THIS IS A LEGACY SPECIFICATION

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RECOGNISING ACHIEVEMENT

Thursday 24 May 2012 – Morning

GCSE TWENTY FIRST CENTURY SCIENCE
SCIENCE A

A214/02   Unit 4: Ideas in Context (Higher Tier)

Duration: 45 minutes

Candidate forename		Candidate surname	

Centre number					Candidate number				

INSTRUCTIONS TO CANDIDATES

* The Insert will be found in the centre of this document.
* Write your name, centre number and candidate number in the boxes above. 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).
* Do **not** write in the bar codes.

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**.
* Where you see this icon you will be awarded a mark for the quality of written communication in your answer.
* This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 **This question is based on the article "Particulate perils".**

(a) How does burning fossil fuels release particulates into the air?

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.... **[2]**

(b) Suggest how an increase in particulate concentration in the air may cause a rise in sea level.

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.... **[3]**

(c) The 'Boston study' discovered a correlation.

   (i) Describe this correlation.

   ....

   .... **[1]**

   (ii) Researchers who carried out the Boston study think that particulates may have caused some of the deaths.

   How could further research be carried out to support their theory, and what evidence could the research produce?

   ....

   ....

   ....

   .... **[2]**

(d) (i) Look at the graph of PM_{10} concentration in a European city centre from 1st to 6th January 2010.

The scientists note that the PM_{10} concentration went above $50\,\mu g/m^3$ on 1st, 2nd, 4th and 5th January.

They decide that the daily average European limit has been exceeded only on 4th and 5th January.

Explain how they make this decision.

....

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....

.... **[3]**

(ii) What steps could be taken to make sure that the European limit for particulates is not exceeded on any day in this city?

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....

....

.... **[2]**

[Total: 13]

2 **This question is based on the article "Scientist knows his own future".**

The article is about gene mapping.

(a) It is now possible to map a person's genes.

   (i) Explain why insurance companies and employers might want to know the results of these tests.

   ....

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   .... **[2]**

   (ii) Genetic testing and family trees can both be used to work out the inheritance of genetic factors.

   Describe the differences between the information that these two methods can provide.

   ....

   ....

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   .... **[2]**

(b) Henry Greely of Stanford Law School said that doctors would soon be hit by a 'tsunami' of data and we need to think hard about how we use such data.

Explain the different implications of Henry Greely's comments.

In your answer, use ideas about 'technical feasibility' and 'values'.

   ....

   ....

   ....

   ....

   .... **[2]**

(c) Three people are talking about the article.

Mike
It's hard to decide if finding out your own future risks for genetic diseases is the right thing to do, or not.

Mary
I think it's a good idea because it may soon be possible to treat diabetes with genetic engineering.

Peter
Knowing your own genetic future is not right. It's only for God to know what lies ahead for us.
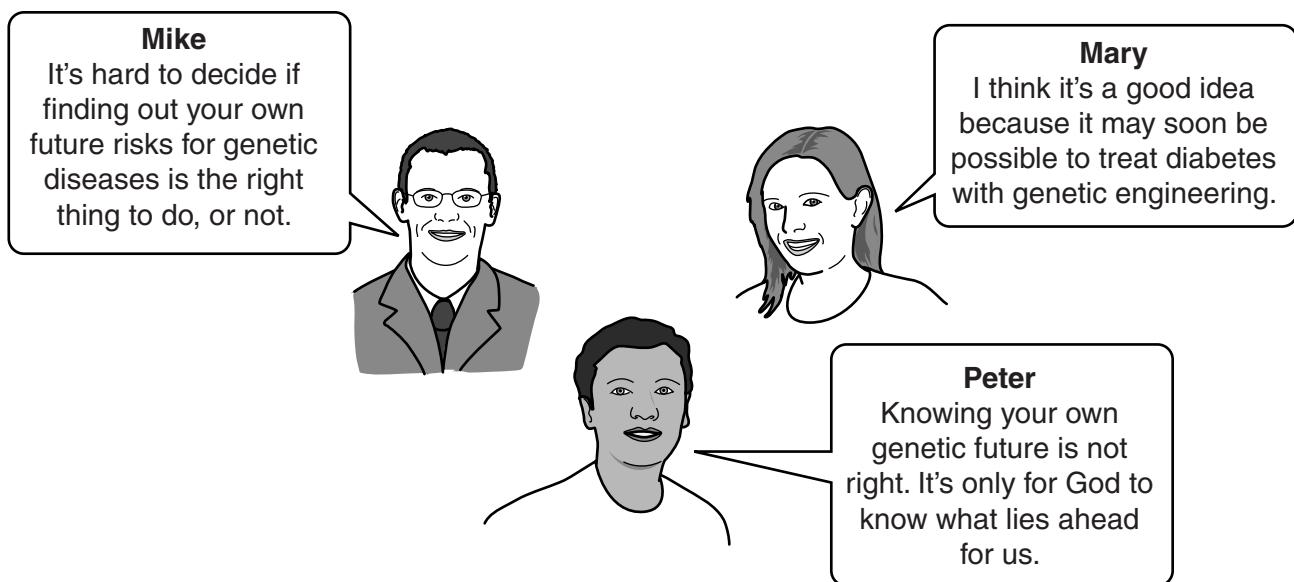
State clearly what the issue is that the three people are discussing.

....

.... **[1]**

(d) Genetic databases created since the Human Genome Project are stored on computers. They can be used to answer a number of questions.

  (i) Write down a question that could be answered by scientists using these databases.

....

.... **[1]**

  (ii) The data can **not** be used to accurately predict if a young child will develop into a world class tennis player.

Explain why.

....

.... **[1]**

(e) When talking about gene mapping, Stephen said that this issue raises "many questions that need to be addressed".

State clearly what issue Stephen is talking about and summarise **two** different views that might be held.

One mark is for presenting different points of view on the issue.

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.... **[2+1]**

(f) Two people have their genes mapped. They are told that they have an equal risk of developing the same genetic disease.

Explain why one person may develop the disease whilst the other may not.

....

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.... **[2]**

[Total: 14]

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Question 3 begins on page 8

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Turn over

3 **This question is based on the article "Observing the night sky".**

(a) The Moon and the planets all move across the fixed pattern of the stars.

The movement of the Moon looks quite simple, but the movements of the planets appear more complex.

Explain this difference in terms of how the Moon and the planets move in the Solar System.

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....

.... **[2]**

(b) Shapley and Curtis were both expert astronomers, but they had very different explanations for the location of nebulae.

Explain why they could have such different explanations.

....

....

.... **[2]**

(c) Scientific explanations often lead to predictions, which can be tested by new observations.

This happened to the explanations given by Shapley and Curtis.

Using the article, give **another** example of a prediction and an observation that tested it.

prediction ....

observation .... **[1]**

(d) The table gives the distances to different galaxies and the speeds at which they are moving away from us.

distance in millions of light-years	10	15	22	31	35
speed in km/s	220	330	500	650	750

(i) Plot the data on the graph. Two points have been plotted for you. **[2]**
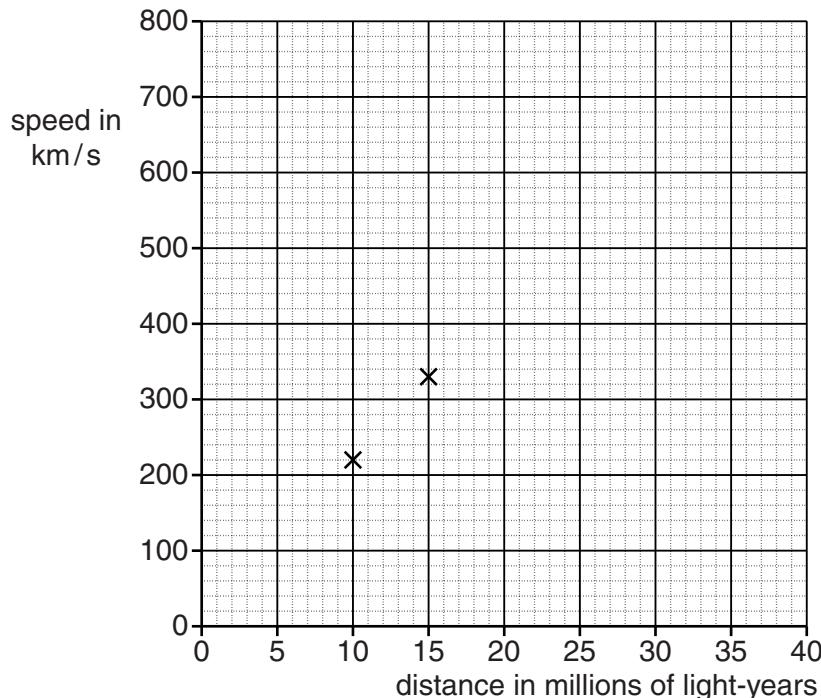
(ii) Draw a straight line of best fit through the data on the graph. **[1]**

(iii) The gradient of the straight line is known as the Hubble constant.

Calculate the Hubble constant.

Hubble constant = ... km/s per million light-years **[2]**

(iv) Suggest why the straight line of best fit would be expected to go through the origin.

....

.... **[1]**

(e) The Big Bang theory predicts that the expansion of the Universe should gradually slow down.

Recent measurements of distant galaxies show that the expansion of the Universe seems to be speeding up.

Discuss what this suggests about the Big Bang theory as a scientific explanation.

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.... **[2]**

[Total: 13]

END OF QUESTION PAPER

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