



General Certificate of Secondary Education
2009–2010

Science: Single Award (Modular)

Road Safety, Radioactivity
and Earth in Space
Module 6

Higher Tier

[GSC62]

FRIDAY 21 MAY 2010, MORNING

Centre Number

71

Candidate Number



GSC62

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all six** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 45.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

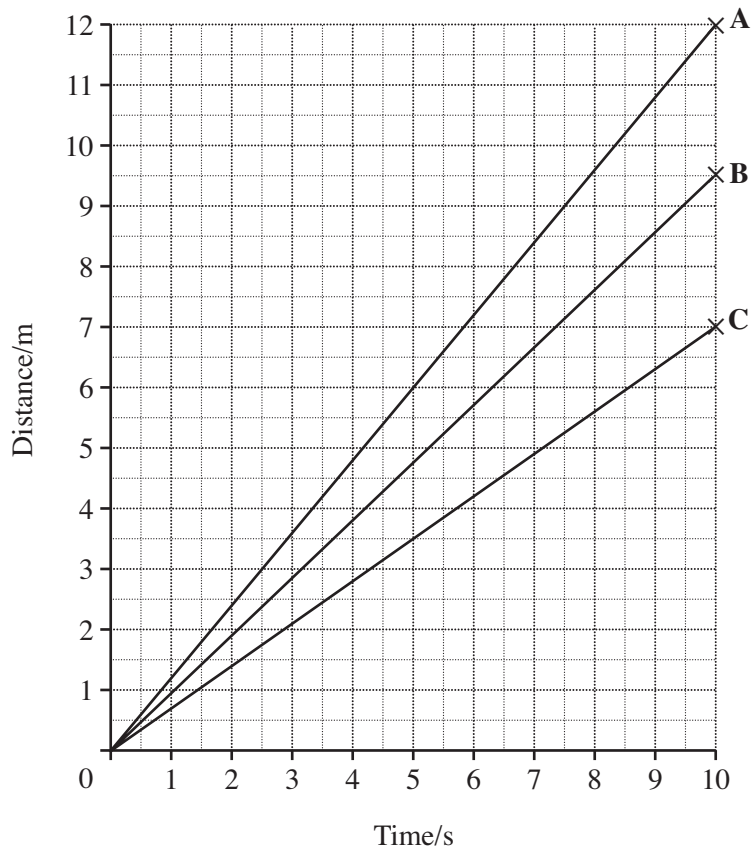
For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	

Total
Marks



1 (a) Distance-time graphs for three cars are shown below.



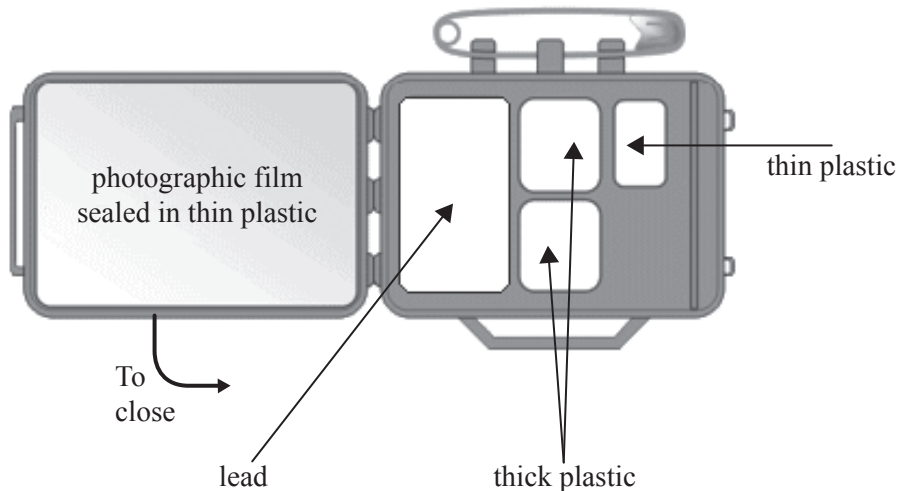
Which car (A, B or C) is moving at the greatest speed? Use the graphs to explain your answer.

[2]

Examiner Only	
Marks	Remark

- 2 (a) Nuclear power station workers have to wear film badges to indicate their absorbed dose of radiation.

Film badge (opened to show internal parts).



© BBC <http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/radiation/radiocativerev5.shtml>

When the film is developed it will turn black where it has been exposed to radiation.

If the worker is exposed to **beta** radiation, shade the parts which would show up black on the diagram below.



© BBC <http://www.bbc.co.uk/schools/gcsebitesize/science/aqa/radiation/radiocativerev5.shtml>

[2]

- (b) Explain fully why people who work in nuclear power stations may be worried about exposure to radiation.

[2]

Examiner Only	
Marks	Remark

(c) (i) What is meant by the term background radiation?

_____ [1]

(ii) Suggest **one** source that might produce background radiation.

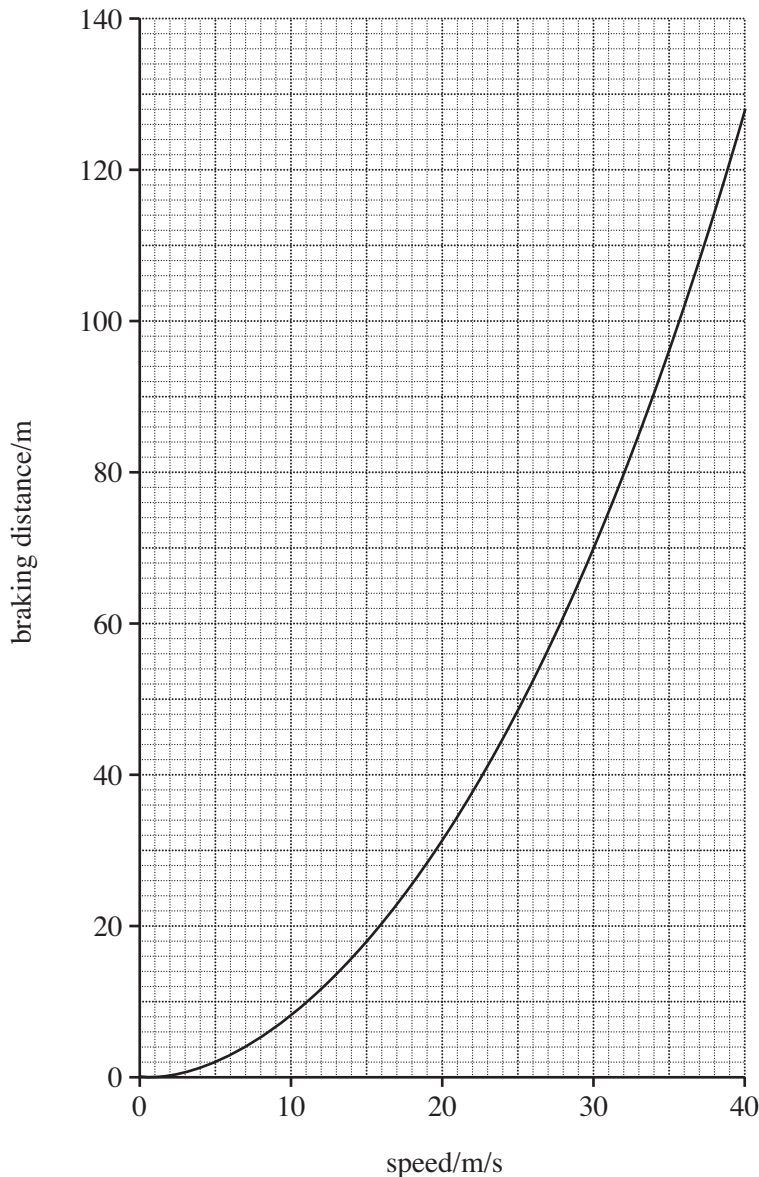
_____ [1]

(d) Explain fully why some nuclei may be radioactive.

_____ [2]

Examiner Only	
Marks	Remark

- 3 The graph below shows how the braking distance of a car depends on the speed at which the car is travelling.



- (a) Describe fully the relationship between speed and braking distance.

_____ [2]

- (b) (i) Use the graph to find the braking distance when the speed of the car is 34m/s.

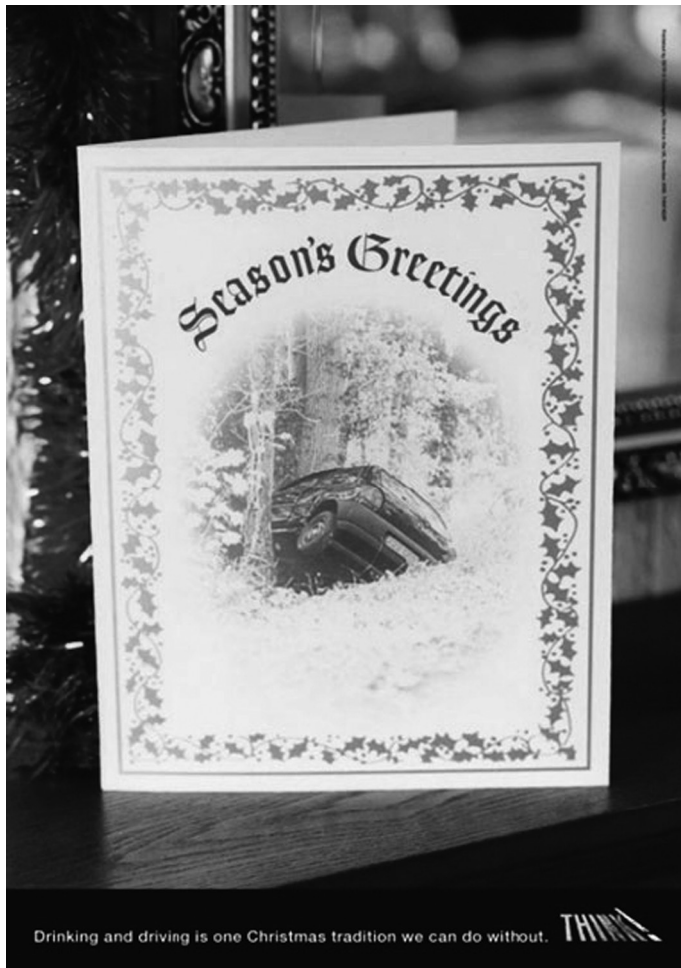
Distance _____ m [1]

- (ii) The driver of a car travelling at 34m/s sees a child stepping into the road, and applies his brakes. Explain why the **stopping** distance is greater than your answer to (b)(i).

_____ [1]

Examiner Only	
Marks	Remark

- (c) The picture below shows a typical advert used in a ‘don’t drink and drive’ campaign.



© Crown Copyright - Department for Transport

- (i) Explain fully why an increase in the blood alcohol content of a driver will increase the chance of having a crash.

[2]

- (ii) Some people think there should be a zero blood alcohol legal limit. Suggest one reason for not having a zero blood alcohol legal limit.

[1]

Examiner Only	
Marks	Remark

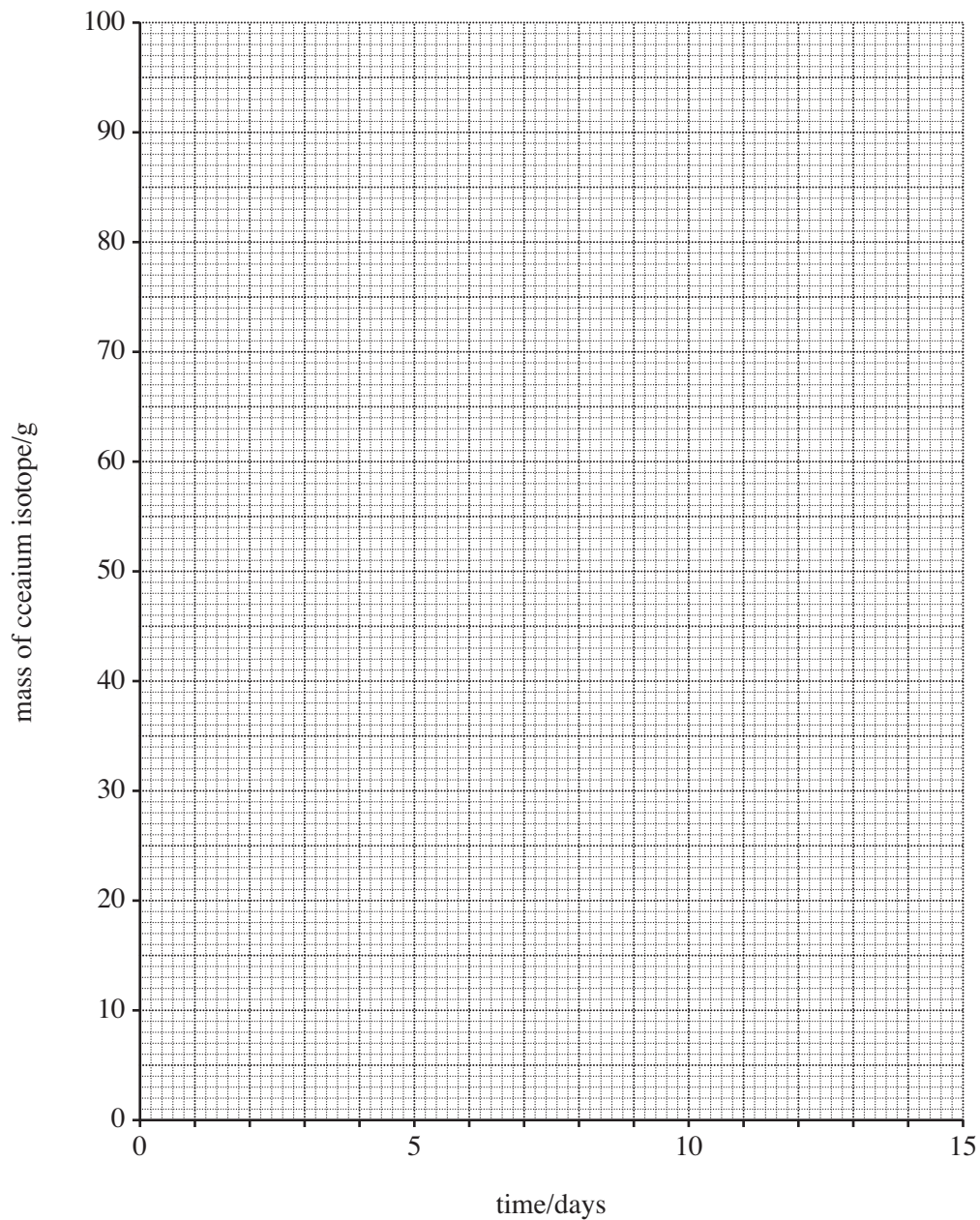
- 4 Scientists believe they have found a new radioactive isotope called cceaium.

The original sample contained 100g of the cceaium isotope. The mass of the isotope was measured over 15 days. The table below shows how the mass of the isotope changed.

Time/days	Mass of cceaium isotope/g
0.0	100.0
2.5	75.0
8.0	35.0
12.0	20.0
15.0	12.5

- (a) Plot and draw a line graph for these results on the grid opposite.

Examiner Only	
Marks	Remark



[3]

(b) (i) Use the graph to find the half-life of the caesium isotope.

_____ days [1]

(ii) The original sample of caesium had a radiation count of 600. After two half-lives what would the radiation count be?

_____ [1]

Examiner Only	
Marks	Remark

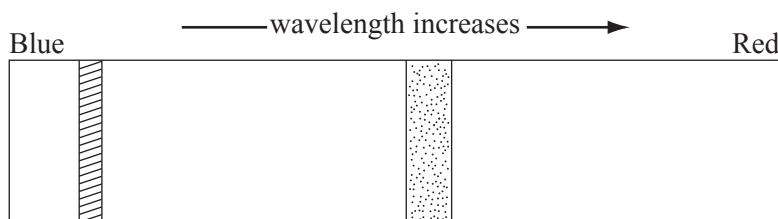
- 5 (a) In 1543 Copernicus stated that the Earth orbited the Sun. What name is given to this theory?

_____ [1]

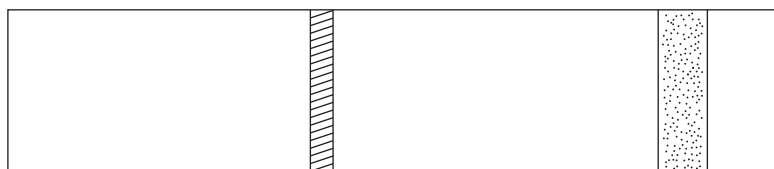
- (b) Many scientists believe that the Universe began with the Big Bang theory. Explain fully the Big Bang theory.

 _____ [3]

- (c) When scientists analyse the light from our galaxy they see the following black lines in the spectrum of light.



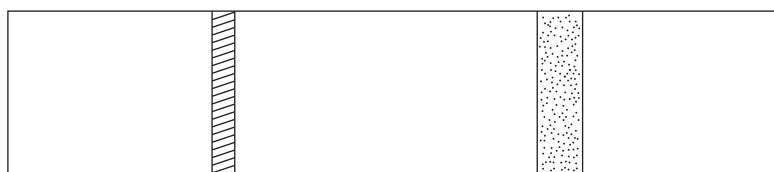
The spectrum from distant galaxies is different because they are moving away from us. The faster they are moving away the more the black lines move to the red end of the spectrum, this is called 'Red Shift'.



Galaxy A



Galaxy B



Galaxy C

- (i) Which of the galaxies (A, B or C) is moving fastest away from us?

_____ [1]

- (ii) Which galaxy (A, B or C) is furthest away from us?

_____ [1]

Examiner Only	
Marks	Remark

6 Crash barriers are often placed in the central reservations of motorways.

(a) Explain fully how crash barriers are designed to reduce the seriousness of accidents which may occur on motorways.

[2]

The photographs below show two types of crash barriers found on our motorways.



Wire rope barrier

© Highway Barrier Solutions Ltd www.hbsonline.co.uk/Site/7%5CImages%5Csupplie..



Concrete barrier

Copyright © 2006 – saferMOTORWAYS <http://safermotorways.co.uk/photos/safety-barriers/safety-barrier-photograph-3>

(b) Concrete barriers are safer but suggest why wire barriers are still used on motorways.

[1]

Examiner Only	
Marks	Remark

- (c) The diagram below shows the collision between a lorry and a stationary car.



- (i) When they collide the lorry stops instantly and all its momentum is transferred to the car which starts to move.

Use the equation:

$$\text{momentum} = \text{mass} \times \text{velocity}$$

to calculate the maximum velocity the car may move with.

Velocity = _____ m/s [2]

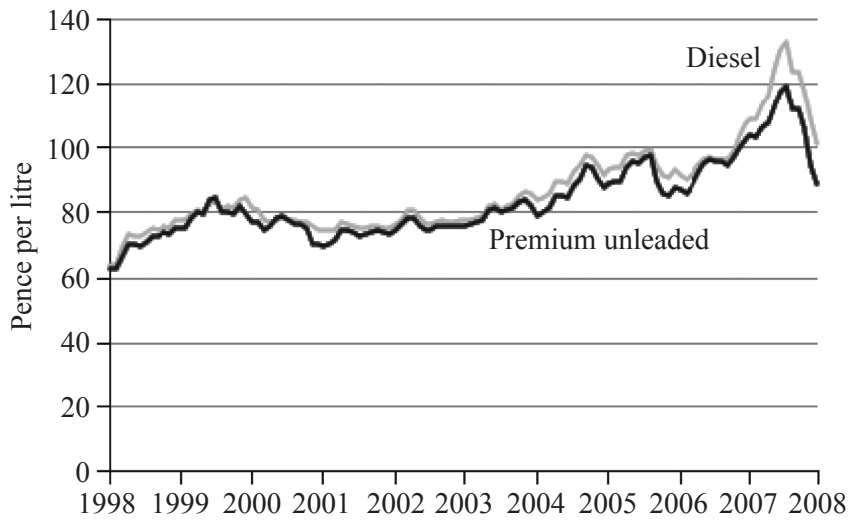
- (ii) It is found that the car moves off with less velocity than expected because some of the energy has been absorbed by the car. Give one feature of the car designed to absorb this energy.

_____ [1]

Examiner Only

Marks Remark

- (f) The graph below shows the price of fuel in the United Kingdom between 1998 and 2008.



© Crown Copyright <http://www.statistics.gov.uk/cci/nugget.asp?id=2136>

Give **two** disadvantages of the Government's decision to raise money through increasing the tax on fuel annually.

[2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

Permission to reproduce all copyright material has been applied for.
In some cases, efforts to contact copyright holders may have been unsuccessful and CCEA
will be happy to rectify any omissions of acknowledgement in future if notified.