BGE S1-S3

Science

Planning & Assessment

Biology • Chemistry • Physics • Topical science

Third and Fourth Levels

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Contents

Part 3 – Answers and Marking Schemes

Overview of Resources

Within this pack you will find materials to complement the BGE Science Third and Fourth Levels textbook. As with the textbook, careful consideration has been given to include examples and contexts which promote literacy, numeracy, health and wellbeing, interdisciplinary learning and Developing the Young Workforce.

Scheme of Work

This title is designed to be used in conjunction with schemes of work that reflect learning and teaching practices which are most applicable to the sciences.

Opportunities for scientific enquiry are provided as well as examples of scientific scenarios where pupils can, for example, improve their scientific thinking or make informed judgements based on the basis of scientific principles, which are the skills and attributes of scientifically literate citizens.

The provided schemes of work highlight the objectives of each lesson or block of lessons. These objectives are linked to the Experience and Outcomes and are an extension of the information provided by the Benchmarks documentation. Included within the schemes of work are key aspects of student achievement and key assessment opportunities.

Assessments

To inform pupil progress, tracking and monitoring data may be generated through the use of the provided assessments, which should be issued at the end of each unit. These assessments are intended for use with individual learners under supervised conditions and a standardised approach to marking carried out to ensure consistency across a department or faculty and to provide accurate tracking information for pupils and parents.

The provided assessments are designed to assess both knowledge, reflecting the objectives of the schemes of work, and skill, such as interpreting and presentation of data.

We sincerely hope you enjoy using this resource alongside the textbook and find it an asset in your delivery of Third and Fourth Level Science.

Biology: 1 Cells and Reproduction

Unit title	Objectives	Key aspects of student achievement	Key assessment opportunities
1 Cells and Reproduction – covering textbook pages 12–31	**In this unit, pupils will learn**: • Cell ultrastructures and functions • Specialised cell types • Structure and function of DNA • Reproductive strategies and life cycles • Process and importance of cell division • Variation and Inheritance	**Understanding of concepts in context** Real world examples of the terms and concepts described throughout. Determination of uses of concepts in personal context. **Applying world understanding to new concepts** Application of knowledge and understanding to various problems and contexts including experimental data handling, moral and ethical debate and discussion. Consideration of the cells that make our own body, the impact of genetic inheritance and the importance of the reproductive and life cycles of various species. **Competence in numeracy** • Numeracy addressed through problem solving calculations in end-of-topic questions and summative assessment • Scale conversion between millimetre amd micrometre units • Measurement and recording of continuous variation • Creation of tables of data and graphs • Consideration of pregnancy timeline • Handling exponential increase in cell numbers in cell division	**1.** End-of-topic questions offer initial formative assessment. **2.** Worksheet 1A and 1B offer further assessment opportunities and could be used as homework. Worksheet 1A covers Topics 1.1–1.4 Worksheet 1B covers Topics 1.5–1.7 **3.** End-of-unit summative assessment (may also be used as formative assessment). **4.** Research topics throughout the unit could be used as significant extension tasks with potential for assessment.

Unit title	Objectives	Key aspects of student achievement	Key assessment opportunities
1 Cells and Reproduction		**Competence in literacy** • Literacy addressed through extended response questions at end of each topic, in worksheet and summative assessment • Multiple research opportunities • Considering different points of view • Development of opinions and arguments • Opportunity to engage in debate **Health and Wellbeing** • Considered in research activities, end-of-topic questions and summative assessment • The use of cells to improve human health • Disease and genetic disorders considered • The emotional impact and implication of the storage of our DNA to solve crimes, research disease, etc. • Health and wellbeing during pregnancy **The Ethical use of Living Organisms** Pupils should be taught to respect living things. Introduce the concept of the '3 R's' to minimise harm to animals used in Science. Careful consideration should be giving to the use of animals in the classroom. Refer to Materials of Living Origin at *https://www.sserc.org.uk/wp-content/uploads/2018/06/SSERC-Materials_of_Living_Origin_Code_of_Practice.pdf* **Health and Safety** All activities must be fully risk assessed and meet Health and Safety standards.	

Topic	Teaching notes	Experiences & Outcomes	Benchmarks	Assessment opportunities
1.1 Cells – covering textbook pages 12–13	**In this topic, pupils will learn:** • Structure and function of animal cells • Structure and function of plant cells • Comparison between plant and animal cells • The need to use a microscope and stains including preparing a microscope slide • Structure and function of various specialised cell types **Possible IDL links:** Art and Design Physics **Employability:** Cell Biologist Various Biological and Medical Specialisms Manufacture of microscope technology **Additional notes:** Research opportunity could be extended or used as homework.	Using a microscope, I have developed my understanding of the structure and variety of cells and of their functions. **SCN 3-13a** **Numeracy** – Scale. Conversion between millimetre and micrometre. Creation of table of data **Health and Wellbeing** – Understanding of the cells that build our own bodies.	• Identifies the structures found in plant and animal cells and describes their functions. • Describes the main similarities and differences between plant and animal cells. • Researches and describes the structure and function of some specialised cells, for example, nerve, root hair, red blood cell, sperm and egg.	**10 end-of-topic questions** **Worksheet 1A** **End-of-unit assessment**

Topic	Teaching notes	Experiences & Outcomes	Benchmarks	Assessment opportunities
1.2 DNA – covering textbook pages 14–16	**In this topic, pupils will learn:** • Structure and function of DNA • History of the discovery of DNA and Nobel Prizes (possible IDL with History) • Importance of DNA in terms of inheritance • The importance of DNA profiling **Possible IDL links:** History Debate Club English **Employability:** DNA Profiling Forensics Genetics **Additional notes:** Activity: Extraction of DNA. Ethics of DNA Profiling – This topic is a good place to encourage some debate and address different points of view. It is worth noting that this can be an emotive topic for some. Research opportunity and chance to consider and express opinions.	I have extracted DNA and understand its function. I can express an informed view of the risks and benefits of DNA profiling. **SCN 3-14b** **Health and Wellbeing** – Considering the impact of having your own DNA collected and stored.	• Knows that DNA is found in the nucleus of most cells and that it contains the instructions for the development and function of living things (genetic code). • Describes a gene as a piece of DNA which controls specific characteristics in an individual and demonstrates understanding that every individual has a unique combination of genes. • Describes DNA profiling as a way of using technology to analyse DNA to see a unique pattern for an individual and gives examples of practical applications (paternity tests and forensics). • Presents reasoned arguments on the ethical implications of collection, processing, storage and ownership of genetic information or DNA profiles.	**11 end-of-topic questions** **Worksheet 1A** **End-of-unit assessment**

Topic	Teaching notes	Experiences & Outcomes	Benchmarks	Assessment opportunities
1.3 Reproduction – covering textbook pages 17–21	**In this topic, pupils will learn:** • The processes involved in sexual reproduction • To compare the features of internal fertilisation vs external fertilisation • Sexual intercourse • Pregnancy and birth • The dangers of alcohol, drugs, smoking and disease during pregnancy **Possible IDL links:** PSHE **Employability:** Medical including Widwifery, Genetic Screening, IVF and other fertilisation specialisms. **Additional notes:** Use of drugs, alcohol, etc. during pregnancy and history of thalidomide use could be an emotive topic for some.	I understand the processes of fertilisation and embryonic development and can discuss possible risks to the embryo. **SCN 3-14a** **Numeracy** – Pregnancy timeline **Health and Wellbeing** – Impact of diet and toxins on pregnancy. Changes in the body during pregnancy.	• Knows that a sex cell (gamete) contains half the genetic information needed to a make a complete individual. • Explains how the nuclei of an egg and a sperm (sex cells) fuse through the process of fertilisation and how the fertilised egg divides repeatedly to form an embryo. • Identifies the main structures within the pregnant womb (for example, placenta, amniotic fluid and umbilical cord) and describes their function. • Gives examples of substances, including toxins, which can cross the placenta from the mother to the embryo and demonstrates understanding of the potential damage to the embryo.	**8 + 5 end-of-topic questions** **Worksheet 1A** **End-of-unit assessment**

Topic	Teaching notes	Experiences & Outcomes	Benchmarks	Assessment opportunities
1.4 Asexual and Sexual Reproduction – covering textbook pages 21–23	**In this topic, pupils will learn:** • The differences between sexual and asexual reproduction • Comparison of clutch size, parental care and rate of reproduction • Different species using each method • The benefits and drawbacks of each type of reproduction **Possible IDL links:** Mathematics **Employability:** Species protection Wildlife Zoology Statistical analysts	Through evaluation of a range of data, I can compare sexual and asexual reproduction and explain their importance for survival of species. **SCN 4-14b** **Numeracy** – Pregnancy timeline **Health and Wellbeing** – Impact of diet and toxins on pregnancy. Changes in the body during pregnancy.	• Evaluates and compares data and information on sexual and asexual reproduction, for example, rate of reproduction and numbers of organisms, and explains the importance of both methods for survival of species.	**5 end-of-topic questions** **Worksheet 1A** **End-of-unit assessment**

Worksheet 1A (Topics 1.1–1.4)

1. Complete the following table.

Cell organelle	Function	Present/absent in animal cell	Present/absent in animal cell
Cell membrane			
Cytoplasm			
Nucleus			
Chloroplast			
Cell wall			
Vacuole			

2. Explain why a microscope is required when viewing cells.

_____

3. Explain why cells must be stained when creating microscope slides.
(If you have time, find out why different cell types required different stains.)

_____

_____

_____

4. Draw and label an animal cell.

5. Draw and label a plant cell.

6. Explain why a plant cell requires some extra features compared to an animal cell.

_____

_____

7. DNA contains the _____ information needed to make all living things. DNA is tightly coiled into _____ which are found in the _____ of living cells. DNA has a structure that is described as a _____ _____ and is made up of four different _____, A, T, C and G. A always pairs with ___ and C always pairs with ___. Short sections of DNA called _____ code for different characteristics such as eye colour.

8. Identify a specialised cell and describe the unique features that allow it to carry out its function.

_____

9. State an alternative name for sex cells.

_____

10. Describe the process of fertilisation.

_____

_____

11. List four substances or factors that can have a negative effect on pregnancy.

1.

2.

3.

4.

12. Describe the differences between sexual and asexual reproduction.

_____

_____

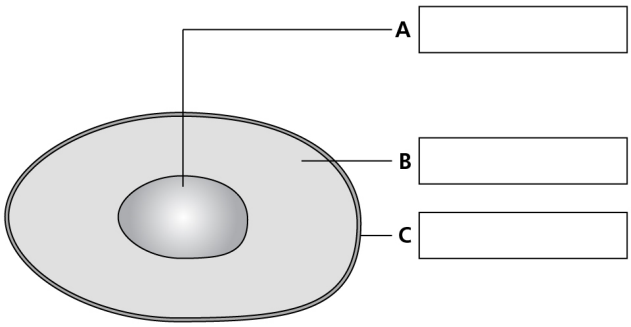
_____

_____

Cells and Reproduction: Unit Assessment

(41 marks)

1. a) Label the cell below. (3)

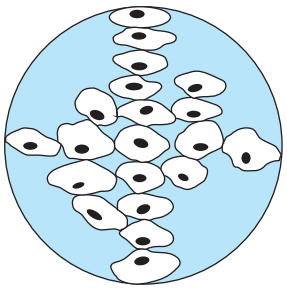


b) Underline the correct option to complete the sentence. (1)

The cell shown above is a plant/an animal cell.

c) List three features of a plant cell that are not found in an animal cell. (3)

2.



The diagram shows human cheek cells viewed under a microscope. The field of vision you can see has a diameter of 2 mm. 1 mm = 1000 micrometres.

a) Calculate the diameter of the field of vision in micrometres. (1)

b) Calculate the average length of just one human cheek cell in micrometres. (1)

3. State where DNA is found in the cell. (1)

4. Complete the table to correctly identify the structure and functions of the male reproductive system. (3)

Name of Structure	Function
	Site of male gamete (sperm) production
	Carries sperm out of the body
	Carries sperm to the penis

5. Complete the table to correctly identify the structure and functions of the female reproductive system. (4)

Name of Structure	Function
	Where penis deposits sperm
	Carries the egg from the ovary to the uterus.
	Site where ball of cell implants and develops into a foetus
	Site of female gamete (egg) production

6. State the name given to a fertilised egg. (1)

7. State the function of the umbilical cord. (1)