Cambridge International A Level

Cambridge International Examinations
Cambridge International Advanced Level

THINKING SKILLS **9694/41**

Paper 4 Applied Reasoning **October/November 2017**

1 hour 30 minutes

No Additional Materials are required.

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READ THESE INSTRUCTIONS FIRST

An answer booklet is provided inside this question paper. You should follow the instructions on the front cover of the answer booklet. If you need additional answer paper ask the invigilator for a continuation booklet.

Answer **all** the questions.

The number of marks is given in brackets [ ] at the end of each question.

This document consists of **7** printed pages, **1** blank page and **1** insert.

CAMBRIDGE International Examinations

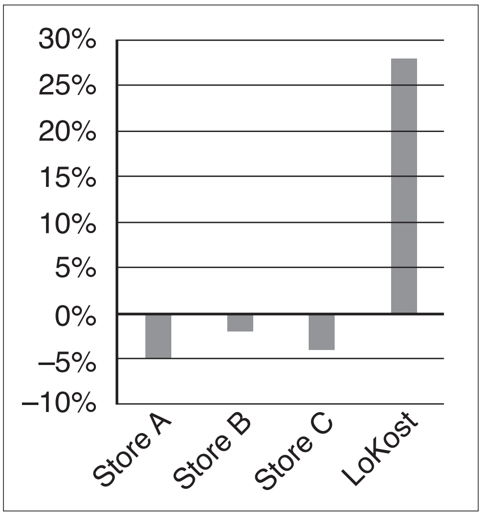
1 Make **five** criticisms of the use of the statistics and/or claims in this advertisement. [5]

Great Prospects for LoKost Stores

LoKost stores are taking over the High Street! This graph shows last year's sales trends in just one town, where crowds of customers are deserting other stores, in order to benefit from the low prices, great product range and superlative customer service at our new **LoKost** store.

Sales at three other stores fell, while **LoKost** increased its turnover by a whopping 28%!

We will soon become the number 1 store in the country.



Join the trend, and shop at your local **LoKost** store!

Questions 2, 3 and 4 refer to Documents 1 to 5.

2 Briefly analyse Louisa's argument in Document 1: *No need for a hairy elephant*, by identifying its main conclusion, intermediate conclusions and any counter-assertions. [6]

3 Give a critical evaluation of the strength of Louisa's argument in Document 1: *No need for a hairy elephant*, by identifying and explaining any flaws, implicit assumptions and other weaknesses. [9]

4 'We should encourage scientists to pursue de-extinction projects.'

Construct a reasoned argument to support **or** challenge this claim, commenting critically on some or all of Documents 1 to 5 and introducing ideas of your own. [30]

DOCUMENT 1

No need for a hairy elephant

Molecular biology has made bringing extinct animals back to life more than just a dream. The extinction of mammoths and other species has been caused, sometimes deliberately, by the activity of humans. We might be able to use the new technology to bring these species back – perhaps we have a moral duty to do so, in order to make amends for our callous treatment of nature.

However, destruction of the environment and loss of species as a result of human activity are continuing at an alarming rate. Climate change, deforestation, pollution and over-fishing are threatening the life-support system that is planet Earth. At the current rate of extinction we will lose three quarters of vertebrate species (the big, often fluffy, things we seem to care more about) in 300 years. Imagine your great (×8) granddaughter never having seen an elephant! It is much more sensible for conservation science to focus resources on tackling the causes of species demise. There are more important things to spend money on than de-extinction. Spending millions trying to bring back a couple of sabre-toothed tigers to look at in a zoo will not make up for losing what we already have.

De-extinction is by no means guaranteed to work. The two main techniques are both problematic. The first – selective breeding using similar modern species – takes a long time. People have been trying to recreate a wild aurochs by breeding modern domestic cattle since the 1920s and have not succeeded yet. It takes between 3 and 6 years for a cow to grow to maturity and produce offspring. How long would it take to recreate mammoths by breeding Asian elephants, which don't start reproducing until they are 20 years old? The other method is cloning. Dolly the sheep was the first cloned mammal. She was the only surviving lamb from 277 attempts. That's 276 lost eggs and Dolly herself developed arthritis and died young. There are not many Asian elephants around as it is. Can we afford to 'throw away' 276 precious eggs?

The problems do not end in the laboratory. Re-inserting a resurrected species into a habitat is a much bigger project than recreating a pair of dodos to waddle round a zoo. The habitats that sustained these species have largely vanished. Passenger pigeons once feasted on the American chestnut, which has now almost disappeared. What would resurrected passenger pigeons eat? Those habitats that remain are now populated by other species, some of which are themselves now endangered. Reintroduced species would compete with the current occupant and one species is going to lose out. Reintroductions of surviving endangered species can be very successful – wolves to parts of North America, for example. However, they are monumental undertakings in terms of both planning and expense. Zoos are already overwhelmed breeding endangered species for reintroduction. The factor limiting the rate of attempted reintroductions is not species availability but habitats into which they can be re-introduced.

De-extinction is clearly a bad idea; the international scientific community should not be promoting it as the way forward. Who can tell what the consequences might be? The possibility of de-extinction could be used by governments as an excuse for diverting funds away from climate change and conservation projects.

Louisa

DOCUMENT 2

Woolly mammoth inches to de-extinction: cloning potential sparks debate

In May 2013, Russian fossil scientists found a woolly mammoth, nearly perfectly preserved in the ice, on an island off the coast of Siberia.

These animals became extinct at the end of the last ice age, but the blood still present in its veins could provide biologists with the ability to clone the animals.

De-extinction, as the process is called, could be carried out on many species that no longer roam the Earth. The iconic woolly mammoth is one of the species researchers have considered bringing back to life, along with the dodo, the passenger pigeon and the thylacine, an extinct Australian carnivore that looked like a dog but had a pouch like a kangaroo.

“The most important and difficult step in the cloning process is the search for living cells. Mammoths are particularly promising, as good frozen specimens are relatively common,” said Dr Petrova from the University of Northern Siberia. “If successful, then the cloning procedure itself will be carried out in South Korea, where they have extensive experience in cloning mainly dogs but other animals also.”

The ice-bound animal was revealed to be a female, approximately 60 years old. She was the oldest, flesh intact, specimen of a woolly mammoth unearthed to date. Scientists believe she roamed the Earth around 12 000 years ago. The prehistoric beast probably perished in water, which quickly froze over, preserving the lower half of the body including the stomach. Parts of the animal’s back had been picked at by predators before the freezing was complete.

“When we broke the ice underneath her belly, the blood flowed out from there; it was very dark. This is the most astonishing case in my whole life. How was it possible for it [the blood] to be in liquid form? And the muscle tissue is red also, the colour of fresh meat,” the leader of the mammoth-finding expedition told reporters.

Woolly mammoths were one of several mammoth species, relatives of today’s elephants, particularly the Asian elephant. They stood around 3 metres (10 feet) tall at the shoulder, similar in size to a modern African elephant. Strangely, global warming has been good for mammoth scientists. As the ice in Siberia has melted, more specimens have been uncovered.

DOCUMENT 3

De-extinction – let's at least try

There are real benefits to de-extinction, for both conservation and our sense of the natural world. The objections to it are trivial.

Mammoths are prime candidates because frozen specimens are available, but museum specimens could provide a rich source of workable DNA from other species. Using this, it might be possible to bring some extinct species back to life. The tools of synthetic biology are advancing. Things quickly go from impossible, to expensive, to routine. The process is getting ever cheaper and ever more sophisticated. Scientists interested in trying to resurrect extinct species must be free to pursue their interests if they can get the needed support. As with any science, there are inevitable benefits that could not be imagined when the original funding was secured.

De-extinction science could actually help to prevent extinction in many endangered species. A limited gene pool and hence inbreeding with its risk of genetic diseases is a major problem within endangered populations. Gene manipulation technology could restore genetic variety within endangered species.

Some might say, "What's the point of bringing back hairy elephants that couldn't hack the climate change of 5000 years ago?" The obvious extension of that argument is, "What's the point of saving the polar bear today, or the panda, or the Asian elephant for that matter?" We protect endangered species in order to preserve the richest biodiversity possible, for a variety of ecological, aesthetic and economic reasons. We also protect them because humans have caused their decline, so we have a moral duty to do so. Each one of these reasons can also be applied to bringing back extinct species. Furthermore, imagine the thrill of seeing the flightless moa, twice the height of an ostrich, once again roaming free in New Zealand for the first time in a millennium. A generation of potential scientists could be inspired for a fraction of the cost of the moon landings.

Passenger pigeons once darkened the sun in the American skies. They were slaughtered from billions to zero in the 19th century. The new telegraph system was used to let hunters know where the last remaining flocks were. How great would it be to reverse such a crime? The deciduous forest in which they once lived has been largely restored – only now awaiting the comeback of the passenger pigeon and the American chestnut, which is on the way back thanks to new genetic techniques.

Worries about what will happen when formerly extinct animals are reintroduced to the wild are unfounded. Successful reintroductions are common, either from other regions or from captive breeding programmes. Wolves have been reintroduced to Yellowstone Park and the whole ecosystem has been improved. It turns out what was missing was a top predator. In the UK they are considering the reintroduction of the lynx to control the large roe deer population. The American bison currently has no predator – perhaps it is time for the sabre-toothed cat to make a comeback!

DOCUMENT 4

Points made during a school debate about de-extinction

1. Animal cloning is rarely successful. Dolly the sheep only lived for five years, whereas the normal lifespan of a domestic sheep is 10 years. The cell she was cloned from was from a 5-year-old sheep. It was as if she was born with cells that had already lived five years. The first “successful” de-extinction using cloning, the Pyrenean ibex (a large wild goat, extinct for less than 15 years), lived for a whole 12 minutes, and spent all that time in acute respiratory distress.

2. If so-called experts attempt to clone mammoths they will have to use elephants as surrogates. It is likely that the much smaller elephant mother would suffer carrying a baby mammoth to term. Elephants themselves are endangered and using them for this purpose could divert stock from repopulating their own species. Furthermore, the ethics of turning such intelligent social animals, which appear to grieve the death of their relatives, into ancestor-resurrection machines is questionable.

3. Once resurrected, organisms could become pests in the new environment in which they have been introduced. They might be vectors of disease or provide a habitat for such vectors. The genetic manipulation used to create them might harbour dangerous viruses or other harmful mutations in their genomes.

4. The revival of a single previously-dead individual in a lab does not mark the return of a species. Creating viable populations that can flourish in modern ecosystems is a much more difficult challenge. The IUCN Red List categorises more than 20 000 species as threatened with extinction. We cannot hope to save them all. So we face difficult choices about which species and ecosystems to try to save.

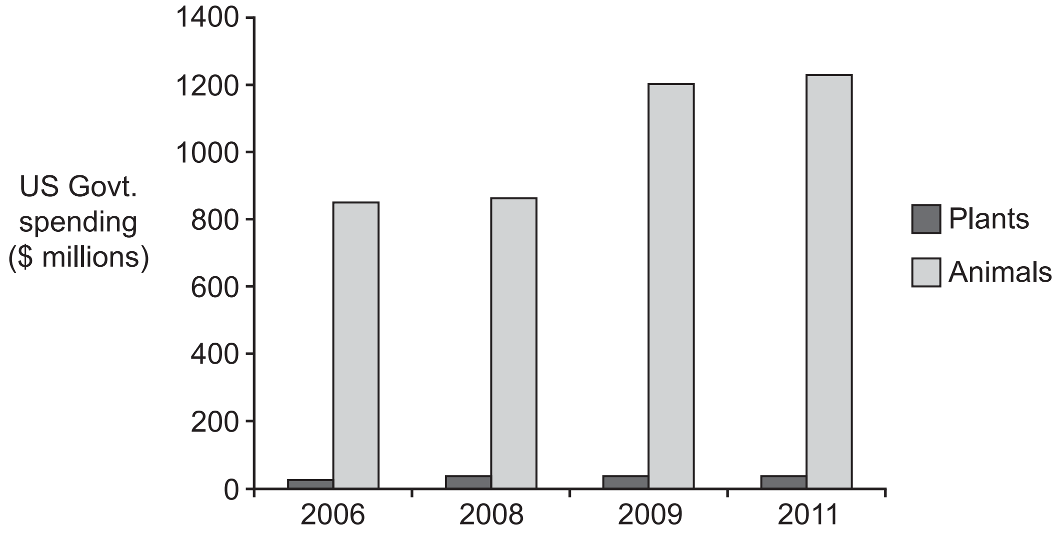
5. The Nile rhinoceros has only 7 members of the species left, all in captivity. It has not had a viable wild population for years. Three of the individuals are too old to breed. The others are too closely related to rebuild a viable population. The technology associated with de-extinction would be put to much better use saving species like the Nile rhinoceros from the brink of extinction.

6. Claims that de-extinction (or resurrection biology) will cost a lot of money are rarely supported by evidence. Such projects could easily attract philanthropic donations from wealthy benefactors, perhaps from people who have never thought about conservation before. This could open up a whole new funding stream to the field of conservation. They might even become interested in saving species the old-fashioned way, too.

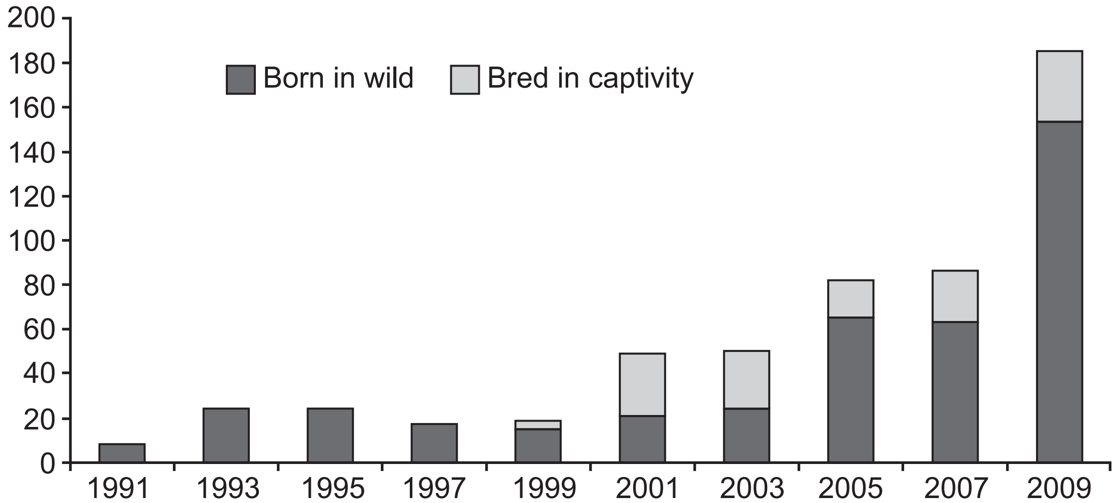
7. Focussing public interest and money on a big de-extinction project could have wider benefits. Before a large, headline-grabbing, species is brought back the environment would need to be made ready for its arrival. This means spending money on conserving a wide variety of other, less camera-friendly but nevertheless biologically-important, plant and animal species. Putting Californian condors back in the wild has highlighted the problem of environmental lead poisoning, which affects dozens of other species. Efforts at lead reduction are now underway in more than one US state.

DOCUMENT 5

Spending by US government on endangered species conservation projects



California condor* population



*The California condor is a very large vulture native to the western United States

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