AQA Please write clearly in block capitals. Centre number Candidate number Surname Forename(s) Candidate signature

Level 3 Certificate/Extended Certificate APPLIED SCIENCE

Unit 3 Science in the Modern World

Friday 25 January 2019

Afternoon

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a clean copy of pre-release Sources A, B, C and D
- a calculator.

Instructions

- Use black ink or black ball-point pen.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do **not** write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- You will be provided with copies of pre-release **Sources A**, **B**, **C** and **D**.
- There are two sections in this paper Section A and Section B.
- You should answer all questions in each section.
- You should spend approximately 1 hour on Section A and 30 minutes on Section B.
- The marks for questions are in brackets.
- The total marks for this paper is 60.

Advice

Read each question carefully.



For Exam	iner's Use
Question	Mark
1	
2	
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11	
12	
TOTAL	

		Do not write
	Section A	outside the box
	This section is based on Sources A , B , C and D .	
	Answer all questions in this section.	
0 1	Source A suggests that the development of a system called CRISPR-Cas9 has 'sparked a lot of concern about the creation of designer babies'.	
0 1.1	Source A describes the CRISPR-Cas9 system as a 'copy and paste' tool for DNA.	
	Explain why the CRISPR-Cas9 system is described as a 'copy and paste' tool for DNA.	
	[2 marks]	
01.2	One concern is that the human embryos used in the research could be implanted into a woman.	
	Source A reassures people that this will not be allowed to happen.	
	Which of the statements below does Source A use to reassure people that these embryos will not be implanted into a woman?	
	Tick (✓) one box.	
	[1 mark]	
	Embryos from IVF treatments will be used.	
	Embryos must be destroyed within 14 days.	
	Only one group of scientists has permission for this research.	
	Research ethics approval is required.	3



0 2	Source A suggests that the development of healthy human embryos is still an area	Do not write outside the box
	that is poorly understood by scientists.	
	Calculate the percentage of implanted eggs that continue to develop in the womb beyond 3 months.	
	Use information from Source A.	
	[2 marks]	
	Percentage =	2
03	Source B describes a procedure called germline genetic engineering used by a US scientist called Shoukhrat Mitalipov.	
0 3 1	How is germline genetic engineering described in Source B ?	
	[2 marks]	
0 3 2	How might germline genetic engineering benefit families? [1 mark]	
		3
	Turn over for the next question	



Turn over ►

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0 4	According to Source B , Mitalipov's study was similar to other studies by sci such as Kathy Niakan. However, in many ways Mitalipov's study was 'a momeaningful use of this technology'.	
04.1	Mitalipov and Niakan are both scientists who study genes.	
	Give the name for the type of scientist who studies genes.	[1 mark]
04.2	Give two ways that Mitalipov's study was similar to Niakan's study.	
	Use information from Source B .	[2 marks]
	1	
	2	
04.3	Describe one way that Mitalipov's study was different from Niakan's study.	
	Use information from Source B .	[1 mark]



5

0 5	Suggest why the author of Source B made reference to cosmetic surgery in their argument.	Do not write outside the box
	[3 marks]	
		3
06	Source B describes 'mosaicism' as a problem when you use germline genetic engineering.	
	Use Source B to answer the following questions.	
06.1	What is mosaicism?	
	[1 mark]	
06.2	When does mosaicism occur?	
	[1 mark]	
06.3	How did Mitalipov reduce mosaicism in his study? [1 mark]	
		3
	Turn over for the next question	

0 5

Turn over ►

0 7	Source C is an article from <i>National Geographic</i> magazine. Source C has not been peer reviewed.	Do not write outside the box
0 7.1	Describe the process of peer review. [3 marks]	
07.2	Suggest one reason why Source C would not be required to undergo the process of peer review. [1 mark]	
07.3	Suggest one reason why <i>National Geographic</i> magazine might want to include the opinions of two different authors. [1 mark]	
		5



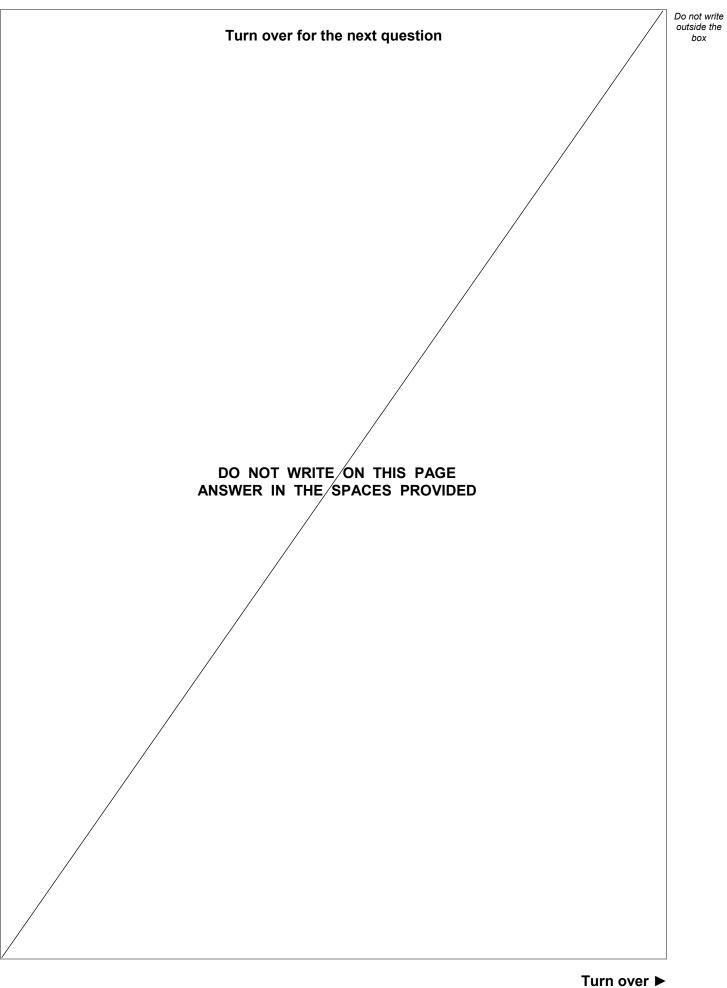
0 8	Source C discusses the future of gene editing.	Do not write outside the box
0 8.1	Source C includes data on children born each year with genetic defects.	
	Calculate the total number of children born worldwide per year to the nearest million .	
	Use data from Source C .	
	[2 marks]	
	Total number of children born worldwide = million	
08.2	Gene editing is one method that parents could use to avoid transmitting an inherited disease. One of the authors in Source C discussed two other methods.	
	Give the two other methods that could be used. [2 marks]	
	1	
	·	
	2	
08.3	According to Source C , there are social and political questions to answer before allowing gene editing in human embryos.	
	An example of a political question is 'How will legislation distinguish between gene editing for medical reasons or for enhancement?'	
	Give one example of a social question, according to Source C . [1 mark]	
08.4	Suggest an ethical issue that could result from gene editing in human embryos. [1 mark]	
		6



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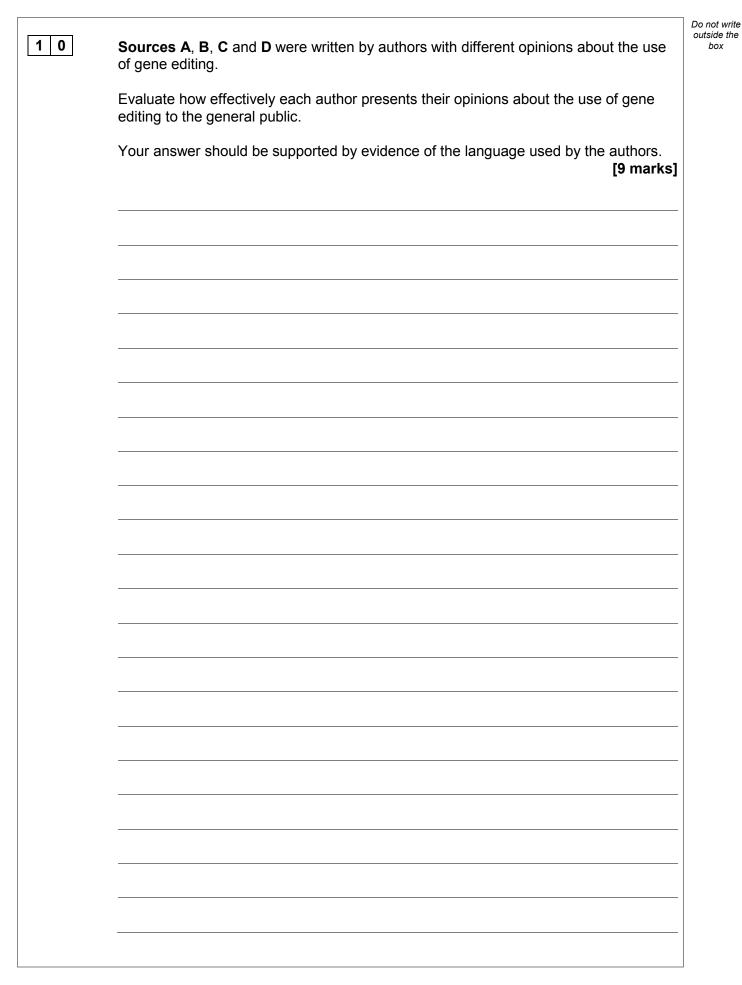
	8	
09	The author of Source D states that gene editing is 'about hope for people like me'. Explain what the author means by this. [3 marks]	Do not write outside the box
		3







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Table 1 shows data about inherited diseases in the UK.

Name of inherited disease	Proportion of births	Estimated number of people	Average life expectancy/years
Down's syndrome	1 in 1000	60 000	60
Cystic fibrosis	1 in 2500	10 800	41
Sickle cell anaemia	1 in 2000	15 000	50
Duchenne muscular dystrophy	1 in 3500	2500	27
Fragile X syndrome	1 in 4000 males 1 in 8000 females	Unknown	Not affected

Table 1

Use information from Figure 1 and Table 1 to answer Question 11.



10

11.1	Suggest why some diseases are called inherited diseases. [2 marks]	Do not write outside the box
1 1.2	Use the data in Figure 1 to estimate the total number of births in the UK each year. [2 marks]	
	Estimated total number of births in the UK each year =	
11.3	The actual recorded number of births in the UK will be lower than your estimated value in Question 11.2 .	
	Suggest one reason why. [1 mark]	
1 1.4	A disease is classified as 'rare' if there are fewer than 5 in 10 000 of the population with the disease.	
	Identify one disease from Table 1 which is a rare disease and one disease that is not a rare disease. [2 marks]	
	Rare disease	
	Not a rare disease	
	Question 11 continues on the next page	



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11.5	Give two reasons why the estimated number of individuals in the UK with Down's syndrome and Duchenne muscular dystrophy are different. Use information from Table 1 . 1 [2 marks] 2	Do not write outside the box
1 1.6	Suggest two reasons why the total number of people affected by Fragile X syndrome might be unknown. [2 marks] 1	
11.7	2 Explain the difference in the inheritance of Fragile X syndrome in males and females.	
	Use information from Figure 1 and Table 1. [4 marks]	



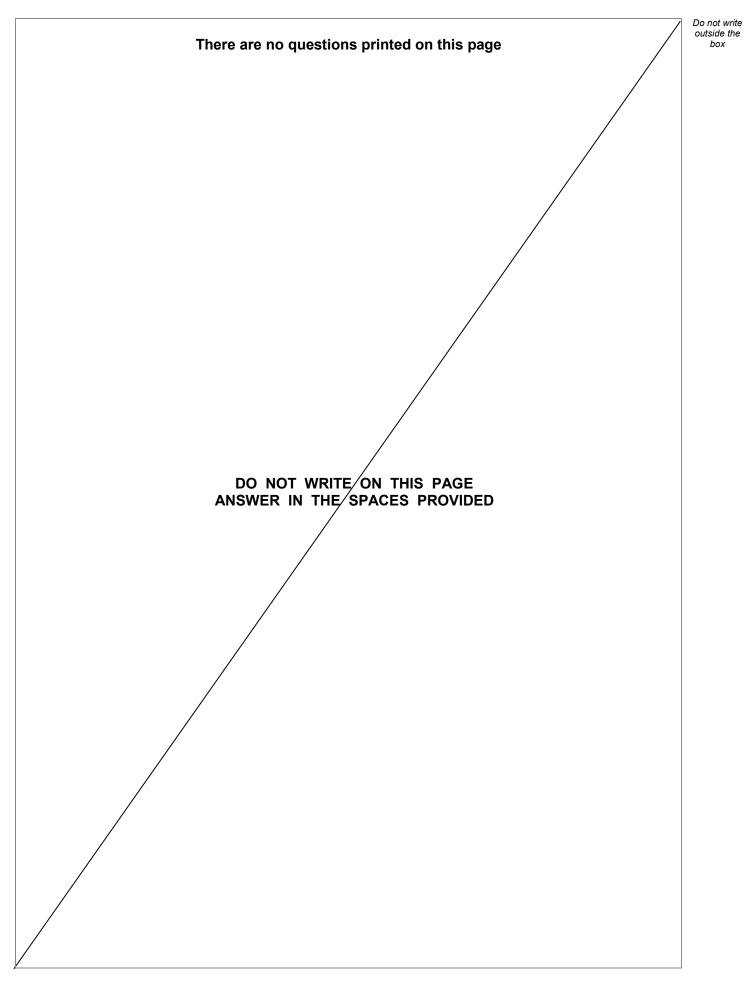
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	Turn over for the next question	
		16
1 1.8	Suggest how a doctor could diagnose an individual with Fragile X syndrome. [1 mark]	outside the box
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1 2	Many different scientists study inherited diseases.	box
	Suggest one role for each of the following scientists when they study inherited diseases.	
	[3 marks]	
	Research scientist	
	Biomedical scientist	
	Pharmacologist	
		3
	END OF QUESTIONS	







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