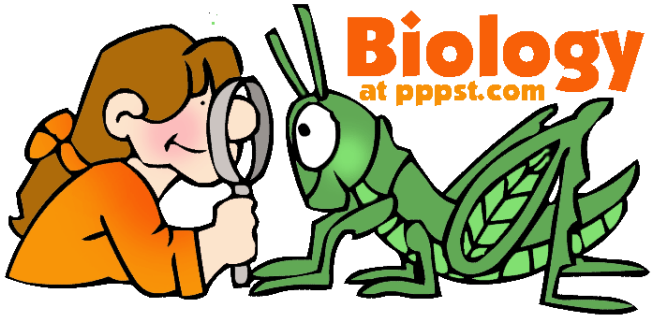

A2 Biology

Course Information

2011 - 2012

Course Details:
A2 Biology
OCR Biology A H421

http://www.ocr.org.uk/qualifications/type/gce/science/biology/documents/index.html

Teachers:

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Name: _____

Tutor Group: _____

Contents

Drop –in Study and Homework club

Monday after school you will be able to go to Sc10 for help with Biology homework and work covered within the week.

Assessment

Course: OCR Biology A H021/ H421

Module	Weightings	Assessment details
Cells, Exchange and Transport	15% (30% of AS)	Jan Yr 12 (60 min)
Molecules, Biodiversity, Food and Health	25% (50% of AS)	June Yr 12 (105 min)
Practical Skills in Biology 1	10% (20% of AS)	Throughout Yr 12
Communication, Homeostasis and Energy	15%	Jan Yr 13 (60 min)
Control, Genomes and Environment	25%	June Yr 13 (105 min)
Practical Skills in Biology 2	10%	Throughout Yr 13

Assessment Criteria

Exam questions will assess the following objectives in relation to the content covered within each module (see the Learning Objectives section):

- Knowledge and understanding of science and of How Science Works
- Application of knowledge and understanding of science and of How Science Works
- How Science Works

AO weightings in Advanced GCE

Unit	% of Advanced GCE			Total / %
	AO1	AO2	AO3	
AS Unit F211: *Cells, Exchange and Transport*	7	7	1	15
AS Unit F212: *Molecules, Biodiversity, Food and Health*	10.5	12	2.5	25
AS Unit F213: *Practical Skills In Biology 1*	1.5	1	7.5	10
A2 Unit F214: *Communication, Homeostasis and Energy*	5	9	1	15
A2 Unit F215: *Control, Genomes and Environment*	9	13.5	2.5	25
A2 Unit F216: *Practical Skills In Biology 2*	1	1.5	7.5	10
	34	44	22	100%

	Assessment Objective 1	Assessment Objective 2	Assessment Objective 3
Assessment Objectives	**Knowledge and understanding of science and of How Science Works** Candidates should be able to: • recognise, recall and show understanding of scientific knowledge; • select, organise and communicate relevant information in a variety of forms.	**Application of knowledge and understanding of science and of How Science Works** Candidates should be able to: • analyse and evaluate scientific knowledge and processes; • apply scientific knowledge and processes to unfamiliar situations including those related to issues; • assess the validity, reliability and credibility of scientific information.	**How Science Works** Candidates should be able to: • demonstrate and describe ethical, safe and skilful practical techniques and processes, selecting appropriate qualitative and quantitative methods; • make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy; • analyse, interpret, explain and evaluate the methodology, results and impact of their own and others' experimental and investigative activities in a variety of ways.
A/B boundary Performance Descriptions	Candidates characteristically: a) demonstrate detailed knowledge and understanding of most principles, concepts and facts from the A2 specification; b) select relevant information from the A2 specification; c) organise and present information clearly in appropriate forms using scientific terminology.	Candidates characteristically: a) apply principles and concepts in familiar and new contexts involving several steps in the argument; b) describe significant trends and patterns shown by complex data presented in tabular or graphical form; interpret phenomena with few errors; and present arguments and evaluations clearly; c) evaluate critically any statements, conclusions or data; d) carry out accurately most of the calculations specified for A2; and apply the principles of statistical analysis when directed; e) translate successfully data that is presented as prose, diagrams, drawings, tables or graphs from one form to another; f) select a wide range of facts, principles and concepts from both AS and A2 specifications; g) link together appropriate facts principles and concepts from different areas of the specification.	Candidates characteristically: a) devise and plan experimental and investigative activities, selecting appropriate techniques; b) demonstrate safe and skilful practical techniques and comment effectively on ethical issues; c) make observations and measurements with appropriate precision and record these methodically; d) interpret, explain, evaluate and communicate the results of their own and others' experimental and investigative activities, in appropriate contexts; e) use an appropriate statistical technique to assess the validity of a hypothesis.
E/U boundary Performance Descriptions	Candidates characteristically: a) demonstrate knowledge and understanding of some principles, concepts and facts from the A2 specification; b) select some relevant information from the A2 specification; c) present information using basic terminology from the A2 specification.	Candidates characteristically: a) apply given principles or concepts in familiar and new contexts involving a few steps in the argument; b) describe, and provide a limited explanation of, trends or patterns shown by complex data presented in tabular or graphical form; c) identify, when directed, inconsistencies in conclusions or data; d) carry out some steps within calculations; e) translate data successfully from one form to another, in some contexts; f) select some facts, principles and concepts from both AS and A2 specifications; g) put together some facts, principles and concepts from different areas of the specification.	Candidates characteristically: a) devise and plan some aspects of experimental and investigative activities; b) demonstrate safe practical techniques and comment on ethical issues; c) make observations and measurements and record them; d) interpret, explain and communicate some of the results of their own and others' experimental and investigative activities, in appropriate contexts; e) use a given statistical technique.

Course Outline: A2 Biology 2011 – 2012

A2 Biology Route through 2011-2012

Week	Date	Teacher A	Teacher B	Assessments
1	Mon 5th Sept			
2	12th Sept	1.1.1 The need for communication	1.2.1 Excretion 1.2.2 The liver	
		1.1.2 Homeostasis and negative feedback	1.2.3 Functions of the liver 1.2.4 The Kidney	
3	19th Sept	1.1.3 Maintaining body temp - ectotherms	1.2.5 Formation of urine 1.2.6 Water reabsorption	
		1.1.4 endotherms	1.2.7 Osmoregulation 1.2.8 Kidney Failure	Qualitative task 1 Practical Assessment
4	26th Sept	1.1.5 Sensory Receptors	Excretion revision and test	
		1.1.6 Resting potentials and action potentials	1.3.1 Importance of ph/s 1.3.2 Structure v function of chloroplasts	Unit 1: Module 2 Homework
5	3rd Oct	1.1.7 Transmission of action potentials	1.3.3 The light dependent stage 1.3.4 Light independent stage	
		1.1.8 Nerve junctions	1.3.5 Limiting factors 1.3.6,7 Investigating rate	
6	10th Oct	1.1.9 Signals and messages	1.3.8 Limiting factors and Calvin cycle	
		1.1.10 The endocrine system	PH/S Revision and test	
7	17th Oct	1.1.11 The regulation of blood glucose	Quantitative and Evaluative task 1	Quantitative and Evaluative task 3
		1.1.12Regulation of insulin levels	Respiration 1.4.1 Why do living organisms respire?	Unit 1: Module 1, 2 and 3 Test
8	Mon 31st Oct	1.1.13 Control of heart rate in humans	1.4.2 Coenzymes 1.4.3 Glycolysis	
			1.4.4 Structure and function of mitochondria 1.4.5 Link reaction and Krebs	

9	7th Nov	Communication revision and test	1.4.6 Ox phos and chemios 1.4.7 Evaluative evidence for chemios	
			1.4.8 Anaerobic respiration 1.4.9 Respiration substrates	
10	14th Nov	2.2.1 Clones in nature	Respiration revision and test	
		2.2.2 Artificial clones and agriculture	Quantitative and evaluative task 2	Unit 1, Module 4 Homework
11	21st Nov	2.2.3 Cloning animals	2.1.1 How DNA codes for proteins 2.1.2 Translation	
		2.2.4 Biotechnology basics	2.1.3 Mutations 1 2.1.4 Mutations 2	
12	28th Nov	2.2.5 the growth curve	2.1.5 Lac operon 2.1.6 Genes and body plans	
		2.2.6 Commercial application of biotechnology	2.1.7 Apoptosis 2.1.8 Meiosis	
13	5th Dec	Revision	Revision	
14	12th Dec	MOCKS	MOCKS	
				Unit 1 Mock
15	Wed 4th Jan	2.2.7 Industrial enzymes	2.1.9 Significance of meiosis 2.1.10 Terms you need to know	
		2.2.8 Studying whole genomes		
16	9th Jan	Qualitative task 2 enzyme and biotechnology	2.1.11 Using genetic diagrams 1 2.1.12 Using genetic diagrams 2	
			2.1.13 Interaction between gene loci-1 2.1.14 What determines sex?	
17	16th Jan	Revision	Revision	
18	23rd Jan	2.2.9 DNA manipulation - separating and probing	2.1.15 Interaction between gene loci-2 2.1.16 Chi sq test	
		2.2.10 Sequencing and copying DNA-1	2.1.17 Continuous and Discontinuous variation 2.1.18 Population genetics	

19	30th Jan	DNA Manipulation practical	2.1.19 Roles of genes and environment in evolution 2.1.20 what's a species?	
			2.1.21 Natural and artificial selection	Unit 2, Module 1 Homework
20	6th Feb	2.2.11 Sequencing and copying DNA-2	Cellular control revision and test	
		2.2.12 Introduction to genetic engineering		
21	Tues 21st Feb	2.2.13 Genetic engineering and bacteria	2.3.1 Ecosystems 2.3.2 Understanding energy transfer	
		2.2.14 Engineering case study -1: Human insulin	2.3.3 Maping energy transfer 2.3.4 Succession	Unit 2, Module 1 and 2 Test
22	27th Feb	2.2.15 Engineering case study-2: Golden rice	2.3.5 Studying ecosystems 2.3.6 Decomposers and recycling	Unit 2, Qualitative task 2 Practical Assessment
		2.2.16 Gene therapy	2.3.7 What affects population size? 2.3.8 Competition	Unit 2 module 2: DNA manipulation Class practical
23	5th March	2.2.15 and 2.2.16 and 2.4.1	2.3.9 Sustainable management 2.3.10 Conservation; 2.3.11	
		2.2.17 Rights and wrongs of genetic manipulation	Ecosystems and sustainability revision and test	
24	12th March	2.4.2 and test	2.4.5 The Brain 2.4.6 Organising the nervous system	
			2.4.7 Coordinated movement 2.4.8 3 types of muscle	Unit 2, Module 2 Homework
25	19th March	2.4.1 Why plants respond to environments 2.4.2 How plants respond to the environment	2.4.9 Sliding filament model 2.4.10 Pulling together-muscles	
			2.4.11 Innate behaviour 2.4.12 Behaviour can be learned	
26	26th March	2.4.3 Controlling plant growth 2.4.4 Common use of plant hormones	2.4.13 Primate behaviour 2.4.14 Human behaviour, dopamine, DNA	
			Responding to the environment revision and test	Unit 2 Mock

Lesson Objectives

You will be given an objective sheet at the start of each module. You will use this at the start of each lesson to complete the date section on the handout. You must keep this in your folder and take it to every lesson. See below for an example.

Communication
Outline the need for communication systems within multicellular organisms, with reference to the need to respond to changes in the internal and external environment and to coordinate the activities of different organs.
State that cells need to communicate with each other by a process called cell signalling.
State that neuronal and hormonal systems are examples of cell signalling.
Define the terms negative feedback, positive feedback and homeostasis.
Explain the principles of homeostasis in terms of receptors, effectors and negative feedback.

Examiners' Tips

General guidance

There are a number of general areas that often cause problems for students when answering examination questions. These problem areas are regularly mentioned in examiners' reports. This general guidance should help you avoid these common problems and build good examination technique.

- Practise questions on past examination papers and check the corresponding mark schemes. These can be an invaluable learning and revision resource. You can use knowledge of a previous mark scheme to answer questions asked from a different aspect, requiring answers that demonstrate the *application* of your knowledge. However, don't expect *exactly* the same questions to come up on your examination paper – be prepared to *adapt* your knowledge to suit the question.

- When revising for your exams consider the variety of ways that a topic could be tested – be prepared to draw together strands of information from different areas of the specification. Remember to use the information given in the question's introduction to provide an appropriate answer.

- Always read the question fully and carefully (at least twice!) before beginning your answer.

- Consider your responses carefully and ensure that you express yourself clearly, using appropriate scientific terminology. This is particularly important in questions that have been flagged as QWC (Quality of Written Communication).

- Always read through your answer. Examiners cannot award marks if it is not clear what you are trying to say. Avoid repetition and reverse statements. Examiners often allow considerable leeway with the spelling of technical terms, but will not be so generous if answers are unclear.

- Make sure you use scientific terms appropriately – incorrect use can lose you marks. The following terms are often used inappropriately:
    - gene and allele
    - biotic and abiotic
    - sympatric and allopatric
    - glucagon, glucose and glycogen
    - glucose and sugar
    - interspecific and intraspecific.
- Calculations are another area in which mistakes are often made. Make sure you have a calculator with you during the exam, and that you are familiar with the necessary functions.
- Make use of the all the data provided, whether it is presented in table, graph or text form. Marks will be allocated for quoted data.
- When asked to make comparisons, don't simply describe one thing and then the other. You must describe the differences or similarities between them.
- Your A2 papers will always include questions designed to test your knowledge and understanding of the AS specification. The F215 unit will also test your synoptic knowledge of the material in F214, so look out for questions that may draw on your knowledge from previous work.
- Use the information given in the introductory part of the question when being tested on unfamiliar material. It is a good idea to highlight key pieces of information as you read through the question. You will often be expected to make particular use of information provided in bullet point format.

Points to note by module

Each module of the physics specification consists of a series of *Learning Outcomes* and these outcomes often revolve around specific definitions, for example, photosynthesis and respiration. Make sure you highlight these definitions in your revision and learn them. See the separate Glossary booklet.

You will be given an Examiner's Tips section for each module. See below for an example.

Unit F214: Communication, homeostasis and energy

Module 1 – Communication and homeostasis
Negative feedback
• The general principle of negative feedback can be difficult to understand, but it is an essential component of homeostatic mechanisms. • One common error is to suggest that the homeostatic mechanism will reverse the environmental change that caused the stimulus.

Sample Exam Questions

Unit F214: Communication, homeostasis and energy

Module 3: Photosynthesis

Question 1 — **Total marks: 11**

The table below shows the results of an investigation into photosynthesis and respiration in a leaf. The net uptake of carbon dioxide in bright light and the mass of carbon dioxide released in the dark were recorded from one leaf at a range of temperatures.

Temperature / °C	Net uptake of CO_2 /mg g^{-1} dry mass h^{-1}	Release of CO_2 / mg g^{-1} dry mass h^{-1}	True rate of photosynthesis / mg CO_2 g^{-1} dry mass h^{-1}
5	1.3	0.4	
10	2.4	0.7	
15	3.0	1.0	
20	3.3	1.4	
25	3.0	1.9	
30	2.2	2.8	

(a) Complete the table.

Marks available: 1

Student answer:

(a)

Temperature / °C	Net uptake of CO_2 /mg g^{-1} dry mass h^{-1}	Release of CO_2 / mg g^{-1} dry mass h^{-1}	True rate of photosynthesis / mg CO_2 g^{-1} dry mass h^{-1}
5	1.3	0.4	**1.7**
10	2.4	0.7	**3.1**
15	3.0	1.0	**4.0**
20	3.3	1.4	**4.7**
25	3.0	1.9	**4.9**
3	2.2	2.8	**5.0**

Examiner comments:

(a) Here we have some How Science Works in analysing the data. The candidate has realised that the CO_2 released in respiration is used in photosynthesis. Therefore the true rate of photosynthesis is the sum of the CO_2 taken in plus the CO_2 released in respiration.

(b) Carbon dioxide is absorbed by the leaf and used to manufacture sugars.

(i) Describe the biochemical pathway in which carbon dioxide is used.

(ii) Describe exactly where, in the leaf, this process occurs.

Marks available: (i) 5 (ii) 2

Student answer:

(b) (i) The biochemical pathway is called the Calvin cycle. Carbon dioxide is fixed by ribulose bisphosphate (RuBP) to produce an unstable six-carbon compound. The enzyme ribulose bisphosphate carboxylase (rubisco) ensures this occurs. The unstable six-carbon compound breaks down to produce two molecules of a three-carbon compound (glycerate 3-phosphate). The glycerate 3-phosphate is converted to triose phosphate. These triose phosphates can be recombined to produce hexose sugars. However, many of them are actually used to remake the RuBP.

(ii) The Calvin cycle occurs in the stroma of the chloroplasts (in the palisade mesophyll cells).

Examiner comments:

(b) (i) A clear description which uses all the relevant terms correctly. This question could easily be used to test the use of scientific terms. You should note that no further detail than this is expected.

(ii) As two marks have been allocated to this answer, it should tell you that the examiner is looking for two points. In this case the terms stroma and chloroplast, both of which are required to name the site of the Calvin cycle.

(c) When plants are grown in glasshouses during autumn and winter, the natural light levels are low. Using the information in the table above, suggest why it is essential to keep temperatures fairly low.

Marks available: 3

Student answer:

(c) When light levels are low, light is the limiting factor on photosynthesis. Therefore photosynthesis will not occur at a high rate. If temperatures are high, the rate of photosynthesis does not rise much, but the rate of respiration does increase with higher temperature. We can see this in the table. Between 10 °C and 25 °C the rate of photosynthesis rises from 3.1 to 4.9 mg g^{-1} dry mass h^{-1}. But the rate of respiration rises from 0.7 to 1.9 mg g^{-1} dry mass h^{-1}. At a higher temperature the plants use a greater proportion of the carbohydrates made in photosynthesis for respiration. Therefore the plants have less carbohydrates left to use in growth and will not grow as well at the higher temperature.

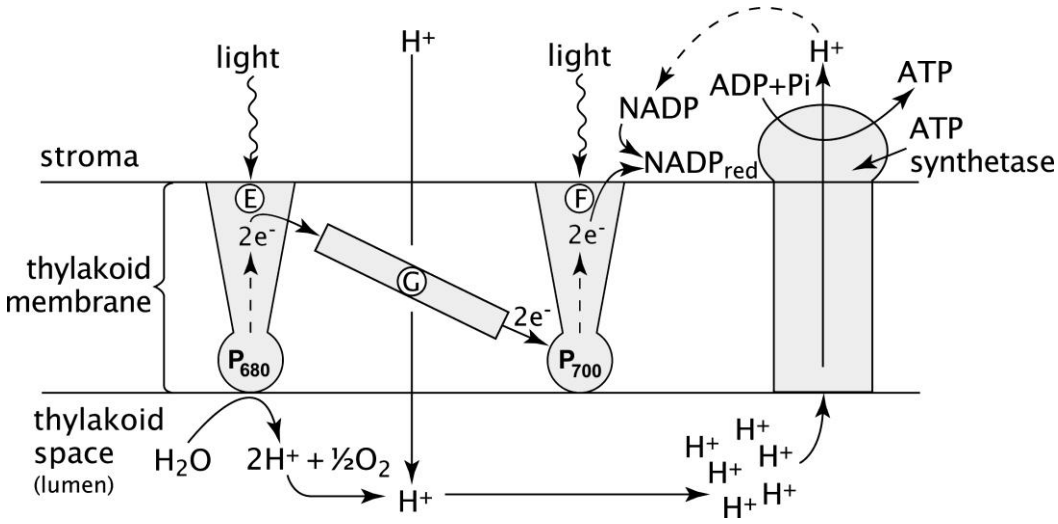
Examiner comments:

(c) This is a potential area for Stretch and Challenge. The question is looking at the effects of temperature on enzyme action and asking you to apply that knowledge from your AS biology to a novel context. This is a very good answer but could be improved further if the candidate had calculated the % increase in respiration and photosynthesis over the stated temperature rise. This would have made the point even more clear.

Module 3: Photosynthesis

Question 2	**Total marks: 12**

The figure below summarises the light-dependent reactions of photosynthesis occurring on the thylakoid membranes.



(a) With reference to the figure above:

(i) State the general name for the pigment complexes at E and F.

(ii) Describe what is happening at points E and F.

(iii) Name two accessory pigments that may be found at E and F.

Marks available: (i) 1 (ii) 2 (iii) 2

Student answer:

(a) (i) E and F are known as photosystems.

(ii) Light is being absorbed by the pigments. The energy from the light is being used to boost the energy level of the electrons in chlorophyll molecules so that they become excited.

(iii) Xanthophyll and carotenoids

Examiner comments:

(a) (i) E and F have a number of names. Antenna complexes, light harvesting apparatus, photosystems or even quantasomes would be OK.

(ii) The energy from light is used to increase the energy levels of electrons so that they move to higher orbits. This makes them unstable and the electrons can be passed to other pigments or to the electron transfer chains.

(iii) Other forms of chlorophyll a and chlorophyll b can also be used as accessory pigments in the light harvesting apparatus.

(b) P_{680} and P_{700} refer to the pigment chlorophyll. Explain the significance of the designation of P_{680} and P_{700}.

Marks available: 3

Student answer:

(b) Chlorophyll absorbs light over a range of wavelengths. There are different forms of chlorophyll which can absorb different wavelengths more effectively. P_{680} means that this form of chlorophyll absorbs light most effectively at wavelength 680 nm. P_{700} absorbs light of 700 nm best.

Examiner comments:

(b) Remember that P_{680} and P_{700} refer to the peak of absorption – not the only wavelength that is absorbed. And remember nm = nanometre (10^{-9}m).

(c) Weedkillers such as paraquat interfere with electron transport chains (G) in the thylakoid membrane. Suggest how this will kill the plant.

Marks available: 4

Student answer:

(c) The paraquat stops electrons passing down the transfer chain. It may act as an electron acceptor. If the electrons cannot pass down the chain there will be no photophosphorylation. No ATP will be produced. Also there will be no reduced NADP produced. The ATP and NADP are used in the Calvin cycle. Therefore the Calvin cycle will stop. No carbon dioxide will be fixed and no sugars will be made. The plant will run out of energy and die.

Examiner comments:

(c) Another question that involves Stretch and Challenge. The use of weedkillers to improve crop production links back to your AS biology. This is a clear response that shows how well this candidate understands the light-dependent stage of photosynthesis and how it links to the light-independent stage.

Practical Assessment

What are A2 practical skills?

- Your practical and investigative skills will be developed during the A2 course under the guidance of your teacher(s). The unit F216 assesses practical and investigative skills developed within each topic.
- These skills will build upon those developed during your AS course.
- There is formal internal assessment of your practical work, entitled *Practical Skills in Biology 2* (unit code F216).
- You will carry out three different types of task, set by OCR.
- Tasks will be based on the two A2 modules F214 or F215.

How much are practical skills worth?

- The practical skills are worth 40 marks. This is out of a total of 200 marks for the whole A2 course, so they represent 20% of the A2 course (and 10% of an A level course).
- Centres will supply OCR with a single mark out of 40 for each candidate.
- Remember that for *every* two marks you gain from your A2 practical skills, you will achieve 1% towards your final A2 percentage.

Who does the marking and when?

- Your teacher will mark your practical skill tasks as you do them throughout the A2 course, using a mark scheme provided by OCR.
- Within each teaching centre, marks will be internally moderated – by your teachers.
- The marking will be checked by OCR moderators. Marks can be changed to ensure the marks of your school or college are in line with those from other teaching centres.

What proportion of the formal practical skills assessment will be done in lessons?

- All the tasks will be carried out under supervision during lesson time.
- Your teacher must be able to say that the work is yours.
- Both you and your teacher will have to sign documents to this effect.

What tasks do I have to do?

- A **qualitative** task worth 10 marks
- A **quantitative** task worth 10 marks
- An **evaluative** task worth 20 marks

What is covered by the qualitative task?

- You will carry out a practical task using instructions supplied by OCR.
- You are expected to carry out the task skilfully and safely using qualitative techniques.
- You will need to make and record valid observations and tabulate them in an appropriate way.
- You may be required to show your observations using diagrams or graphs.
- You will be asked to comment on the results.

What is covered by the quantitative task?

- You will carry out a practical task using instructions supplied by OCR.
- You are expected to carry out the task skilfully and safely using quantitative techniques.
- You will need to make and record accurate observations and tabulate them in an appropriate way.
- You will be required to show your data using graphs.
- You will also need to process your results and reach valid conclusions.

What is covered by the evaluative task?

- You will carry out an evaluative task using instructions supplied by OCR.
- Evaluative tasks will be based on a quantitative task.
- Evaluative tasks will *not* require additional data collection.
- The data, along with your own knowledge, will be used to reach valid conclusions.
- You will need to assess the reliability and accuracy of an experimental task.
- You will need to identify anomalies.
- You will be required to identify significant weaknesses in procedures and measurements.
- You will use your knowledge to understand and select simple improvements to procedures and measurements.

Do I have to plan a practical?

- No, but you may be required to suggest changes to practical techniques or apparatus that would improve the accuracy or reliability of the results and/or the validity of the conclusions.

Will every piece of practical work be assessed?

- No. OCR provides certain tasks that can be done at any point during the course, but your teacher should do other work with you to develop your skills.
- The *minimum* number of practical assessments would be one for each of the three types of task; however, it is likely that you will do more than three.
- You must *not* repeat any particular task – although a poor mark given for a particular task may be improved by completing a similar task from those supplied by OCR.

If I do more than three practical assessments, which ones count towards A2?

- Your final mark out of a possible 40 will be comprised of the *best* scores that you achieve for a qualitative task, a quantitative task and an evaluative task.

The qualitative task

Possible qualitative tasks include:

- Using a light microscope and making annotated drawings of plant and animal tissue
- Using a light microscope to make annotated drawings showing the distribution of tissues in an organ or structure
- Investigating different methods of immobilising enzymes
- Investigating the effects of changing light direction on plant growth

When carrying out qualitative tasks:

- You may be expected to make comments about safety. These comments should be *relevant* to the practical and *not* be general safety comments.
- An explanation as to *why* you are taking a safety precaution is helpful, for example, including a reference to a hazard or the safety measure required.
- Wear safety glasses and gloves when advised to do so.
- Organise your work area and wipe up any spillages immediately.
- Dispose of chemicals as instructed – this may *not* be down a sink.
- When choosing which measurements to take, use as large a range as possible and make sure the intervals between the measurements cover the whole range.
- Data should be measured with a degree of precision consistent with the equipment used to make the measurement.
- Repeat measurements where necessary and calculate an average.
- Record all your results in a table.
- All column headings should be labelled with a quantity *and* a unit.
- Carefully describe any observations. Diagrams may also be helpful.
- Make a record of *all* observations such as colour changes, temperature changes, etc.

The quantitative task

Possible quantitative tasks include:

- Investigating the effect of a limiting factor on photosynthesis
- Investigating the effect of a variable on the rate of respiration in either an animal or a microorganism
- Comparing aerobic and anaerobic respiration in yeast
- Using a colorimeter
- Using models to investigate sex-linkage and codominance in genetic crosses
- Measuring the effect of different growing conditions in a fermentation vessel
- Measuring the effect of changing an abiotic factor on distribution or abundance in an organism

When carrying out quantitative tasks:

- The points already listed for carrying out qualitative tasks also apply to quantitative tasks.
- All the raw readings should be recorded to the same number of decimal places.
- Calculations should be calculated to not more than one decimal place more than the input data.
- Scales on graphs must be labelled with the quantity being measured along with its unit, and the value being changed along with its unit. Scales must be linear and simple.
- Each axis should be labelled.
- The scale must be correctly selected to make good use of the graph paper.
- All points must be plotted accurately and clearly. Use a sharp pencil and check carefully any points that do not appear to fit a trend.
- Draw lines with a ruler through the plots if there is any uncertainty about the intermediate values between your readings. In some cases a line of best-fit is acceptable. The line must be thin and clear.
- When calculating the gradient, clearly show both the points on the line and the calculation.
- Give your final answer to an appropriate number of significant figures (s.f.). The accuracy of the final answer is dictated by the least accurate piece of data. Avoid going from less to more significant figures during your working.

The evaluative task

Possible evaluative tasks include:

- Extensions of the quantitative tasks
- Identifying limitations in the procedure you follow and identifying anomalies in the data
- Identifying significant limitations that may lead to inaccurate or unreliable data
- Commenting upon the reliability of the data and discussing the validity of your conclusions
- Using your scientific knowledge and understanding to suggest explanations

When carrying out evaluative tasks:

- You will carry out some calculations using the correct mean of a set of data.
- You may be required to carry out some more advanced data processing techniques such as standard deviation, the chi-squared (χ^2) test or Hardy-Weinberg principles.
- Concentrate on the difficulties encountered while actually doing the experiment.
- Make a note of any procedural errors *as you go* when carrying out a practical.
- Explain how each of these difficulties or errors could have affected your results.
- You should *not* just describe the procedure you have followed.
- To assess the reliability of the experiment, identify anomalous results and refer to the scatter of points of the replicates about the mean or best-fit line.
- You may be asked to put any errors in order of their significance.
- You need to be able to calculate the percentage error of measurements. Take care with stopwatches – often a stopwatch will read to 0.01 s; however, human reaction time is at least 0.1 s, therefore Δt is not 0.01 s but 0.1 s.

- Explain how procedural errors may be overcome by suggesting improvements to the procedure and to the apparatus used which would improve the accuracy of the experiment. Your improvements *must* relate to the experiment and be possible within a school laboratory.

What you need for a practical assessment

Equipment

- Calculator
- 30cm ruler
- Sharp pencil
- Pencil eraser
- Blue or black pen

Getting the basics right - study skills

- **Keeping your notes organised**

  Your folder (with dividers) should be taken to every lesson. You should have a section in your folder for the following:
  - Notes
  - Homework
  - Formal assessments (Anything with a green sticker!)

- **What you need to know**

The OCR biology specification is perhaps the most important document you'll need to refer to during your A2 course. This lists everything you're required to know for your A level biology course. The material is divided into topics and each topic contains a list of statements called *Learning Outcomes*. The examiner will set questions based on these learning outcomes – so ensure that you are familiar with them.

- **Making good use of all the resources**

Ensure you have a copy of these learning outcomes – they are available on the OCR website. Your teacher will probably go through the specification one topic at a time. When you start a new topic place the list of learning outcomes for that topic at the start of a new section in your notes folder. As you cover a topic in class or at home tick it off the list – don't cross it out as you will need to read it later! This will ensure that you have covered all the relevant work.

- **Which notes to keep**

Your notes folder will expand very rapidly as you go through the course. It is a good idea to use dividers which can be labelled according to the specification sections. After each lesson (or perhaps each week), file your work in sequence in the relevant section. Practical work is best used to consolidate the theory; it will have analysis and evaluation sections that relate directly to the theory. Many schools and colleges may be

unable to carry out the practical work at the same time as the corresponding theory teaching. However, you should still file any practical work with the corresponding theory.

- **The need for study time**

In the section *Getting Started in AS Biology* on the AS Exam Café CD, we highlighted the need for you to spend time studying. Your biology lessons will guide you through the material required on the specification. However, lesson time is limited and may often be used for practical work. So it is essential that you make use of any extra time to consolidate and extend your knowledge.

- **Planning your study time**

Planning is important. There is a revision planner on the Exam Café CD which should help you plan your study time. Set aside a certain amount of time each week. Many schools and colleges will suggest how much extra time you should aim to spend each week on extra study.

- **Where you should study**

Study time may be during lessons or at home. Wherever it is, you should try to ensure that there are no distractions such as TV or loud music. Ideally, you should be sitting at a desk or table – it may be tempting to lie on the bed but you are more likely to fall asleep! Try to break up your study time into reasonable chunks. Studying loses its effectiveness if you keep going for too long – you will lose concentration. Everyone has their own way of studying effectively. How long you study for at one time is up to *you*. Aim to study for about 45 minutes, have a 15 minute break, and then carry on for another 45 minutes etc. Plan a timetable which will work for *you* and stick to it!

- **Study methods**

When you study it must be an active process – don't just sit there looking at the textbook expecting to absorb knowledge by diffusion; unfortunately it doesn't work that way! During your study time read over the notes you made in class. Ensure that you fully *understand* everything. Highlight areas where you are uncertain. Use your textbook, look up the relevant section and read it through. As you do this, add some additional explanations to your class notes. If your class notes are untidy it may be worth rewriting them, incorporating more detail as you go. Make use of the questions in the textbook to test your knowledge. You may also find it useful to try the multiple choice questions on the Exam Café CD. If there are still areas that you are uncertain about, make a note to ask your teacher for help.

- **Study summary**

    - planned
    - no distractions
    - active
    - read and improve class notes

- refer to textbook
- answer questions

Getting the basics right – exam skills

Exams are not designed to catch you out. Their aim is to assess your knowledge in a fair and reliable way. However, there are a few simple things you can do to ensure you attain the grade you deserve for your A2 biology exam.

- **Preparation**

Having studied the course it may seem obvious to suggest that you need to revise. However, don't underestimate how much there is to learn or how long this will take. You should be certain that you know when your biology examinations are scheduled and how this affects any other arranged subject examinations. Your examinations officer will give you a personalised exam timetable – keep it safe. However, if you do lose it you can look up your examination times on the OCR website.

- **Planning your revision**

The main holiday before an examination session is an important time to ensure your notes are complete and that you get as much revision done as possible. The Exam Café CD contains a *Revision planner* that you should find helpful. Plan to revise for a certain length of time each day – perhaps one hour for biology and one hour for each of your other subjects. Plan to spend time revising every day of the holiday – not just in the last few days! If you do four hours each day there will be plenty of time to do other activities as well. Keep on revising until your examinations actually start!

- **How to revise**

Everyone has a method of revising that works best for them. Try a few different techniques and decide which is best for you. Tackle the subject one topic at a time. Whichever method you choose, your revision must be *active* – this means doing something that makes you think! Here are some revision techniques you could try after reading through your notes:

- use the *Revision flashcards* provided on the Exam Café CD
- highlight important points
- make summary notes as you go
- try to write brief notes from memory
- try to answer some questions
- write out some revision cards that contain important facts
- use a revision guide

- **Last-minute revision**

This type of revision can be very useful but don't leave it *all* until the last minute. Any revision technique that provides you with some concise notes or cards is a good idea. These can be used as your source for any last-minute revision.

- **Approaching the examination**

Again, you must be certain you know when your examinations are scheduled – what time of day do they start? Make sure you arrive at the examination centre in plenty of time. You will need certain equipment for the examination, including:

  - a blue or black pen (plus a spare)
  - a pencil
  - a ruler
  - a sharpener
  - an eraser
  - a calculator

Make sure you have *all* these items ready the day *before* the examination.

- **In the examination**

Be sure to read the instructions on the *front* page of the examination paper. It is also important to read *each* question *carefully* – it is often worth reading it twice!

- **What to look for**

There are a number of important points in each question:

- look for words written in **bold** text – these are there to guide you;
- check the number of marks allocated;
- use the number of lines allocated to the answer to guide you on how much to write; and
- look for the important words that tell you what the examiner wants you to do. These are called *command words*.

Getting the basics right – command words

The list below includes the command words used most often in examinations. The command words that are in *italics* ask you to use relatively basic skills. You must be comfortable with using these skills and must not underestimate how important it is to practise using them. Even the very best candidates sometimes gloss over them and lose credits as a result.

- **Compare** – identify similarities. This can be done using a table.
- **Contrast** – identify differences. This can also be done using a table.
- **Define** – specify meaning of the word or term.
- **Describe** – provide a detailed account (using diagrams/data from figures or tables where appropriate). The depth of the answer should be judged from the marks for the question.
- **Explain** – set out reasons or purposes using biological background. The depth of treatment should be judged from the marks allocated for the question.
- **Identify –** name or otherwise characterise
- **List** – provide a number of points with no elaboration. If you are asked for **two** points, then give only two!
- **Name** – give the name of
- **Plot** – mark points between a pair of axes
- **Record** – note down
- **Sketch** – produce a simple, freehand drawing. A single, clear sharp line should be used. In the context of a graph, the general shape of the curve would be sufficient.
- **State** – a concise answer is expected with no supporting argument.

Getting the basics right – practice questions

Here are some questions from AS for you to try. Think carefully about the command words and the basic skills required.

1 **Name** three types of cell found in the lungs.

2 **Describe** the structure of a starch molecule.

3 **Compare** the structure of a prokaryotic cell with that of a eukaryotic cell.

4 **Sketch,** on axes, a curve to show how rising temperature affects the rate of an enzyme-controlled reaction.

5 **Define** the terms active immunity and passive immunity.

Stretch yourself - study skills

- **Improving study skills**

In order to gain a deeper understanding of the subject matter you need to refer to your textbook. Your teacher will probably tell you which topic is coming next – so try to read about that topic *before the lesson*. Then during the actual lesson you should be able to listen more attentively, make clear notes, contribute to discussion and ask any relevant questions.

Having made use of one excellent resource and reread the topic in your textbook, what about other resources? Your textbook, good as it is, is limited by space and the need to keep to the specification. There are many other potential resources available to you, including:

- Websites
  - Exams Tutor – Biology study resources
  - S-cool – Free revision resources
- Specialised textbooks – OCR provides a suggested reading list.
- Periodicals such as *New Scientist* – there is a link to the *New Scientist* website on the Exam Café CD.
- Your teacher – teachers usually have a deep interest and enthusiasm for their subject and have spent many years studying it, so please make use of their expertise.
- Examiners' reports on previous examinations – these are available on the OCR website and can be very useful. They list which topics candidates usually have trouble with and note typical errors made each year. You should also refer to the *Examiner's tips* section on the Exam Café CD.
- There are also multiple choice quizzes and sample student answers available on the Exam Café CD.

Another way to improve your study skills is to practise examination questions. Try to practise questions from OCR examination papers only – other examination boards do not always have the same content or emphasis within a topic as OCR. Sample question papers are available on the OCR website (see above). There are also sample questions following each module in your textbook.

- **Making effective use of examination questions**

You could simply write answers to these questions by using your notes or from memory. Although both these techniques are fine, there are other, perhaps better, ways to make use of the sample questions.

  - Read the question and underline the command word; *highlight* words in **bold**.
  - Write an answer and ask a friend to mark it – mark their work at the same time.
  - Work in a small group (three or four students) to discuss ideas for the answer.
  - Draw a spider diagram or mind map linking all aspects of the topic.
  - Try to extend the question by writing further subsections.
  - Write your own question on the same topic and ask a friend to answer it.

- **Using the mark scheme**

You will find sample mark schemes on the OCR website as well as mark schemes for previous examinations. Try not to look at the mark scheme until *after* you have attempted the question. These mark schemes are designed for the examiners to use while marking your examinations. When you have written an answer refer to the mark scheme to mark your work. Remember to mark *your work* not the mark scheme! It is all too easy to read the mark scheme and tick points thinking, "Yes, I said that", or, "Yes, that is what I meant". Be careful to read your answer *thoroughly* and check that you really have made the same point as appears in the mark scheme.

Stretch yourself – exam skills

Good exam technique is essential. A level exams are less forgiving than GCSE ones and you need to approach them appropriately. Here are some pointers to help you.

- **Reading the question**

Some candidates read the question too quickly. They see the topic and start to write all they know about it. This is poor technique. Better candidates read the question at least twice. They will look for the important words that tell them *what* the examiner wants them to do. These are called *command words* (see below). A good candidate will check the command word and consider carefully what is being asked. Does the examiner really want to know about the *structure* of the heart when the question actually says, "Explain why the mammalian heart has four chambers but a fish heart has only two chambers"? In this case the examiner wants to know about *single* and *double circulation systems* rather than detailed heart structure.

Remember that the number of marks allocated and the number of lines set aside for the answer are important clues about the level of detail required in your response. If three marks are allocated, ensure that you write down at least *three* main points.

It is a good idea to keep your examination paper open so that you can see the *whole* double-page spread. This is because each question is written over a double-page spread and there may be information on one side that you need to refer to while answering later parts of the question. If the paper is folded over you may miss some vital information given in the question.

Finally, read on until you see the statement "End of Examination Paper". Sometimes pages are left blank to ensure that subsequent questions are on a double page. This can mean that you may miss the final question or questions if you think you have already finished the paper.

- **Answering the question**

When writing answers you must be able to express yourself clearly and concisely. This is particularly true when writing longer responses. Just stop and think *before* writing your answer. Plan your answer and write a few notes. Select the relevant points and decide on the best sequence in which to write the key points. Only then start to write your answer.

Read your response through after you have written it. In the rush and pressure of an examination it is all too easy to write sentences that are missing words or are incomplete. Make sure that what is written down is *exactly* what you wanted to write!

Don't forget that some types of question require you to make links. For instance, if asked to describe how the lungs are well adapted as a surface for gaseous exchange, you will be expected to note each structural feature *and* explain how it benefits the exchange of gases. If you describe *all* the features in one go and then try to link them to gaseous exchange, it will be more difficult to make any clear links between the features and their specific benefits. You could answer this type of question very well in table form, by writing the structural feature in one column and the corresponding benefit in a second column.

To help you make links and describe things concisely you could try:

- using flashcards (such as the ones provided on the Exam Café CD) to pair up the structure with the benefit or to make other sets of pairs – this could be done with a friend or even in a group
- mixing the flashcards together and then sorting them into topic groups
- using the flashcards in each group to create a mind map for the topic
- picking cards that could be in more than one topic group and discussing with friends which topic groups they could be added to
- modifying the flashcards by adding brief text descriptions or diagrams
- planning answers to longer questions by writing a few bullet-pointed notes

Stretch yourself - command words

The list below includes the command words used most often in examinations. The command words that are in *italics* ask you to use higher skills. This means you are expected to *process* your knowledge rather than simply recall it. You may need to select certain information or apply your knowledge and understanding to give a detailed account.

- ***Analyse*** – separate information into components and identify their characteristics
- ***Calculate*** – generate a numerical answer, with working shown
- ***Comment*** – this is an open-ended instruction inviting you to recall or infer points of interest relevant to the context of the question
- ***Deduce –*** draw conclusions from information provided
- ***Determine –*** the quantity cannot be measured directly but can be obtained by calculation. A value can be obtained be following a specific procedure or substitute values into a formula.
- ***Discuss –*** give a detailed account that addresses a range of ideas and arguments.
- ***Explain*** – set out purposes or reasons
- ***Illustrate*** – present clarifying examples
- ***Interpret*** – translate information into recognisable form
- ***Outline*** – restrict the answer to essential detail only
- ***Predict*** – suggest possible outcome(s)
- ***Review*** – survey information
- ***Suggest*** – apply your biological knowledge and understanding to a situation which you may not have covered in the specification.
- ***Summarise*** – present principal points without detail

Stretch yourself - practice questions

Here are some questions from AS for you to try. Think carefully about the command words and the basic skills required.

1 **Outline** the way in which the immune system provides long-term immunity to a disease such as TB.

2 **Explain** how the Bohr effect causes the release of extra oxygen from haemoglobin.

3 **Review** the evidence for evolution.

4 **Suggest** how the Malaysian Tapir (an endangered species of mammal) could be conserved.

5 **Comment** on the following statement and illustrate your answer with clear examples.
"Global warming will lead to a whole new range of diseases affecting the UK."