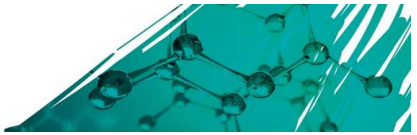
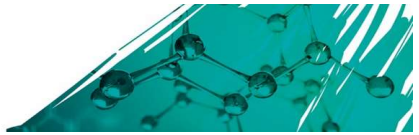
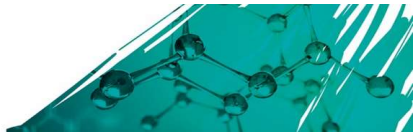


Unit title	Principles and Applications of Biology II
Guided learning hours	60
Number of lessons	30
Duration of lessons	2 hours
Links to other units	
Unit 9: Biomedical Science Unit 11: Functional Physiology of Human Body Systems Unit 12: Human Regulation and Reproduction Unit 13: Biological Molecules and Metabolic Pathways Unit 15: Diseases and Infections	

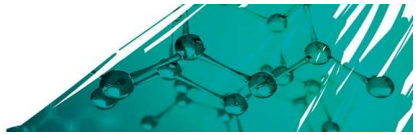
Key to learning opportunities			
AW	Assignment writing	**PA**	Preparation for assessment
GS	Guest speaker	**V**	Visit
IS	Independent study	**GW**	Group Work



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
Learning aim A: Understand biological molecules and pathways and their effect on the body				
1	Introduction to the unit and learning aim A. Overview of the structure of biological molecules.	PA/IS	**Teacher presentation (10 min)** PowerPoint presentation overview of the unit and topic: biological molecules and physiological and psychological diseases. **Worksheets (20 min)** with headings e.g. 'good/some/no knowledge or understanding' could be used to establish prior knowledge. **Class discussion or independent work (60 min)** to complete a review or quiz to establish prior knowledge of the structure of biological molecules in the unit content. Learners could use mini whiteboards to answer questions. Learners could work in pairs or small groups to produce models and diagrammatic structure of the main biological molecules. **Plenary (30 min)** Learner presentations and discussion of the structure of molecules.	Teacher prepared PowerPoint Prepared prior knowledge worksheets or quiz Textbooks, Internet access Diagrams of the structure of molecules
2	Overview of structure and function of biological molecules: • carbohydrates • proteins • triglycerides • glycoproteins • high-density lipo-proteins (HDLS) and low-density lipoproteins (LDLS) • phospholipids.	IS/GW	**Teacher presentation (10 min)** of molecules in the unit content. **Class discussion and/or independent work (60 min)** Learners could use mini whiteboards to answer questions or they could work in pairs or small groups, each taking one aspect of the unit content to produce a presentation and/or models and diagrammatic structure of the molecules and their functions. Learners could produce a quiz sheet or leaflet about their chosen biological molecule. Photographs of models could be taken and used in learner evidence for assessment. **Learner presentations (40 min)** **Plenary (10 min)** Teacher-led discussion and consolidation of knowledge of the structure of the molecules.	Teacher prepared PowerPoint Textbooks, Internet access Equipment for model making Access to A-level online quizzes – search biochemical molecules



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
3	Overview of structure and function of **specific biological molecules**: • deoxyribonucleic acid (DNA) • ribonucleic acid (RNA), to include messenger RNA (mRNA), transfer RNA (tRNA) and short interfering RNA (siRNA) • adenosine triphosphate (ATP) • collagen	IS/GW	**Teacher presentation (10 min)** using photomicrographs of specific biological molecules in the unit content. **Class discussion or independent work (60 min)** Complete a review or quiz to establish prior knowledge of the structure and function of biological molecules in the unit content. Learners could use mini whiteboards to answer questions. Learners could work in pairs or small groups, each taking one aspect of the unit content to produce a presentation and/or models and diagrammatic structure of the specific biological molecules and their functions. Learners could produce a quiz sheet or leaflet about their chosen biological molecule. **Learner presentations (30 min)** **Plenary (20 min)** Teacher-led discussion and review of function in relation to structure.	Teacher prepared PowerPoint Textbooks, Internet access Use of online videos Photographs of models of biological molecules
4	Detailed exploration of the role of **proteins** i.e. enzymes, neuro-transmitters, antibodies, hormones, transport of molecules, growth and repair, muscle contraction, blood clotting in maintaining health.	IS	**Teacher-led discussion (10 min)** What do the following have in common: enzymes, neurotransmitters, antibodies, hormones, transport of molecules, growth and repair, muscle contraction, blood clotting? They all involve protein. **Learner research (60 min)** into each of the above and the importance of the protein structure to the role they carry out. Leaflet or presentation to be produced. **Learner presentations (30 min)** **Plenary (20 min)** Teacher-led discussion to ensure accurate understanding.	Textbooks, Internet access

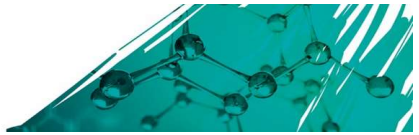


Lesson	Topic	Lesson type	Suggested activities	Classroom resources
5	Detailed exploration of the role of **lipids** i.e. energy sources, insulation of nerves, organ protection, phospholipids in membranes, association with vitamins, production of hormones in maintaining health.	IS	**Teacher-led discussion (10 min)** What do the following have in common: energy sources, insulation of nerves, organ protection, phospholipids in membranes, association with vitamins, production of hormones? They all involve lipids. **Learner research (60 min)** into how the structure of lipids relates to their role. Leaflet or presentation to be produced. **Learner presentations (30 min)** **Plenary (20 min)** Teacher-led discussion to ensure accurate understanding.	Textbooks, Internet access
6	Disruption of biological process in **physiological** diseases such as cancer, coronary heart disease, diabetes.	IS/GS	**Teacher-led discussion (10 min)** into physiological disorders such as cancer, CHD and diabetes. Sensitivity will be required whilst dealing with these topics. **Learner practical (40 min)** Use of microscopes and photomicrographs to observe normal and damaged tissue resulting from physiological disorders. **Learner research/discussion (60 min)** about how the biological molecules can contribute to physiological diseases. The role of nucleic acids, hormones, carbohydrates, lipids and metabolic pathways must be considered. Alternatively, it may be possible to arrange a visit from a representative(s) of an organisation offering support to sufferers of cancer, CHD, diabetes. **Plenary (10 min)** Teacher-led discussion to ensure accurate understanding.	Textbooks, Internet access Visits from organisations supporting physiological diseases
7	Disruption of biological processes in **psychological** diseases.	IS/GW	**Teacher-led discussion (20 min)** into psychological diseases such as Alzheimer's disease, anxiety and mood disorders, psychotic disorders, personality disorders, addiction disorders. Sensitivity will be required whilst	Teacher-prepared case studies Model brain

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			dealing with these topics. Overview of the structure and role of the different regions of the brain. **Learner practical (40 min)** Use of microscopes and photomicrographs to observe normal and damaged brain and nervous tissue. **Learner research (40 min)** in small groups or pairs to investigate how biological molecules can contribute to psychological diseases. Learners could be given a case study for each condition and then research the disease and the role of biological molecules involved. Alternatively, learners could be encouraged to produce a case study for each disease/disorder. It may be possible to arrange visits from representatives of organisations offering support to sufferers with psychological diseases/disorders. **Plenary (20 min)** Teacher-led discussion to ensure accurate understanding of the impact of the disruption. Reminder to complete presentations for the next lesson.	Computer access Visits from organisations supporting psychological diseases
8	Impact of disruption to the biological molecules, processes and pathways.	IS	**Teacher-led discussion (10 min)** about how the biological molecules can affect pathways and processes in the body, and the presentations that will be given. Draw lots for the order of presentation. **Learner presentations (80 min)** Presentation and discussion of research work from the previous lesson. **Plenary (30 min)** Discussion to consolidate understanding of the learning aim. **Preparation for assessment in next lesson**: Go through the assignment brief. Highlight the command words and discuss the amount of detail required. Discuss the forms of evidence required. Stress the need to meet the submission deadline.	Glossary of terms used for internal assessment Computer access Presentation of materials prepared by learners

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
9/10	Assignment writing for learning aim A.	AW	**Teacher lead-in (10 min)** Explain the layout of the assignment brief and clarify the tasks if necessary. Reminder about the amount of detail required for the command words and format of evidence for the presentation of evidence. Stress the deadline for submission. **Assessment opportunity for learning aim A (100 min)** following the tasks in the assignment brief. **Plenary (10 min)** Remind learners to continue with assignment work and hand in to meet the deadline.	Assignment brief Computer access
Learning aim B: Understand the effects of physiological diseases and disorders and associated treatments				
11	Introduction to learning aim B.	V or GS	**Teacher-led discussion (10 min)** of the learning aim. **Visit** from practitioner(s) or representative(s) supporting sufferers from cancer, CHD, diabetes. Opportunity for learners to gain an understanding of the effects and treatments of these diseases. **Plenary (10 min)** Opportunity for learner to ask final questions and give thanks to organisations for their support.	Teacher PowerPoint presentation of the treatments Unit content for learning aim B Arrange a visit/visitor
12	Treatments for physiological disorders – delivery of treatments and how they work.	GW	**Class discussion (30 min)** to establish current learner understanding of possible treatments and therapies. Who knows someone who has received any of the treatments in the unit content? **Class discussion (30 min)** using a case study of physiological disease. Use the information to discuss information that needs to be in a case study and how to construct one for presentation/assessment. **Teacher-led introduction (50 min)** to learner research. Pairs or small groups will choose or be given one type of treatment from the unit content and will become an 'expert' on this treatment. They must produce a	Teacher PowerPoint presentation of the treatments Unit content for learning aim B Teacher sourced case study of a physiological disease

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			presentation, leaflet or case-study about the suitability of their chosen treatment/therapy for the range of three physiological diseases: cancer, CHD, diabetes. The presentations must demonstrate: • An understanding of the way the treatment is delivered • How it works to counteract the involvement of the biological molecules in the disruption of processes and pathways Learners will continue their work next lesson when additional content will be added. Class discussion about possible formats for the presentation. **Plenary (10 min)** Learner pairs/groups and treatments to be investigated to be decided. Learners to be reminded to start collecting information for the next lesson.	
13	Treatments for physiological disorders - delivery of treatments and how they work.	IS	**Teacher-led reminder (10 min)** of research activity discussed during the last lesson. Reminder to compile a bibliography and reference sources. **Learner research (90 min)** Learners to work on their chosen treatment. **Plenary (20 min)** Teacher feedback about any issues seen during the research session. Inform learners that additional information will be researched and added to the presentation next lesson. Continue work at home.	Computer and Internet access Teacher prepared worksheet identifying what must be included in the presentation
14	Treatments for physiological disorders – extend work to include positive and negative effects of treatments, risks and why some treatments	IS	**Teacher-led discussion (20 min)** about additional content to be added to the presentation: • The positive and negative effects of the treatment must be investigated • Risks must be identified	Teacher prepared worksheet identifying what must be included in the presentation



Lesson	Topic	Lesson type	Suggested activities	Classroom resources
	may not be suitable for some people.		• Reasons why the treatment may not be suitable for some people must be identified **Learner research (90 min)** Learners to work on their chosen treatment. **Plenary (10 min)** Reminder to continue work at home.	Computer and Internet access
15	Treatments for physiological disorders – extend work to include positive and negative effects of treatments, risks and why some treatments may not be suitable for some people.	IS	**Teacher-led discussion (15 min)** Reminder about the completion of presentation to include all identified aspects. **Learner research (90 min)** Learners to finalise their work for presentation over the next two lessons. **Plenary (15 min)** Any work that needs photocopying for a handout as part of a presentation. Draw lots for order of delivery of presentations over the next two lessons.	Teacher prepared worksheet identifying what must be included in the presentation Computer and Internet access
16	Presentations of treatments for physiological disorders.	IS	**Teacher-led reminder (10 min)** about presentation and final preparation for learners. **Learner presentations (100 min)** Discussion after each presentation to clarify any information. **Plenary (10 min)** Reminder to learners to make sure notes are up to date. Finalise group of presentations next lesson.	
17	Presentations of treatments for physiological disorders.	IS	**Teacher-led reminder (10 min)** about presentation and final preparation for learners. **Learner presentations (100 min)** Discussion after each presentation to clarify any information. **Plenary (10 min)** Reminder to learners to make sure notes are up to date. Finalise group of presentations next lesson.	

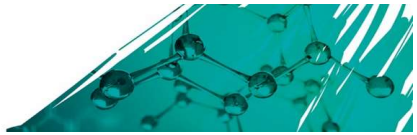
Lesson	Topic	Lesson type	Suggested activities	Classroom resources
18	Preparation for assessment.	IS	**Teacher-led discussion (20 min)** of the assignment brief and reminder about command words and referencing source material. **Independent learner (90 min)** to ensure all their notes are up to date and they have decided on the format, and two physiological diseases and treatments they are going to use and explain, analyse and evaluate for assessment. **Plenary (10 min)** Final reminder about producing independent evidence and meeting the deadline.	Assignment brief
19/20	Assignment writing for learning aim B.	AW	**Teacher lead-in (10 min)** Explain the layout of the assignment brief and clarify the tasks if necessary. Reminder about the amount of detail required for the command words and format of evidence for the presentation of evidence. Stress the deadline for submission. **Assessment opportunity for learning aim B (100 min)** following the tasks in the assignment brief. Stress the deadline for submission. **Plenary (10 min)** Remind learners to continue with assignment work to complete and hand in to meet the deadline.	Assignment brief Access to computer and Internet
Learning aim C: Examine the development of innovative and future types of treatment for physiological and psychological diseases and disorders				
21	Introduction to learning aim C. Where drugs come from. Drugs from natural sources.	IS	**Teacher-led discussion (40 min)** of the learning aim. Pose the question: where do drugs come from? Learners could be asked to use mini whiteboards or call out the names of drugs and how they are obtained from natural sources.	Teacher PowerPoint Unit content for learning aim C Computer and internet access

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			Discussion about naturally occurring drugs/medicines and synthetic replicas. Learners could be given a list of medicines and be asked to identify which are naturally occurring and which are synthetic. Use of a video about the development of drugs. In-depth knowledge of each step is not required. **Learner research (60 min**) to find out about drugs derived from natural sources. **Plenary (20 min)** Discuss the findings. Discuss how the loss of habitat/species may impact future natural sources of drugs.	
22	How are natural compounds extracted?	GW	**Teacher-led discussion (20 min)** How are compounds extracted from plants or other natural sources? Video of extraction of plant compounds. Learners **do not** need to know the chemical processes in detail. They **do** need to know the reasons for the processes/stages. **Group practical work (90 min)** An opportunity to carry out the preparation of 'Aspirin'. Practical work is not essential but adds a vocational dimension. Videos are available on the Internet. **Plenary (10 min)** Construct a flowchart of the various processes and stages. Reasons for each stage to be added to the flowchart for the next lesson.	Video equipment and worksheet to prepare a pure sample of Aspirin (There are practical instructions available on the Internet.)
23	Where drugs come from. Drugs synthesised for a specific purpose.	IS	**Teacher-led introduction (30 min)** An interesting way to introduce this may be to discuss the appearance and rise in the use of synthetic drugs such as 'Spice'. Following on from the discussion about synthetic drugs, learners need to be guided to understand that many drugs/medicines originally derived	Articles about synthetic drugs to mimic illicit drugs Teacher prepared sheet listing

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			from plants are now being made synthetically. What drugs/medicines are involved? Why? What are the advantages/disadvantages e.g. synthetic hormones, insulin, growth hormone, development of synthetic antibiotics? Detail about the chemical processes is not required. **Learner research (60 min)** on techniques for synthesising medicines – recombinant DNA, altering the shape of a molecule **Plenary (30 min)** Feedback and discussion of learner findings.	medicines synthesised for a specific purpose for learners to research
24	Purification processes.	IS	**Teacher-led discussion (20 min)** about the need for drugs/medicines to be pure and techniques that can be used to ensure purity. **Group practical work (70 min)** to purify samples of aspirin produced in the previous lesson. Practical work is not essential but adds a vocational dimension. Videos are available on the Internet. Learners could be presented with a list of techniques and discuss how/why they are used. **Plenary (30 min)** Discussion about how medicines are regulated and why.	List of purification techniques Equipment for purification testing Practical worksheets
25	Innovative treatments.	IS	**Teacher-led discussion (20 min)** into the development of innovative treatments. **Learner research (60 min)** in pairs or small groups, learners will each choose an innovative treatment to research and produce a presentation. **Presentation of research findings (30 min)** **Plenary (10 min)** Check learners have understood the treatments and answer any questions.	Learning aim C2 unit content
26	Moral, ethical and legal issues.	IS	**Teacher-led discussion (20 min)** What is the difference between a moral, ethical and legal issue? Give learners examples of issues and ask them to decide what is moral, ethical and legal. e.g. If you find a wallet with a large	List/articles for learners to discuss

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			amount of money in it, should you keep it? If you are undercharged for your shopping, should you tell the cashier/shop? If you see someone damage a car whilst parking, what should you do? If someone tells you they are being abused, what should you do? **Learner debates (40 min)** In small groups, learners to choose sides and discuss issues such as: Is it right to have a lottery/draw tickets to see who should get a new potentially life-saving drug? Should drug companies charge high prices for new drugs? Should expensive treatments be available for all people? Should animals be used for testing medicines? The list is endless! Learners may have other issues of interest to themselves that they could debate. Learners must be aware that some people will have very strong views on some issues. 'Rules of engagement' may have to be decided and agreed prior to the debates. It must be understood that there are often no right or wrong answers to some of the issues discussed. **Learner summary of the debates (40 min)** Each debating team must summarise their arguments to the class. **Plenary (20 min)** Ensure learners understand the definitions of ethical, moral and legal.	Newspaper and media articles topical at the time could be used to introduce the topic
27	Oral, ethical and legal issues to explore development of innovative treatments and surgical techniques.	IS	**Teacher-led introduction (30 min)** Learners to discuss, should conjoined twins be separated? What if this meant one twin might not survive? How does this fit into health professional values of 'Do no harm'? **Learner debates (40 min)** Pairs or small groups to consider the following and present their findings/conclusions. Why is confidentiality important in the medical profession? Can it be done and should it be done? **Learner feedback to class (40 min)** on discussions.	Stimulus material given by the teacher about moral, ethical and legal issues.

Lesson	Topic	Lesson type	Suggested activities	Classroom resources
			Teacher summary (10 min) of the debates and the fact that there is often no one correct answer/solution.	
28	Moral, ethical and legal issues relating to treatments and drug development and testing		**Teacher introduction (30 min)** about a high-profile case where drug testing had fatal results e.g. 2006 drug trial TGN1412 to treat leukaemia. **Class discussion (30 min)** about drug testing protocols and issues raised in the video. Placebos, what are they, should they be used? What are blind and double-blind clinical trials? Should animal testing be used? **Learner research (40 min)** into how clinical trials are conducted and monitored. **Plenary (20 min)** summary of how trials are conducted.	Video 58 mins (may need to be summarised or edited): "When a Drug Trial goes Wrong: Emergency At The Hospital (Medical Documentary) Real stories" on YouTube
29/30	Assignment writing for learning aim C.	AW	**Teacher lead-in (10 min)** Explain the layout of the assignment brief and clarify the tasks if necessary. Reminder about the amount of detail required for the command words and format of evidence for the presentation of evidence. Learners must briefly cover the development of a drug or medicine derived from a plant or animal and the development of a synthetic drug or medicine for a named disorder or disease. A brief description of the stages of drug and medicine testing is required. Stress the deadline for submission. **Assessment opportunity for learning aim C (100 min)** following the tasks in the assignment brief. Stress the deadline for submission. **Plenary (10 min)** Remind learners to continue with assignment work to complete and hand in to meet the deadline.	Assignment brief Access to computer and the Internet



Pearson is not responsible for the content of any external Internet sites. It is essential for teachers to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that teachers bookmark useful websites and consider enabling students to access them through the school/college intranet.