.**

It is a **semi-permeable** barrier i.e. can let small molecules e.g. water (by osmosis), oxygen and carbon dioxide (by diffusion) through but not large molecules e.g. salt, sugar, protein.

Proteins assist in the active transport of materials across the membrane (energy needed).

Thus, the cell can control the amount of water and salt conc. (osmoregulation).

Phospholipids affect the fluidity and permeability of membrane.

**Cytoplasm**

**Structure:**

This is a watery jelly in which cell organelles are suspended.(Protoplasm = cytoplasm + nucleus)

**Function:**

* Site of metabolism e.g. glycolysis, protein synthesis.
* Storage of water, lipids, amino acids etc.
* Support of cell organelles.

**Nucleus** (5-10μm diam.)

**Structure:**

* Enclosed by a double membrane.
* Contains chromatin (genetic material) - becomes arranged into chromosomes during cell division. These are made of protein and **DNA**. Genes are located along the chromosome.
* Contains one or more nucleoli.
* **Nuclear pores** allow passage of mRNA, rRNA, nucleotides.
* Nucleoplasm = a liquid in nucleus surrounding nucleolus and chromatin.

.**Function:**

1. To **control all cell activities (**by making enzymes).
2. Contains genetic material.
3. Involved in cell division.

**Nucleolus** –found in nucleus and makes ribosomal RNA. It passes through the pores and makes ribosomes in the cytoplasm.

Red blood corpuscles and phloem sieve tube elements do not have nuclei.

**Mitochondrion** (5-10μm long)

Plentiful in active cells e.g. muscle, nerve, liver, brain, kidney, neck region of male sperm, apical meristems (shoot/root tips). Few in inactive cells e.g. fat, bone, skin, cortex in plants. Not found in bacteria.

**Structure:**

* 1. Have two membranes - the inner one is folded into cristae.
  2. Lumen is filled with a dense matrix of water, food, enzymes, some ribosomes and small portions of DNA - self-duplicating organelles.

**Function:**

* Release energy in aerobic **respiration –** Kreb’s cycle occurs in lumen and electron transport chain occurs in cristae.

**Ribosomes** (14-18nm)

Found in large numbers in the liver.

**Structure:**

* Small granular structures made of two sub-units.
* Made of RNA (ribonucleic acid) and protein.
* Found free in cytoplasm or attached to folded membranes

**Function:**

* Protein synthesis.

Free ribosomes make protein used by cell and those on tubes make proteins for export.

**\*Cell wall** (0.5-1μm thick) (**Plants only)**

Secreted by cell membrane.

**Structure:**

* Made of **cellulose**.
* Adjacent cells are cemented together by the middle lamella of pectin.

**Function:**

* Gives strength and **protection** to the cell.
* Controls cell growth and **shape.**
* Prevents osmotic bursting of cell membrane.
* Fully permeable to gases and water.

**\*Vacuoles**

Usually one in plants - very large & permanent. Small, temporary and more in animals because they excrete their waste (often called vesicles).

**Structure:**

Fluid-filled spaces surrounded by a membrane

**Function:**

Temporary **storage** of food (sugars, amino acids, fats), water, salts (help in osmoregulation), pigments, tannins, gases (O2 & CO2) and excretory products.

The cell sap makes the cells turgid.

**\*Chloroplasts**

(plant cells only)

**Structure** (2-5μm):

* + double membrane
  + contain chlorophyll and DNA - self-duplicating.

Both mitochondria and chloroplasts have a double membrane and DNA. Having DNA supports the theory that chloroplasts and mitochondria were once independent prokaryotic organisms that lived symbiotically inside large eukaryotic cells.

**Function:**

* used to make food(carbohydrate) by **photosynthesis –** light phase in grana and dark phase in stroma.

|  |  |  |
| --- | --- | --- |
| **Plant cells** | **Animal cells** |  |
| 1. Have cell walls. | 1. No walls. |  |
| 2. Have chloroplasts. ∴have chlorophyll. | 2. No chloroplasts ∴no chlorophyll. |  |
| 3. Large and more permanent vacuoles. | 3. Few, if any, small, temporary vacuoles. |  |
| 4. Store carbohydrates as starch. | 4. Store carbohydrate as glycogen. |  |

[**www.youtube.com/watch?v=-zafJKbMPA8**](http://www.youtube.com/watch?v=-zafJKbMPA8) **Cell Structure rap**

**Mandatory expts. :**

**1. To examine animals cells unstained/stained.**

1. **To examine plant cells unstained/stained**

**\*Electron micrographs**

**Microscope**

**Section A**

**2007 OL Q3**

(a) If the eyepiece lens of a microscope is marked X10 and the objective lens

is marked X4, the total magnification is X14 T F

**OL 2012 Q3(c)**

****

**Section B**

**2004 OL Q7**

(a) Name the parts of the light microscope labelled A and B.

If the magnification of A is X 10 and the magnification of B is X 40, what magnification results when a slide is viewed using B?

(b) Answer the following in relation to preparing a slide of stained plant cells and viewing them under the microscope.

(i) From what plant did you obtain the cells?

(ii) Describe how you obtained a thin piece of a sample of the cells.

What stain did you use for the cells on the slide?

Describe how you applied this stain …………………………………………………………….…….

What did you do before placing the slide with the stained cells on the microscope platform?

State **two** features of these cells that indicate that they are typical plant cells.

**2010 OL Q9** (a)

(ii) In school, a light microscope is normally used to examine cells and tissues.

Name a more powerful type of microscope that is used to show what cells are made of in much

greater detail (cell ultrastructure).

2011 OL Q9



**Section C**

**OL 2013 Q13(a)(ii)**

****

**Cell Structure**

**Section A**

**SEC Sample Paper OL Q3**

Select the correct term from the following list to match each of the terms in column A and write it in column B.

liver, variation, lipid, haploid, sap

|  |  |
| --- | --- |
| **A** | **B** |
| Cell membrane |  |
| Vacuole |  |

**2004 OL Q2**

Select the correct cell component from the following list and write it opposite its partner in column B.

ribosome, vacuole, chloroplast, cell membrane, mitochondrion

|  |  |
| --- | --- |
| **Column A** | **Column B** |
| Contains chlorophyll |  |
| Site of protein formation |  |
| Site of energy release |  |
| Site of storage of water, salts and sugars |  |
| Allows osmosis to occur |  |

**2005 OL Q2**

Use ticks (✓) to show if the named structure is present in an animal cell, in a plant cell or in both.

The first has been completed as an example.

****

**2005 OL Q7**

(a) (ii) What is a selectively permeable (semi-permeable) membrane? …………………….

**2006 OL Q2**

The diagram shows a plant cell.



(a) Label A, B, C and D.

(b) Name **two** features shown in the diagram which are not normally associated with an animal cell.

(c) What is usually found in D? …………………………………………………..……………………

(d) Name a carbohydrate found in A. ……………………………………………...…………………..

**2007 OL Q1**

(d) The liquid in which chemical reactions take place in the cell is .………………………................

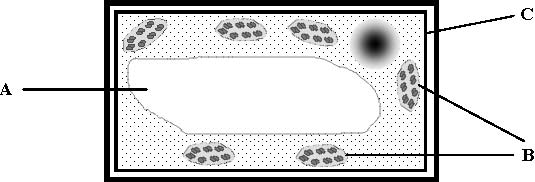
**2007 OL Q3**

(b) Plant cells have chloroplasts, animal cells do not have chloroplasts T F

(d) Cell membranes let only some molecules pass through T F

(e) Human chromosomes are found in the nucleus T F

**2010 OL Q13**



The diagram shows a cell.

1. Is this a plant cell or an animal cell? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Give **two** reasons for the answer given above.

(b) Name the structures labelled A, B and C in the diagram.

OL 2011 Q5



|  |  |
| --- | --- |
| (v) The cell structures in which Stage 2 of aerobic respiration takes place. |  |

**SEC Sample Paper HL Q1**

Answer any **five** of the following.

(a) State a function of the cell membrane …………………………………………………………

(b) State **one** feature that would allow you to identify an eukaryotic cell

**SEC Sample Paper HL Q2**

Select the correct term from the following list to match each of the terms in column A and write it in

column B.

protein, enzyme, uracil, sap, ethanol, mutation, thymine, chlorophyll.

|  |  |
| --- | --- |
| **A** | **B** |
| Ribosome |  |
| Vacuole |  |

**2006 HL Q1**

(c) Where in a cell would you expect to find phospholipids? ……………………………

**2010 HL Q3**

(c) Is the cell of *Amoeba* prokaryotic or eukaryotic? ….………………………………………………….

(d) Give a reason for your answer to part (c) ....…………………………………………………………..

2013 HL Q5

**Section B**

**2010 OL Q8**

(a) (i) What is an enzyme?

**2006 HL Q8**

(a) State a function of each of the following components of a cell.

(i) Ribosome ……………………………………………………………………...

(ii) Cell membrane …………………………………………………………………

(b) Answer the following questions in relation to the preparation, staining and microscopic observation

of a slide of an animal cell.

(i) What type of animal cell did you use? ........................................................................................

How did you obtain the cell? ………..………………………………………………….………

(ii) Name the stain that you used …………………….……………………………………………

Describe how you applied the stain ……………………………………………………………

(iii) After staining, a cover slip is placed on the slide. Give a reason for this

(iv) How did you apply the cover slip …………………………………………………………….

Why did you apply it in this way? …………………………………………………………….

(v) Describe the difference in colour or depth of colour, if any, between the nucleus and cytoplasm when the stained cell was viewed under the microscope

**HL 2012 Q7(vii)**





**Section C**

OL 2013 Q13

(a) (i) Draw a labelled diagram of an animal cell as seen using a light microscope.

(ii) Name another type of microscope that gives greater detail than a light microscope.

(b) The diagram below shows the ultrastructure of a section of cell membrane.



(i) Give two functions of the cell membrane.

(ii) Name the parts labelled A and B.

(iii) Which organelle is known as the “powerhouse of the cell”?

(iv) Why does the nucleus of a cell have many pores?

(v) List two differences between a plant cell an an animal cell.

(vi) What is the primary source of energy for plant cells?

**2009 HL Q14**

(c) (vi) The cells of this organism are described as eukaryotic.

Give **two** characteristic features of eukaryotic cells.

(vii) What corresponding term is used to describe bacterial cells?

**2010 HL Q8**

(b) For which purpose did you use each of the following in the course of your practical studies?

(i) Methylene blue or iodine solution when examining cells with the microscope.

2011 HL Q14(c)



**Answers**

**Microscope**

**Section A**

## 2007 OL Q3

|  |  |  |  |
| --- | --- | --- | --- |
| **3.** |  | | **5(4)** |
|  | **(a)** | **F** |  |

## 2012 OL Q3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **3.** |  |  |  | **2(1)+3(2)+2(6)** |
|  | (c) |  | **F** |  |

**Section B**

## 2004 OL Q7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **7.** | **(a)** |  | **A** = eye piece  **B** = objective or lens or high power  (allow lens for A or B but not for both)  X 400 | **2**  **2**  **2** |
|  | | | | |
|  | **(b)** | **(i)** | name of plant | **3** |
|  |  | **(ii)** | description – peel off thin film of plant tissue with forceps / cut thin section of plant tissue with blade (or microtome) or any other correct method i.e. How = 3 plus instrument = 3 | **2(3)** |
|  |  |  | name of stain | **3** |
|  |  |  | application of stain – use dropper to place stain on tissue on slide or place tissue in stain or any other correct method. | **3** |
|  |  |  | put on cover slip or remove excess stain **any one** | **3** |
|  |  |  | cell wall/ chloroplasts or chlorophyll/ (large) vacuoles/ (starch) granules/ leucoplasts/ chromoplasts / shape **any two** | **2(3)** |

## 2010 OL Q9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **9.** | (a) | (i) | A group of tissues (working together) | **5+1** |
|  |  | (ii) | Electron microscope |  |

## 2011 OL Q9

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **9.** | (a) | A | Eyepiece / Eye lens | | | **5+1** |
|  |  | B | Platform / Stage | | |  |
|  | (b) | (i) | Any named plant | **2(6)+6(2)** | | |
|  |  | (ii) | Cut or peel /with what / onto slide / into water //safety point / stain / cover slip / detail on cover slip ***Any 3***  **(At least 1 point ‘HOW’ and 1 point ‘PREPARE)** | |  | |
|  |  | (iii) | Iodine solution. | |  | |
|  |  | (iv) | With a dropper / Under coverslip / method | |  | |
|  |  | (v) | 4X / Low Power | |  | |
|  |  | (vi) | Cell Wall / Chloroplast / (Large)Vacuole | |  | |

**Section C**

## 2013 OL Q13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **13.** | (a) |  |  | **3(3)** |
|  |  | (ii) | Electron microscope | (1 pt) |

**Cell structure**

**Section A**

## 2004 OL Sample Q3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **3.** |  |  |  | | **5(4)** |
|  |  |  | Cell membrane | **Lipid** |  |
|  |  |  | Vacuole | **Sap** |  |

## 2004 OL Q2

|  |  |  |  |
| --- | --- | --- | --- |
| **2.** |  | | **2(7)+3(2)** |
|  | **Column A** | **Column B** |  |
|  | a. Contains chlorophyll | **chloroplast** |  |
|  | b. Site of protein formation | **ribosome** |  |
|  | c. Site of energy release | **mitochondrion** |  |
|  | d. Site of storage of water, salts and sugars | **vacuole** |  |
|  | e. Allows osmosis to occur | **cell membrane** |  |

## 2005 OL Q2

|  |  |  |
| --- | --- | --- |
| **2.** |  | **5+5(3)** |
|  | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Structure | Cytoplasm | Cell Wall | Chloroplast | Nucleus | Vacuole | | Animal Cell |  |  |  | ✓ | ✓ | | Plant Cell |  | ✓ | ✓ | ✓ | ✓ | | **N.B.** One wrong cancels one right for Cell Wall and Chloroplast | | | | | | |  |

## 2005 OL Q7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **7** | **a** | **(ii)** | Allows some molecules through /Visking tubing / cell membrane | **3** |

## 2006 OL Q2

|  |  |  |  |
| --- | --- | --- | --- |
| **2.** |  | | **6(3)+2(1)** |
|  | **(a)** | **A** = cell wall [allow membrane]**B** = nucleus **C** = cytoplasm **D** = vacuole |  |
|  | **(b)** | (cell) wall/vacuole/chloroplast/definite shape |  |
|  | **(c)** | Sap or component e.g. water, glucose |  |
|  | **(d)** | Cellulose or no carbohydrate if ‘membrane’ given above |  |

## 2007 OL Q1

|  |  |  |  |
| --- | --- | --- | --- |
| **1.** | *any four* | | **4(5)** |
|  | **(d)** | water [allow cytoplasm or cytosol or plasmosol] |  |

## 2007 OL Q3

|  |  |  |  |
| --- | --- | --- | --- |
| **3.** |  | | **5(4)** |
|  | **(b)** | T |  |
|  | **(d)** | T |  |
|  | **(e)** | T |  |

## 2010 OL Q3

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **3.** | (a) |  | Plant cell | **2(7) + 2 + 4(1)** | |
|  |  | 1.  2. | e.g. cell wall/definite shape/chloroplasts/(large) vacuole  **(Two points)** | |  |
|  | (b) |  | A = (Large) vacuole; B = chloroplasts; C = (Cell) membrane | |  |
|  | (c) |  | Water **or** sugar **or** sap **or** salt(s) **or** named gases **or** protein | |  |

## 2011 OL Q5

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **5.** |  |  |  | **2(7) + 3(2)** | |
|  | (i) |  | A substance required for aerobic respiration. **Oxygen** | |  |
|  | (ii) |  | A product of anaerobic respiration in muscles. **Lactic Acid** | |  |
|  | (iii) |  | A product of aerobic respiration. **Water** | |  |
|  | (iv) |  | A product of anaerobic respiration in yeast. **Alcohol** | |  |
|  | (v) |  | The cell structures in which Stage 2 occurs. **Mitochondria** | |  |

## 2004 HL Sample Q1

|  |  |  |  |
| --- | --- | --- | --- |
| **1.** |  | | **5(4)** |
|  | (a) | protection/ boundary/ bears antigens/ controls exit and entry of substances |  |
|  | (b) | membrane –bound nucleus/ membrane-bound organelles |  |

## 2004 HL Sample Q2

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | | **6(3)+2** |
|  |  | |  |  | | --- | --- | | **A** | **B** | | DNA | **Thymine** | | Ribosome | **Protein** | | Vacuole | **Sap** | | Fermentation | **Ethanol** | | RNA | **Uracil** | | Active Site | **Enzyme** | | Variation | **Mutation** | |  |

## 2006 HL Q1

|  |  |  |  |
| --- | --- | --- | --- |
| **1.** | *any five* | | **5(4)** |
|  | **(a)** | minerals **or** trace elements **or** inorganic nutrients |  |
|  | **(b)** | lignin |  |
|  | **(c)** | membrane **or** named membrane |  |
|  | **(d)** | Vitamin C **or** ascorbic acid / Vitamin B **or** named |  |
|  | **(e)** | correctly matched disorder |  |
|  | **(f)** | amino acid - [*accept peptide*] |  |

## 2010 HL Q3

|  |  |  |  |
| --- | --- | --- | --- |
| **3** | (c) | Eukaryotic | **3** |
|  | (d) | Membrane-bound organelles **or** named membrane-bound organelle  [*allow nucleus*] | **3** |

## 2013 HL Q5

|  |  |  |  |
| --- | --- | --- | --- |
| **5.** | **1 + 1 + 8 + 6 + 4(1)** | | |
|  | (a) | (i) | Only certain substances (or named) allowed through |
|  |  | (ii) | Substances can be kept in (or out) **or** substances can be let in (or out) |
|  |  | (iii) | Oxygen / glucose / water / amino acids / phosphate (or P) / iron **Any two** |
|  | (b) | (i) | Pressure / of cell contents (or described) / on cell wall **Any two** |
|  |  | (ii) | Vacuole **or** cell wall **or** cell sap |
|  |  | (iii) | Support(or described) |

**Section B**

## 2010 HL Q8

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **8** | (b) | (i) | As a stain **or** to see more clearly | **3** |

## 2012 HL Q7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **7** | b | (viii) | \*200 | **3** |

**Section C**

## 2013 OL Q13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **13.** | (a) |  |  | **3(3)** |
|  |  | (i) | Diagram - three labels | **3,0 + 3(1)** |
|  |  | (ii) | Electron microscope | (1 pt) |
|  |  |  |  |  |
|  | (b) |  |  | **3(5) + 6(2)** |
|  |  | (i) | Holds cell together/ selectively permeable/ displays antigens | 2(pts) |
|  |  | (ii) | *~~A~~* ~~= Lipid /~~ *~~B~~* ~~= Protein~~ \**7 marks to be allocated here as long as any part of 13 (b) attempted – this is not part of a sliding scale* | **7 marks i.e.**  **5 + 2** |
|  |  | (iii) | Mitochondrion | (1 pt) |
|  |  | (iv) | To allow passage of materials [allow diffusion?] – allow (to make it) permeable | (1 pt) |
|  |  | (v) | Plant cells have a wall/ large vacuole/ chloroplast | (2 pts) |
|  |  | (vi) | Sun/ light | (1 pt) |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 2009 HL Q14(c) | | | |  |
| 14 | c | (vi) | Nucleus  Membrane-bound organelles **or** other named organelle | **3**  **3** |
|  |  | (vii) | Prokaryotic | **3** |

## 2011 HL Q14(c)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **14.** | (c) | (i) | Immediately inside the cell wall | **3** |
|  |  | (ii) | \*Eukaryotic | **3** |
|  |  | (iii) | \*Prokaryotic | **3** |
|  |  | (iv) | Only some substances are allowed through | **3** |
|  |  | (v) | No (or little) energy (or ATP) required | **3** |
|  |  | (vi) | Movement of water **or** (osmosis) requires a membrane | **3** |