SCIENCE   **2843/01**

Interpreting Scientific Information

Friday	**9 JUNE 2006**	Morning	1 hour

Candidates answer on the question paper.

Candidate Name		Centre Number		Candidate Number

TIME   1 hour

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.

- Write your Centre number and Candidate number in the boxes above.

- There are **four** questions in this paper. Answer **all** parts of the questions.

- Write your answers in the spaces provided on the question paper.

- Read each question carefully and make sure you know what you have to do before starting your answer.

INFORMATION FOR CANDIDATES

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

- The questions in this paper are based on the abridged version of a scientific article, which is printed in the insert to this question paper.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	7	
2	15	
3	10	
4	13	
TOTAL	45	

This question paper consists of 8 printed pages and an insert.

Answer **all** the questions.

All of the questions in this paper refer to the article 'Harbingers of doom?' This is abridged from an article by Fred Pearce which first appeared in New Scientist (24 July 2004).

A copy of the article is provided as an insert to this paper.

Read the article carefully before you answer the questions.

1 The author begins by explaining that forecasts from climate models can be shown as graphs.

(a) If the amount of carbon dioxide in the atmosphere doubles, what will be the most likely increase in global temperature, according to conventional climate models?

.... [1]

(b) Complete Fig. 1.1 below by sketching the standard bell-shaped curve predicted by conventional climate models.

<u>Likely warming caused by a doubling of CO_2</u>

probability

0   1   2   3   4   5   6   7   8   9   10   11   12

projected warming / °C
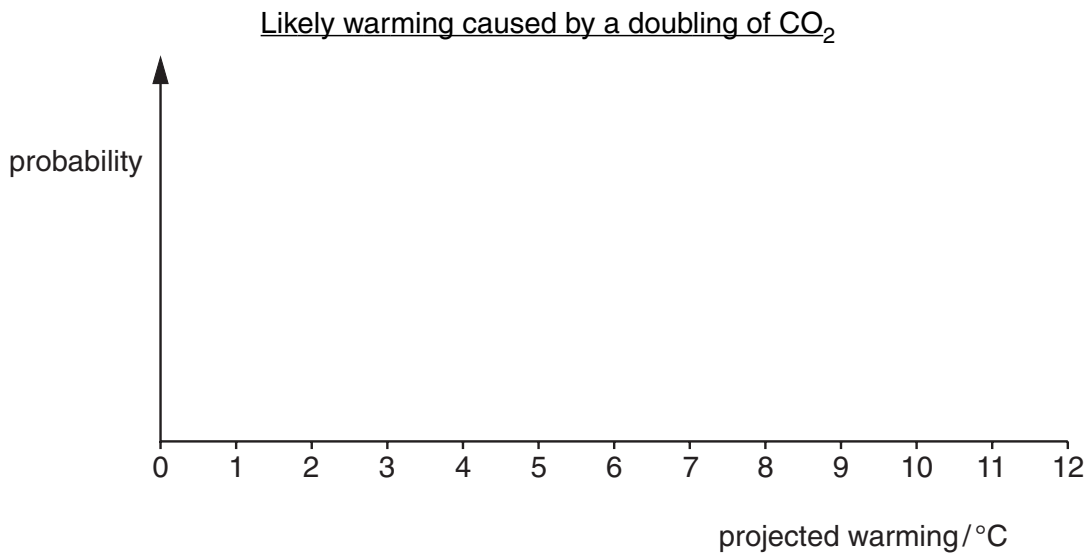
Fig. 1.1

[2]

(c) In what way do the shapes of both James Murphy's and David Stainforth's graphs differ from the conventional one as shown in Fig. 1.1?

.... [1]

(d) Add to Fig. 1.1 two lines, clearly labelled, showing Murphy's and Stainforth's predictions. [2]

(e) What factor, missing from conventional climate models, has been added by Murphy and Stainforth to their new models?

.... [1]

[Total: 7]

2 The author goes on to discuss the effects of various feedbacks in the global climate system.

(a) (i) Suggest what the author means by his use of the term *direct greenhouse effect*.

....

.... [2]

(ii) Use your scientific knowledge to outline how the behaviour of a greenhouse gas towards incoming solar radiation differs from its behaviour towards the radiation emitted by the Earth.

....

....

.... [2]

(b) (i) Explain why the melting of snow and ice is likely to result in greater absorption of radiation from the Sun by the Earth.

....

....

.... [3]

(ii) Explain why this effect is an example of positive feedback.

....

....

....

.... [2]

(iii) State a second source of positive feedback which has been incorporated into conventional climate models.

.... [1]

(c) Explain how scientists have in the past arrived at their prediction that the Earth is likely to warm by 3 °C for a doubling of carbon dioxide in the atmosphere.

....

....

.... [3]

[Turn over

(d) Clouds can affect the Earth's temperature in a variety of ways.

   (i) State **one** way in which clouds provide negative feedback in the global warming process.

      .... [1]

   (ii) What suggestion has been made in conventional models regarding the overall effect of cloud cover on global temperatures?

      .... [1]

[Total: 15]

3   Cloud and climate expert, Bruce Weilicki, has done research to show that skies in tropical regions are clearer than they were 20 years ago.

(a)   What name is given to that area of the tropics in which air rises and clouds form?

.... [1]

(b)   Fig. 3.1 represents cloud formation in the tropics, as observed in 1986.

Draw a second annotated diagram to complete Fig. 3.1, showing the new situation twenty years later.

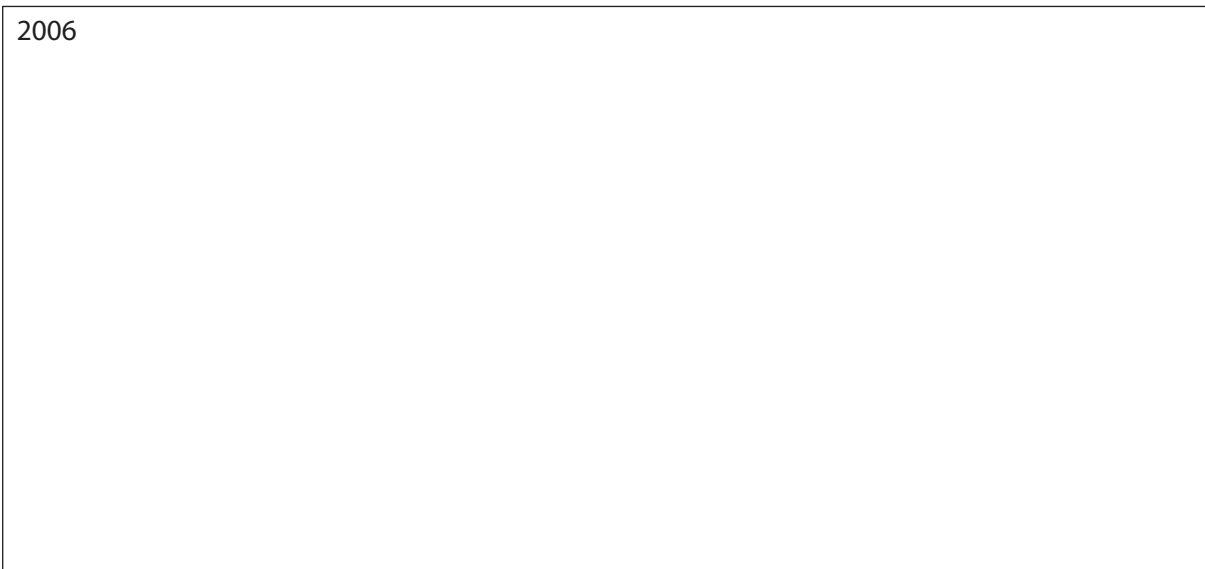1986

A diagram has been removed due to third party copyright restrictions

Details:

A diagram representing a cloud formation in the tropics.
Warm, moist air rises which cools creating clouds which produce rain

2006

Fig. 3.1

[3]

[Turn over

(c) **(i)** Why might Weilicki's findings be considered evidence of global warming?

....

.... [2]

(ii) What interpretation does Weilicki place on his own results?

.... [1]

(d) Summarise, in your own words, the reasons why Weilicki believes that information about clouds should be incorporated into future climate models.

....

....

....

.... [3]

[Total: 10]

4 The accurate prediction of global climate change is further complicated by factors that the author discusses in the last section of the article.

(a) Why is it not possible to make accurate predictions based on climate data collected over the last century?

.... [1]

(b) State **two** types of naturally-occurring event that can produce changes in temperature on a global scale.

.... [2]

(c) An aerosol is a suspension of tiny particles in a gas, in this case the air.

(i) Suggest **one** substance present in the microscopic particles mentioned in the article.

.... [1]

(ii) Suggest **one** reason why it might be considered good for the environment to eliminate these aerosols.

.... [1]

(iii) Explain how eliminating the aerosols might affect global temperatures.

....

....

.... [3]

(iv) The author concludes that Paul Crutzen's recent estimate of the effects of aerosols on global temperatures supports James Murphy's graph. Do you agree or disagree with this conclusion? Explain your reasoning.

....

....

....

....

....

....

.... [5]

[Total: 13]

END OF QUESTION PAPER