OCR
RECOGNISING ACHIEVEMENT

GCSE

BIOLOGY A

H

A223/02

Biology A Unit 3 Ideas in Context plus B7

Specimen Paper

1 hour

Candidates answer on the question paper:

Additional materials: ruler (cm/mm), calculator

Candidate Name	

Centre Number						Candidate Number				

TIME 1 hour

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 **55.**

This specimen paper consists of 26 printed pages.

Registered Charity Number: 1066969

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Answer **all** the questions.

1. Jane's heart rate is normally 73 beats per minute.

Jane did an experiment to see how exercise affected her heart rate.

The table shows Jane's heart rate at different times.

time after exercise in minutes	0	2	4	6	8	10	12	14
heart rate in beats per minute	115	99	92	86	80	76	73	73

(a) After exercise her heart rate had increased to 115 beats per minute.

Calculate the percentage increase in heart rate compared to her normal rate.

Use the formula: $$\% \text{ increase} = \frac{\text{actual increase}}{\text{number at start}} \times 100$$

You **must** show how you worked out your answer.

..... % [2]

(b) Explain why Jane's heart rate increases during exercise.

One mark is for a clear ordered answer.

.....

.....

.....

.....

..... [3+1]

(c) Jane's friend Sue has a resting heart rate of 71.

She is worried that it is different to Jane's heart rate.

Should Sue worry about this difference?

.....

.....[2]

[Total: 8]

2. Some footballers suffer from injuries to their joints.

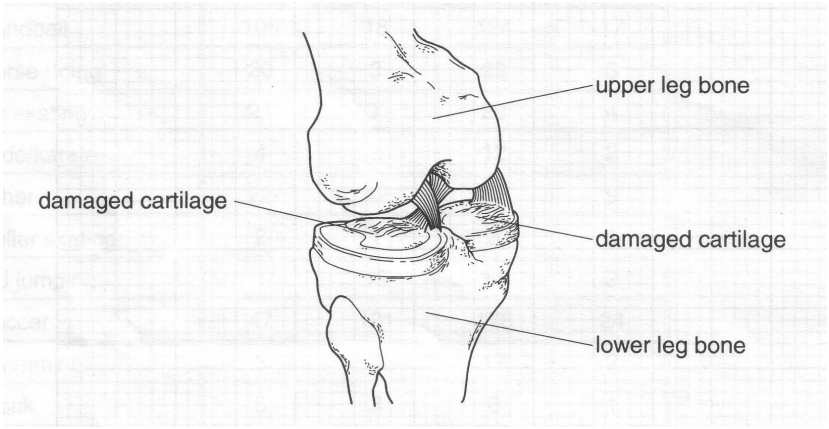
(a) Draw one line from each part of a joint to the function of that part.

Use each part only once.

part of a joint	**function**
Ligaments	join bone to bone
Tendons	move the bones at a joint
Muscles	reduce friction between bones
synovial fluid	join muscles to bone

[3]

(b) A common injury to footballers' knees is shown in this diagram.



When the cartilages are damaged the joint may become swollen and movement may be painful.

Why are there cartilages in the knee joint?

.....[1]

(c) A footballer with a damaged knee decides to visit an expert in sports injuries.

The expert asks the footballer a number of questions before he examines his knee.

Suggest **two** questions that he might ask the footballer.

1. .....

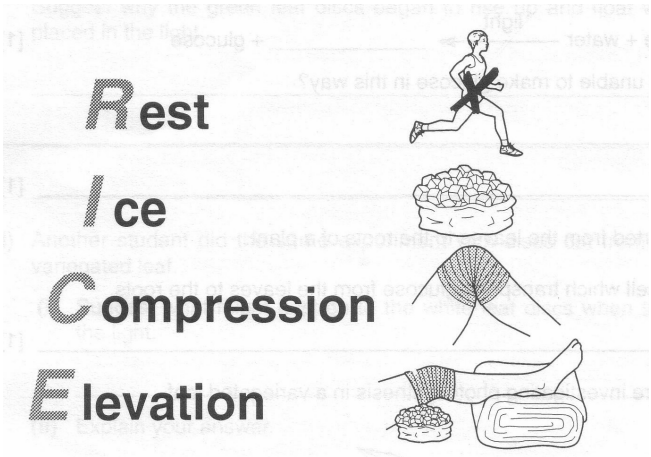
.....

2. .....

.....[2]

(d) The immediate treatment for a knee injury is called RICE.

This is shown in the following diagram.



Use this diagram and your biological knowledge to answer the following questions.

(i) Why does a person with a joint injury have to rest?

.....

.....[1]

(ii) If a joint becomes swollen people often apply ice to the swollen area.

Suggest why using ice helps to reduce the swelling.

.....

.....[1]

(iii) Sometimes people put an elastic bandage around the swollen joint. They area advised to make sure that the bandage is not too tight.

Suggest a reason for this advice.

.....

.....[1]

(iv) Suggest why raising the injured joint above the level of the heart helps reduce the swelling.

.....

.....[1]

[Total: 10]

3.

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.

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

The World Health Organization 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.

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 have 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% are 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

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

- The percentage of people who are infected.
- 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**

(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.

One mark is for a clear ordered answer.

.....

.....

.....

..... [3+1]

(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 are therefore storing a drug called Tamiflu.

Tamiflu is not an antibiotic.

Why can't bird flu be treated with antibiotics?

.....

.....[1]

(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 choose whether to have a vaccination or not.

.....

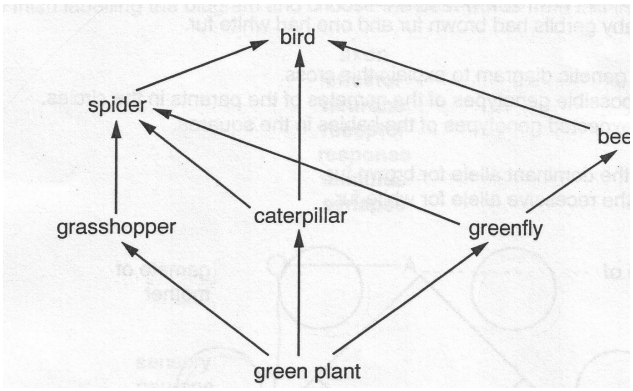
.....

.....

.....[3]

[Total: 14]

4. This question is about what animals eat and energy flow.



(a) **(i)** Suggest what happens to the number of caterpillars if all the grasshoppers die.

Explain your answer.

One mark is for correct spelling.

.....

.....

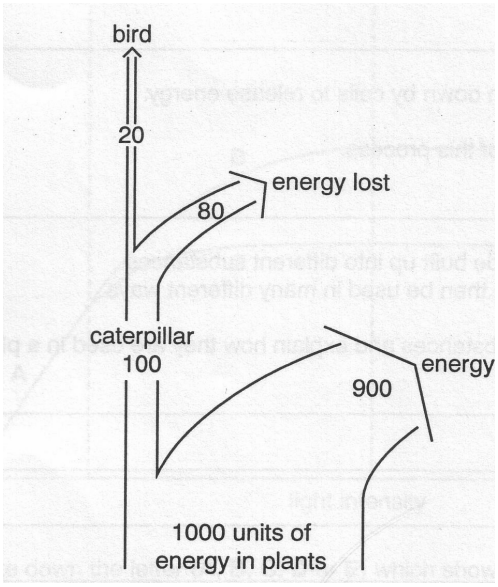
..... [2+1]

(ii) Write down the name of the organism in the diagram which can be placed at two different trophic levels.

.....[1]

(b) Energy enters the food web as the energy of sunlight.

The diagram shows the flow of energy through part of the food web.



A small percentage of the energy of sunlight is transferred to the plant.

Part of the energy in the plant is transferred to the caterpillar.

Part of the energy in the caterpillar is transferred to the bird.

(i) Calculate the percentage of energy in the plant that is transferred to the bird.

Use the numbers in the diagram.

You **must** show how you work out your answer.

Answer ..... % [2]

(ii) Energy moves through the food web in organic compounds.

Name **one** of these organic compounds.

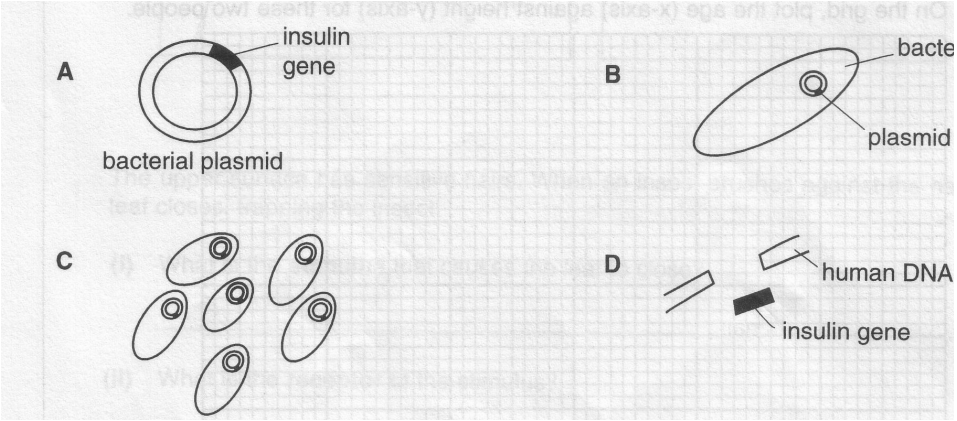
.....[1]

[Total: 7]

5. Human insulin can be produced by genetic engineering.

The diagrams show four stages of this process.

The diagrams are not in the correct order.



(a) Put the stages in order and describe what is happening at each stage.

stage	letter	description of stage
1		
2		
3		
4		

[7]

(b) Give **one** argument for and **one** against producing insulin by genetic engineering.

For: .....

.....

Against: .....

.....[2]

[Total: 9]

6. Read the following passage about sickle-cell anaemia

> People with normal haemoglobin possess alleles Hb^A Hb^A.
> A mutant allele Hb^S exists.
>
> A person who inherits both alleles Hb^S Hb^S develops defective haemoglobin and distorted red blood cells.
> This results in a type of severe anaemia, which is called sickle-cell anaemia. Such people have a shortened life expectancy.
>
> In heterozygous individuals (Hb^A Hb^S) only some of the red blood cells are sickle shaped. The result is mild anaemia which is not life threatening. The malarial parasite has difficulty in completing its life cycle in distorted red blood cells.

(a) How is the malarial parasite transmitted to humans?

.....

.....[1]

(b) A person with the genotype HbAHbS married a person with normal haemoglobin.

What is the probability of the first child having some sickle shaped red blood cells?

Explain your answer by completing the following genetic diagram.

genotype of parents	$Hb^A\ Hb^S$		x	$Hb^A\ Hb^A$	
gametes	HbA	HbS		HbA	HbA
genotypes of offspring					
phenotypes					

Probability.....

[2]

(c) Sickle-cell anaemia is only common in areas of the world where malaria is regularly found.

Describe how natural selection might allow the sickle-cell allele (Hb^S) to stay in the population of such areas.

One mark is for correct spelling.

.....

.....

.....

.....

.....

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.....

.....

..... [3+1]

[Total: 7]

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BIOLOGY A

Biology A Unit 3 Ideas in Context plus B7

Specimen Mark Scheme

Maximum mark for this paper is [55]

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1 hour

This specimen mark scheme consists of 4 printed pages.

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Question Number	Answer	Max Mark
1(a)	42/73 x 100;	
	= 57.5%	[2]
1(b)	**Three from:**	
	Jane's muscles working harder;	
	More respiration;	
	Need to supply more oxygen;	
	Remove more carbon dioxide;	[3]
	One mark for a clear ordered answer.	[1]
1(c)	Very little difference / probably not significant;	
	Peoples' heart rates show variation;	[2]
	Total marks	[8]
2(a)	Ligaments = bone to bone	
	Tendons = muscle to bone	
	Muscles = move the bones at a joint	
	Synovial fluid = reduce friction at a joint	[3]
2(b)	Stop the bones rubbing together / Absorb shock;	[1]
2(c)	**Two from:**	
	Symptoms;	
	Current medication;	
	Alcohol and tobacco consumption;	
	Previous treatments/problems;	
	Family history;	[2]
2(d)i	Prevent further damage / Provide opportunity for healing;	[1]
2(d)ii	Reduce temperature / Reduce blood flow;	[1]
2(d)iii	So that blood flow is reduced;	[1]
2(d)iv	Makes it easier for blood to flow back to the heart;	[1]
	Total marks	[10]

3(a)i	250 000	**[1]**
3(a)ii	It does not spread easily from person to person;	**[1]**
3(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]**
	One mark for a clear ordered answer.	**[1]**
3(b)ii	The factory is using animals to produce / test the virus;	
	They believe that it is cruel to the animals;	**[2]**
3(c)i	A person catches both bird flu and normal flu;	
	Genes from the two viruses are exchanged;	**[2]**
3(c)ii	Antibiotics only work on bacteria / Antibiotics don't work on viruses;	**[1]**
3(c)iii	**Three 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 their right to choose for themselves:	**[3]**
	Total marks	**[14]**
4(a)i	Increase:	
	More green plants to eat;	
	Because less plants eaten by grasshoppers;	
	Decrease:	
	Less grasshoppers for spiders to eat;	
	So they eat more caterpillars;	**[2]**
	One mark for correct spelling;	**[1]**
4(a)ii	Bird;	**[1]**
4(b)i	20/1000 x 100;	
	= 2%;	**[2]**
4(b)ii	Any organic compound;	**[1]**
	Total marks	**[7]**

5(a)	Order: D A B C D before A; A before B; B before C; D gene cut from human DNA using restriction enzymes; Gene inserted into plasmid using ligase; Plasmid taken up into bacterium; Bacteria divide;	**[7]**
5(b)	For: Produce large quantities/ No need to kill animals/ Less side effects; Against: Ethical objections;	**[2]**
	Total marks	**[9]**
6(a)	(Injected by) mosquito;	**[1]**
6(b)	Correct genotypes and phenotypes; Probability 50% / ½ / 1 to 1 / 1 in 2;	**[2]**
6(c)	**Three from:** Allele produced by mutation; Makes individual less likely to die of malaria; Survives to reproduce; Passes on HbA allele;	**[3]**
	One mark is for correct spelling	**[1]**
	Total marks	**[7]**
	Overall marks	**[55]**