

A LEVEL BIOLOGY A

Lesson Element

Hoop Jump – Right or Wrong?

Instructions and answers for teachers

These instructions should accompany the OCR resource 'Hoop Jump' activity which supports OCR A Level Biology B.

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Hoop Jump (Learner Sheet 1)

Exam-style Questions on Ethics

Task 1 Exam-style Questions on Ethics

This worksheet brings together questions on ethics in biology from OCR's legacy F215 question papers, with the mark schemes on the reverse of the worksheet. In each case:


- Identify whether the case material is medical, genetic or ecological.
- Write your own answer to the question.
- See how you would have scored overall!

1. Movement Disorders Research

Movement disorders are conditions in which people lose the ability to control their body movements. Scientists have discovered that inserting electrodes to stimulate parts of the brain can help to cure some movement disorders. This discovery has resulted from experimental work with monkeys, which has made the research controversial.

Suggest why monkeys rather than other laboratory animals, such as rats, were used for this work and comment on whether their use in this way is justified or not.

Version 2



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Hoop Jump (Learner Sheet 2)

This worksheet gives some information about making ethical decisions and asks questions inviting your response to these ideas. The questions could be discussed in groups or pairs but try to express your own individual thinking in what you write down.

Task 1

Ethics studies the values and reasons behind people's choices and presents theories about what constitutes morally good and morally bad actions. Three different ways of deciding between right and wrong are outlined below:


Natural Law is a belief that there are certain objective rules in the world that should never be broken. The world's religions subscribe to a Natural Law, often instituted by a ruling being (God). Commonly-held guiding principles of different religions based on Natural Law are that it is wrong to kill people and to steal property. Religious beliefs give people a basic moral checklist like the Judeo-Christian Ten Commandments or a guiding principle like 'Love your neighbour'.

The **Motivian** theory prioritises a person's motives. For an action to be morally right the person must have a good intention and be acting unselfishly and out of a sense of duty to benefit others.

The **Consequentialism** theory says that what matters is the end result and that a person's motives are irrelevant. **Utilitarianism** is a form of this theory and it measures the moral worth of an action by the 'Greatest Happiness' principle. A good action creates more happiness than suffering. A bad action creates more pain than benefits. When considering applications of biology potentially millions of people are affected by decisions to approve or not approve new technologies for medicine, agriculture and industry, and we must also weigh up the consequences for other species both in the short-term (suffering and death) and the long-term (extinction).

Can you recognise your own guiding principle for making moral decisions here?

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Hoop Jump (Learner Sheet 3)

How to use the graph axes

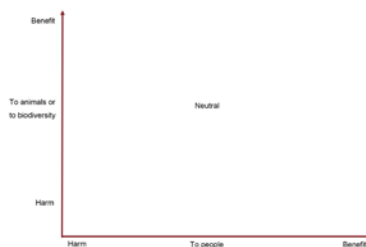
The x axis measures harms and benefits to people. Select a position along the x axis to rate the harm or benefit that an application of biology brings to people.

The y axis measures harms and benefits to animals and biodiversity. Select a position along the y axis to rate the harm or benefit that the application brings to animals and biodiversity.


Mark the intersection of the two points you have chosen with a cross and label it with the application it represents.

Task 1

Your teacher will select some of the applications you considered in the hoop jump game for you to plot on the graph.



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The Activity:

Hoop Jump' Lesson Element learner activity sheets 1, 2 and 3.



This activity offers an opportunity for English skills development.



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Introduction

The goals of this activity are to:

- develop student skills in judging the ethical implications of applications of Biology
- develop student skills in writing evaluations referring to both benefits and harms
- highlight specification learning outcomes where ethical evaluations are required.

Hoop Jump game instructions and worksheets are provided to cover three broad areas:

- Medical Ethics 2.1.6 / 4.1.1 / 4.2.2
- Breeding and Genetic Manipulation Ethics 6.1.2 / 6.1.3 / 6.2.1
- Biodiversity and Conservation Ethics 4.2.1 / 6.3.2

These can be used separately or together, and all can be used with worksheets **1 (exam question practice)**, **2 (framework)** and **3 (graph)**.

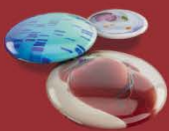
Student problems with commenting on the ethics of situations in biology include:

- not having the language skills to justify their opinions
- not understanding what ethical means
- not giving a balanced view considering both benefits and harms or potential harms (risks) of an application
- not considering the alternatives or the lack of alternatives to the application
- resorting to clichés like 'playing God' and 'interfering with nature'.

Task Instructions

Plastic hula-hoops are needed for the jumping game, at least one for every three students to avoid crashes.

1. Lay the hoops out on the floor in an area with sufficient space around them that students can jump in and out of the hoops safely and comfortably.
2. Explain that students jump into the hoop if they agree that a statement read by the teacher is **right**, and out if they think the statement is **wrong**. Students need to be told to listen carefully to the statements and also to student answers as the teacher will question one student each time as to why they have chosen a position inside or outside the hoop.
3. A practice run could include simple factual statements that are right or wrong in the true or false sense, like the name of the school, subject being studied, name of the head teacher, etc. This exercise also lends itself to true or false subject content revision statements.



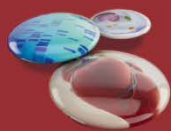
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4. Explain that the statements which will now be read concern actions and areas of research that require an **ethical judgement**. Students jump into the hoop if they consider the action described as **morally right**, or out if they consider it **morally wrong**. If they cannot decide either way, or they think the situation is neutral with no moral dimension, they can place one foot in the hoop and one outside it.
5. A selection of statements is read by the teacher. The blocks of statements that follow are grouped according to different syllabus areas. Within a block the statements are ordered to take students deeper into the material and make them question and re-evaluate their previous decisions. Teachers may like to devise their own statement blocks or to pick and choose to devise a 'playlist' from the statements listed.
6. After each statement the teacher asks one student to justify their position inside or outside the hoop. If most students have voted one way it may be interesting to ask a dissenter for their reason for jumping the other way. This oral practice at expressing beliefs about right and wrong, and the experience of listening to others articulate these ideas, is designed to improve student skills at evaluating ethical implications. Also, everybody has to take up a position and think how to justify it in case they are questioned.
7. The teacher should try to maintain neutrality and seek to get students to express their reasoning clearly, even if the decision conflicts with the teacher's own views.

Statement Blocks

1. General Ethics concerning treatment of human beings

1	Inflicting pain
2	Inflicting pain by stitching a wound
3	Killing people
4	Killing in self-defence
5	Being a soldier
6	Agreeing to a terminally ill patient's request for euthanasia
7	Carrying out termination of pregnancy operations
8	Disposing of unwanted human embryos in an IVF clinic



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2. General Ethics concerning treatment of animals

1	Eating meat
2	Humane slaughter of farm animals
3	Drinking milk
4	Shooting of male calves born to dairy cows as soon as they are born
5	Eating eggs
6	Keeping hens in battery cages
7	Keeping pets
8	Taking animals from the wild for pets

3. Medical Ethics 2.1.6/4.1.1/4.2.2

1	Stem cell research
2	Obtaining stem cells from unwanted human embryos
3	Non-reproductive cloning to obtain embryonic stem cells for spare parts
4	Using stem cells to cure Parkinson's disease
5	Using stem cells to cure Alzheimer's disease
6	Testing stem cell cures on mice
7	Testing stem cell cures on monkeys
8	Trying stem cell cures on human patients without prior animal testing
9	Causing a baby pain by vaccinating it using a hypodermic syringe
10	Parents refusing vaccinations for children leading to measles epidemics
11	Discovering a wonder drug called penicillin
12	Prescribing penicillin for known bacterial infections
13	Prescribing penicillin for assumed bacterial infections
14	Reducing antibiotic use to combat bacteria with antibiotic resistance
15	Using plasmids with antibiotic resistance genes as markers in genetic engineering
16	Providing high-cost personalised medicine involving DNA sequencing of patient
17	Prioritising research on diseases common in rich countries that can afford medicines
18	Charging less for drugs in poor countries



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4. Breeding and Genetic Manipulation Ethics 6.1.2 / 6.1.3 / 6.2.1

1	Selectively breeding farm animals to produce more food for humans
2	Choosing the fastest-growing chickens as breeding stock over many generations
3	Reducing the time taken for chickens to grow to slaughter weight from 3 months to 45 days causing leg fractures in birds
4	Buying and eating the cheapest chicken
5	Inbreeding dogs resulting in genetic diseases becoming common in the breed
6	Breeding flat-faced dogs with breathing difficulties and sores under loose folds of skin
7	Altering the gene pool of a species by selective breeding
8	Altering the gene pool of a species by genetic engineering
9	Growing insect-resistant GM maize
10	Using broad-spectrum insecticide sprays instead of growing GM insect-resistant crops
11	Protecting GM research investment by patenting organisms
12	Protecting GM research investment by making GM seeds sterile
13	Selling herbicide and herbicide-resistant GM crop seeds together
14	Destroying farmers' GM crops to protest against gene technology
15	Manufacturing medicines inside the udders of GM sheep and goats
16	Manufacturing medicines inside GM crop plants grown in open fields
17	Manufacturing medicines inside GM crop plants grown in closed greenhouses
18	Somatic gene therapy of humans with recessive genetic diseases
19	Germline gene therapy of humans
20	Genetic modification of pathogens



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5. Biodiversity and Conservation Ethics 4.2.1 / 6.3.2

1	Using slug pellets to protect garden plants
2	Spending taxpayers' money on an environmental impact survey for a new road
3	Building on the last known habitat of a rare snail species causing its extinction
4	Diverting a new road to protect a rare snail species at a cost of millions of pounds
5	Trapping a set quota of animals for their fur
6	Farming animals for their fur
7	Animal liberation activists setting free North American mink from British fur farms
8	Killing released mink to prevent the extinction of native British water voles preyed on by mink
9	Re-introducing large predators to an area, such as lynx to Scotland
10	Making laws to restrict human freedom in national parks and conservation areas
11	Killing elephant poachers on wildlife reserves
12	Holding wild animals in zoos for captive breeding programmes
13	Killing zoo animals not needed for breeding programmes eg Marius the giraffe
14	Culling wild deer populations to maintain an optimum population number

Additional Information

Before running the activity teachers should check their familiarity with the scenarios described and pre-select statements accordingly. A Teacher's Appendix outlining the significance of the three blocks of statements linked to syllabus learning outcomes follows here, with web references giving more information. These can be used for teacher research, for displaying web material to students in class or for incorporating into student research tasks.

After carrying out the hoop-jumping activity students should be directed to some or all of the Hoop Jump Lesson Element learner worksheets 1, 2 and 3. For worksheet 3, the teacher selects a short-list of statement scenarios used in the game to be plotted on to the harm-benefit graph. The hyperlinks in the teacher's appendix, particularly those featuring video clips, could be used in class before completing worksheet 3 to give students more information about these selected statements.



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Teacher's Appendix

Medical 2.1.6 / 4.1.1 / 4.2.2

Statements 1 – 5

Stem cell research offers hope for diseases with poor prognosis or treatment options now, but the sourcing of stem cells from unwanted or specifically-created embryos is one source of concern.

http://www.sciencedaily.com/articles/e/embryonic_stem_cell.htm gives basic definitions as well as links to relevant video clips. <http://www.eurostemcell.org/factsheet/parkinson%E2%80%99s-disease-how-could-stem-cells-help>

Statements 6 – 8

This topic can also be used to raise student awareness of animal testing requirements for novel treatments. The article relating to Laurie Pycroft is likely to engage students as he was a 16 year old student at the time he formed Pro-Test in support of animal testing for medical research

<http://www.independent.co.uk/news/education/higher/the-appliance-of-science-the-teenager-who-took-a-stand-against-animal-rights-protesters-2257712.html> . The statements relating to mice and monkeys can be used to remind students of the idea of a hierarchy of animal sentience up the phylogenetic tree and how species most like humans for testing purposes have more complex brains and behaviour and are more likely to suffer stress due to captivity.

http://www.bbc.co.uk/ethics/animals/rights/moralstatus_1.shtml#top

The Cambridge Declaration of Animal Consciousness 2012 is reviewed here in New Scientist:

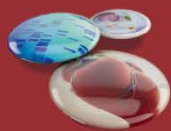
<http://www.newscientist.com/article/mg21528836.200-animals-are-conscious-and-should-be-treated-as-such.html#.U141JfldWSo>

Statements 9 – 10

Most people see the long-term benefit of vaccination outweighing the short-term pain. Parents who choose not to vaccinate their children may be influenced by the discredited research of Wakefield on a link between autism and the MMR vaccine. It is estimated that this led to a measles epidemic in the UK in 2012, <http://news.bbc.co.uk/2/hi/health/7819874.stm>, <http://www.bbc.com/news/health-22277186> (maps and graphics).

Statements 11–15

Fleming's discovery of penicillin and the work of Florey and Chain in making it available in commercial quantities were landmarks in twentieth century medical research, and were followed by the discovery of many new antibiotics. The rise of antibiotic-resistant strains of bacteria continues to challenge us however. The Wellcome Trust site features a radio clip of Fleming predicting the problem of antibiotic resistance: <http://www.wellcomecollection.org/explore/time--place/topics/pioneers/audio.aspx>. The



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Alliance for the Prudent Use of Antibiotics site features a time line showing when drugs were introduced and when resistance first arose: http://www.tufts.edu/med/apua/about_issue/antibiotic_res.shtml.

Statements 16 - 18

Relate to issues of fair allocation of resources for healthcare. Personalised medicine will be very expensive, the prerogative of rich people in first world countries while in other parts of the world basic healthcare needs like oral rehydration therapy for infants are not met:

http://www.pfizer.ie/personalized_med.cfm.

Development of orphan drugs for rare diseases is impaired due to low profit potential, so governments offer financial incentives for their development:

http://www.ema.europa.eu/ema/index.jsp?curl=pages/special_topics/general/general_content_000034.jsp&mid=WC0b01ac058002d4eb.

Price discrimination by pharmaceutical companies means prices for the same drug vary widely across the globe: <http://www.hcs.harvard.edu/hghr/online/price-discrimination-method/>.

Breeding and Genetic Manipulation 6.1.2 / 6.1.3 / 6.2.1

Statements 1 – 4

Modern broiler chickens live for six weeks and may suffer injury and pain due to their legs and heart not being sufficiently developed to support their body weight:

http://ciwf.org.uk/what_we_do/meat_chickens/default.aspx.

Statements 5 – 6

Dogs such as pugs and boxers fit the description given. Schools with access to Clickview may be able to obtain a copy of the BBC programme 'Pedigree Dogs Exposed'. A follow-up programme was made in 2012 and a clip features here: <http://www.bbc.co.uk/programmes/b01cqp75>.

Statements 7 – 8

Genetic engineering gets a lot of negative publicity as 'Frankenfood' engineering but this pair of statements highlights the fact the humans have been changing gene pools of domesticated animals and crop plants for thousands of years.

Statements 9 – 10

Students may be slow to realise that control of insect pests is essential for world food production and that the two alternatives of insecticides and biological control both raise problems of their own:

<http://www.nature.com/scitable/knowledge/library/use-and-impact-of-bt-maize-46975413>.



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Statements 11 – 13

Issues relating to patenting of genes, organisms and terminator seed technology:

<http://www.nature.com/news/the-great-gene-patent-debate-1.11044>

<http://www.nytimes.com/1988/04/13/us/harvard-gets-mouse-patent-a-world-first.html>

<http://www.nature.com/news/seed-patent-case-in-supreme-court-1.12445>

Statement 14

In the UK eco-activists have destroyed GM crop trials:

<http://www.theguardian.com/environment/2012/may/04/gm-food-activists-destroying-crops>.

Statements 15 – 17

Pharming may be carried out in animals or plants. Two significant episodes (Prodigene growth of volunteer plants harvested with conventional crop next year and StarLink corn recall) have set back the field of plant-derived pharmaceuticals in the USA. The PDP industry now focuses on crops under cover or in plant cell culture in reactors. A video clip from the Horizon programme Playing God features on this BBC hyperlink: <http://www.bbc.com/news/science-environment-16554357>

<http://pubs.acs.org/cen/coverstory/8123/8123biotechnologyb.html>

Statements 18 – 19

Students should be aware of a proposed world-wide moratorium on germline gene therapy of humans:

<http://news.sciencemag.org/2000/09/moratorium-urged-germ-line-gene-therapy>. The trial that reversed

blindness in LCA patients features in a video clip in: <http://www.bbc.com/news/health-25755950>.

Statement 20

This article discusses both the development of GM pathogens as biological weapons and the routine introduction of antibiotic resistance genes into bacteria that may act as pathogens or pass DNA to other bacteria: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1326447/>.

Biodiversity and Conservation 4.2.1 / 6.3.2

Statements 1 – 4

This relates to the development of the Newbury by-pass. Update:

<http://news.bbc.co.uk/2/hi/science/nature/5217558.stm>

Statement 5

Ecological monitoring and quota-setting allow the Canadian fur trade to remain a valuable source of income, while conserving and maintaining populations of beaver, muskrat, etc. at optimum levels for continued existence of biodiversity and future income: http://www.fur.ca/TC_about_trapping.php.



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Statements 6 – 8

Unauthorised release of mink by activists in the UK led to a 94% decrease in the native water vole population: <http://www.nonnativespecies.org/index.cfm?pageid=149>.

Statement 9

Restoration ecology is a developing science with re-introduction of large mammals being a prime target, eg successful re-introduction of wolves to Yellowstone park, and proposed re-introduction of lynx and beaver to Scotland: <http://www.nps.gov/yell/naturescience/wolfrest.htm> and <http://www.bbc.co.uk/nature/22287080>.

Statements 10 – 11

Enforcing wildlife reserve laws in Africa has led to the deaths of hundreds of wildlife rangers and poachers. <http://www.theguardian.com/environment/2013/oct/08/shoot-elephant-poachers-tanzania-ivory> and <http://www.theguardian.com/world/2013/dec/31/elephant-deaths-rise-tanzania-shoot-to-kill-poachers>

Statements 12 – 13

Captive breeding programmes in zoos seek to preserve and re-introduce species to their habitat in the wild, but in order to avoid inbreeding some offspring are not needed. Marius was culled in Copenhagen zoo. <http://www.independent.co.uk/news/world/europe/copenhagen-zoo-kills-four-lions-despite-outcry-over-death-of-marius-the-giraffe-9215375.html>

Statement 14

The lesson of the Kaibab plateau is an ecological classic and lends support to the culling of wild deer populations in the New Forest: <http://depts.alverno.edu/nsmt/youngcc/research/kaibab/story3.html> and http://www.newforestvrs.org.uk/forest-information/forest-deer/?locale=en_US&wppa-album=1&wppa-photo=27&wppa-cover=0&wppa-occur=1.

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