Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

GCSE

A161/02

TWENTY FIRST CENTURY SCIENCE

BIOLOGY A

Modules B1 B2 B3 (Higher Tier)

THURSDAY 12 JANUARY 2012: Morning
DURATION: 1 hour

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (RW/JG) 12MPE01166 56981

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the front page. Please write clearly and in capital letters.**
- **Use black ink. HB pencil may be used for graphs and diagrams only.**
- **Answer ALL the questions.**
- **Read each question carefully. Make sure you know what you have to do before starting your answer.**
- **Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).**

INFORMATION FOR CANDIDATES

- **Your quality of written communication is assessed in questions marked with a pencil (✎).**
- **The number of marks is given in brackets [ ] at the end of each question or part question.**
- **The total number of marks for this paper is 60.**

Answer ALL the questions.

1 All humans have different phenotypes.

(a) Put a tick (✓) in the box next to the statement below that best explains the word phenotype to complete the following sentence:

Phenotype describes the …… an organism has.

… genes …	
… number of cells …	
… nuclei …	
… characteristics …	
… chromosomes …	

[1]

(b) Genetic differences in humans are caused by genes.

Each gene has more than one allele.

Draw a straight line to link each DESCRIPTION of alleles, on the left, with its correct DEFINITION, on the right.

DESCRIPTION	DEFINITION
	has more than two alleles for a gene
homozygous	
	the alleles for the gene are the same
heterozygous	
	each chromosome has two alleles
	the alleles for a gene are different
	each cell has a different allele

[2]

(c) The Punnett square below shows the inheritance of a characteristic caused by a recessive allele g.

	G	g
G	GG	Gg
g	Gg	gg

(i) Write down the genotype of a carrier.

answer = _____ [1]

(ii) Write down the genotype that will show the characteristic.

answer = _____ [1]

[Total: 5]

2 Some disorders are inherited.

One of these disorders is Huntington's disease.

(a) Complete the sentences below to show how Huntington's disease is inherited.

Put a (ring) around the correct word to complete each sentence.

Huntington's disease is caused by a change in

ONE

TWO

MULTIPLE gene(s).

Only one faulty allele is required to cause the disease, because the allele is

DOMINANT.

RECESSIVE.

POWERFUL.

WEAK. **[2]**

(b) Genetic testing can be used for screening adults, children and embryos.

Describe uses of genetic testing and the implications of these tests for these people.

The quality of written communication will be assessed in your answer.

_____

_____

_____

_____

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_____

_____

_____ **[6]**

(c) Genetic testing is viewed differently by different people.

Write down ONE argument for and ONE argument against genetic testing.

_____

_____

_____

_____ **[2]**

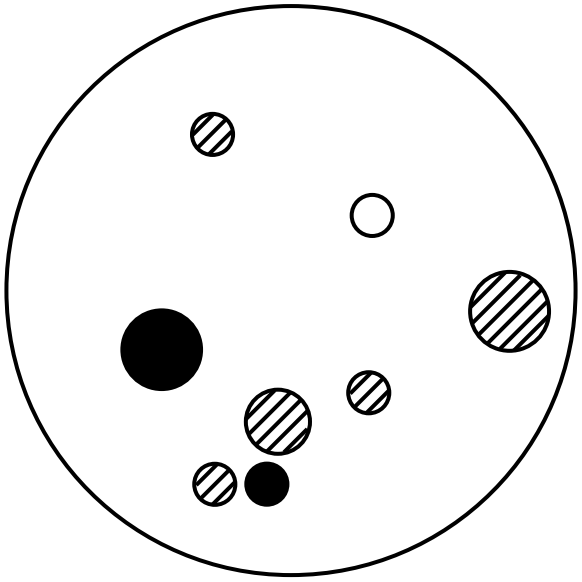
[Total: 10]

3 Microorganisms can cause disease.

They can reproduce rapidly.

A single bacterium will divide many times to form a colony.

(a) Bacteria are added to a Petri dish. The dish is sealed. After 24 hours the dish contains several COLONIES of bacteria.



(i) What is the smallest number of bacteria that could have been present in the Petri dish at the start of the 24-hour period?

answer = _____ [1]

(ii) A single bacterium can divide every 20 minutes.

One of the colonies has 4096 bacteria.

Calculate how long this colony has been growing.

Show your working.

answer = _____ [2]

(iii) A similar colony takes longer than expected to grow to 4096 bacteria.

Which of these statements are possible reasons why?

Put ticks (✓) in the boxes next to the possible reasons.

The Petri dish is too large.	☐
There is a shortage of food.	☐
They were left for too long.	☐
There were not enough bacteria to start with.	☐
The temperature has been reduced.	☐

[2]

(b) A student studies two strains of bacteria. The graphs, Insert, show the number of bacteria in three flasks over a period of time.

(i) Describe the effect on the number of bacteria after adding penicillin to FLASK C.

_____

_____

_____ **[2]**

(ii) The student drew these conclusions ONLY from information in the three graphs. Assume the vertical axis of each graph has the same scale.

1 After 2 hours there were more bacteria in FLASK B than in FLASK A.
2 The growth rate of bacteria in FLASK A was greatest at about 3 hours.
3 Resistant bacteria grew slower than non-resistant bacteria because they had less food.
4 After six hours, FLASK C mostly contained resistant bacteria.
5 The growth rate of bacteria in FLASK C increased after 5 hours because strain R– had become resistant to the penicillin.

Which of the student's conclusions could be correctly drawn from the graphs?

Choose from 1, 2, 3, 4 and 5 above.

answer = _____ **[2]**

(iii) Another student said that the results for FLASK C clearly show why patients should complete a course of antibiotics.

State whether the student was correct. Explain your answer.

_____

_____

_____

_____

_____ **[3]**

[Total: 12]

4 Vaccinations help prevent disease.

(a) Edward Jenner discovered the first vaccine.

Read the article about Edward Jenner then answer the following questions.

EDWARD JENNER 1749 – 1823

Edward Jenner discovered the first vaccine in 1796. He noticed that milk maids who caught the mild disease of cowpox never caught the deadly disease of smallpox. He thought that cowpox must give protection against smallpox. To test his idea he injected a small boy called James Phipps with pus from a milk maid who had cowpox. James caught cowpox. When James had recovered, he injected James with pus from a person who had smallpox. This would normally have resulted in James getting smallpox, but he did not. Edward Jenner had used cowpox pus to invent the first vaccine.

(i) Using ideas about vaccines, explain how Jenner's treatment prevented James Phipps from getting smallpox.

The quality of written communication will be assessed in your answer.

_____

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_____ **[6]**

(ii) Use the example in the article to describe a correlation between a factor and an outcome.

_____

_____ **[1]**

(iii) Explain the ethical issue that was involved in the article about Edward Jenner.

_____

_____

_____ **[2]**

(iv) One common argument is that the right decision is the one that leads to the best outcome for the greatest number of people involved.

Explain why Jenner's work is an example of this.

_____

_____

_____ **[1]**

(v) If scientists were developing this vaccine today, how would their methods be different from Jenner's?

_____

_____

_____ **[1]**

(b) To prevent epidemics of infectious disease it is necessary to vaccinate a high percentage of the population.

The more infectious the disease, the greater the percentage of the population that needs to be vaccinated.

Explain why.

_____

_____

_____

_____

_____ **[2]**

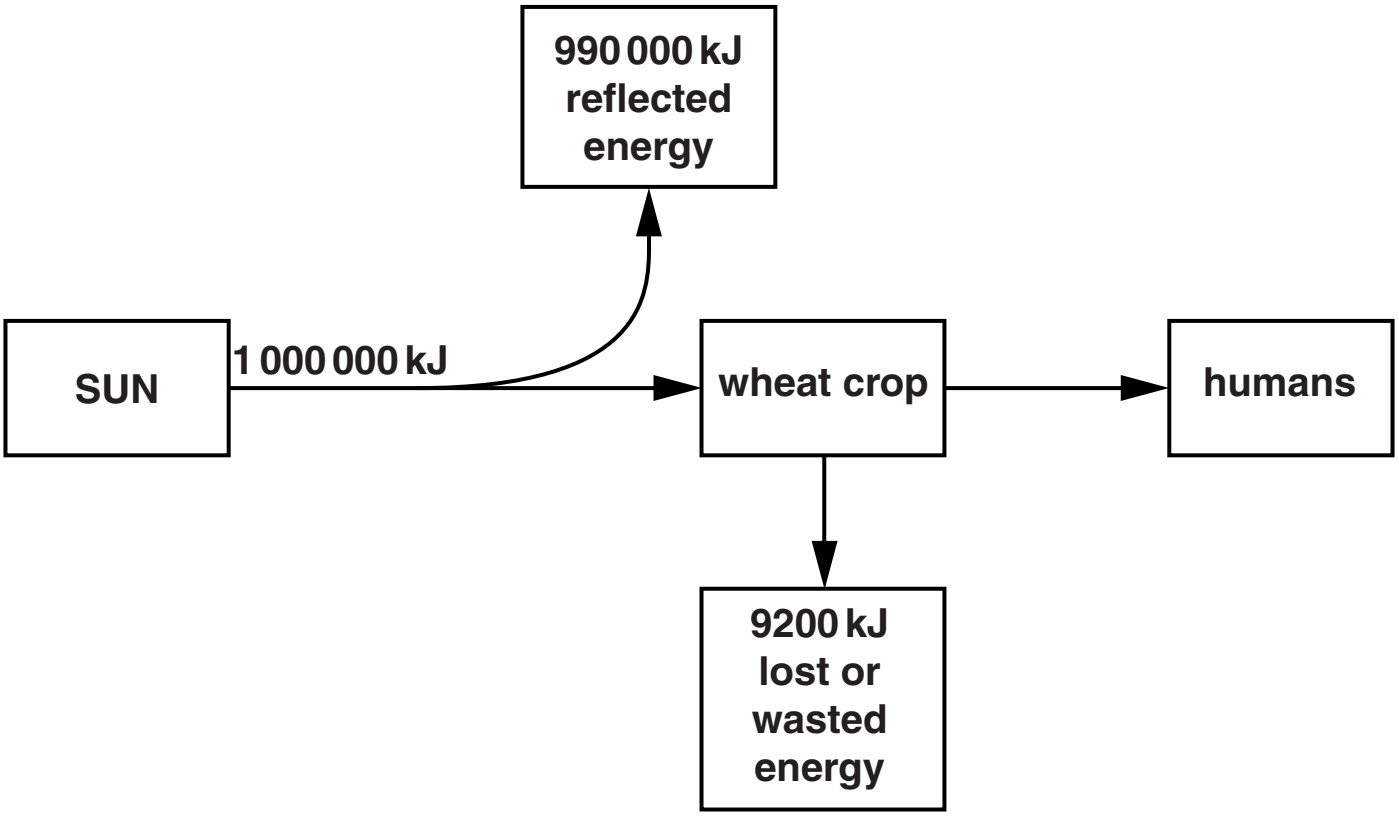
(c) Explain why vaccinations can never be completely risk free.

_____

_____ **[1]**

[Total: 14]

5 Energy flows through food chains.



(a) Look at the energy flow chart.

(i) Calculate how much energy in the wheat is passed to humans.

Show your working.

answer = _____ kJ [2]

(ii) Calculate the percentage efficiency of the energy transfer from the wheat crop to humans.

Show your working.

answer = _____ % **[2]**

(b) Vegetarians do not eat meat. Use your answers to part (a) and your knowledge of food chains to help you to evaluate the sustainability of vegetarianism compared to eating meat.

_____

_____

_____

_____

_____ **[3]**

[Total: 7]

6 Nitrogen is recycled through the environment.

Explain how the process takes place.

A space has been left for you below to draw a diagram as part of your explanation.

The quality of written communication will be assessed in your answer.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

[Total: 6]

7 Biodiversity and sustainability are important for life on Earth.

(a) Explain what is meant by BIODIVERSITY.

_____

_____

_____ **[2]**

(b) Write down TWO reasons why biodiversity is important.

1 _____

_____

2 _____

_____ **[2]**

(c) Explain what is meant by SUSTAINABILITY.

_____

_____

_____ **[2]**

[Total: 6]

END OF QUESTION PAPER

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