Introduction

This activity is intended as a review of current ideas about the health effects of gene environment interactions. This is in the form of an information leaflet for prospective participants in a cohort study. It is similar in style to one of the longer answers in the Unit 4 exam.

Activity

Reference is given to the ALSPAC study as a guide to style and level of content but it is not necessary for students to access the web site to do this activity.

The leaflet might be expected to include information and explanations on some of the following:
- the study design
- basic inheritance and alleles
- the effect of multiple genes in determining most characteristics
- the role of the environment in determining characteristics at all stages of development, perhaps with an example
- information for participants on confidentiality, on their time, on long term not individual benefits
- the importance of this type of study and the need for large numbers

It should be in an appropriate style.

You may wish to show students an example such as the UK biobank information leaflet http://www.ukbiobank.ac.uk/docs/BIOINFOBK14920410.pdf and allow them to criticise it before they write their own.

If you wish to mark the leaflets according to the 4 level mark scheme for long answers it is given overleaf.

Science explanations

La Every living thing has a specific genetic make up (genotype) dependent on the precise form of the DNA present. The characteristics (phenotype) of a living organism are partly, determined by its genes.

Lb There are controlled processes by which the information coded in a gene is converted into the chemicals in the cell. This is gene expression. Expression of any particular gene is controlled by other genes called gene regulators. Gene regulators switch a gene on or off in response to specific input from the internal or external environment.

Lc Genes can be switched on or off in a way that is passed on to the next generation of cells (epigenetics). These changes are reversible but can be are inherited from one generation to the next.

Ld Many factors influence which particular genes are expressed at any point in time. These include: stages in development, where in the body the cell is, epigenetic inheritance, the action of other genes and direct influences from the internal and external environment.
A2 Science in Society - Level descriptors for 12 mark questions

The marking scheme for this section includes an overall assessment for the quality of written communication. There are no discrete marks for the assessment of written communication but quality of written communication will be one of the criteria used to assign the answer to one of four levels. Marks are assigned according to level descriptors.

Candidates would be expected to achieve at least 3 of the 6 descriptors to be awarded marks at that level. Not all descriptors are relevant to each answer.

The marks awarded within the range depend on the extent to which candidates have met the criteria for that range and also on guidance relevant to the specific question

<table>
<thead>
<tr>
<th>level of response</th>
<th>descriptors:</th>
<th>mark range</th>
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| good level 4      | • clear exposition of science explanations relevant to the issue;  
|                   | • appropriate and effective use of the relevant ideas about how science works;  
|                   | • good overall grasp of the range and nature of the issue(s);  
|                   | • interprets arguments presented, recognising evidence, claim and counterclaim;  
|                   | • writes well structured argument using a range of evidence to reach a reliable conclusion, includes counter-argument;  
|                   | • fluency and accuracy of expression, with only minor errors of grammar, punctuation or spelling.                                                                                                                                                                                                                                       | 10-12      |
| competent level 3  | • good attempt at exposition of science explanations;  
|                   | • use of some relevant ideas about how science works;  
|                   | • general grasp of the range and nature of issue(s);  
|                   | • interprets arguments presented, recognising some of the main components  
|                   | • writes structured argument using some evidence to reach a conclusion;  
|                   | • accuracy of expression, with some errors of grammar punctuation or spelling                                                                                                                                                                                                                                                          | 7-9        |
| limited level 2    | • exposition of science explanation minimal or inaccurate  
|                   | • minimal use of ideas about how science works;  
|                   | • grasp of some features of the issue(s);  
|                   | • interprets only part of arguments presented  
|                   | • arguments presented but with weak structure and/or minimal evidence  
|                   | • accuracy of expression, but with serious errors of grammar punctuation or spelling                                                                                                                                                                                                                                                  | 4-6        |
| inadequate level 1  | • exposition of science explanation confused  
|                   | • use of ideas about how science works absent or wrong  
|                   | • appears not to understand the issue;  
|                   | • cannot interpret the argument presented  
|                   | • argument presented as just a claim with no structure or evidence  
|                   | • expression unclear with serious errors of grammar punctuation or spelling                                                                                                                                                                                                                                                          | 1-3        |
| 0                  | incorrect or no response                                                                                                                                                                                                                                                                                                                                                                           | 0          |

Total 12

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Introduction

Part B of the Unit 4 exam paper will often contain a question asking you to explain science or how science works ideas for a particular audience. This activity is of that kind though probably longer than a single exam question.

The activity

Assume that a new research project is being developed to investigate the genetic and environmental factors that predispose people to develop disorders such as asthma, autism, hyperactivity, dyslexia and eczema.

The researchers have decided to use a longitudinal cohort study, recruiting pregnant women. The women would have to agree to give their own, their partner’s and their baby’s genetic information and to allow researchers to follow the baby at annual review meetings for many years. This is what the Avon Longitudinal Study of Parents and Children, ALSPAC, did in 1991 and 1992. This new project would be a repeat 20 years later. See textbook page 47.

Either alone or in a small group, you have to write an information leaflet for these pregnant women that would explain the purpose of the research and the science behind the project in a way that people with no science background can understand. You will need to do so in a way that makes them interested and helps them feel that the research will be really useful, but of course does not make false promises about their own personal health benefits from the project’s findings.

Your leaflet should be no more than 2 pages, including any diagrams you think useful. It should be in an appropriate style.

You might decide to include some of the following points in your leaflet.

- the study design
- basic inheritance and alleles
- the effect of multiple genes in determining most characteristics
- the role of the environment in determining characteristics at all stages of development, perhaps with an example
- information for participants on confidentiality, on their time, on long term not individual benefits
- the importance of this type of study and the need for large numbers

Before you start your teacher may suggest that you criticise this very long example so that you have ideas for making yours better.

UK biobank information leaflet [http://www.ukbiobank.ac.uk/docs/BIOINFOBK14920410.pdf](http://www.ukbiobank.ac.uk/docs/BIOINFOBK14920410.pdf)

You can find out more about ALSPAC [http://www.bristol.ac.uk/alspac/participants/](http://www.bristol.ac.uk/alspac/participants/) (see also the latest newsletter which may give you ideas about style).