EDEXCEL GCSE SCIENCE (360SCIENCE)

SCIENCE



EXAM QUESTION PACK

UNIT B1a MULTIPLE CHOICE 5005 PAPERS

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Paper Reference(s)

5005 5025

Edexcel GCSE

Science (5005)

Biology (5025)

B1a – Topics 1 and 2

Foundation and Higher Tier

Tuesday 15 November 2011 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

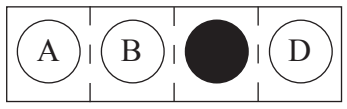
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:

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For each question, choose the right answer, A, B, C or D
and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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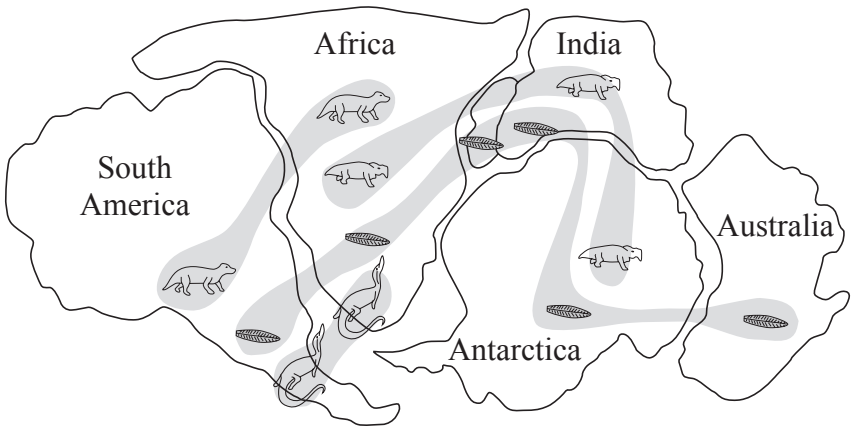
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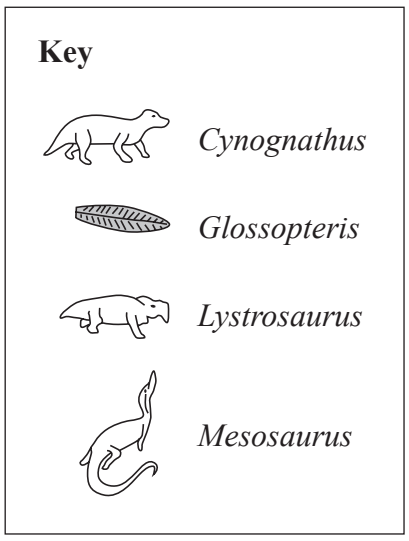
Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Fossil evidence

Use the information and diagram to help you answer questions 1 and 2.

Millions of years ago, the southern continents were joined together.
The map shows these continents and some of the fossils found on these continents.





1. Which fossil was found on all the continents shown in the map?

A *Cynognathus*
B *Glossopteris*
C *Lystrosaurus*
D *Mesosaurus*

2. Which continents show fossil evidence of *Cynognathus*?

A Antarctica and South America
B South America and Africa
C Africa and India
D India and Antarctica

3. What is a fossil?

A rocks with drawings on them
B the mineralised remains of the soft parts of animals only
C the mineralised remains of plants and animals
D the bones and shells of animals

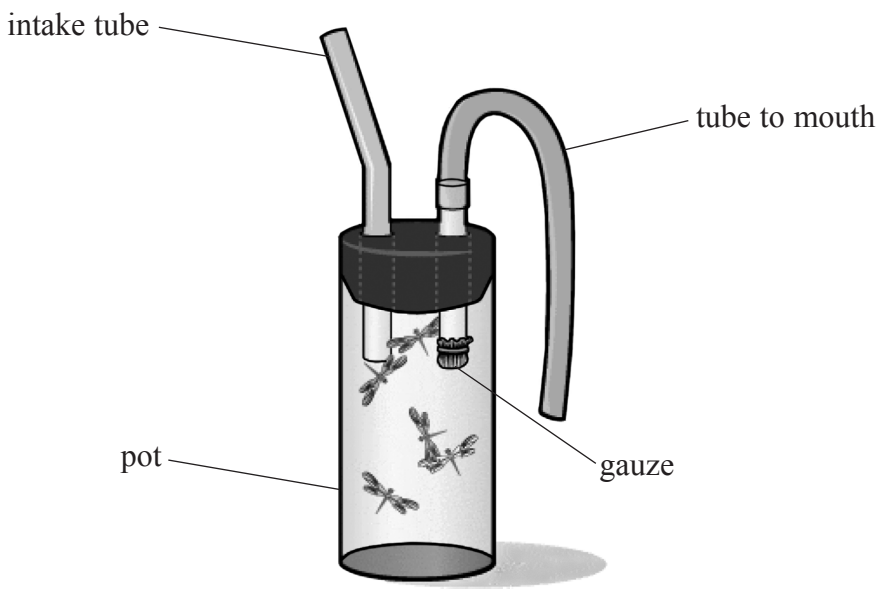
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4. Fossils provide evidence for

A selective breeding
B genetic engineering
C forensics
D evolution

Sampling populations

5. Sally used a pooter to catch small invertebrates in her garden.



Sally placed the intake tube over the invertebrates to be sampled and sucked through the tube to her mouth.
This caused the invertebrate to enter the pot.

What is the reason for the gauze underneath the tube to the mouth?

A to help the invertebrates to escape
B to keep the air in the pot clean
C to stop the invertebrates getting into your mouth
D to keep the invertebrates in the pot long enough to count

6. Sally collected 10 invertebrates in 1 m^2 of her garden.
Estimate how many invertebrates Sally would expect to find in her 50 m^2 garden.

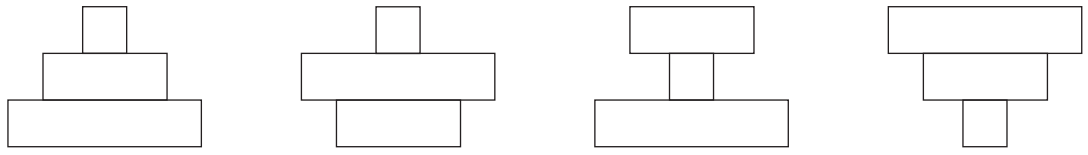
A 10
B 50
C 500
D 5 000

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7. Sally suggested a food chain for the garden could be

rose bushes ⟶ aphids ⟶ ladybirds

Which pyramid of biomass best represents this food chain?



A **B** **C** **D**

8. Sally only collected invertebrates.
What is absent in all invertebrates?

A a heart
B legs
C a backbone
D eyes

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Gene therapy

9. A recent study which has mapped each human gene is likely to lead to the treatment of genetic disorders.
Which row of the table shows genetic disorders?

	sickle cell anaemia	**haemophilia**	**Huntington's disease**
A	yes	yes	yes
B	no	yes	yes
C	yes	no	yes
D	yes	yes	no

10. Genetic disorders are usually due to a change in a gene.
Which of these statements about genes are true?

1 genes are made up of DNA
2 genes are found on chromosomes

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

11. The research study to map every human gene was called the

A human project
B human genetic project
C human genome project
D human therapy project

12. For human gene therapy to be carried out, healthy alleles must be removed from the

A membrane of a cell
B nucleus of a cell
C mutated cell
D chloroplast of a cell

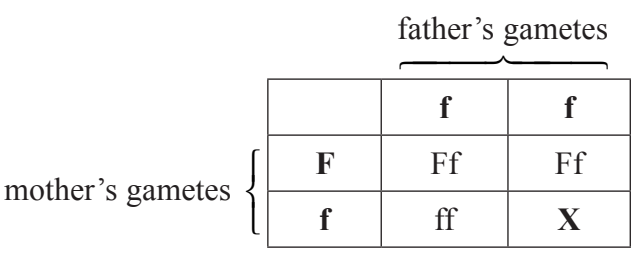
13. Some genetic disorders are caused by recessive alleles.
An allele is an alternative form of

A the same chromosome
B a different chromosome
C the same gene
D a different gene

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Use the information and diagram to answer questions 14 to 16.

The Punnett square shows the genetic cross for two parents where the father has the genetic disorder cystic fibrosis (CF).
Cystic fibrosis is caused by recessive alleles.



14. Which row of the table correctly names the father's and mother's gametes?

	gametes	
	father's	**mother's**
A	sperm	sperm
B	sperm	ova
C	ova	sperm
D	ova	ova

15. What will be the genotype of **X**?

A FF
B Ff
C fF
D ff

16. How many of the potential offspring in the Punnett square would be carriers of CF but not have the disorder?

A one
B two
C three
D four

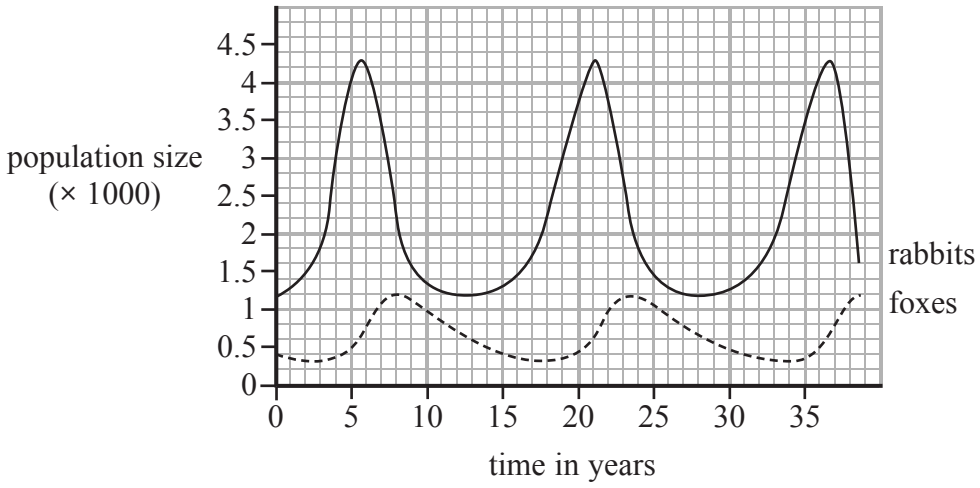
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Predator-prey relationships

Use this information to answer questions 17 and 18.

The graph shows the relationship between rabbits and foxes in a specific ecosystem.



17. Which statement is correct for this graph?

A the population of foxes is always greater than the population of rabbits
B the population of rabbits is always greater than the population of foxes
C the populations of rabbits and foxes are directly proportional to one another
D the population of rabbits always decreases as the population of foxes decreases

18. Which row of the table shows the correct numbers of rabbits and foxes at 25 years?

	population of rabbits at 25 years	**population of foxes at 25 years**
A	1050	1400
B	1400	1050
C	400	3600
D	3600	400

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19. The male rabbits in this ecosystem fight with each other for mates.
This is an example of

A interdependent competition
B intra-species competition
C selective breeding of rabbits
D predator-prey relationships

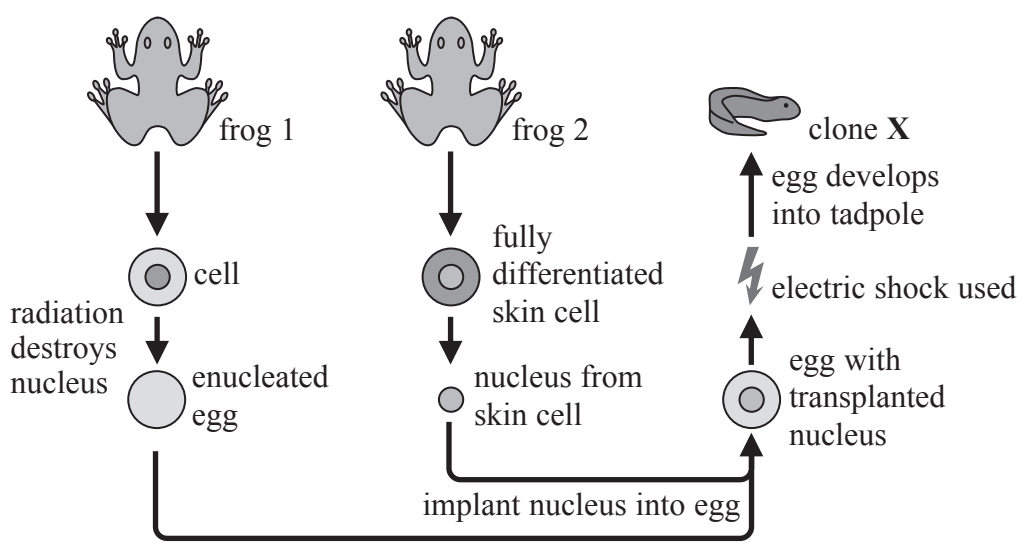
20. Computer models are used to predict the change in predator-prey relationships.
Which row of the table is correct for computer modelling?

	always accurate	can predict long-term changes	uses present and past data
A	yes	yes	no
B	yes	no	no
C	no	yes	yes
D	no	no	yes

Cloning frogs

Use this information to answer questions 21 and 22.

Frogs are easier to clone than sheep as a surrogate mother is not needed.



21. **X** is a clone of

A frog 1 only
B frog 2 only
C both frog 1 and frog 2
D neither frog 1 nor frog 2

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22. An electric shock is used during the process of cloning.
Why is an electric shock used?

A to enucleate the egg cell from frog 1
B to remove the skin cell from the frog 2
C to start cell division in the egg cell with the transplanted nucleus
D to insert the nucleus into the egg cell

23. Frogs have smooth skin and lay their eggs in water.
Frogs belong to the vertebrate group named

A amphibians
B fish
C reptiles
D mammals

24. There are three main types of common frog.
Their names are

- *Rana temporaria*
- *Rana esculenta*
- *Rana catesbeiana*

These frogs belong to

A the same species only
B the same species but different genus
C a different genus and species
D the same genus but different species

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Human population growth

25. It is expected that by 2050 the world's human population will be 9 billion.
This means that food production across the world needs to increase by approximately 70% to keep up with demand.

Growing more crops rather than farming cattle would

A decrease food production as more energy will be lost at each trophic level
B increase food production as less energy will be lost at each trophic level
C increase food production as meat from cattle has a higher energy value
D decrease food production as crop plants have a higher energy value

26. Scientists can genetically modify plants.
Which row of the table identifies how crops can be genetically modified to **increase** crop yield?

	drought resistant	**higher vitamin content**	**pest resistant**
A	yes	no	yes
B	yes	yes	yes
C	no	no	yes
D	yes	yes	no

27. Which of the following are used to insert genes into DNA to genetically modify crop plants?

A transgenic animals
B cloning techniques
C gene therapy techniques
D enzymes including ligase

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28. The introduction of genetically modified crops into the environment is controversial.

Which of these statements are likely to cause concern to some people when growing genetically modified crops?

1 there may be unforeseen effects on food chains
2 genetically modified crops may cross fertilise with other plants in the environment

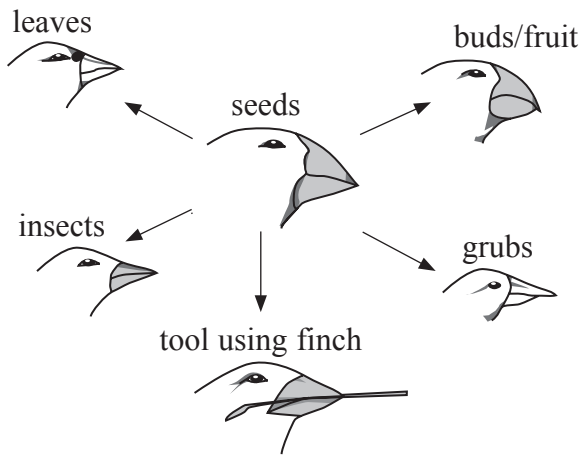
A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

Darwin's finches

Use the information and the diagram to answer questions 29 and 30.

When Charles Darwin visited the Galapagos Islands he discovered many types of finches.
The diagrams show the finches found on the Galapagos Islands and the type of food they ate.

Heads of Darwin's finches



29. These finches provided evidence for

A evolution as a result of artificial selection
B evolution as a result of natural selection
C evolution due to genetic engineering
D evolution due to asexual reproduction

30. Each species of finch had a different shaped beak.
The different beak shapes led to the finches

A becoming extinct due to less competition for food sources
B becoming extinct as they were better able to survive a changing environment
C surviving better due to less competition for food
D surviving better due to less competition for mates

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31. Which of these statements about Darwin's finches are true?

1 mutations in the finches made their gene pool more diverse
2 the change in beak shape came about as a result of intra-specific competition

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

32. Darwin's theory of natural selection caused problems for the scientific community at the time because

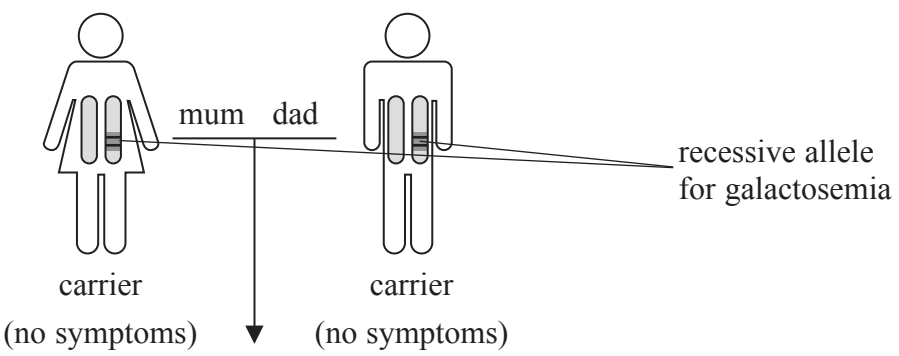
A it went against the religious belief that God created all the creatures on Earth
B Darwin had not researched his theory very well
C it agreed with the other scientific theories of evolution
D Darwin was unable to give any evidence to support his theory

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Galactosemia

Use this information to answer questions 33 and 34.

Galactosemia is a rare genetic disorder which is caused when a person inherits two recessive alleles. Galactosemia affects the body's ability to break down a sugar called galactose.



33. Both of these parents are carriers of galactosemia.
What is the genotype of each of these carriers?

A both heterozygous for galactosemia
B both homozygous recessive for galactosemia
C both homozygous dominant for galactosemia
D mum is heterozygous but dad is homozygous recessive for galactosemia

34. What is the percentage likelihood that a child of these two parents will have galactosemia and show symptoms of the disease?

A 25%
B 50%
C 75%
D 100%

35. If a person has the disorder galactosemia, what is the percentage likelihood that they will pass one recessive allele for galactosemia to their offspring?

A 25%
B 50%
C 75%
D 100%

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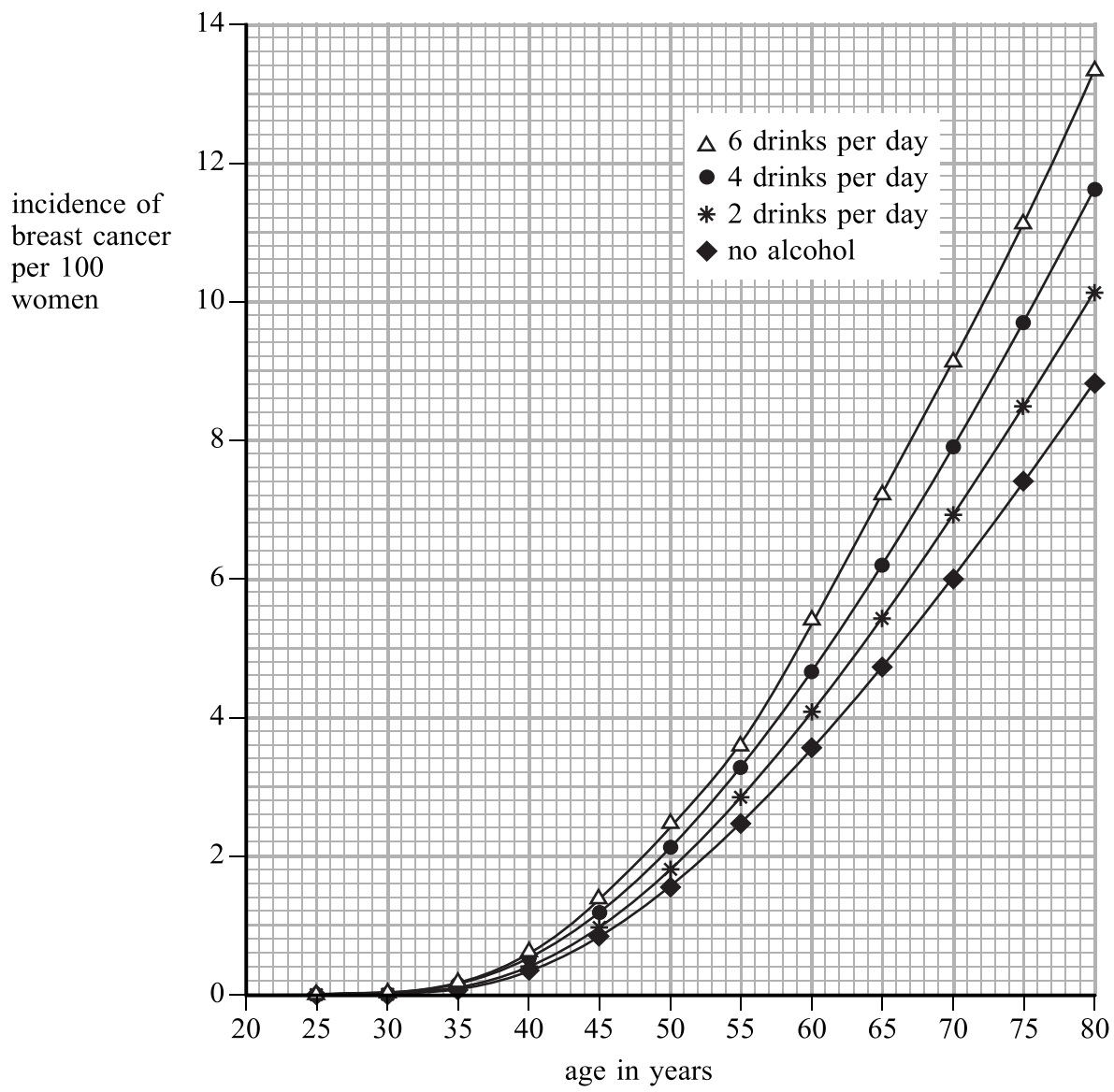
36. Currently in the UK, gene therapy can

A cure genetic disorders and stop them from being inherited by offspring
B alleviate the symptoms of genetic disorders in the short term
C change the genetic material of the gametes of a carrier of the disorder
D eradicate the disease from all body cells and the gametes of a carrier

Nature or nurture

Use the graph to answer questions 37 and 38.

The graph shows how the incidence of breast cancer changes with alcohol intake and age.



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37. Which interpretation is incorrect based on the information on the graph?

A the incidence of breast cancer is lower when no alcohol is drunk
B as age increases the risk of breast cancer increases
C drinking increasing amounts of alcohol per day increases the risk of breast cancer
D there is no change in breast cancer at 50 with increased alcohol intake

38. The graph shows evidence that

A breast cancer is affected by both genetic influences and the environment
B ageing has no effect on breast cancer
C the environment can have an influence on the incidence of breast cancer
D breast cancer is mainly caused by genetic mutation

39. Breast cancer is linked to the faulty BRCA1 allele.
'Designer babies' that do not have the faulty BRCA1 allele can be produced and therefore are less likely to develop breast cancer.

The production of 'designer babies' involves the

A cloning of embryos to produce genetically identical offspring
B genetic modification of embryos to remove the BRCA1 allele
C use of surrogate mothers to prevent the BRCA1 allele being passed on
D screening of embryos so those without the faulty BRCA1 allele are used

40. Producing a 'designer baby' that does not contain the faulty BRCA1 allele may present an ethical problem because

A clones will all carry identical genes and may have other genetic disorders
B embryos carrying the faulty gene will develop breast cancer
C during the process many embryos may be destroyed
D changing the genome of any organism results in further mutation

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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Mark Scheme (Results)

November 2011

360Science

GCSE Science
Multiple Choice Paper B1a (5005)

GCSE Biology
Multiple Choice Paper B1a (5025)

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You can also telephone 0844 576 0037 to speak to a member of our subject advisor team.

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5005 & 5025 (B1a) Mark Scheme
November 2011

Unit B1a – 5005/5025	
Topics 1 & 2	
1	B
2	B
3	C
4	D
5	C
6	C
7	A
8	C
9	A
10	C
11	C
12	B
13	C
14	B
15	D
16	B

Unit B1a – 5005/5025	
Topics 1 & 2	
17	B
18	B
19	B
20	C
21	B
22	C
23	A
24	D

Unit B1a – 5005/5025	
Topics 1 & 2	
25	B
26	A
27	D
28	C
29	B
30	C
31	C
32	A
33	A
34	A
35	D
36	B
37	D
38	C
39	D
40	C

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Science (5005)

Biology (5025)

B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 17 June 2011 – Afternoon

Time: 20 minutes

Materials required for examination
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HB pencil, eraser and calculator

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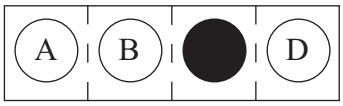
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Higher tier candidates start at question 17.

Feed the world

In many countries rice provides 25% of the energy obtained from food.

1. In a food chain rice is described as

A a consumer
B a predator
C prey
D a producer

2. A new variety of rice has been genetically engineered to provide the human body with extra vitamin A.
To genetically modify the rice, a gene must be removed from the

A cytoplasm of a cell
B nucleus of a cell
C sex cell
D cell membrane

3. Genes are made of

A cells
B cytoplasm
C DNA
D gametes

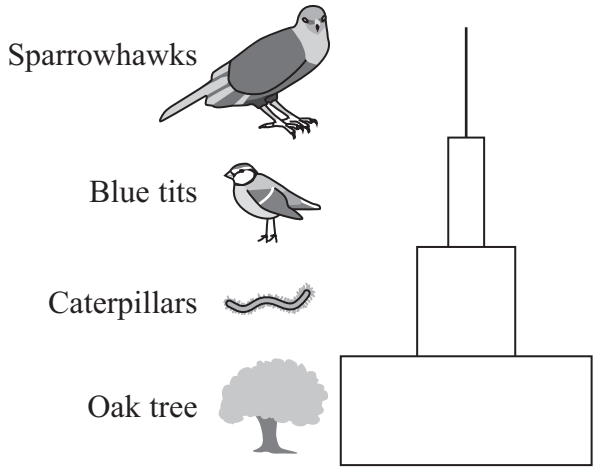
4. The production of rice for food can provide more energy than the production of meat for food because

A when you produce meat there is no waste
B rice can be grown organically
C rice is at the start of the food chain so there is less energy wastage
D meat has no nutritional value

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Food chains

Use the diagram to answer questions 5, 6 and 7.



5. Which organism has the greatest biomass in this food pyramid?

A sparrowhawk
B blue tit
C caterpillar
D oak tree

6. What is the name given to this type of pyramid?

A a pyramid of numbers
B a pyramid of biomass
C a pyramid of organisms
D a pyramid of populations

7. Which of the organisms in the pyramid are predators ?

A sparrowhawk and oak tree
B blue tit and sparrowhawk
C blue tit and caterpillar
D caterpillar and oak tree

8. How is most energy lost from the food pyramid?

A growth and respiration
B respiration and excretion
C excretion and feeding
D feeding and growth

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Spider plants (*Chlorophytum)*

A spider plant can reproduce by producing genetically identical plantlets on the ends of hanging stems.



9. What is the name given to this type of reproduction?

A asexual reproduction
B sexual reproduction
C internal fertilisation
D external fertilisation

10. The new plantlets are

A clones of the parent plant
B variants of the parent plant
C carriers of the parent plant
D gametes of the parent plant

11. The characteristics of the spider plant are coded for by its genes.
Genes are found on structures called

A nuclei
B alleles
C chromosomes
D chloroplasts

12. A project carried out by scientists has mapped human genes.
This project is known as the

A human DNA project
B human chromosome project
C human inheritance project
D human genome project

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Organic farming

Many farmers in Britain today are changing their farming methods to those approved by the Soil Association for the production of organic crops.

13. What is the most likely reason for farmers choosing to produce organic crops?

A it increases shelf life
B it increases the selling price
C it decreases crop yield
D it decreases biodiversity

14. Organic farmers can use the soil bacterium *Bacillus thuringiensis* to control pests.
What is the main benefit of using *Bacillus thuringiensis* for organic farming?

A insects and their larvae are never harmed by this bacterium
B less fertilisers are needed to maximise the crop growth
C it can act as a selective pesticide and can be naturally present in soil
D there is a possibility that the pests may become resistant to it

15. Modern crop plants are often identical.
This is important because

A they increase biodiversity
B they give consistent crop yields
C only part of the plant can be eaten by insects
D all the crop plants are resistant to insecticides

16. Which of the following methods would be acceptable when trying to produce organic beef from cattle?

A genetic modification of cattle
B selective breeding of cattle
C use of steroids to increase muscle mass
D injecting cattle with multiple antibiotics

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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

The Sloth

Sloths spend about 18 hours per day sleeping and can live for up to 30 years.



17. What is the name given to features such as the long arm and hooked claws that help the Sloth to survive?

A selections
B classifications
C adaptations
D chromosomes

18. What is the most likely advantage to the Sloth of moving very slowly and spending 18 hours per day sleeping?

A they will spend less time eating
B they will not require as much energy to live
C they will be less likely to be caught by predators
D they will live longer

19. Members of the same species of Sloth may fight with one another for food.
This is an example of

A predator prey relationship
B intra-species competition
C natural selection
D adaptation leading to new species

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20. One type of Sloth is *Bradypus torquatus*.
Which row of the table is correct for the classification of this Sloth?

	Bradypus	***torquatus***
A	species	species
B	genus	genus
C	species	genus
D	genus	species

Haemophilia

21. Haemophilia is a genetic disorder that affects the blood's ability to clot.
People who do not have the disorder, have clotting factors which cause bleeding to stop. Haemophiliacs lack these clotting factors.

What is the most likely effect of a lack of clotting factors?

A blood becomes too sticky and does not flow
B blood is unable to carry as much oxygen
C the body is less effective at fighting bacterial infection
D a wound is less likely to heal

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Use the information to answer questions 22 and 23.

Haemophilia is caused by a genetic mutation on the **X** chromosome.
The genetic diagram shows sex inheritance.

		male gametes	
		X	**Y**
female gametes	**X**	**XX**	**XY**
	X	**XX**	**XY**

22. If the mother has one mutated **X** chromosome, what is the percentage chance that her son will inherit this chromosome?

A 25%
B 50%
C 75%
D 100%

23. If the father has a mutated **X** chromosome, what is the percentage chance that his daughter will inherit this chromosome?

A 25%
B 50%
C 75%
D 100%

24. A child has two of the same alleles for a specific characteristic.
This is known as

A homozygous
B heterozygous
C transgenic
D a carrier

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

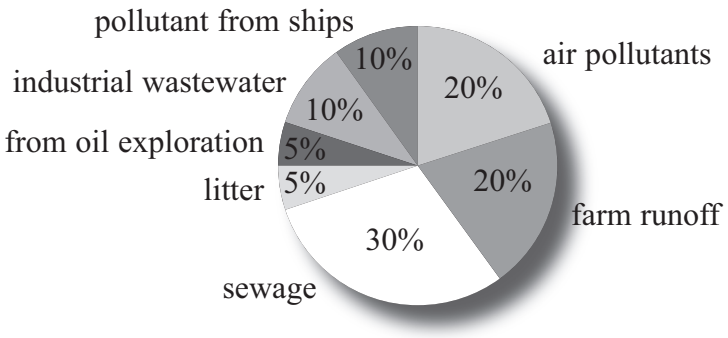
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Water pollution

Use the information to answer questions 25 and 26.

The pie chart shows the percentage of pollutants entering oceans.



25. All of these pollutants result from human activity.
What will be most likely to happen to the percentages and the amount of pollution if the human population continues to increase?

A the percentages will be similar but the amount of pollution would increase
B the percentages will increase but the amount of pollutants remain the same
C both the percentages of each type of pollutant and the amount would rise
D there is no effect on either the percentage or the amount of pollution

26. Which statement about ocean pollutants is true?

A oceans are at their maximum pollution level
B half the pollutants are from sewage and farming
C air pollutants have no effect on water pollution levels
D industrial wastewater is the lowest contributor to ocean pollution

27. Sewage contains nitrogen compounds which help plants

A produce magnesium
B produce proteins
C produce oxygen
D produce glucose

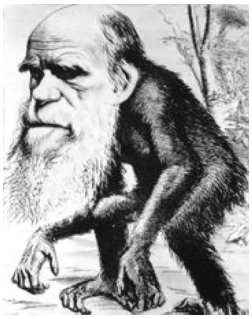
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28. Computer modelling is used to predict the effects of pollutants.
Computer modelling is used because

A it always produces accurate results
B it is faster than carrying out live measurements
C the models produced can be unreliable
D you can put in all known and unknown variables

On the origin of species

This cartoon appeared following the release of the book by Charles Darwin titled 'On the origin of species'.



29. Why does this cartoon show Darwin as an ape?

A people at the time believed the theory stated that humans evolved from apes
B people at the time believed that humans were evolving into apes
C people at the time believed in natural selection
D people at the time did not have strong religious beliefs

30. Darwin's book proposed a theory of evolution.
Darwin suggested that

A humans evolved from apes
B humans and apes had a common ancestor
C humans and apes did not exist at the same time
D apes evolved from humans

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31. Humans have the binomial name *Homo sapiens.*
Which row of the table is correct for the order, family and genus of human beings?

	order	**family**	**genus**
A	primates	hominids	*Homo*
B	hominids	homo	*sapiens*
C	hominids	primates	*sapiens*
D	primates	sapiens	*Homo*

32. Which of the following two statements about Darwin's theory of natural selection are true?

1 individuals within a species can have characteristics which promote successful reproduction
2 individuals within a species well adapted for a changing environment will become extinct

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

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Transgenic calves

George and Charlie, born in 1998, were the first cloned transgenic calves.



33. What does the term transgenic mean?

A an organism that has been cloned
B an organism that has had a gene from another species added to its genome
C an organism which had its genes mapped on its chromosomes
D an organism that has been selectively bred to show the best characteristics

34. George and Charlie are clones from the same parent.
Cloning mammals involves the following stages.
The stages are not in the correct order.

1 electric shock stimulates cell division
2 egg cell is enucleated
3 nucleus from body cell is removed
4 enucleated cell with nucleus is implanted into surrogate
5 nucleus from body cell inserted into enucleated egg cell

What is the correct order for the cloning of mammals?

A 2 – 3 – 1 – 4 – 5
B 1 – 2 – 3 – 5 – 4
C 1 – 3 – 4 – 5 – 2
D 2 – 3 – 5 – 1 – 4

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35. It is possible to use pigs to grow human body organs for transplantation.
Which statements are ethical concerns about this use of pigs?

1 many human embryos will be destroyed during this process
2 transplant organs made by this process will not be rejected

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

36. Transgenic cows can produce 'designer milk'.
Which row of the table shows the benefits to humans of 'designer milk'?

	contain human antibodies	**milk high in cholesterol**
A	yes	yes
B	yes	no
C	no	yes
D	no	no

Factors affecting plant growth

37. Growth occurs in plants due to cell division called mitosis resulting in genetically identical cells being formed.
During mitosis the genetic material is replicated and the cell divides.
Which statement is correct for mitosis?

A DNA is replicated in the nucleus and diploid cells are formed
B DNA is replicated in the cytoplasm and diploid cells are formed
C DNA is replicated in the nucleus and haploid cells are formed
D DNA is replicated in the cytoplasm and haploid cells are formed

38. Plants may naturally develop new characteristics due to a change in their DNA.
This change is

A a genetic change resulting in a mutation
B an environmental change resulting in a mutation
C a genetic change causing the plant to become transgenic
D an environmental change causing the plant to become transgenic

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39. Which statements are true for the process of natural selection of plants in the environment?

1 new variants of species are always better adapted to their environment
2 natural selection is a process over generations which results in changes in species

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

40. Grass plants can be genetically modified.
Which of these three statements about the genetic modification of plants are true?

1 DNA is cut and new genetic material is inserted using enzymes
2 genetically modified plants may have an adverse effect on the environment due to cross fertilisation with other plants
3 plants can be genetically modified to produce their own insecticide

A 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)

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5005 & 5025 (B1a) Mark Scheme
June 2011

Unit B1a – 5005/5025	
Topics 1 & 2	
1	D
2	B
3	C
4	C
5	D
6	B
7	B
8	B
9	A
10	A
11	C
12	D
13	B
14	C
15	B
16	B

Unit B1a – 5005/5025	
Topics 1 & 2	
17	C
18	B
19	B
20	D
21	D
22	B
23	D
24	A

Unit B1a – 5005/5025	
Topics 1 & 2	
25	A
26	B
27	B
28	B
29	A
30	B
31	A
32	A
33	B
34	D
35	D
36	B
37	A
38	A
39	B
40	D

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5005 & 5025 (B1a) Mark Scheme

Unit B1a – 5005/5025	
Topics 1 & 2	
1	A
2	C
3	B
4	C
5	C
6	A
7	C
8	B
9	B
10	C
11	D
12	A
13	D
14	A
15	B
16	A

Unit B1a – 5005/5025	
Topics 1 & 2	
17	A
18	C
19	C
20	D
21	B
22	B
23	A
24	C

Unit B1a – 5005/5025	
Topics 1 & 2	
25	C
26	D
27	A
28	B
29	C
30	B
31	C
32	A
33	B
34	D
35	C
36	D
37	C
38	B
39	C
40	D

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Science (5005)

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B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 12 November 2010 – Afternoon

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

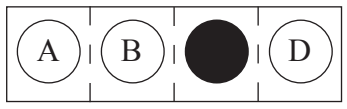
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D
and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

You must not take this booklet or the answer sheet out of the examination room.

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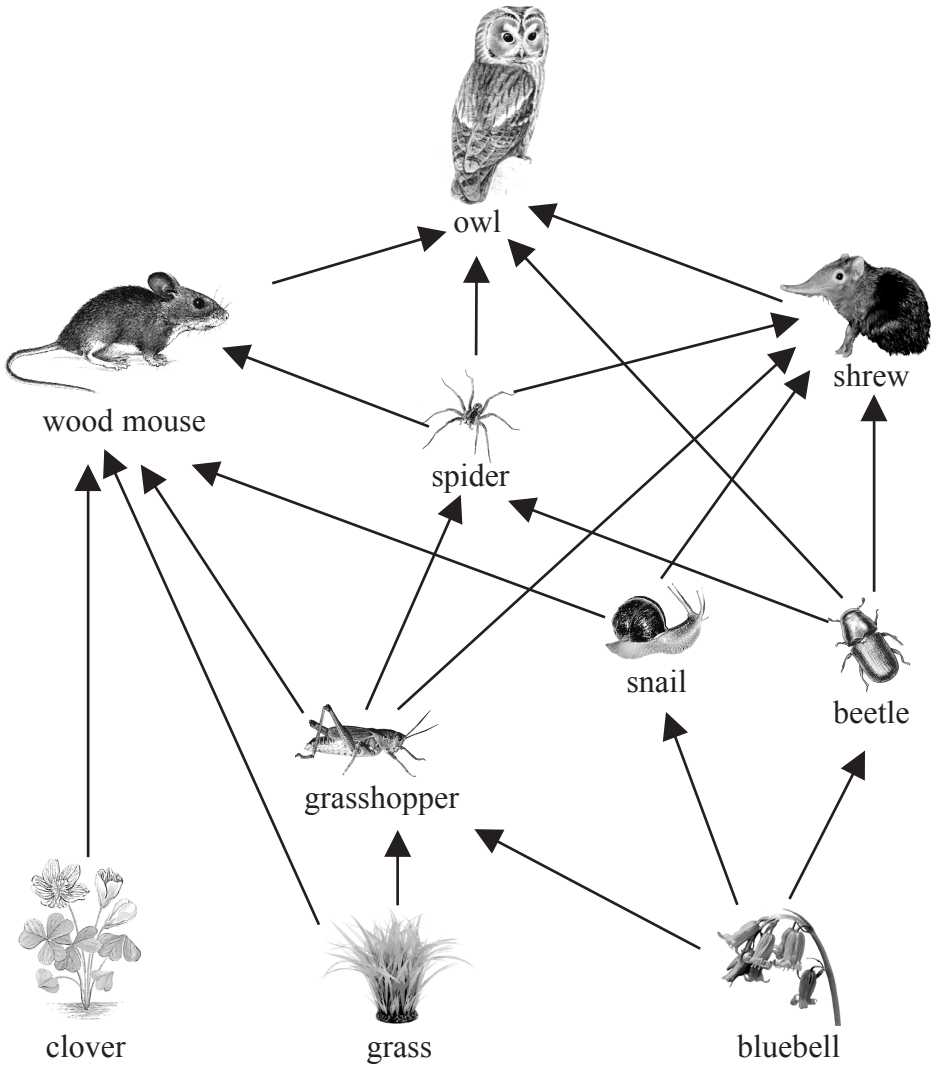
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

In the woods

Use the diagram to answer questions 1 to 4.

The diagram shows a woodland food web.



1. How many types of organisms in the food web are producers?

A none
B one
C two
D three

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2. Two predators of the spider are

A grasshopper and beetle
B owl and shrew
C wood mouse and grasshopper
D snail and beetle

3. Which is a correct food chain from the food web?

A grass → grasshopper → shrew → beetle
B owl → spider → grasshopper → grass
C bluebell → snail → shrew → owl
D owl → shrew → snail → bluebell

4. The number of grasshoppers increased.
The most likely reason for this is

A the number of shrews decreased
B the number of spiders increased
C the number of clover plants decreased
D the grass died

Tigers

These tiger cubs are brother and sister.
Their parents were both orange with black markings.
The colour and markings of tigers are important in helping them to survive in their natural habitat.



5. The natural colour and markings of tigers are controlled by

A characteristics
B genes
C cells
D genetic engineering

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6. The chromosomes of the tiger cubs are found in their cells.
Which part of a cell contains chromosomes?

A DNA
B genes
C nucleus
D cytoplasm

7. The white tiger looks very different to his sister and to his parents.
This difference is caused by

A gene mutation
B natural selection
C asexual reproduction
D competition

8. White tigers are less likely to be successful in their natural habitat than coloured tigers.
The reason for this is because white tigers

A are less camouflaged than coloured tigers so are more likely to be eaten by prey
B will be better camouflaged than coloured tigers so will not be seen by prey
C will have more predators than coloured tigers so are more likely to be eaten
D cannot compete as well for resources with other tigers that are better camouflaged

9. Passing genetic information from parents to offspring is called

A natural selection
B selective breeding
C evolution
D inheritance

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Sea monsters

The fossilised skull of a ferocious, 16 metres long ‘sea monster’ has been discovered.
The skull is from an extinct dinosaur called a pliosaur.



10. The pliosaur had very powerful jaws with razor-like teeth.
These features were

A naturally selected
B genetically engineered
C genetically modified
D artificially selected

11. The pliosaur was a reptile.
All reptiles

A produce milk
B have scaly skin
C give birth to live young
D have body hair

12. Which row of the table gives information about the fossilised skull of the pliosaur?

	made from	age of fossil (years)
A	remains of soft tissue	thousands
B	mineralised remains	millions
C	remains of soft tissue	millions
D	mineralised remains	thousands

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13. Which of these statements are true for all fossils?

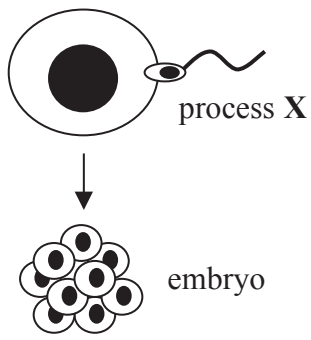
1 fossils provide evidence for evolution
2 dead organisms fully decay before forming fossils

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

A ball of cells

Use the diagram to answer questions 14 and 15.

The diagram shows the early stages in the development of a human.



14. Process **X** is

A transplantation
B cloning
C fertilisation
D competition

15. Which row of the table shows the type of reproduction that produced the embryo and the genetic characteristics of the embryo?

	type of reproduction that produced embryo	**genetic characteristics of embryo**
A	sexual	different from parents
B	asexual	identical to parents
C	sexual	identical to parents
D	asexual	different from parents

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16. Cells from embryos can be tested to see if they contain alleles that cause genetic disorders. Alleles are

A two genes that are the same
B genes which cause disease
C two different genes
D alternative versions of the same gene

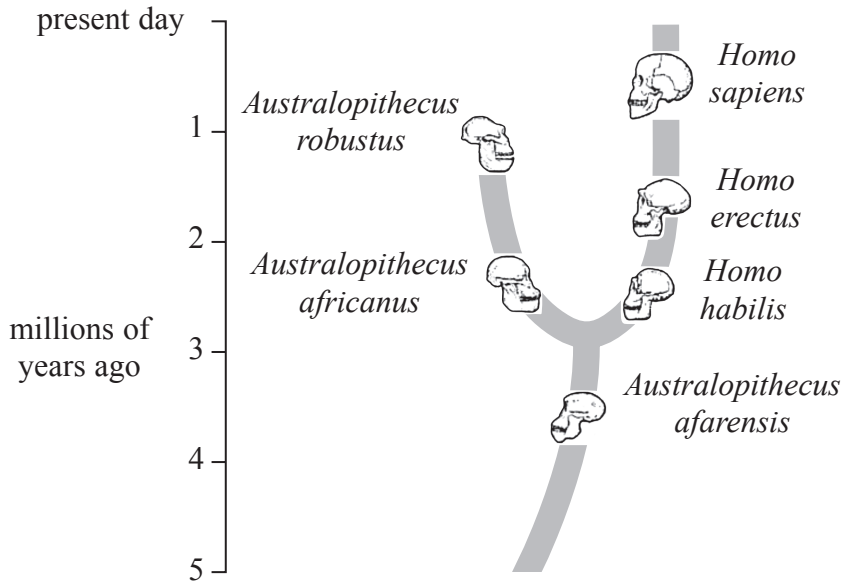
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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Passing time

Use the diagram to answer questions 17 to 19.

This evolutionary tree shows the possible relationship between humans (*Homo sapiens*) and their ancestors.



17. How many of these organisms belong to the same species as *Homo sapiens*?

A none
B two
C three
D six

18. Which of the organisms, that lived approximately 2.5 million years ago, is a direct ancestor of *Homo sapiens*?

A *Homo erectus*
B *Homo habilis*
C *Australopithecus africanus*
D *Australopithecus afarensis*

19. *Homo sapiens* is thought to have evolved by natural selection.
Natural selection is a process over

A a few generations which produces changes within a species
B many generations which produces changes within a species
C a few generations which produces no change in a species
D many generations which produces no change in a species

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20. Which process does **not** result in the evolution of *Homo sapiens*?

A genetic mutation
B competition
C asexual reproduction
D adaptation

Cloned pigs

Pigs can be used to produce organs for human transplants.
In 2001, five cloned piglets were produced.
They all lacked a gene which triggers the human immune system.



21. The five piglets were produced using genetic information from

A a sperm cell
B a body cell
C an egg cell
D a bacterial cell

22. Which of these statements about using mammals to produce cloned human organs for transplants are true?

1 cloned human organs are less likely to be rejected by humans than donated human organs
2 mammals are likely to be killed after they have been used to grow cloned human organs

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

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23. Selective breeding, using the cloned pigs, may produce future piglets that have the desired characteristic.
Which of these statements are true?

1 selective breeding involves changing the genes of the parents
2 selective breeding involves choosing two parents to breed together

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

24. Animals can have their genomes altered to give them desired characteristics.
Genomes that have been altered in this way are genetically

A modified
B transplanted
C mutated
D selected

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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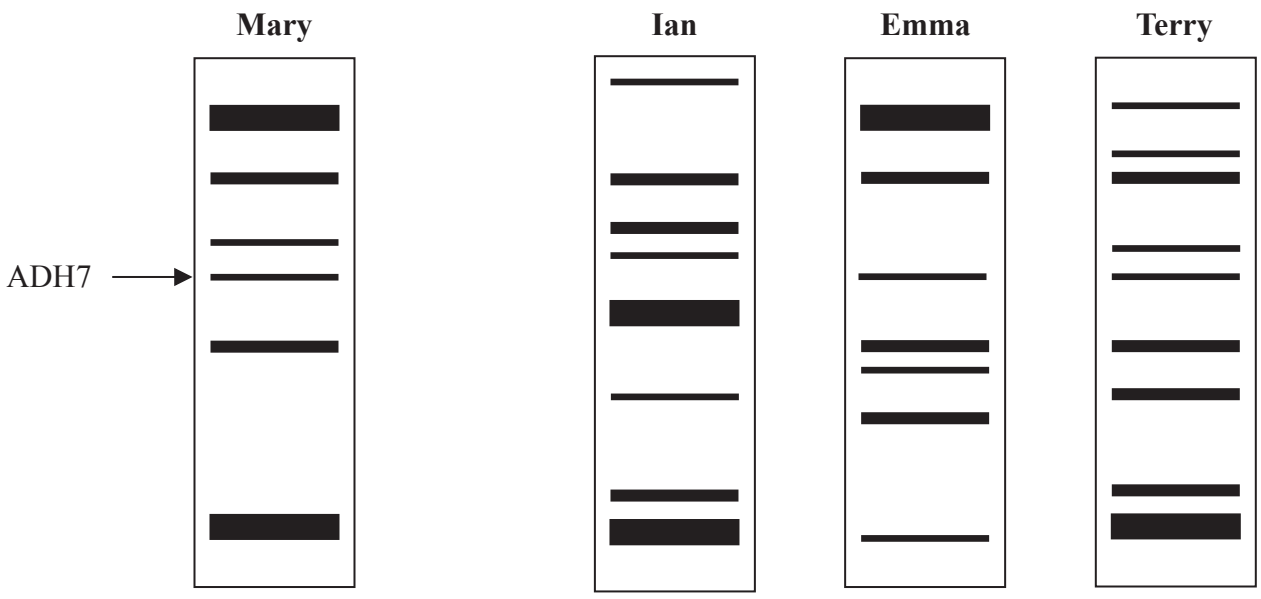
Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Inheriting characteristics

Gene found that reduces dangers of alcohol

An allele of the gene ADH helps to remove alcohol from the body. This allele is called ADH7 and could reduce the risk of alcohol related cancers.

25. Genetic fingerprints can be used to determine which alleles have been inherited.
The genetic fingerprints have been taken from Mary and her three children Ian, Emma and Terry.



Which of the three children have inherited the ADH7 allele from Mary?

A Ian only
B Ian and Emma
C Ian and Terry
D Emma and Terry

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26. Mary's husband, Philip, is homozygous recessive for the ADH allele.
Mary is heterozygous for the ADH allele.
A represents the dominant ADH7 allele and **a** represents the ADH allele.

Which Punnett square is correct?

A

Phillip's gametes

Mary's gametes	a	a
A	Aa	Aa
a	aa	aa

B

Phillip's gametes

Mary's gametes	A	a
A	AA	Aa
a	Aa	aa

C

Phillip's gametes

Mary's gametes	a	a
A	Aa	Aa
A	Aa	Aa

D

Phillip's gametes

Mary's gametes	A	A
a	Aa	Aa
a	Aa	Aa

27. What is the percentage chance that Mary and Philip's next child will carry the ADH7 allele?

A 25%
B 50%
C 75%
D 100%

28. How many alleles of any gene does each of Mary's body cells contain?

A 2
B 4
C 8
D 12

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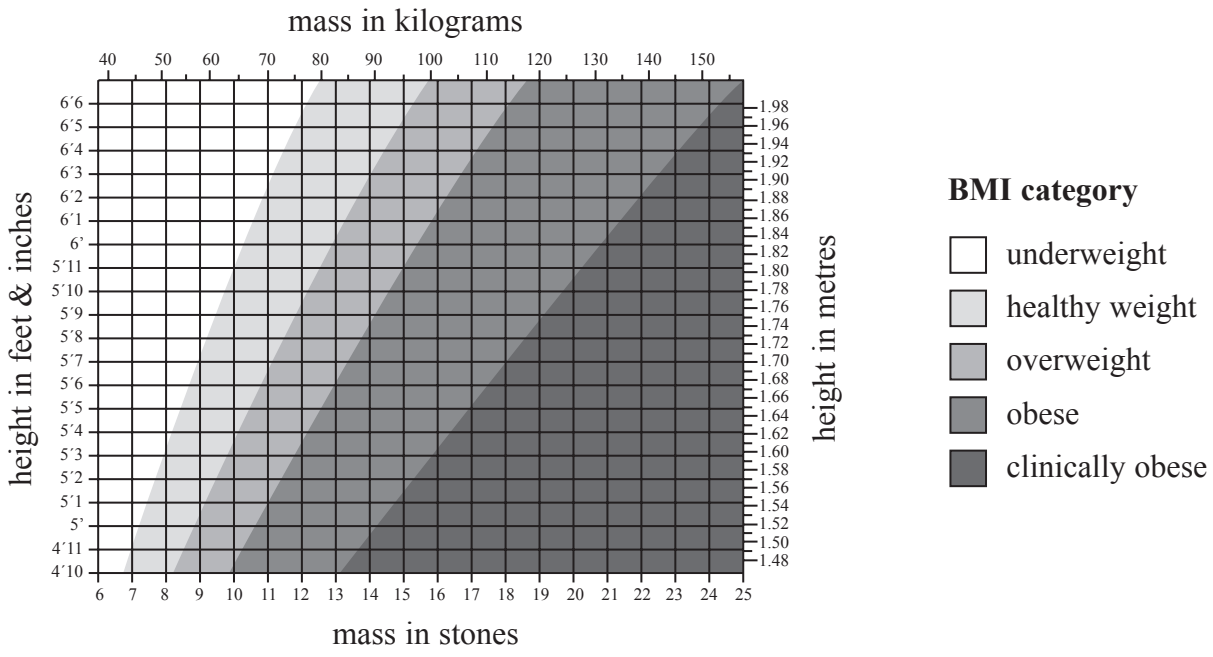
29. The Human Genome Project (HGP) will allow scientists to find out whether an unborn child is carrying the alleles for a genetic disorder.
A disadvantage of having this information is that

A the disorder could be cured before the child is born
B some tests are unable to confirm that the child will develop the disorder
C scientists can develop new medicines to treat the disorder
D it can prevent the disorder from being inherited

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Growth in organisms

30. A doctor can use a BMI chart, like the one shown below, to determine your BMI category.



Suzie's height is 1.7 m and her mass is 80 kg.
What is Suzie's BMI category?

A underweight
B healthy weight
C overweight
D obese

31. BMI can be calculated using the formula

$$\text{body mass index} = \frac{\text{body mass in kg}}{(\text{height})^2 \text{ in m}^2}$$

Russell's height is 1.5 m and his mass is 90 kg.
What is Russell's BMI in kg/m^2?

A 12.5
B 30
C 40
D 48.2

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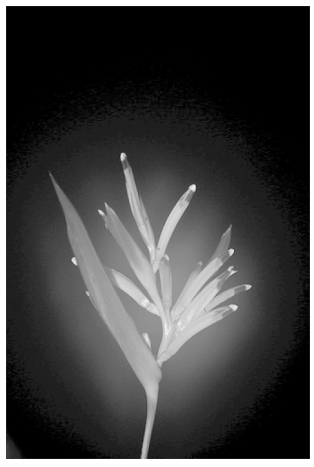
32. These statements are about growth of organisms.
How many of the statements are true?

- plant growth is affected by nitrate concentration in the soil
- plant and animal growth is influenced by nutrition
- human growth is determined by genes and is influenced by the environment

A none
B one
C two
D three

Glow in the dark

Scientists have used a bioluminescent gene from a firefly to modify a plant so that the plant can glow in the dark.



33. The statements give the stages used to genetically modify a plant.
They are not in the correct order.

1 bioluminescent gene inserted into bacteria
2 bioluminescent gene removed from firefly
3 bacteria infects the plant
4 bioluminescent gene incorporated into plant genome
5 the plant produces light

What is the correct order of these statements?

A 2 – 3 – 1 – 4 – 5
B 2 – 1 – 3 – 4 – 5
C 2 – 1 – 4 – 3 – 5
D 2 – 3 – 4 – 1 – 5

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34. How many of these statements about genetically modified (GM) plants are true?

- GM plants are always transgenic organisms
- GM plants are always organic
- cloning is used to genetically modify plants

A none
B one
C two
D three

35. A field of GM crops can feed more people than a field of beef cattle.
The reason for this is because

A cattle use energy to maintain their body temperature
B plants can be genetically modified but cattle cannot be genetically modified
C cattle store more energy per tonne than the same mass of plants
D plants absorb energy from the Sun to produce sugars

36. The most likely reason that people are opposed to growing GM crops is that

A there is evidence that GM crops have a high nutritional value
B all pests eating the crops will become resistant to pesticides
C the long term effect of eating GM crops on human health is not known
D growing GM crops reduces the need for rearing cattle

Designer babies

The completion of the Human Genome Project (HGP) has brought the possibility of 'designer babies' much closer.



37. Which statement is true for designer babies?

A embryo screening could produce babies without any genetic disorders
B sexual reproduction is not involved in the production of designer babies
C cloning can be used to produce designer babies
D designer babies are genetically identical to their parents

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38. Which row of the table is correct for designer babies?

	designer babies		
	are genetically modified	**are produced using IVF**	**have selected characteristics**
A	yes	no	yes
B	no	yes	no
C	yes	no	no
D	no	yes	yes

Gene therapy for breast cancer

Gene therapy is one of the most promising developments in medicine.
It is currently being investigated for the treatment of breast cancer.

39. These statements are about the effects that gene therapy might have on the lives of breast cancer patients.
Which of the statements are true?

1 gene therapy ensures that the children of breast cancer patients do not develop breast cancer
2 gene therapy could prevent breast cancer from developing further and spreading to other parts of the body

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

40. Scientists are currently investigating different methods of gene therapy for the future treatment of genetic disorders.
Gene therapy could

A treat all diseases in future generations
B prevent alleles in gametes becoming faulty
C incorporate healthy alleles to alleviate the symptoms of the disorder
D remove faulty alleles causing the disorder from all body cells

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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Mark Scheme (Results)
November 2010

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GCSE Science
Multiple Choice Paper B1a (5005)

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5005 Science/ 5025 Biology (B1a)

Unit B1a – 5005/5025	
Topics 1 & 2	
1	D
2	B
3	C
4	A
5	B
6	C
7	A
8	D
9	D
10	A
11	B
12	B
13	A
14	C
15	A
16	D

Unit B1a – 5005/5025	
Topics 1 & 2	
17	A
18	B
19	B
20	C
21	B
22	C
23	B
24	A

Unit B1a – 5005/5025	
Topics 1 & 2	
25	D
26	A
27	B
28	A
29	B
30	C
31	C
32	D
33	B
34	A
35	A
36	C
37	A
38	D
39	B
40	C

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Science (5005)

Biology (5025)

B1a – Topics 1 and 2

Foundation and Higher Tier

Thursday 24 June 2010 – Afternoon

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

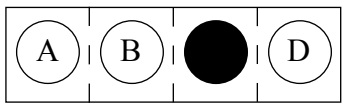
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Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D
and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

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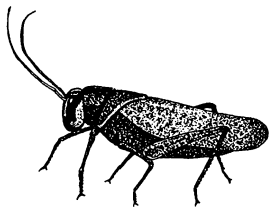
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Crickets

A cricket is a small insect which makes a chirping noise.
The more a cricket eats, the faster it makes the chirping noise.
The faster a male cricket makes the chirping noise, the more attractive he is to females.



1. Crickets are not vertebrates.
This is because they do **not** have

A a heart
B a backbone
C lungs
D scales

2. The effect of eating more food on a cricket's ability to make chirping noises is

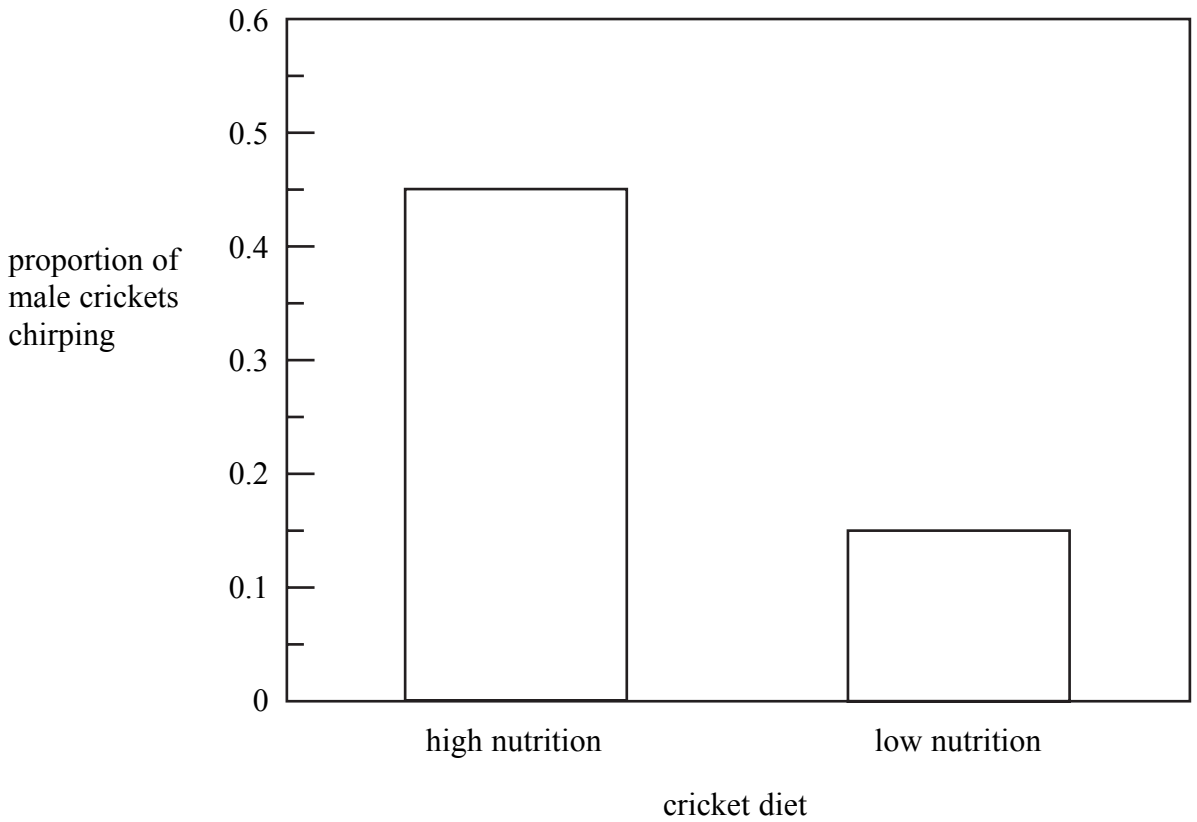
A an environmental influence only
B a genetic influence only
C both environmental and genetic influences
D neither environmental nor genetic influences

3. Male crickets compete with each other to attract female crickets.
This is an example of

A adaptation
B interdependence
C intra-species competition
D selective breeding

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The bar chart shows the results of an investigation into how diet affects cricket chirping.



4. What conclusion can you make based only on the information in the bar chart?

A twice as many crickets chirped when on a high nutrition diet
B three times more crickets chirped when on a low nutrition diet
C three times more crickets chirped when on a high nutrition diet
D twice as many crickets chirped when on a low nutrition diet

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Hummingbirds are faster than fighter jets



Hummingbirds are the fastest animals on Earth relative to their body size.

5. Flying fast helps hummingbirds to compete successfully within their environment.
This is an example of

A genetic modification
B natural selection
C classification
D extinction

6. Hummingbirds feed on the nectar from flowers.
The predators of hummingbirds are hawks, frogs and spiders.
Which of these food chains is correct?

A hummingbird → frog → spider
B flower → hummingbird → hawk
C flower → frog → hummingbird
D hawk → hummingbird → flower

7. In one area, the number of spiders and hawks increased.
What effect would this have on the food chain?

A the number of hummingbirds would increase
B the number of frogs would increase
C the number of hummingbirds would decrease
D there would be no effect on the food chain

8. Some hummingbirds have a long pointed beak which they put into flowers to help them suck up nectar.
This beak shape is an example of

A competition
B adaptation
C selective breeding
D predation

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Chromosome numbers

Use the table to help you answer questions 9 and 10.

The table shows information about four mammals.

common name	biological name	diploid chromosome number
Buffalo	*Bison bison*	60
Domestic cat	*Felis catus*	38
European cattle	*Bos taurus*	60
Dog	*Canis familiaris*	78

9. Which one of the following is a correct conclusion based on this data?

A The smaller the mammal the smaller the diploid chromosome number
B The cat's diploid chromosome number is half that of the dog
C Buffalo and cattle are identical species
D The diploid chromosome number does not affect the size of the mammal

10. The haploid chromosome number is half the diploid chromosome number.
What is the haploid chromosome number of the dog?

A 38
B 39
C 78
D 156

11. Chromosomes are most commonly found in the

A cytoplasm
B cell membrane
C nucleus
D cell wall

12. Chromosomes contain

A DNA
B gametes
C cells
D cytoplasm

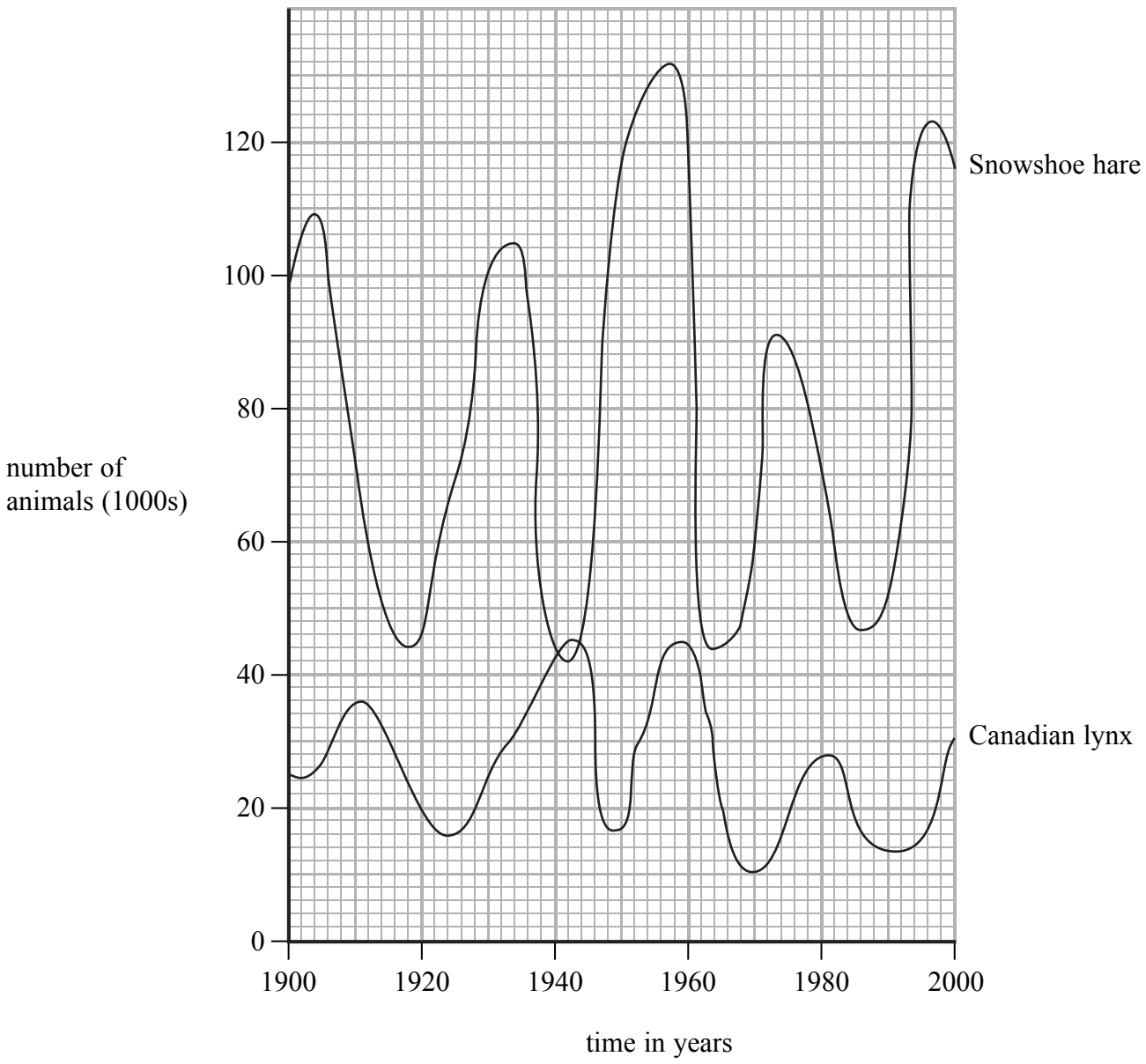
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Compete or die



Use the graph to help you answer questions 13 and 14.

This is an example of a predator-prey graph for the Canadian lynx and Snowshoe hare.



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13. Based on the information in the graph, which statement is correct?

A the predators always outnumber the prey
B the prey always outnumber the predators
C the pattern for predator numbers peaks after prey numbers
D the pattern for prey numbers is identical to predator numbers

14. If a disease caused the Snowshoe hares to die out then the number of Canadian lynx would be most likely to

A decrease as they have a reduced food supply
B decrease as they have an increased food supply
C increase as they have no food supply
D increase as they have an increased food supply

15. The survival and future natural selection of the Canadian lynx depend on

A the Canadian lynx surviving long enough to become extinct
B the Canadian lynx surviving long enough to successfully reproduce
C the Snowshoe hare becoming extinct
D the Snowshoe hare adapting to a changing environment

16. Fossilised remains of ancestors of the lynx have been found in Canada. These fossils are

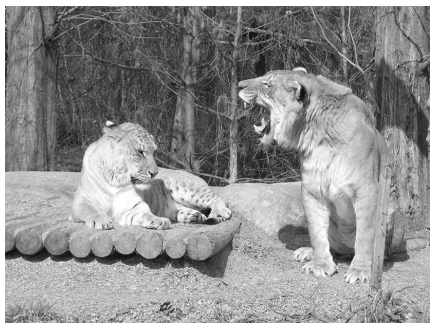
A the decayed bones and flesh of animals
B whole animals preserved in ice
C cave paintings of extinct animals
D the mineralised remains of the hard parts of animals

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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Hybrids

An example of a hybrid is the liger.
A liger is a cross between a male lion (*Panthera leo)* and a female tiger (*Panthera tigris)*.



17. Both lions and tigers belong to the phylum

A Animalia
B Reptilia
C Chordata
D Mammalia

18. Which row of the table shows the genus and species of the lion?

	genus	**species**
A	*Panthera*	*leo*
B	*Panthera*	*tigris*
C	*leo*	*Panthera*
D	*tigris*	*Panthera*

19. Ligers appear to look alike, but there are small differences between individuals.
Scientists refer to these differences as

A features
B alterations
C variations
D changes

20. Ligers are not able to reproduce with other ligers.
Lions and tigers can reproduce by

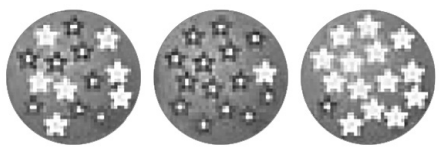
A asexual reproduction involving cloning
B sexual reproduction involving cloning
C asexual reproduction involving fertilisation
D sexual reproduction involving fertilisation

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Daisyworld – The Gaia hypothesis

A scientist named James Lovelock developed a computer program to model the effect of different coloured daisies on the temperature of a planet.
In the model, when the planet was covered in black daisies, the planet got hotter.
In the model, when the planet was covered in white daisies, the planet got cooler.

These are some images from the computer program.



21. Why was a computer used to model this rather than carrying out the experiment?

A it would be quicker to obtain experimental data
B experimental data is always unreliable
C results could be obtained faster using a computer
D computers produce more accurate and reliable results

22. On the model of Daisyworld, when the temperature gets too high, the black daisies start to die off and are not able to reproduce.
The white daisies increase in number and are able to reproduce more successfully.
This is an example of

A predation
B selective breeding
C evolution
D survival of the fittest

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23. Black daisies have the genotype **Bb** or **BB** and white daisies have the genotype **bb**.
White daisies are

A homozygous dominant
B homozygous recessive
C heterozygous dominant
D heterozygous recessive

24. A cross between black daisies with the genotype **Bb** and white daisies with the genotype **bb** would result in

A 100% black daisies
B 25% black daises and 75% white daisies
C 50% black daisies and 50% white daisies
D 75% black daisies and 25% white daisies

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

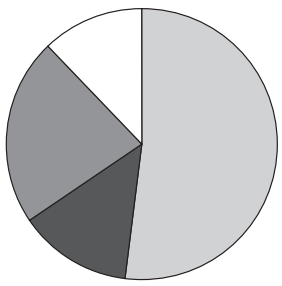
Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Organic farming

25. The pie chart shows the number of farms growing only organic crops in Canada during 2001.



Key

crop	number
field crops	1442
fruit and vegetables	614
livestock or animal-based products	381
other	340

Using information in the chart, which statement is correct?

A More farms in Canada grew organic crops in 2001 than in 2000
B More land was used to grow organic field crops than any other crops
C The number of organic farms in Canada in 2001 was 2777
D Less organic fruit and vegetables were grown than any other crops

26. Which row of the table only shows organic farming methods?

	crop rotation	GM crops	biological control
A	yes	no	yes
B	yes	no	no
C	no	yes	yes
D	no	yes	no

27. Organically grown crops are more expensive to buy.
What is a reason for this?

A the increased use of pesticide is expensive
B the development of GM food is expensive
C the yields of organic crops are often lower
D organic foods always contain a higher nutrient content

28. GM crops can be developed to contain higher levels of vitamin B.
The gene for the production of vitamin B in the GM crop is inserted by using

A hormones
B enzymes
C gametes
D clones

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Huntington's disease

Huntington's disease is caused by a dominant allele on chromosome 4.

29. What is an allele?

A an alternative chromosome
B a broken DNA strand
C an alternative form of the same gene
D a disease causing gene

30. Which row of the table shows the number of chromosomes in a human body cell and in a human gamete?

	number of chromosomes in a human body cell	**number of chromosomes in a human gamete**
A	23	23
B	46	46
C	23	46
D	46	23

31. Greg's father has one dominant allele for Huntington's disease but his mother has none. What is the percentage chance that Greg will have the allele for this disease?

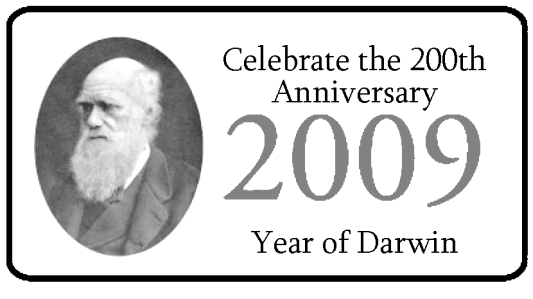
A 25%
B 50%
C 75%
D 100%

32. Our knowledge of the location of each allele on each chromosome is as a result of

A the human DNA project
B the human chromosome project
C the human genome project
D the human allele project

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The theory of evolution



33. 2009 was the 200th anniversary of the birth of the naturalist Charles Darwin.
Darwin set out in his book the fundamental principles that are now accepted as the theory of evolution.

Which of these statements made it difficult for Charles Darwin to get his theory of evolution accepted by the scientific community?

1 the theory of evolution was based on collected evidence and theoretical knowledge
2 species such as the finches on the Galapagos Islands provided evidence for the theory
3 the theory of evolution was at odds with the current religious thinking of the day

A 3 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

34. Which of these three statements about natural selection are true?

1 survival of the fittest is dependent on successful reproduction
2 successful changes in a species can be due to mutations which make the species less well adapted to its environment
3 in an unchanging environment, well-adapted species will become extinct

A 1 only
B 1 and 2 only
C 1 and 3 only
D 1, 2 and 3

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35. Which row of the table is correct for a mutation in a species?

	mutations are always harmful	**mutations can be a change in a gene**
A	yes	yes
B	yes	no
C	no	yes
D	no	no

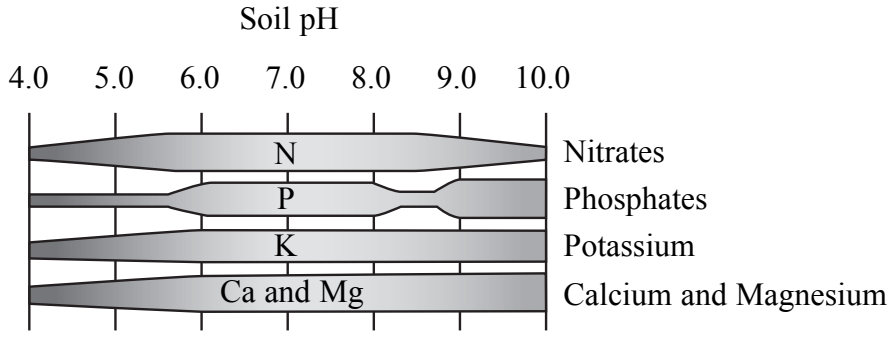
36. Scientists can now modify the DNA of a cow to carry human genes and produce new, useful products in their milk.
These animals are

A designer offspring that produce cloned offspring
B designer offspring that produce human antibodies
C transgenic organisms that produce cloned offspring
D transgenic organisms that produce human antibodies

The importance of minerals in plant growth

Use the information in the diagram to help you answer questions 37 and 38.

This diagram shows the effects of pH on the mineral concentrations in soil.
The thicker the line, the higher the concentration of mineral in the soil.



A low pH indicates more acidic soil and a high pH indicates more alkaline soil.
pH 7.0 is neutral.

37. Which minerals are **most** limited in both strong acid and strong alkali conditions?

A nitrates
B phosphates
C potassium
D calcium and magnesium

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38. Which pH range would give the highest total concentration of minerals?

A pH 4 – pH 5
B pH 5 – pH 6
C pH 7 – pH 8
D pH 9 – pH 10

39. Plants need minerals for different purposes.
Which mineral is most needed for chlorophyll production?

A nitrate
B phosphate
C potassium
D magnesium

40. Plants can be genetically modified to produce their own minerals.
Which of these three statements about the genetic modification of plants are true?

1 plant DNA is cut using enzymes and linked back together using hormones
2 genetically modified plants may have an adverse effect on the environment due to cross fertilisation with other species
3 plants can be genetically modified to be resistant to weedkiller

A 1 and 2 only
B 1 and 3 only
C 2 and 3 only
D 1, 2 and 3

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Unit B1a – 5005/5025	
Topics 1 & 2	
1	B
2	A
3	C
4	C
5	B
6	B
7	C
8	B
9	D
10	B
11	C
12	A
13	C
14	A
15	B
16	D

Unit B1a – 5005/5025	
Topics 1 & 2	
17	C
18	A
19	C
20	D
21	C
22	D
23	B
24	C

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25	C
26	A
27	C
28	B
29	C
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34	A
35	C
36	D
37	A
38	C
39	D
40	C

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B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 5 March 2010 – Morning

Time: 20 minutes

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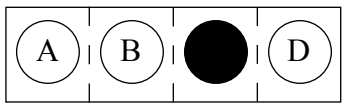
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Do any necessary calculations and rough work in this booklet. You may use a calculator if you wish.

You must not take this booklet or the answer sheet out of the examination room.

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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

The problem with the cane toad



The cane toad was introduced into Australia to eat the beetles that were destroying sugar cane crops.
The cane toad eats small animals and poisons the larger animals that eat it.

1. A food chain for the cane toad is

A cane toad → beetle → sugar cane
B sugar cane → beetle → cane toad
C sugar cane → cane toad → small animals
D cane toad → small animals → large animals

2. The cane toad is

A prey to the beetles and a consumer
B predator to the beetles and a producer
C prey to small animals and a producer
D predator to the small animals and a consumer

3. The food chain for the cane toad can be shown as a pyramid of numbers.
A pyramid of numbers shows

A the amount of biomass at each trophic level
B the number of organisms at each trophic level
C the size of the organisms at each trophic level
D the energy lost at each trophic level

4. The female toad lays eggs which are fertilised outside the body by the male toad.
What type of reproduction is this?

A asexual reproduction
B sexual reproduction
C selective breeding
D internal fertilisation

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Pet cloning

The first cloned-to-order pet sold in the United States is named Little Nicky.
Little Nicky is a kitten cloned from a cat that had died.
A woman paid $50,000 for the cloned kitten.



5. The company that cloned Little Nicky plans to clone another 50 cats in the same year.
What is the total income the company will make from all the cloned cats in that year if each clone is sold for the same price as Little Nicky?

A $50,000
B $250,000
C $2,250,000
D $2,550,000

6. Little Nicky would

A be genetically different from the original cat
B be genetically identical to the original cat
C contain half the genes of the original cat
D be genetically identical to the cat which gave birth to it.

7. Some people object to cloning.
A valid concern about cloning is that

A cloning puts the life of the original animal at risk
B cloning is a result of genetic modification
C cloning techniques produce many embryos and most do not survive
D cloned animals are always very healthy

8. Some plants produce clones naturally.
These clones are produced by the process of

A asexual reproduction
B sexual reproduction
C selective breeding
D genetic modification

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The mayfly



In its adult form the mayfly lives between 30 minutes and 24 hours.
During this time the mayflies mate and then lay eggs which develop into mayfly nymphs.
Nymph is the name given to the early stage of the mayfly life cycle.

9. The mayfly nymphs grow from

A fertilised egg cells
B unfertilised egg cells
C fertilised sperm cells
D unfertilised sperm cells

10. Mayfly nymphs live for 1–2 years before becoming adult mayflies.
During this time they live in rivers feeding on algae and mayfly nymphs are eaten by fish such as trout.
An increase in the numbers of mayfly nymphs would cause

A algae numbers to increase and trout numbers to increase
B algae numbers to increase and trout numbers to decrease
C algae numbers to decrease and trout numbers to decrease
D algae numbers to decrease and trout numbers to increase

11. There is fossil evidence of mayflies dating back over 300 million years.
Fossils are

A pictures of animals in rocks
B the mineralised remains of the hard parts of plants and animals
C the imprint of an organism preserved in ice
D the skeleton of animals that lived millions of years ago

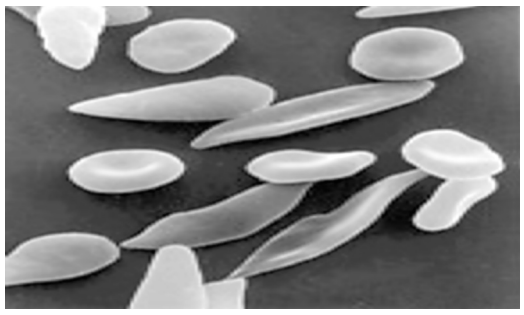
12. Mayflies have survived on Earth for so long because they have

A adapted to a changing environment
B become extinct in a changing environment
C been selectively bred by humans
D mutated to be less well adapted to their environment

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Sickle cell anaemia

Sickle cell anaemia is a disorder which causes the haemoglobin in the red blood cells to become distorted.
The cells become sickle shaped.



13. Sickle cell anaemia is

A a genetic disorder caused by the environment
B a genetic disorder inherited from parents
C caused by human genetic modification
D caused by selective breeding

14. Sickle cell anaemia is coded for by DNA.
Which one of the following structures is where DNA is most found?

A cell membrane
B haemoglobin
C nucleus
D cytoplasm

15. DNA forms alleles.
An allele is an alternative form of a gene.
Human alleles are found on structures called

A carriers
B chromosomes
C characteristics
D red blood cells

16. The allele for sickle cell anaemia is recessive.
A person with only one recessive allele for sickle cell anaemia will

A pass the allele on to some offspring but not have sickle cell anaemia
B pass the allele on to some offspring and have sickle cell anaemia
C have sickle cell anaemia but not pass the allele on to any offspring
D neither have sickle cell anaemia nor pass it on to any offspring

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Higher-tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier

Personalised medicines

Medicine in the 21st century will be changed by the knowledge of the full DNA sequence.

Knowing the full DNA sequence (the digital recipe of our genes) will enable scientists to develop tailor-made drugs.

This opens the door to an era of "personalised medicine", with each patient being treated according to their unique genetic signature.

17. The sequencing of the human genetic code was called

A the human DNA project
B the human genetic mapping project
C the human genome project
D the *Homo sapiens* project

18. The ability of scientists to make personalised medicine to treat diseases is most likely to

A have no impact on current drug usage
B replace traditional drugs to reduce side effects
C cure all genetic diseases
D cure all non-genetic diseases

19. Another use for the sequencing of the human genetic code is for

A forensic science to help solve crimes
B the cloning of pet animals
C the genetic modification of crop plants
D the selective breeding of sheep

20. Personalised medicine could also include the growing of specific human organs on animals for transplantation into humans.
An ethical concern about this method of human organ production is

A human organs may be rejected when implanted
B human organs produced in this way will not be rejected
C the human DNA needs to be harvested from cheek cells
D the animals used may be deformed as a result of the organ growth

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Cystic fibrosis (CF)

21. Genetic research might produce a treatment for cystic fibrosis (CF).
This type of treatment is called

A designer medication
B genetic modification
C gene therapy
D designer cloning

22. CF is a disorder caused by a recessive allele.
If a person has one allele for CF they are a carrier.
Which is the correct Punnett square for the offspring of two people who are both carriers of CF?

	C	**C**
c	Cc	Cc
c	Cc	Cc

A

	C	**C**
C	CC	CC
c	Cc	Cc

B

	C	**c**
c	Cc	cc
c	Cc	cc

C

	C	**c**
C	CC	Cc
c	Cc	cc

D

23. Two carriers for CF produce an offspring.
What is the percentage chance that the offspring will also be a carrier for CF?

A 25%
B 50%
C 75%
D 100%

24. What is the genotype of a person who has CF?

A CC
B Cc
C cC
D cc

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

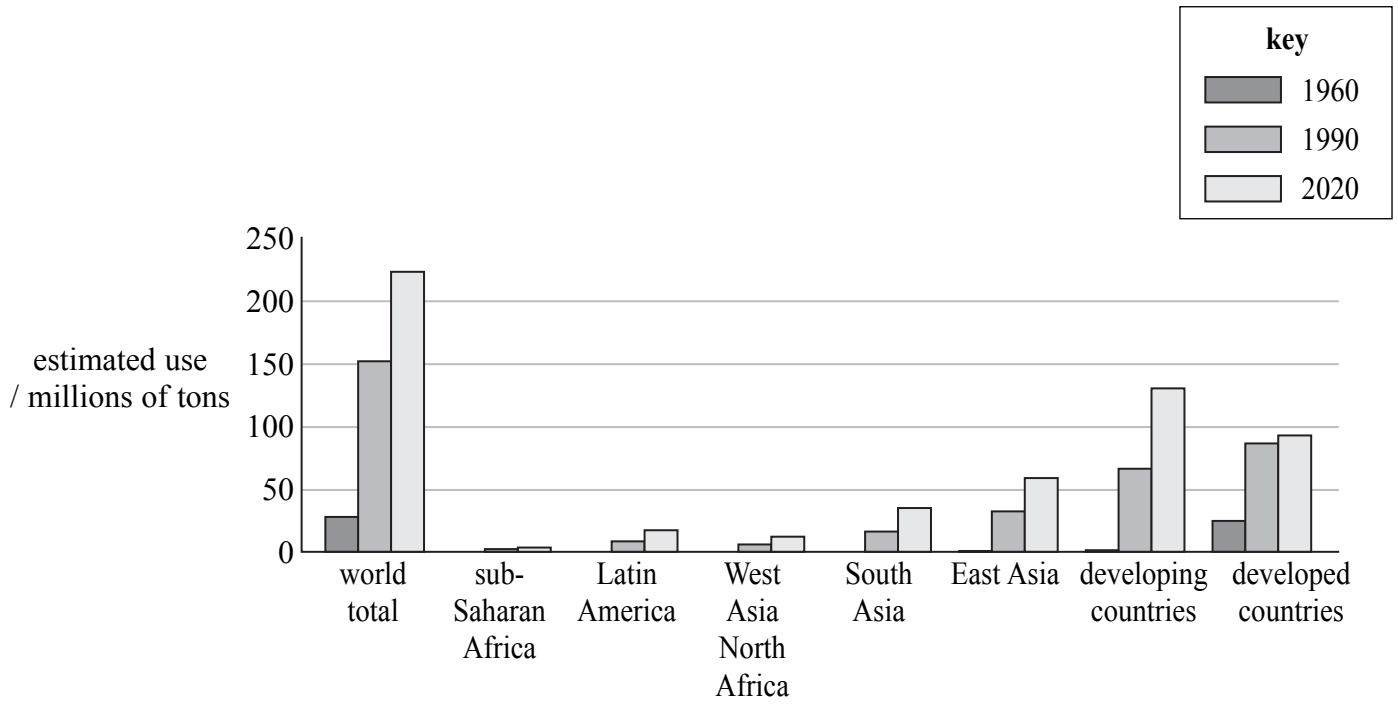
Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Fertilisers

Fertilisers are a source of nitrates.
Nitrates increase crop yields.
The graph shows the estimated fertiliser use from 1960 to 2020 in various countries.



25. A correct interpretation of the graph is

A no fertilisers were used prior to 1960
B the use of fertilisers will increase the most in developed countries by 2020
C the use of fertilisers increased in all areas between 1960 and 1990
D most fertilisers were used by developing countries in 1990

26. The predictions for 2020 are likely to be based on computer models.
Which row of the table shows the factors needed for a computer model to be successful?

	past data used	current data used	predicted data used
A	yes	yes	yes
B	yes	yes	no
C	no	yes	no
D	yes	no	yes

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27. Fertilisers can be used to increase crop yields.
Why do crop yields need to be increased?

A human population is decreasing
B human population is increasing
C farming techniques are improving
D air pollution levels are decreasing

28. The use of nitrogen compounds in fertilisers helps the plants to

A produce proteins for growth of the plants
B produce magnesium for chlorophyll production
C produce proteins for chlorophyll production
D produce magnesium for growth of the plants

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GM cotton

Some cotton plants have been genetically modified to contain a gene for making a pesticide.

29. Which row of the table shows processes necessary for genetic modification?

	gene artificially inserted	**pollination**
A	no	no
B	yes	no
C	yes	yes
D	no	yes

30. These are two statements about GM cotton.

1 Enzymes are used to both remove and insert genes
2 One ethical concern about GM cotton is how it will impact on the environment

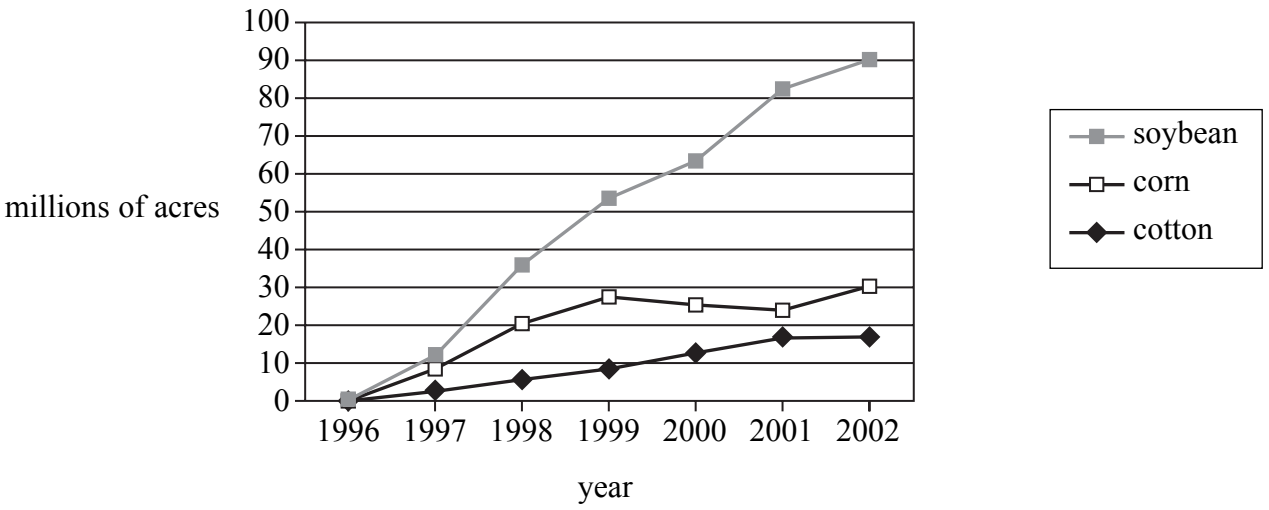
Which are true?

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

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Growing crops

The graph shows the change in the total area of land used in the world to grow GM crops from 1996 to 2002.



31. Which statement is supported by the data in the graph?

A in 2002 the total land used to grow all soybean rose to 90 acres
B there was a reduction in the demand for GM cotton during 2000 and 2001
C the land used for GM corn increased steadily between 1996 and 2002
D more land was used for GM soybean than for GM cotton and GM corn combined in 2000

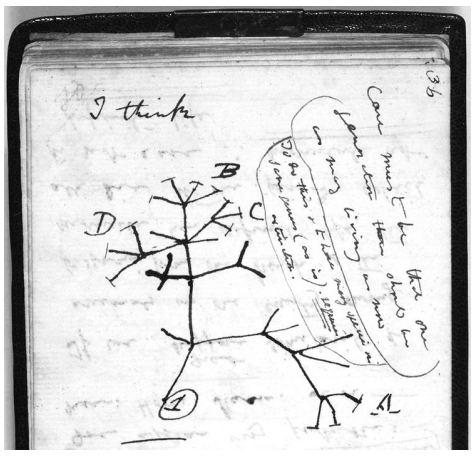
32. The proportion of land used for organic crops has increased over the past 10 years. Which row of the table is correct for the growing of organic crops?

	crop yields are increased	**biological control can be used**
A	yes	yes
B	yes	no
C	no	no
D	no	yes

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Darwin's tree of life

In Darwin's 'On The Origin of Species', published in 1859, the British naturalist drew a diagram of an oak tree to depict how one species can evolve into many others.



33. This diagram shows that

A all organisms evolved from trees
B all organisms have evolved from common ancestors
C evolution is based on natural selection
D evolution is limited and will stop

34. During 1859, Darwin's ideas were not easily accepted by the scientific community. This was because

A Darwin's theory of evolution was not based on observation or evidence
B scientists always need experimental evidence to accept a theory
C some scientists held religious beliefs that conflicted with Darwin's theory
D natural selection was considered to be evidence for extinction

35. The classification of organisms into groups was linked to Darwin's tree of life. What is the correct order of classification from the least similar to the most similar?

A
Phylum
Kingdom
Class
Order
Family
Genus
Species

B
Kingdom
Phylum
Class
Order
Family
Genus
Species

C
Kingdom
Phylum
Family
Order
Class
Genus
Species

D
Phylum
Kingdom
Class
Genus
Order
Family
Species

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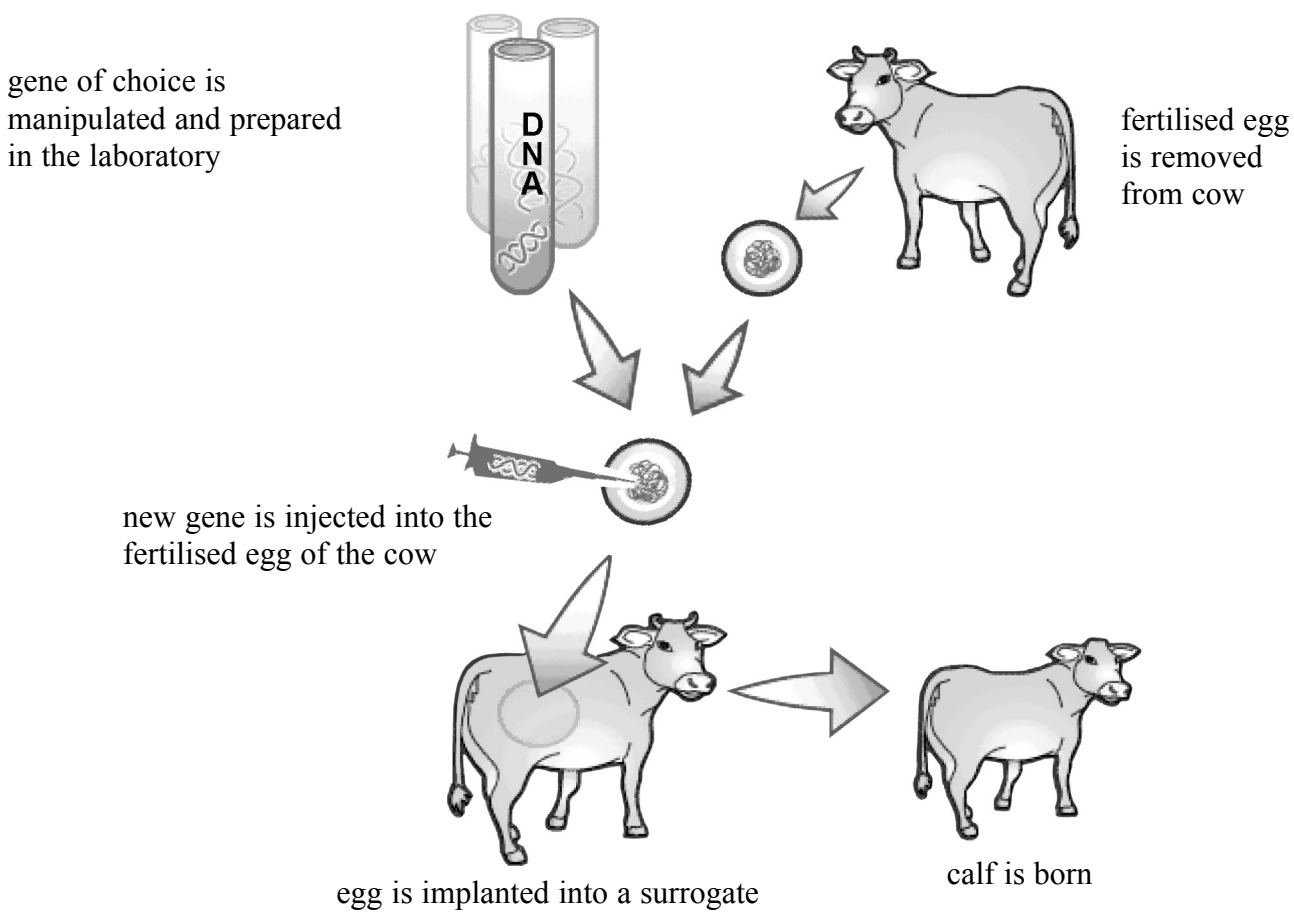
36. Advances in genetics suggest that the relationship between organisms is much more complex than Darwin first thought.
Which row of the table shows areas of genetic research which may influence scientists' view on the tree of life?

	discovery of DNA	**outcomes of HGP**
A	yes	yes
B	yes	no
C	no	yes
D	no	no

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A new method of farming

This is a method used for the production of designer milk containing human antibodies.



37. The gene of choice is removed from

A a cow body cell using hormones
B a cow body cell using enzymes
C a human body cell using hormones
D a human body cell using enzymes

38. The calf produced by this process will have

A diploid body cells and haploid gametes
B diploid body cells and diploid gametes
C haploid body cells and diploid gametes
D haploid body cells and haploid gametes

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39. Which row of the table is correct for the name of an animal used in this way and a useful characteristic of designer milk?

	name of animal used in this way	**useful characteristic of designer milk**
A	transplant	high cholesterol
B	transgenic	high cholesterol
C	transplant	low cholesterol
D	transgenic	low cholesterol

40. These are two statements about the genetic modification of cattle.

1 cattle can be genetically modified, using enzymes, to produce human antibodies in their milk
2 cattle which have been genetically modified only reproduce asexually

Which are true?

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Unit B1a – 5005/5025	
Topics 1 & 2	
1	B
2	D
3	B
4	B
5	D
6	B
7	C
8	A
9	A
10	D
11	B
12	A
13	B
14	C
15	B
16	A

Unit B1a – 5005/5025	
Topics 1 & 2	
17	C
18	B
19	A
20	D
21	C
22	D
23	B
24	D

Unit B1a – 5005/5025	
Topics 1 & 2	
25	C
26	B
27	B
28	A
29	B
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32	D
33	B
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35	B
36	A
37	D
38	A
39	D
40	A

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B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 20 November 2009 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

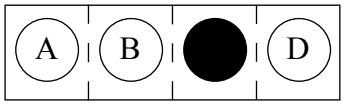
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

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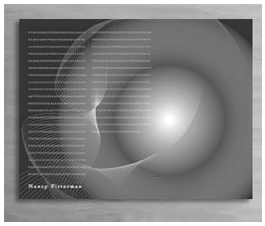
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

Gene art

Art companies are now offering to produce an image of a single gene to hang in your home.



1. Genes are made of

A chromosomes
B cytoplasm
C DNA
D HGP

2. To have a picture of your gene you must send a sample of your cheek cells to the company. They extract the gene and decode it.
Which part of the cheek cell contains the genes?

A cytoplasm
B nucleus
C cell membrane
D vacuole

3. Genes are found on structures called

A chromosomes
B vacuoles
C nuclei
D membranes

4. The human genome project has enabled human genetic information to be used in the

A cloning of sheep
B genetic modification of wheat
C selective breeding of dogs
D solving of crimes

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Robins

According to data collected by the Royal Society for the Protection of Birds (RSPB), climate change is causing some birds to lay their eggs earlier.
On average robins lay their first egg one week earlier in the year compared to robins that lived 40 years ago.

5. This year, the average date when robins laid their first egg was 22nd April.
What was the average date that robins laid their first egg 40 years ago?

A 15th April
B 22nd April
C 29th April
D 22nd May

This is a food chain for a robin.



oak caterpillar robin

6. The robin in this food chain is

A a predator and a consumer
B a predator and a producer
C a consumer and prey to the caterpillar
D a producer and prey to the caterpillar

7. What do the arrows represent in the food chain?

A the number of organisms at each level
B the direction of energy flow
C the amount of food that is eaten
D the amount of energy that is lost

8. Hawks hunt and kill robins.
Which row of the table shows how an increase in the number of hawks will affect the populations of robins and caterpillars?

	robins	**caterpillars**
A	increase	increase
B	decrease	increase
C	increase	decrease
D	decrease	decrease

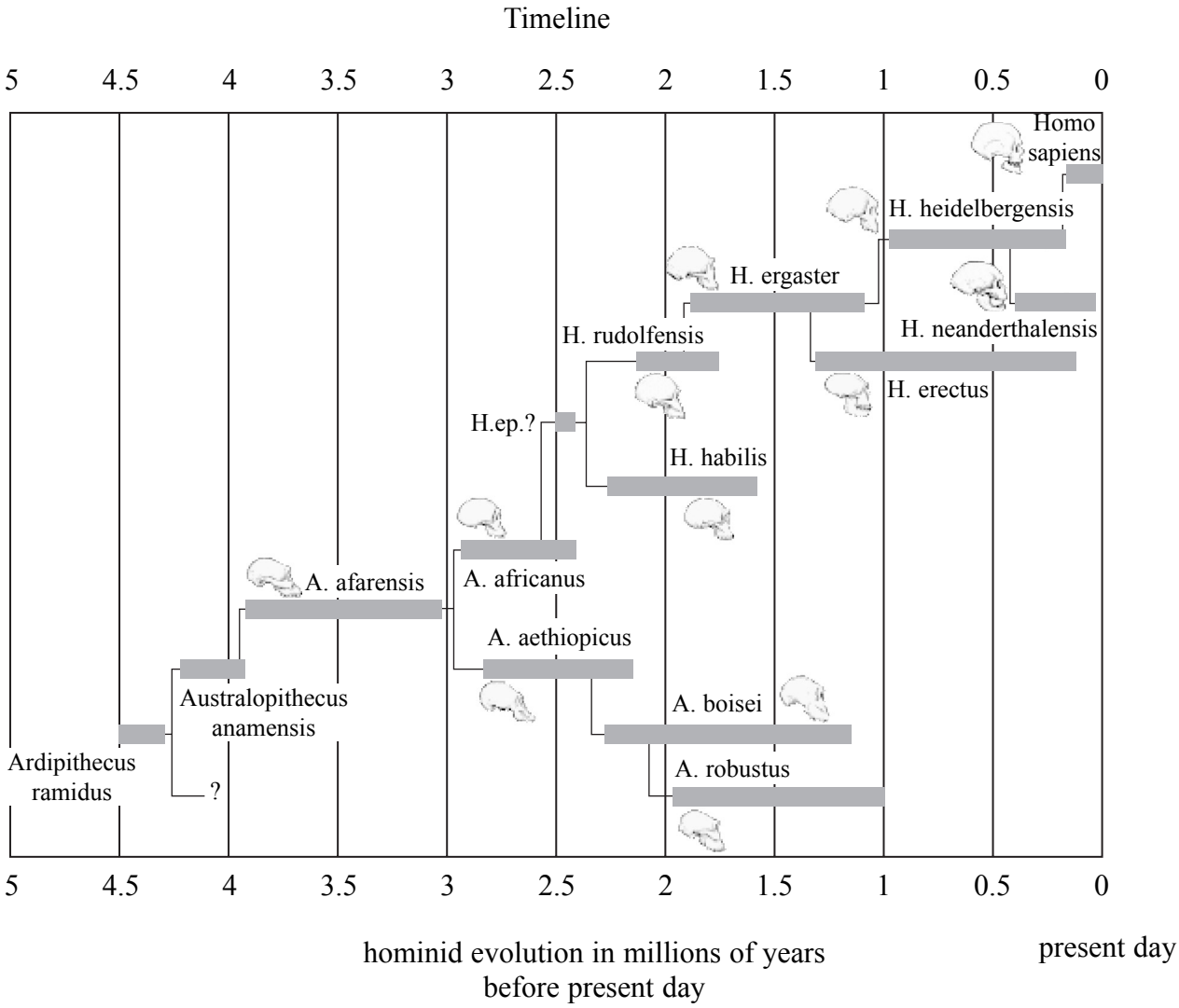
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The evolution of man

Use the information to answer questions 9–12.

The timeline below shows when different hominid species lived during the Earth's history. All the species shown on the timeline are hominids.

Each bar ( ) represents the time span during which each species existed.



9. Evidence for this timeline is mainly from

A direct observation
B the fossil record
C Darwin's book
D computer models

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10. The earliest evidence of hominids was

A 4.5 years ago
B 2.5 million years ago
C 4.5 million years ago
D 5 million years ago

11. What is the maximum number of hominid species living at the same time?

A 2
B 5
C 8
D 15

12. The species of hominid living in the present day is

A *Ardipithecus ramidus*
B *Homo sapiens*
C *H. neanderthalensis*
D *A. robustus*

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A welcome return to knobbly vegetables

EU laws which ensured fruit and vegetables were sold in standard sizes have been changed.
For example, knobbly carrots and curved cucumbers are now set to make a comeback in our shops.

13. What is the most likely effect of this change in the EU laws?

A The price of fruit and vegetables will increase
B Less organic vegetables and fruit will be on sale in supermarkets
C The price of fruit and vegetables will decrease
D The price of organic fruit and vegetables will increase

14. Organic crop farming methods do **not** include

A crop rotation
B weeding by hand
C using compost rather than manufactured fertilisers
D using artificial insecticides rather than biological control

15. Many people prefer to eat organically grown fruit and vegetables because

A they contain fewer pesticides
B they have a lower nutritional value
C they are cheaper to produce
D they have a standard size and shape

16. Farmers can take cuttings from a plant with the best characteristics.
These cuttings can be grown into new plants.
Which row of the table shows this method of reproduction and the genetic characteristics of the new plants produced?

	method of reproduction	**genetic characteristics of the new plants**
A	sexual	genetically identical to each other
B	asexual	genetically identical to the parent
C	sexual	genetically different to each other
D	asexual	genetically different to the parent

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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Lonesome George

Lonesome George is the last living giant tortoise on the island of Pinta (one of the Galapagos Islands). The tortoises are thought to have died out because humans hunted them and goats, which ate the vegetation, were brought to the island.



Steve Allen/Science Photo Library

17. The giant tortoises

A competed intraspecifically with goats for food
B were predators of the goats
C competed interspecifically with goats for food
D were predators of the humans

18. The giant tortoises are an example of how a species less well-adapted to their environment are likely to become

A more competitive
B extinct
C mutants
D more successful

19. Lonesome George has the scientific name *Geochelone abingdoni.*
This means that Lonesome George belongs to the

A species *Geochelone* and genus *abingdoni*
B genus *Geochelone* and species *abingdoni*
C class *Geochelone abingdoni*
D phylum *Geochelone abingdoni*

20. Scientists are attempting to breed Lonesome George with female tortoises from a similar species.
This method of reproduction is known as

A asexual reproduction
B survival of the fittest
C selective breeding
D genetic modification

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Haemophilia

Haemophilia is an inherited disorder.
The allele for haemophilia is on the X chromosome.
Males have XY chromosomes and females have XX chromosomes.

21. Haemophilia is a disorder

A which affects the nervous system
B in which blood fails to clot normally
C which changes the shape of the red blood cells
D which causes excess mucus production

22. The haemophilia allele can be inherited by

A males only because they have one X chromosome
B females only because they have two X chromosomes
C both males and females because they both have an X chromosome
D males only because they have one Y chromosome

23. Harry has haemophilia.
The chance that Harry will pass on the allele for haemophilia to his female children is

A 25%
B 50%
C 75%
D 100%

24. Harry marries Jane. She does not have haemophilia and she does not carry the allele for haemophilia.
All their female children will

A have haemophilia
B carry one allele for haemophilia
C not have haemophilia and not carry the allele for haemophilia
D pass on the allele for haemophilia to their children.

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

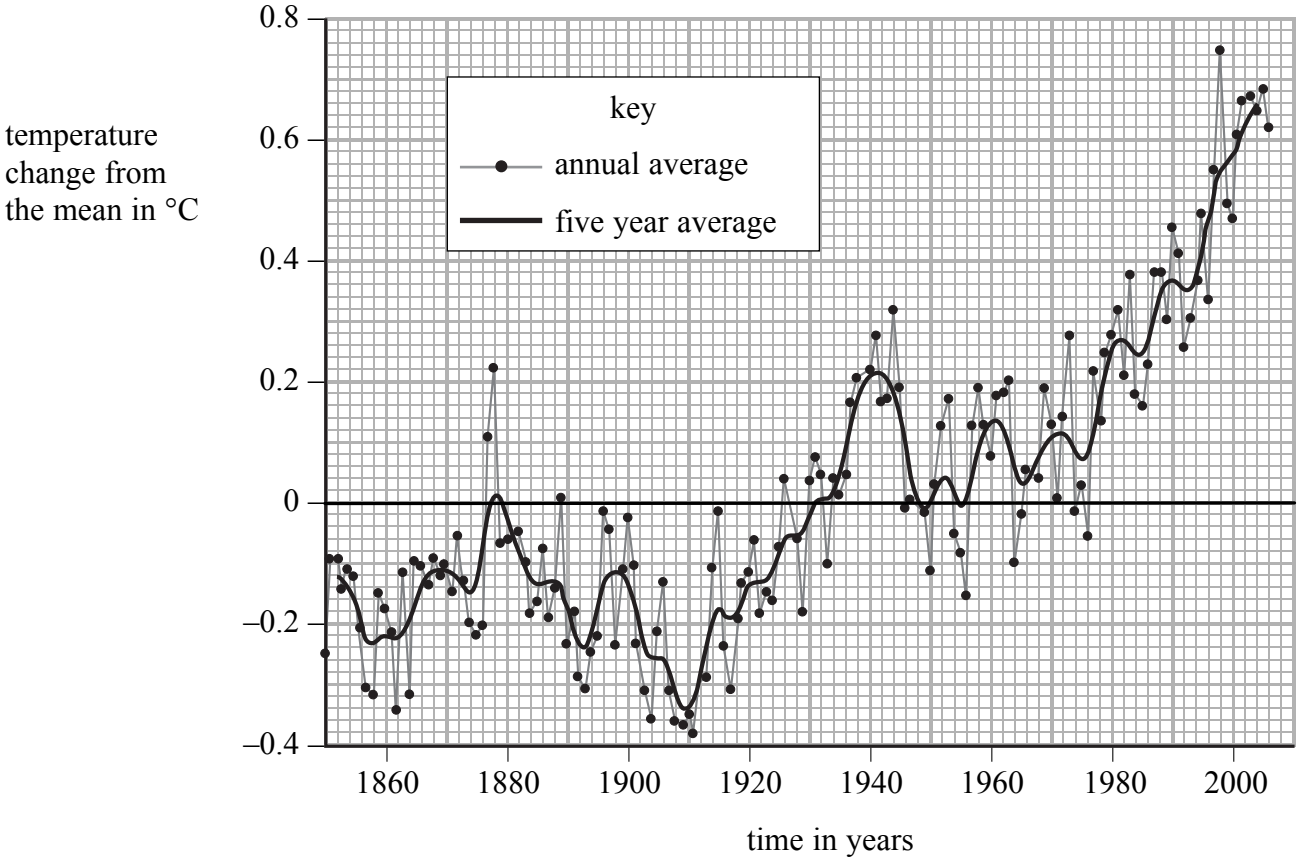
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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Global temperatures

Use the graph to answer questions 25 and 26.

The graph shows how global temperatures have risen or fallen in relation to the mean global temperature. This mean temperature is shown as zero on the graph.



25. The first time that the annual average temperature rose above the mean was

A 1876
B 1888
C 1942
D 1998

26. Which is the correct statement about the graph?

A The global temperature has increased steadily since 1908
B The annual average and five year average are always the same
C The five year average shows no change from the mean in 1932
D The global temperature in the year 2000 was 0.6 °C

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27. The temperature rise is believed to be caused by an increase in greenhouse gases. The main greenhouse gases are

A carbon dioxide and methane
B carbon dioxide and sulphur dioxide
C carbon dioxide and oxygen
D carbon dioxide and nitrogen

28. Computer models are used to predict the future effects of a rise in global temperatures. Which row of the table is correct for computer modelling?

	always accurate	**can predict long term changes**	**uses present and past data**
A	yes	yes	no
B	yes	no	no
C	no	yes	yes
D	no	no	yes

Glow in the dark pigs

Scientists in Taiwan say they have bred three pigs that "glow in the dark". The pigs are created by adding genetic material from jellyfish into a normal pig embryo.

29. What is the name given to an animal which contains a gene from another animal?

A transplant animal
B transgenic animal
C carrier animal
D cloned animal

30. To genetically modify a pig, the following steps are carried out.

1 Jellyfish DNA inserted into embryonic pig cells
2 Embryonic pig cells are implanted into surrogate pig
3 Jellyfish DNA extracted
4 Embryonic pig cells are given an electric shock to stimulate cell division

What is the correct order for the production of the "glow in the dark" pigs.

A 4, 3, 1, 2
B 3, 1, 2, 4
C 3, 1, 4, 2
D 3, 4, 1, 2

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31. It is possible to use a similar technique to grow human body organs on pigs for transplantation into humans.
These are two statements about this process.

1 Many pig embryos fail to develop during this process
2 Transplant organs made by this process will not be rejected by humans

Which are ethical concerns about this use of pigs?

A 1 only
B 2 only
C both 1 and 2
D neither 1 or 2

32. In the UK, gene therapy can be used to treat people with cystic fibrosis.
Gene therapy

A cures an individual of cystic fibrosis
B stops cystic fibrosis being passed on to children
C alleviates the symptoms of cystic fibrosis but does not cure it
D cures cystic fibrosis and prevents it being passed on to children

Music affects plant growth

There is evidence that music can affect the rate at which some plants grow.
Experiments with different types of music have been shown to promote root growth in plants.

33. A valid and reliable experiment to show how music affects root growth in a single species would need to

A have few repeats and the same seed species
B have many repeats and different seed species
C have few repeats and different seed species
D have many repeats and the same seed species

34. Plants need to take in minerals for healthy growth.
Which row of the table shows the type of mineral and its direct use in the plant?

	type of mineral	direct use in plant
A	magnesium	protein formation
B	nitrate	protein formation
C	phosphate	chlorophyll production
D	potassium	chlorophyll production

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Cloning

Some people are concerned about the cloning of animals but they may not realise that they are eating cloned vegetables everyday.

35. What is involved in the process of cloning vegetables?

A a nucleus is inserted into an enucleated cell and transferred into a surrogate
B the required genes are inserted into the vegetables using enzymes
C asexual reproduction resulting in no variation
D pollen and ova combine to produce identical seeds

36. Which row of the table shows the correct processes for the cloning of animals such as 'Dolly the sheep'?

	nucleus is removed from the donor body cell	**enucleated egg cell is inserted into surrogate**	**electric shock is given to start the embryo heart**
A	yes	yes	yes
B	no	yes	yes
C	yes	no	no
D	no	no	no

Genetically modified crop plants to be grown in secret

No GM food trials were undertaken in this country during 2008. More than 50 that have been conducted from 2000 to 2007 have been affected by vandalism. Opponents of GM benefit from current rules, which dictate that all trials must be disclosed on a Government website.

37. The trials of GM crops need to take place over many years.
The reason for this is that

A there may be problems in getting the GM crop plants to grow
B GM crop plants will always destroy natural species
C GM crop plants will never evolve into better species over time
D there may be unexpected problems which develop over time

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38. These are two statements about genetic modification of crops.

1 Plants can be genetically modified, using enzymes, to be resistant to weedkillers
2 Plant hormones are used to genetically modify dwarf wheat plants

Which are true?

A 1 only
B 2 only
C both 1 and 2
D neither 1 or 2

39. The production of designer babies causes some controversy.
Which statement is true?

A It is ethical to produce designer babies as only one embryo is produced
B Cloning is a method of producing designer babies
C Embryo screening could produce babies which do not carry a genetic disorder
D Designer babies can be produced without the mother having hormone treatment

40. Which row of the table is correct for designer babies?

	designer babies		
	are free from all disease	**have selected characteristics**	**are genetically modified**
A	yes	no	no
B	yes	no	yes
C	no	yes	no
D	no	yes	yes

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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Mark Scheme (Results)
November 2009

GCSE

360Science

GCSE Science
Multiple Choice Paper B1a (5005)

GCSE Biology
Multiple Choice Paper B1a (5025)

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November 2009

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5005 Science/ 5025 Biology (B1a)

Unit B1a – 5005/5025	
Topics 1 & 2	
1	C
2	B
3	A
4	D
5	C
6	A
7	B
8	B
9	B
10	C
11	B
12	B
13	C
14	D
15	A
16	B

Unit B1a – 5005/5025	
Topics 1 & 2	
17	C
18	B
19	B
20	C
21	B
22	C
23	D
24	B

Unit B1a – 5005/5025	
Topics 1 & 2	
25	A
26	C
27	A
28	C
29	B
30	C
31	A
32	C
33	D
34	B
35	C
36	C
37	D
38	A
39	C
40	C

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Edexcel GCSE

Science (5005)

Biology (5025)

B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 19 June 2009 – Morning

Time: 20 minutes

Materials required for examination	**Items included with question papers**
Multiple Choice Answer Sheet HB pencil, eraser and calculator	Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

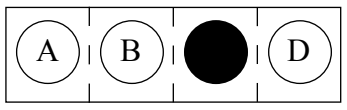
Foundation tier candidates: answer questions 1 – 24.
Higher tier candidates: answer questions 17 – 40.
All candidates are to answer questions 17 – 24.

Before the test begins:

Check that the answer sheet is for the correct test and that it contains your candidate details.

How to answer the test:

For each question, choose the right answer, A, B, C or D and mark it in HB pencil on the answer sheet.
For example, the answer C would be marked as shown.



Mark only **one** answer for each question. If you change your mind about an answer, rub out the first mark **thoroughly**, then mark your new answer.

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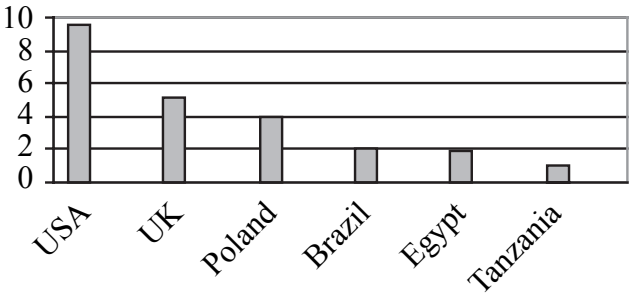
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

A global problem

Countries have a global footprint.
The bigger the global footprint, the more damaging the effect on the environment.
This graph, produced by computer modelling, shows the global footprint of six countries.

Use this graph to answer questions 1–2.



1. Which country causes the most damaging effect on the environment?

A Tanzania
B Brazil
C UK
D USA

2. What is the global footprint of Brazil?

A 9
B 4
C 2
D 1

3. The larger the population of a country, the larger its global footprint.
Which country would be most likely to have the smallest population size?

A USA
B Brazil
C Tanzania
D UK

4. What is a benefit of using computer models to study global footprints?

A Computers always give reliable results.
B Computers use large amounts of energy.
C Computers can process information very fast.
D Computers are now relatively cheap to buy.

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Crime scene investigations

5. Crime scene investigators can link people to crimes on the basis of genetic evidence.
A genetic fingerprint is

A a recessive allele
B a genetically modified organism
C an imprint of an index finger
D the DNA profile of an individual

6. A project has assisted in the process of genetic fingerprinting.
The project, which mapped the human genome, is known as the

A IVF
B MHG
C HGP
D DNA

7. Every individual has their own set of genes.
These genes code for characteristics such as eye colour.
The alleles for blue eyes are recessive to those for brown eyes.
A person with blue eyes will have

A two different genes for eye colour
B two of the same alleles for eye colour
C two different alleles for eye colour
D one gene for eye colour and one allele for eye colour

8. A person who has one allele for blue eyes and one allele for brown eyes will have

A brown eyes
B blue eyes
C one blue eye and one brown eye
D green eyes

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GloFish

GloFish are the first genetically modified organisms to be sold as pets.
GloFish have had a gene from a jellyfish inserted into them.
This causes them to glow in the dark.



9. The gene which causes GloFish to glow came from the

A nucleus of the jellyfish
B nucleus of the non-glowing fish
C cytoplasm of the jellyfish
D cytoplasm of the non-glowing fish

10. Genes are made of

A chromosomes
B alleles
C DNA
D enzymes

11. The gene is removed from the DNA of a jellyfish using

A hormones
B scissors
C gene therapy
D enzymes

12. GloFish would be at a disadvantage in the wild because

A they would be less easily seen by prey
B they would be unable to reproduce
C predators would be able to see them easily
D GloFish predators would be easily caught by GloFish

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Good winter for finches

Use this information to answer questions 13, 14 and 15.

The number of colourful birds called finches visiting UK gardens over winter is at its highest level for five years.
This was recorded by the Big Garden Bird Watch for the RSPB.
Finches mainly eat seeds and are sometimes eaten by cats, kestrels or red kites.

13. Which of these are herbivores?

A cats
B kestrels
C seeds
D finches

14. How many different predators are named in the information above?

A one
B three
C four
D five

15. One correct food chain for the information above is

A seeds → cats → finches
B seeds → finches → red kites
C finches → cats → red kites
D finches → red kites → kestrels

16. An increase in the number of finches is likely to cause

A an increase in the number of seeds
B a decrease in the number of red kites
C the number of cats to decrease
D the number of seeds to decrease

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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

The Great Bird Watch

Use the information below to answer questions 17–19.

The results of a survey show the average number of different types of birds per garden in Berkshire for January in 2007 and 2008.

bird type	January 2007	January 2008
Blue tit	2.86	2.46
Blackbird	1.82	2.26
Woodpigeon	2.00	2.09
Starling	2.07	2.08
House sparrow	2.66	2.04
Chaffinch	1.61	2.00
Robin	1.34	1.39
Great tit	1.34	1.36
Collared dove	1.35	1.29
Goldfinch	1.06	1.10

17. Based on this data, how many bird types declined in number in 2008?

A 3
B 5
C 7
D 10

18. What bird type increased by the most in 2008?

A Great tit
B Goldfinch
C Chaffinch
D Blackbird

19. How can you tell from the information provided that the numbers are averages?

A They counted the birds and divided by the number of gardens
B The numbers are not all whole numbers
C Averages are calculated for validity
D Averages are calculated for reliability

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20. The Great Bird Watch was carried out on the same weekend in January in both years. What is the reason for this?

A It is cold in January
B There are fewer birds in Berkshire in January
C To make the results comparable
D So they could average the results

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The earthworm

The earthworm has been around in the same form for at least 120 million years.



21. What evidence would scientists use to back up the fact that earthworms have been on Earth for at least 120 million years?

A Computer modelling of the earthworm life cycle
B Fossil evidence from 120 million years ago
C Genetic evidence from 120 million years ago
D Earthworms have very long life spans

22. Earthworms are a member of the phylum Annelida (segmented worms).
What kingdom do they belong to?

A Protoctista
B Chordata
C Mammalia
D Animalia

23. Annelids have segmented bodies and light sensitive cells.
These characteristics enable annelids to live in their selected environment.
These characteristics are known as

A mutations
B adaptations
C modifications
D variations

24. The information which codes for the characteristics of annelids is found in the DNA.
What is the shape of a DNA molecule?

A single spiral
B tubular
C double helix
D hexagon

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

Sampling

Jenny and David were investigating the number of species of plants on the school field. They used 1 m^2 quadrats (a square frame) to collect the data on the plants.



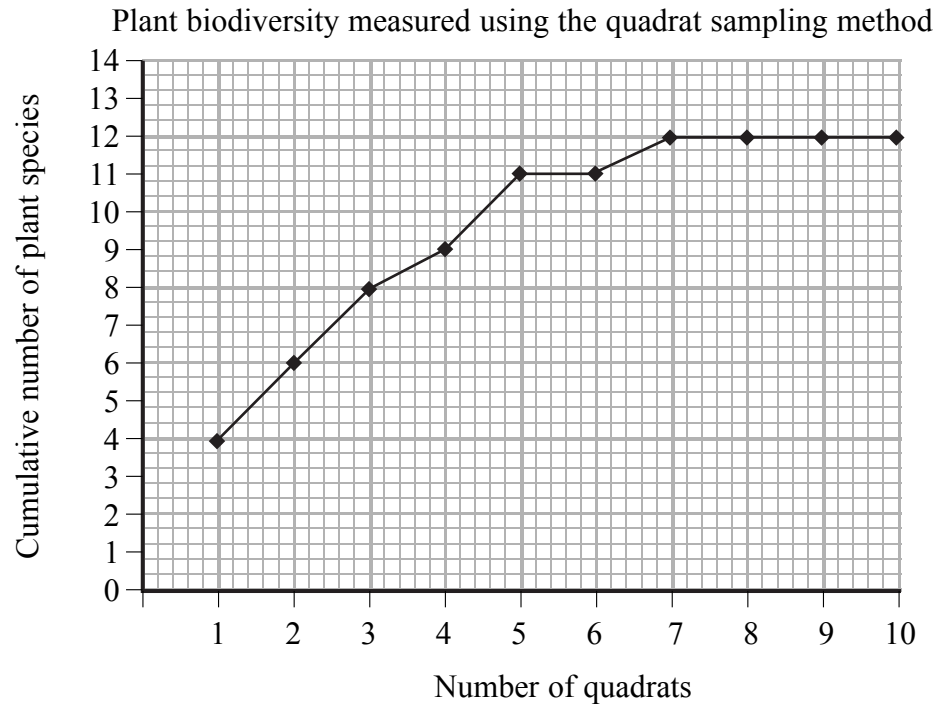
25. What would be the best method to collect valid data on the number of species?

A Place quadrats on the green areas of the field
B Place quadrats where there are more species
C Place quadrats randomly over the whole field
D Place quadrats around the edges of the field

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Use this graph to answer questions 26 and 27.

Jenny and David plotted a graph showing the **cumulative** number of plant species.
In quadrat 1 they found four species.
In quadrat 2 they found two new species so the **cumulative** number of species found was now six.



26. What was the number of **new** plant species found in quadrat 3?

A 2
B 4
C 8
D 12

27. What was the total number of plant species found?

A 10
B 12
C 14
D 22

28. Why are the number of plant species different in each sample taken?

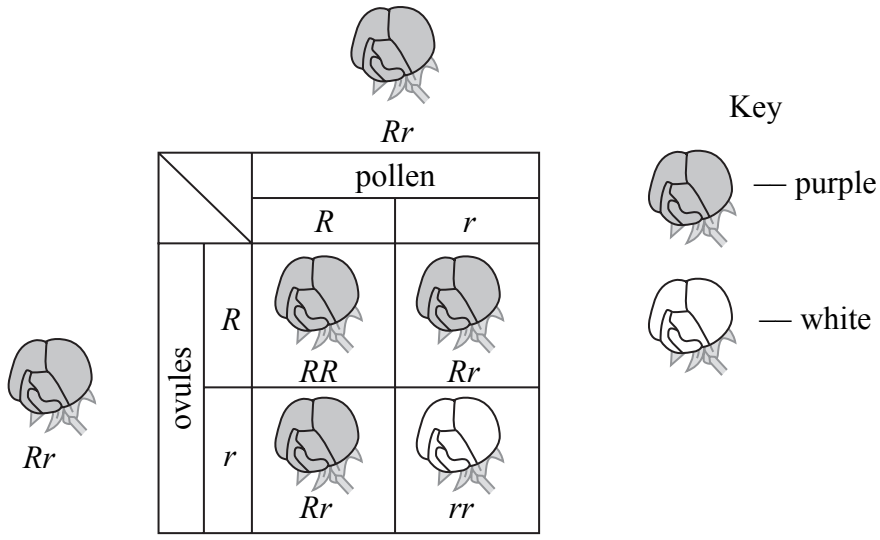
A The conditions across the field were identical
B There was intraspecific competition limiting the number of species
C There was interspecific competition between species
D The conditions varied and as a result there was no competition

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A gardener's problem

A gardener wanted to grow white roses.
He crossed two purple roses together and the results are shown.

Use this diagram to answer questions 29 and 30.



29. The parent plants in this cross were

A both homozygous dominant for flower colour
B both homozygous recessive for flower colour
C both heterozygous for flower colour
D one homozygous and one heterozygous for flower colour

30. The ratio of the offspring phenotypes for flower colour was

A 1:2:1
B 3:1
C 4:1
D 5:1

31. The gametes are contained in ovules and pollen.
This type of cross occurs in

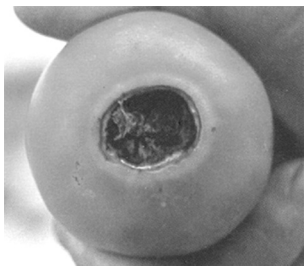
A asexual reproduction
B cloning
C genetic modification
D sexual reproduction

32. The gardener then crossed two white roses.
What is the most likely outcome of this cross?

A 100% purple flowers
B 50% purple flowers and 50% white flowers
C 75% white flowers and 25% purple flowers
D 100% white flowers

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Tomato plants hit by blossom end rot



Blossom end rot occurs in tomato plants.
This can be due to a lack of calcium ions in the soil.
It can also be a result of under-watering as the calcium ions from the soil are not transported through the plant.

33. Using the information above, blossom end rot is an example of

A environmental influence only
B genetic influence only
C both environmental and genetic influences
D neither environmental nor genetic influences

34. In supermarkets many organic tomatoes are on sale.
What is a reason for buying organic tomatoes?

A Organic tomatoes do not get blossom end rot
B Organic tomatoes do not have artificial pesticides sprayed on them
C Organic tomatoes always look better and taste better
D Organic tomatoes produce larger yields and so are cheaper

35. Tomato plants can be genetically modified.
The two statements are about the genetic modification of tomato plants.

1 Tomatoes can be genetically modified to be resistant to herbicides
2 Genetic resistance to herbicides is likely to give a bigger crop yield

Which of the statements are true?

A 1 only
B 2 only
C Both 1 and 2
D Neither 1 or 2

36. A valid concern about the genetic modification (GM) of food crops is that GM crops are likely

A to cause the food to rot more quickly
B to introduce new diseases
C to cause plants to produce a larger yield
D to cross pollinate with other plants

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Cow to give birth to a Gaur (a ox-like animal)



Scientists at Massachusetts Advanced Cell Technology have succeeded in cloning a Gaur, an ox-like animal, at threat of extinction in Southern Asia.
They used the 'Dolly the sheep' cloning technique 692 times using gaur skin cells and cows' eggs.
They succeeded in creating 81 embryos.
All of these cloned embryos were then implanted into cows, resulting in 8 pregnancies.
5 of these were miscarriages.
3 live births are expected.

37. What must be done to the cow's egg before the Gaur genetic material can be put into it?

A The egg must be stimulated with an electric shock
B The egg must be implanted into the surrogate
C The egg must be enucleated
D The egg must be fertilised

38. The success rate for this type of procedure is very low mainly because

A the 'Dolly the sheep' cloning technique does not work
B none of the embryos are viable
C the Gaur are threatened with extinction
D there are few viable pregnancies

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39. Some people object to this type of research on ethical grounds.

- Many embryos are produced of which few are viable
- Many eggs are used in the production of these embryos
- Animals may be distressed by the process
- Animals close to extinction may be saved by this method
- Humans may benefit from this type of research

How many of the statements are ethical reasons for objecting to this type of research?

A two only
B three only
C four only
D all five

40. Genetic research may help humans with genetic diseases.
Treatment for these diseases could be done using gene therapy.
Gene therapy can result in the

A removal of the faulty gene from the gametes
B complete removal of the faulty gene from all body cells
C replacement of the faulty gene to alleviate the symptoms of the disease
D prevention of genetic diseases in future generations

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

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GCSE 360Science

Science (2101)
Additional Science (2103)
Biology (2105)
Chemistry (2107)
Physics (2109)

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Mark Schemes for Multiple Choice Papers

Science 5005 / Biology 5025 (B1a)

Unit B1a - 5005/5025	
Topics 1 & 2	
1	D
2	C
3	C
4	C
5	D
6	C
7	B
8	A
9	A
10	C
11	D
12	C
13	D
14	B
15	B
16	D

Unit B1a - 5005/5025	
Topics 1 & 2	
17	A
18	D
19	B
20	C
21	B
22	D
23	B
24	C

Unit B1a - 5005/5025	
Topics 1 & 2	
25	C
26	A
27	B
28	C
29	C
30	B
31	D
32	D
33	A
34	B
35	C
36	D
37	C
38	D
39	B
40	C

Science 5006 / Biology 5026 (B1b)

Unit B1b - 5006/5026	
Topics 3 & 4	
1	C
2	D
3	A
4	B
5	C
6	A
7	D
8	A
9	C
10	B
11	D
12	D
13	A
14	C
15	B
16	A

Unit B1b - 5006/5026	
Topics 3 & 4	
17	B
18	D
19	C
20	A
21	A
22	C
23	A
24	B

Unit B1b - 5006/5026	
Topics 3 & 4	
25	C
26	C
27	A
28	A
29	D
30	D
31	B
32	C
33	D
34	C
35	B
36	A
37	C
38	A
39	C
40	C

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Paper Reference(s)

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Edexcel GCSE

Science (5005)

Biology (5025)

B1a – Topics 1 and 2

Foundation and Higher Tier

Friday 6 March 2009 – Morning

Time: 20 minutes

Materials required for examination
Multiple Choice Answer Sheet
HB pencil, eraser and calculator

Items included with question papers
Nil

Instructions to Candidates

Use an HB pencil. Do not open this booklet until you are told to do so.
Mark your answers on the separate answer sheet.

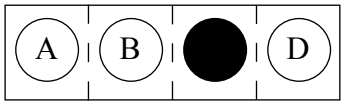
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Questions 1 to 16 must be answered by Foundation tier candidates only.
Higher tier candidates start at question 17.

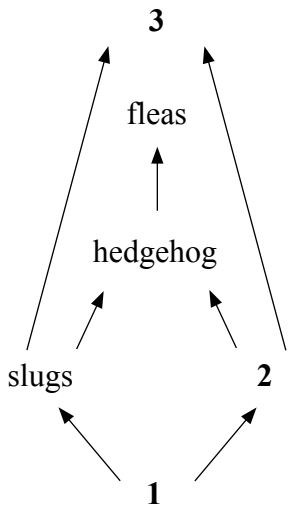
In the garden

David made a pile of dead leaves in his garden.
Worms and slugs feed on these dead leaves.
Birds and hedgehogs eat worms and slugs.
Hedgehogs are covered in fleas which feed on the hedgehogs' blood.

1. Which of the following shows a correct food chain in the garden?

A fleas → hedgehogs → slugs → dead leaves
B dead leaves → worms → hedgehogs → birds
C dead leaves → slugs → hedgehogs → fleas
D worms → hedgehogs → fleas → birds

2. The diagram shows a food web from the garden.

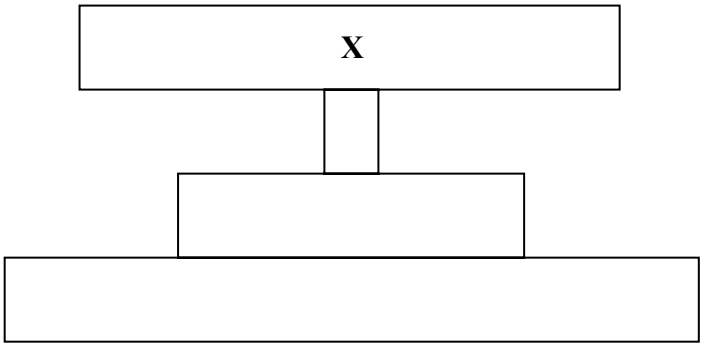


Which row of the table shows the names of organisms **1**, **2** and **3** in the food web?

	organism		
	1	**2**	**3**
A	worms	dead leaves	birds
B	dead leaves	birds	worms
C	birds	worms	dead leaves
D	dead leaves	worms	birds

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3. This is a correct pyramid of numbers for the garden



X is

A birds
B fleas
C slugs
D worms

4. A fox started visiting the garden.
The fox eats some of the birds and hedgehogs in the garden.
The fox is a

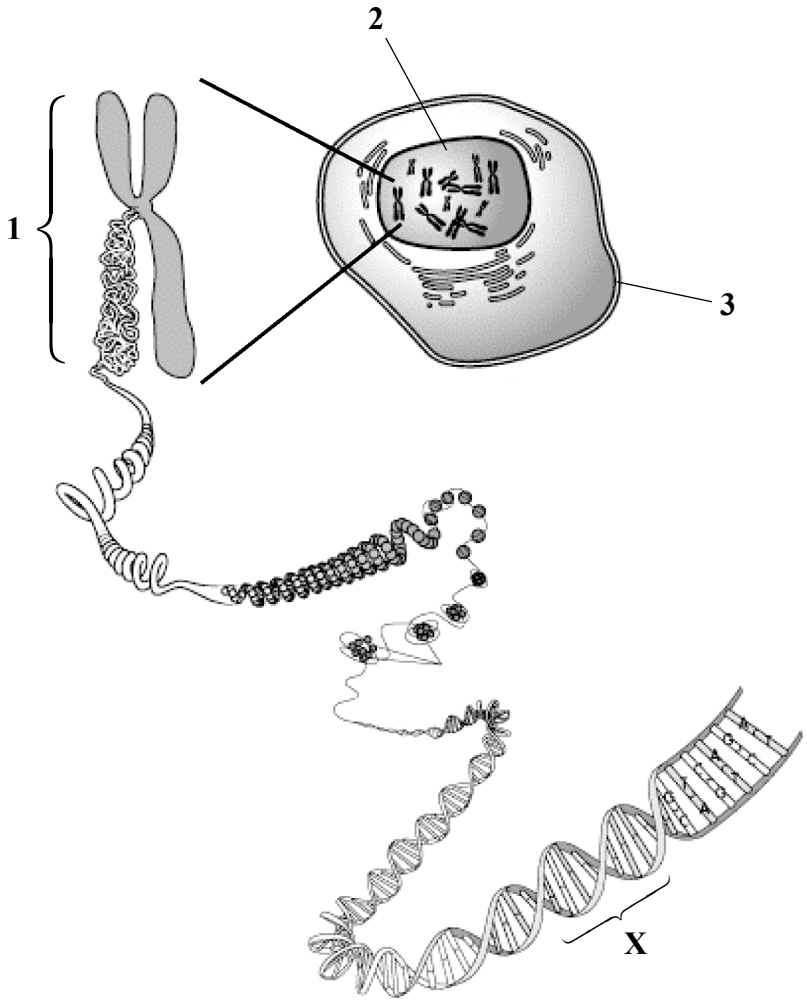
A producer
B predator
C herbivore
D prey

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Animal cells

Our body is made up of different cells.
Each cell contains structures that help to keep the cell alive.

Use the information from the diagram to answer questions 5 and 6.



5. Which row of the table correctly names parts 1 to 3 of the cell?

	part of the cell		
	1	**2**	**3**
A	chromosome	cell membrane	nucleus
B	nucleus	chromosome	cell membrane
C	chromosome	nucleus	cell membrane
D	cell membrane	nucleus	chromosome

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6. Part **X** on the diagram shows a unit of inheritance.
A unit of inheritance is

A a gene
B dominant
C recessive
D a gamete

7. Some organisms produce clones.
Clones are

A identical to both parents
B identical to neither parent
C identical to one parent
D identical to another species

8. Some people carry alleles that cause disease.
An allele is

A a chromosome
B a disease
C an alternative form of a chromosome
D an alternative form of a gene

Classifying organisms

A new species has been discovered in the dry forests of Madagascar.
The new species has wings and can fly, it gives birth to live young and is covered in body hair.



9. The new species is a

A mammal
B bird
C reptile
D amphibian

10. The new species sleeps on broad, slippery green leaves.
Which adaptation would enable the new species to survive in this habitat?

A white hair
B suckers on its feet
C short tail
D webbed feet

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11. Selective breeding can be used to produce animals with desired characteristics.
Another method used by humans to produce animals with desired characteristics is

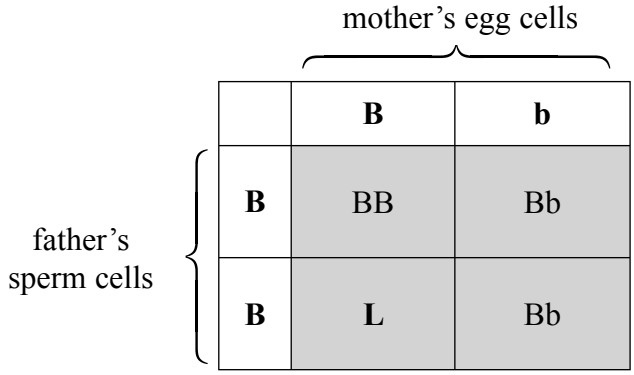
A natural selection
B evolution
C genetic engineering
D classification

12. Modern horses are called *Equus callabus.*
Fossils of earlier horses include *Equus scotti* and *Equus stenonis.*
These horses do **not** belong to the same

A class
B order
C species
D genus

Inheriting characteristics

The Punnett square shows how eye colour is inherited in a family.
The mother's egg cells contain either the allele for brown eyes (**B)** or the allele for blue eyes (**b**).
All of the father's sperm cells contain the allele for brown eyes (**B**).



13. Which of the following is missing from box **L** in the diagram?

A BB
B Bb
C bB
D bb

14. The four shaded boxes show the

A parent phenotype
B parent genotype
C offspring phenotype
D offspring genotype

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15. The type of reproduction indicated by the Punnett square is

A artificial
B asexual
C sexual
D selective

16. The information in the Punnett square shows that the mother has

A two blue eyes
B one brown eye and one blue eye
C two bluish-brown eyes
D two brown eyes

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Higher tier candidates start at question 17 and answer questions 17 to 40.
Questions 17 to 24 must be answered by all candidates: Foundation tier and Higher tier.

Endangered species



One fifth ($\frac{1}{5}$) of the 259 species of birds in Britain are on the endangered list.
Research suggests that more than 1,000 species of other animals and plants could also become extinct.

17. Approximately how many species of birds are on the endangered list?

A 5
B 52
C 207
D 1295

18. To find out if a species is endangered, scientists must do a survey.
They must be sure that their data is valid.
They must collect data on the total number of

A males and females within the species
B females only within the species
C males only within the species
D individuals regardless of their gender

19. To be sure that the data is reliable the scientists must do the survey

A several times within a single habitat
B once only within a single habitat
C several times in several habitats
D once only in several habitats

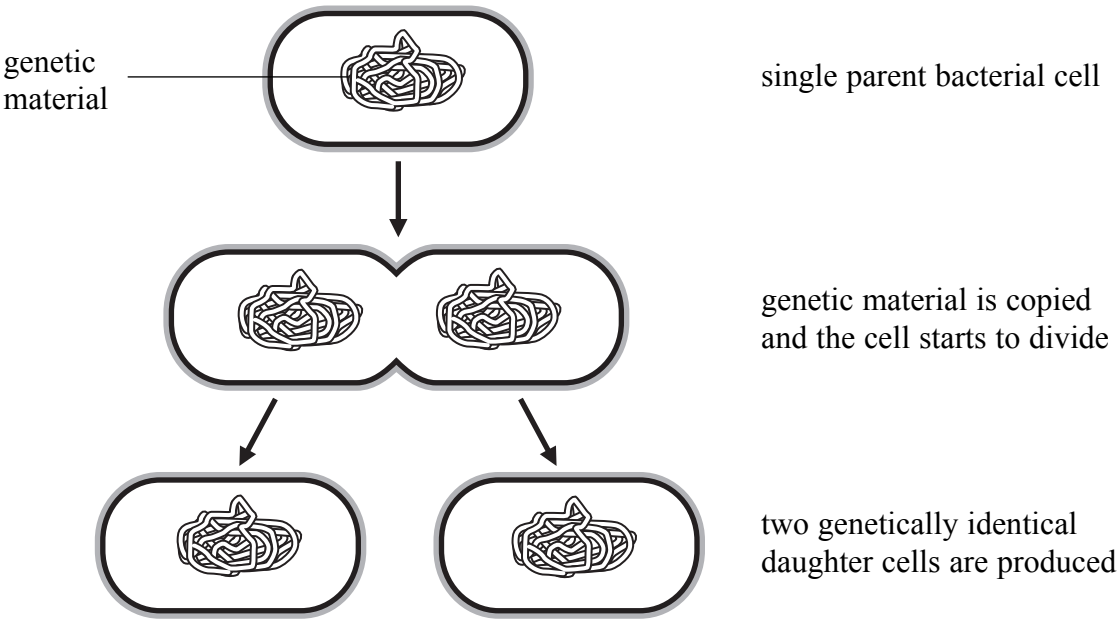
20. Scientists used a computer model to study the effects of a fungal disease on a population of birds.
Computer modelling can be unreliable when it

A predicts changes that occur over a long period very quickly
B includes information on other organisms in the environment
C takes too long to re-run the computer model
D does not include information on all of the changes that will affect population size

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Mutations

Bacteria reproduce by a process called binary fission.
The diagram shows how this process is carried out.



21. This method of producing offspring involves

A sexual reproduction
B asexual reproduction
C artificial selection
D genetic modification

22. Cell division involves mitosis.
Mitosis produces

A 2 haploid daughter cells
B 4 haploid daughter cells
C 2 diploid daughter cells
D 4 diploid daughter cells

23. The genetic material in bacteria can mutate.
A mutation in one of the daughter cells would mean that this daughter cell is a

A clone of the parent cell
B variant of the parent cell
C clone of the other daughter cell
D gamete of the parent cell

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24. The population size of the mutated cells is greater than the population size of the non-mutated cells because

A the non-mutated cells have evolved
B the mutated cells are better adapted to the environment
C the mutated cells reproduce less rapidly
D the non-mutated cells compete more successfully for resources

TOTAL FOR FOUNDATION TIER PAPER: 24 MARKS

Foundation tier candidates do not answer any more questions after question 24.

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Questions 25 to 40 must be answered by Higher tier candidates only.
Foundation tier candidates do not answer questions 25 to 40.

A long voyage

During his world voyage, Charles Darwin made observations that led him to write 'On the origin of species'.



25. During his voyage Darwin collected evidence by observing

A the physical appearance of different organisms only
B the physical appearance of different fossils only
C the physical appearance of different organisms and the appearance of fossils
D the physical appearance and behaviour of different organisms and the appearance of fossils

26. On the Galapagos Islands Darwin found many species of finches that had different shaped beaks.
Darwin suggested that species with different shaped beaks evolved from one common ancestor.
This was due to the availability of

A different types of food
B different nesting sites
C mates
D water

27. Darwin stated that natural selection is necessary for evolution.
Natural selection is when organisms with

A only genetic mutations survive to breed
B only dominant genes survive to breed
C the best adaptations survive but do not breed
D the best adaptations survive to breed

28. Darwin published his book 'On the origin of species' and some people were upset.
This was because the book stated that

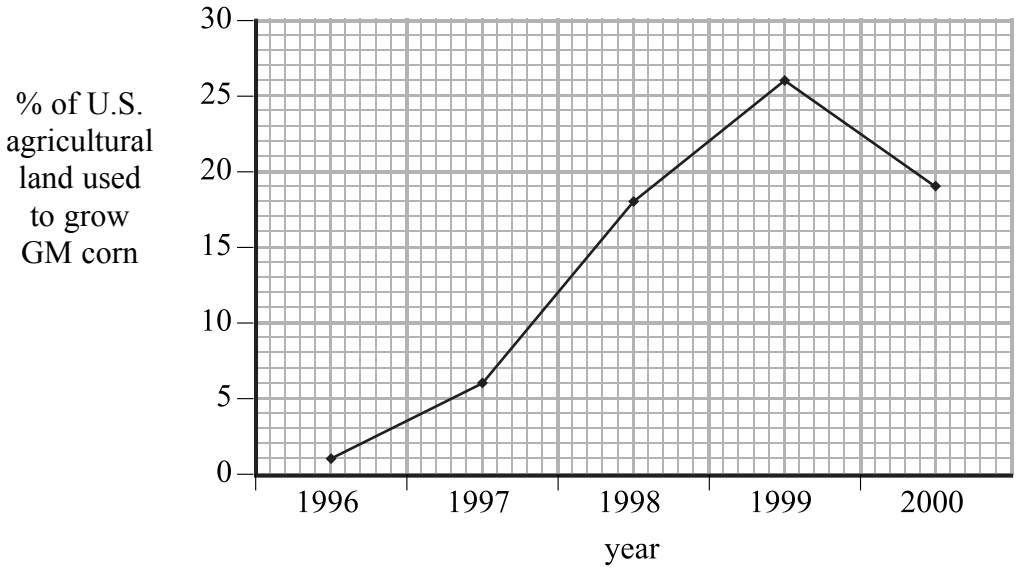
A humans evolved from Adam and Eve
B humans evolved from apes
C humans and apes had common ancestors
D humans and apes evolved from a single cell

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Modifying organisms

The United States (U.S.) produces 40% of the world's corn.
A certain amount of this corn is genetically modified to make it resistant to pests that destroy the crops.

The graph shows how the percentage of U.S. agricultural land used to grow GM corn has changed over time.



29. The graph shows that the percentage of agricultural land used to grow GM corn

A increased most rapidly between 1996 and 1997
B increased steadily from 1996 but dropped by 8% between 1999 and 2000
C was three times greater in 1998 than in 1997
D doubled between 1996 and 1997

30. Corn is genetically modified by inserting foreign genes into its genome.
This is carried out using

A plasmids and enzymes
B plasmids and hormones
C hormones and enzymes
D hormones, plasmids and enzymes

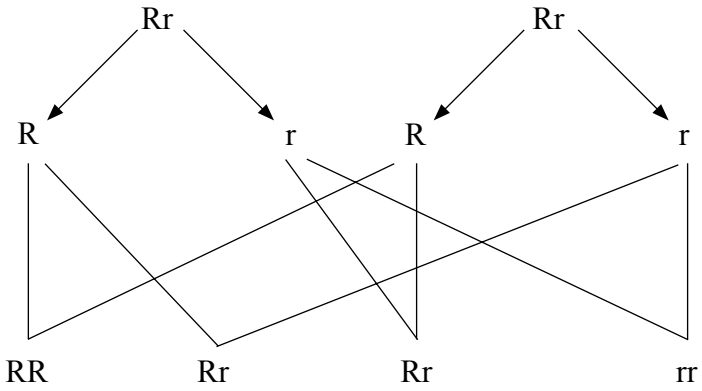
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31. Which of the statements below give a valid reason why the U.S. might genetically modify their crops?

1 GM crop yields are greater than yields produced from non-GM varieties
2 GM crops are organic which removes the need for chemical pesticides that harm the environment

A 1 only
B 2 only
C 1 and 2
D neither

32. The genetic diagram shows how GM crops might transfer their genes to their offspring. The allele, R, represents resistance to pesticide and the allele, r, represents non-resistance.

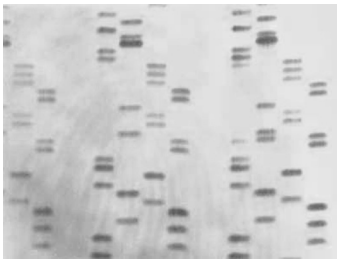


The genetic diagram shows that

A both parent plants are homozygous for the pesticide resistance
B 25% of the offspring have the same genotype as the parent plants
C 50% of the offspring have a heterozygous genotype
D 75% of the offspring have a homozygous genotype

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Getting personal



First the Human Genome Project (HGP), now the Personal Genome Project (PGP).
The PGP means that you can have your DNA sequenced.
You can find out about your health, now and in the future, and about what time of day you work best.

33. PGPs are likely to cause some concern.
The reason for this is most likely to be because personal information could be

A used by doctors to prescribe appropriate drugs
B used by scientists to personalise medicine
C used by couples to find out what colour eyes their child is likely to have
D used by insurance companies to refuse life insurance

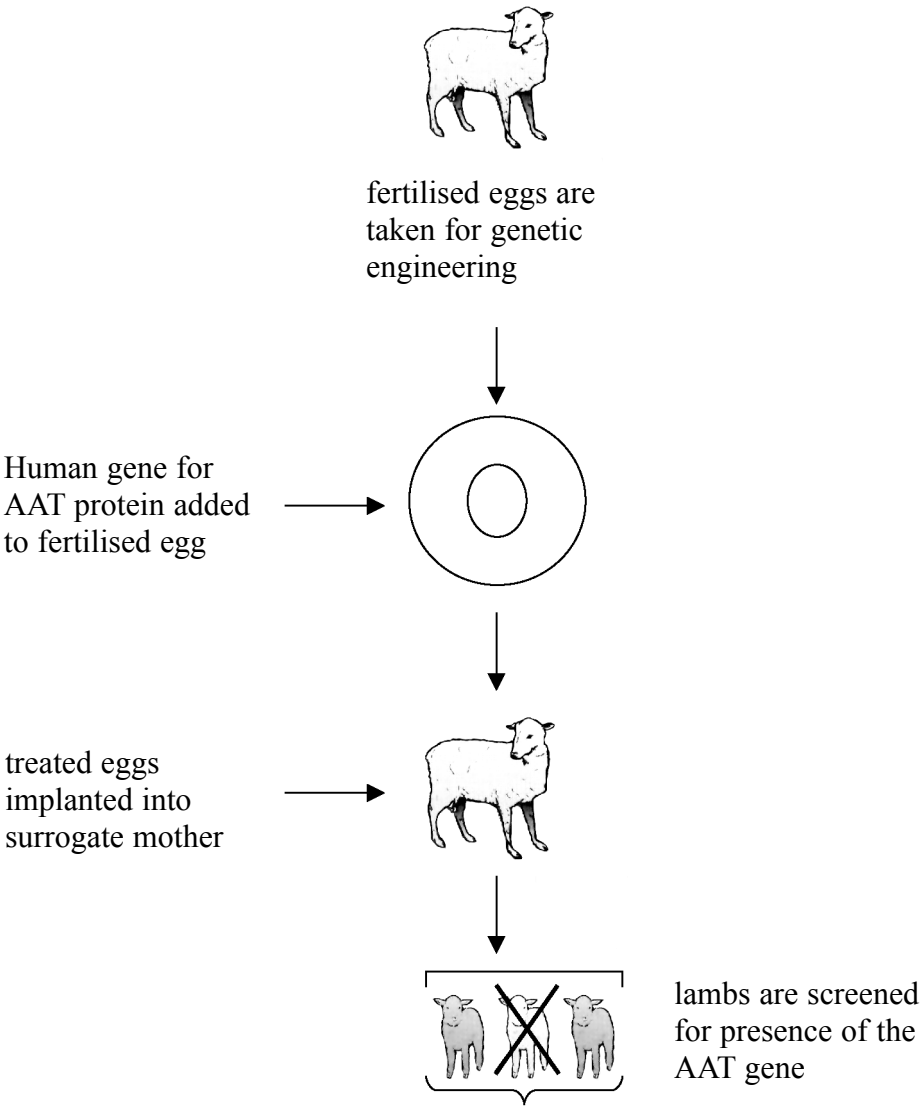
34. A PGP will enable you to find out whether you carry a genetic disease.
Cystic fibrosis (CF) is a homozygous recessive disorder that is inherited.
This means that for a child to inherit CF

A only one parent has to carry the faulty allele
B both parents need to carry at least one faulty allele
C both parents need to carry two faulty alleles
D only one parent has to carry two faulty alleles.

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Some GM sheep produce milk containing a human gene called AAT.
This gene produces a protein that can be used to treat the symptoms of CF.

The diagram shows how sheep can be genetically modified to contain the human AAT gene.



35. The final stage in the process to obtain the AAT protein is

A shear the lambs and extract the AAT from the wool
B kill the lambs and extract the AAT from the blood
C kill the lambs and extract the AAT from the milk
D allow the lambs to grow and breed, then extract the AAT from the milk

36. Sheep that produce AAT in their milk are known as

A transgenic
B designer
C surrogates
D transplants

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The health of the nation

The Body Mass Index (BMI) is used to determine whether an individual is obese.



A survey carried out between 1996 and 2003 collected data on the BMI of children between the ages of 2 and 10.
The table shows the results.

BMI status	survey year							
	1996	1997	1998	1999	2000	2001	2002	2003
obese	9.9%	10.6%	10.9%	11.6%	13.4%	13.1%	15.5%	13.7%
overweight including obese	22.7%	23.1%	23.4%	25.2%	26.6%	27.9%	28.7%	27.7%

37. The table shows that

A the percentage of obese children has risen annually between 1996 and 2003
B the percentage of overweight including obese children follows the same trend as the percentage of obese children between 1996 and 2003.
C there are two years when the percentage of obese children is lower than the previous year
D there is generally a greater percentage of obese children than overweight children.

38. In which two consecutive years are the percentage of overweight children the same?

A 1996 and 1997
B 1997 and 1998
C 1998 and 1999
D 1999 and 2000

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39. The following statements give possible reasons for the decline in obesity between 2002 and 2003.

1 healthy eating programmes were introduced
2 1.8% fewer children were included in the survey

Which statements could be a reason for the decline in obesity during this period?

A 1 only
B 2 only
C both 1 and 2
D neither 1 nor 2

40. The survey also found out that 19.8% of overweight or obese children had parents that were either overweight or obese.
What can be concluded from this data?

A that obesity is inherited
B that obesity is inherited but there is an environmental influence
C that obesity is influenced only by the environment
D no definite conclusion can be made

TOTAL FOR HIGHER TIER PAPER: 24 MARKS

END

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5005 / 5025 (B1a)

Unit B1a – 5005/5025	
Topics 1 & 2	
1	C
2	D
3	B
4	B
5	C
6	A
7	C
8	D
9	A
10	B
11	C
12	C
13	A
14	D
15	C
16	D

Unit B1a – 5005/5025	
Topics 1 & 2	
17	B
18	A
19	C
20	D
21	B
22	C
23	B
24	B

Unit B1a – 5005/5025	
Topics 1 & 2	
25	D
26	A
27	D
28	C
29	C
30	A
31	A
32	C
33	D
34	B
35	D
36	A
37	C
38	B
39	A
40	D

5006 / 5026 (B1b)

Unit B1b – 5006/5026	
Topics 3 & 4	
1	A
2	B
3	C
4	A
5	A
6	C
7	A
8	C
9	C
10	B
11	D
12	A
13	A
14	A
15	B
16	C

Unit B1b – 5006/5026	
Topics 3 & 4	
17	D
18	B
19	A
20	B
21	A
22	D
23	A
24	B

Unit B1b – 5006/5026	
Topics 3 & 4	
25	D
26	B
27	A
28	C
29	C
30	B
31	D
32	C
33	C
34	D
35	B
36	A
37	A
38	C
39	A
40	C