OCR
RECOGNISING ACHIEVEMENT

GCSE

SCIENCE A

H **A214/02**

Science A Unit 4 Ideas in Context

Specimen Paper

45 mins

Candidates answer on the question paper:
Additional materials: ruler (cm/mm), calculator

Candidate Name	

Centre Number						Candidate Number				

TIME 45 mins

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers on the dotted lines unless the question says otherwise.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- There is a space after most questions. Use it to do your working. In many questions marks will be given for a correct method even if the answer is incorrect.
- Do not write in the bar code. Do not write in the grey area between the pages.
- DO NOT WRITE IN THE AREA OUTSIDE THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.

INFORMATION FOR CANDIDATES

- 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 **40.**

This specimen paper consists of 16 printed pages.

 Registered Charity Number: 1066969

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Answer all questions.

Question 1

Is "Bird Flu" coming our way?

What is bird flu?

Bird flu was thought only to infect birds until the first human cases were seen in Hong Kong in 1997.

Humans can catch the disease through close contact with live infected birds.

Bird flu produces similar symptoms to other types of flu such as fever, sore throats and coughs.

The World Health Organisation said that, by the end of January 2005, there had been 55 confirmed cases of bird flu and 42 deaths in Asia.

There are signs that bird flu can be passed from person to person.

In Thailand a girl who had the disease may have passed the virus to her mother. They both died. The girl's aunt, who was also infected, survived the virus.

Fortunately the normal virus only seems to pass to close relatives and spreads no further.

What really worries experts is if the virus could exchange genes with a human flu virus.

If the modified virus is able to pass easily between humans the results could be catastrophic. Worldwide experts predict anything between 2million and 50million deaths could occur.

The Government plan for bird flu

In a normal year between 12 000 and 18 000 people die in Britain from normal flu.
The British government has started preparing for an epidemic of modified bird flu.
They have produced a plan to buy 14.6 million courses of an antiviral drug called Tamiflu.
Experts say that the government should order supplies of the vaccine against the normal bird flu that is present in Asia.
Of course this might not work against a modified bird flu virus.
Another difficulty at the moment is that the main vaccine factory in Britain has been having problems.
It was closed for a while because microorganisms were contaminating the vaccine.
Animal-rights protesters have also been targeting the factory.

How bird flu vaccine is made

Bird flu virus is first weakened.

⇩

It is then grown on hens' eggs.

⇩

Genetic material from the virus is extracted and mixed with genetic material from other known strains.

⇩

The vaccine is then tested on animals.

Human testing then takes place.

How serious is the threat?

	number of people who will die in Britain		
death rate	if 10% are infected	if 25% is infected	if 50% are infected
1.0	56 700	141 800	283 700
1.5	85 100	212 800	425 500
2.0	141 800	354 600	709 300

1. **(a)** The number of people who die from any disease depends on two factors.

1. The percentage of people who are infected
2. The percentage of these people who die, (the percentage death rate).

(i) In 1918 a new strain of flu virus caused an epidemic in Britain.
It infected about 45% of the population.
The percentage death rate was 1%.

Put a ring around the number of people who died of the flu in 1918.
Use the table in the article to help you.

50 000 **100 000** **150 000** **250 000**

[1]

(ii) The article says that 55 people have caught normal bird flu in Asia.
Of these people 42 have died.
This gives a percentage death rate of over 76%.

Despite this very high rate, scientists do not think that normal bird flu is much of a threat to people.
Explain why they think this.

.....
.....[1]

(b) The article says that it is possible to make a vaccine against the normal bird flu found in Asia.

(i) Explain how a vaccine could protect people from normal bird flu.

.....
.....
.....
.....[3]

(ii) Suggest why animal-rights protesters are targeting the vaccine factory.

.....

.....

.....

.....[2]

(c) The article says that the normal bird flu vaccine may not work on a modified bird flu virus.

(i) Describe how a modified bird flu virus may be formed.

.....

.....[2]

(ii) The government is storing an antiviral drug called Tamiflu.
Tamiflu is **not** an antibiotic.
Why can't bird flu be treated with antibiotics?

.....

.....[2]

(iii) The government will need to inform people of the dangers of modified bird flu to encourage them to have the vaccine.
Otherwise, the vaccination may have to be compulsory.
Explain why some people feel that they should be allowed to chose whether to have a vaccination or not.

.....

.....

.....

.....[2]

[Total: 12]

Question 2

This newspaper article is about a food scare that occurred in February 2005:

Carcinogenic dye causes food scare

More than 400 well-known processed foods have been removed from sale because they are contaminated with an illegal red dye which can cause cancer.

The bright red dye (Sudan 1) had been used to colour a batch of chilli powder used as an ingredient in a brand of Worcester sauce. The sauce in turn was sold on to hundreds of food companies for manufacture into famous brands of food and supermarket ready meals

The Food Standards Agency warned that the crisis was likely to get worse, as it came under attack for failing to prevent the lapse in food safety and for taking too long to make the information public.

Some flavours of crisps were removed from supermarket shelves

This table shows how the crisis developed.

28 January 2005	Sudan 1 contamination of chilli powder is discovered by a laboratory in Italy.
1 February 2005	Sudan 1 is found in a brand of Worcester sauce. Environmental health officers are notified.
7 February 2005	Further tests finally confirm presence of the dye.
10 February 2005	The F S A demands a list of companies supplied the Worcester Sauce for use in other products.
14 February 2005	The list of 200 companies is received by the FSA. The FSA begins ringing the companies.
15 February 2005	The FSA begins telling the companies and supermarkets that they are planning a recall.
18 February 2005	Britain's largest food recall is launched, with more than 400 products withdrawn from supermarket shelves.

Banned in 2003 under European Union rules, the harmful Sudan dye, also known as ‘scarlet red’, has been found in a range of chilli powders and curry powders, as well as more than 200 food products ranging from pesto sauce to chicken tikka masala.

The FSA said that over 300 food companies were involved in the effort to trace how far the Worcester sauce had spread. Companies involved include all of the leading supermarkets, and top brand owners such as crisp makers. The FSA said it could not guarantee that there was not more adulterated chilli in circulation.

"The big supermarkets are all using the same manufacturers, so if there is a problem it spreads very quickly," said a leading food critic.

The food chain is now both highly industrialised and highly centralised. The main supermarket groups depend on a handful of suppliers to provide the ingredients for their processed meals. The use of sauces containing additives to bolster the flavour of factory food is widespread. The result is not just that many ready meals taste the same but also that any breakdown in safety is instantly multiplied.

Sudan 1 is an azo dye, which has been shown to cause liver cancer in animal tests. It has not been shown to cause cancer in humans. It was first used in the US in 1918 but withdrawn from food use the same year. Sudan 1 is not permitted as a dye for foods in the EU but is meant to be used as a colour for boot polish, industrial solvents and petrol.

“At the levels present the risk is likely to be very small but it is sensible to avoid eating any more. There is no risk of immediate ill-health,” said the chief executive of the FSA.

A further difficulty is that by the time the contaminated chilli has been used in other ingredients such as Worcester sauce it is present only in parts per billion making it virtually undetectable. Public analysts have had to devise new tests to detect it, according to one food safety officer.

2. **(a)** From the discovery of Sudan 1 in a brand of Worcester sauce to the recall of contaminated food from UK supermarkets took 17 days.

Suggest **and** explain why this took so long.

.....

.....

.....[2]

(b) Over 400 food products were removed from supermarket shelves.

Explain how modern methods of manufacture, distribution and marketing of food enabled Sudan 1 contamination get into so many food products?

One mark will be for a clear ordered answer

.....

.....

.....

..... [3+1]

(c) The chief executive of the FSA says that the risk from eating these foods contaminated with Sudan 1 is very small.

(i) Suggest why the risk is small.

.....

.....[1]

(ii) Use the idea of a 'risk benefit analysis' to explain why the contaminated foods were removed from supermarket shelves.

.....

.....

.....

.....[2]

(iii) The FSA said it could not guarantee that there was not more adulterated chilli in circulation.

Use ideas about level of risk to explain how this is an acceptable situation.

.....

.....[1]

(d) Scientists test a brand of meat pie for the presence of Sudan 1.

They test samples from two different supermarkets.

(i) The scientists test several samples from each supermarket.

Suggest why.

.....

.....[2]

Results of their tests are shown in the table.

	Sudan 1 content in ppm							
sample	1	2	3	4	5	6	range	average
supermarket A	16	13	19	15	12	14	12 to 16	14
supermarket B	12	10	13	14	12	11	11 to 14	12

(ii) The scientists work out the range and average for the samples from supermarket **A.**

They ignore the value for sample 3.

Suggest why.

.....

.....[2]

(iii) The scientists conclude that there is not a real difference between the content of Sundan 1 in this brand of meat pie from these two supermarkets.

Explain how the data in the table show this.

.....

.....[1]

[Total 14]

Question 3

X-Rays – seeing the 'invisible'

Discovery of X-rays

In the late 19th Century many scientists were investigating the way an electric current was carried through a gas in a glass tube.
The gas inside the tube glowed when an electric current passed through.
Wilhelm Röntgen was a German scientist. In November 1895 he was investigating the glowing gas when he made an unexpected observation.
Some fluorescent material, the other side of the room, was glowing. The gas tube was covered with a dark cloth, so it was not the light from the glowing gas which made the fluorescent material shine.
Over the following seven weeks Röntgen investigated what was causing the fluorescence. He discovered that the rays that were coming from the end of the glass tube penetrated wood, a thick book and metal sheets.

JEAN-LOUP CHARMET / SCIENCE PHOTO LIBRARY

Strangest of all he saw the bones of his hand on the fluorescent screen.
During these investigations Röntgen had his meals served in the laboratory and even moved his bed there so he could work undisturbed. Only once did he mention his work to colleagues, he said "I have discovered something quite interesting but I do not know whether my observations are correct".
On 1st January 1896 Röntgen sent his first report and some examples of X-ray photographs to scientific colleagues in several countries. These new rays became known as X-rays.
During 1896 other scientists investigated X-rays and found similar results. Many scientists gave lectures, with members of the audience paying a fee to have their hands or purses X-rayed.

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The first X-ray photograph of a human being shows the hand of Röntgen's wife, who was wearing a ring.

Dangers from X-rays

In the first few years after the discovery of X-rays there was no awareness of the risks of working with this new radiation.
The first known death from X-ray exposure was in 1904. At this time many radiologists suffered radiation burns as they used self-exposure experiments to determine exposure times for patients.
It was not until 1921 that the first recommendations were made to limit exposure to X-rays in hospitals. Commercial and industrial applications of X-rays were not controlled until much later.
Up until the late 1950s buying new shoes for children included the chance to see images of your feet inside the shoes to check the fit.
Governments now provide strict guidelines about the amount of exposure to ionising radiation – both for workers and for the public.

3. **(a)** Röntgen discovered X-rays.

Describe two **different** properties of X-rays **discovered by Röntgen.**

1. .....

.....

2. .....

.....[2]

(b) The article describes the discovery of X-rays and how they became accepted as a new kind of radiation.

(i) The list describes one way a scientific discovery is made and accepted by other scientists.

They are in the wrong order.

A A scientist makes an unexpected observation.

B The scientist tells other scientists about the results of the experiments.

C The new ideas are accepted as being correct.

D The other scientists repeat the experiments.

E The scientist carries out further experiments.

Fill in the boxes to show the right order. The first one has been done for you.

A

[3]

(ii) Explain why other scientists wanted to repeat Röntgen's experiments when they read his report.

.....

.....[2]

(c) X-rays are now known to pose a risk for those who work with them.

(i) Explain how X-rays can harm people.

.....

.....

.....[2]

(ii) Suggest why it was 25 years after the discovery of X-rays before there were regulations to limit exposure to X-rays.

.....[1]

(d) Dentists use X-rays to examine teeth.

Up until the 1950s children's feet were X-rayed to check the fit of shoes.

Use ideas about feasibility, cost and benefit to discuss why dentists do use x-rays and shoe shops do not.

✎ (One mark is for using correct spelling.)

.....

.....

.....

.....

..... [3+1]

[Total: 14]

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SCIENCE A

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Science A Unit 4 Ideas in Context

H

Higher Tier

Specimen Mark Scheme

45 mins

Maximum mark for this paper is [40]

This specimen mark scheme consists of 3 printed pages.

Registered Charity Number: 1066969

Question Number	Answer	Max Mark
1(a)i	250 000	[1]
1(a)ii	It does not spread easily from person to person;	[1]
1(b)i	Three from: Vaccine contains a weakened virus; Stimulates the body to make antibodies; Antibodies/memory cells stay in the blood; Full strength virus is destroyed rapidly;	[3]
1(b)ii	The factory is using animals to produce/test the virus; They believe that it is cruel to the animals;	[2]
1(c)i	A person catches both bird flu and normal flu; Genes from the two viruses are exchanged;	[2]
1(c)ii	Antibiotics only work on bacteria/ Antibiotics don't work on viruses;	[1]
1(c)iii	Two from: Can give a person a mild form of the disease; Some vaccines have been linked to side effects; One example of such suspected link; It is there right to chose for themselves:	[3]
	Total mark	[12]
2(a)	contamination had to be confirmed; had to be sure before starting a scare; many different organisations were involved; analysis was difficult/involved new techniques/very small amounts had to be detected	[2]
2(b)	all supermarkets use the same manufacturers/suppliers; food chain is centralised; use of sauces to bolster flavour is widespread; QWC – The candidate has attempted to answer the question using statements which are ordered in a logical way. Generally there will be at least three statements.	[3] [1]
2(c)i	the amount of Sudan 1 in food products is very small/is in parts per billion / Sudan 1 has not been shown to cause cancer in humans / Sudan 1 has been shown to cause cancer only in animals	[1]
2(c)ii	although the risk is small a large number of people are involved; using Sudan 1 gives little/no benefit	[2]
2(c)iii	the risk is ALARA / the risk is as low as reasonably achievable / it is not possible to ensure that all contaminated food has been recalled	[1]
2(d)i	to increase reliability; to get an average/mean; to identify/discard outliers; because content in samples varies; to avoid a one-off error	[2]

2(d)ii	It is an outlier/it is far different from all of the other results.	**[1]**
2(d)iii	the mean/average/best estimate for A is within the range of B; or the mean/average/best estimate for B is within the range of A; or the mean/average/best estimate of each is within the range of the other	**[1]**
	Total mark	**[14]**
3(a)	pass through: glass/wood/paper/sheet metal; cannot be seen; detected by photographic film/fluorescent material;	**[2]**
3(b)i	(A) E B D C	**[3]**
3(b)ii	difficult to believe that these rays existed; to verify his results;	**[2]**
3(c)i	ionise chemicals in cells; causing cells to behave differently; causing cancer;	**[2]**
3(c)ii	took some time for damage to show / information was not collected together	**[1]**
3(d)	idea of meaning of feasibility; for teeth the benefit of keeping healthy teeth outweighs the low risk of an occasional X-ray; for feet there are other ways of checking the fit of the shoes, so the risk of costs X-raying dare greater than the benefit of well fitting shoes;	**[3]**
	QWC Correct spelling	**[1]**
	Total mark	**[14]**
	Overall mark	**[40]**