Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Road Safety, Radioactivity and Earth in Space Module 6

Higher Tier

[GSC62]

GSC62

THURSDAY 24 MAY 2012, MORNING

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.

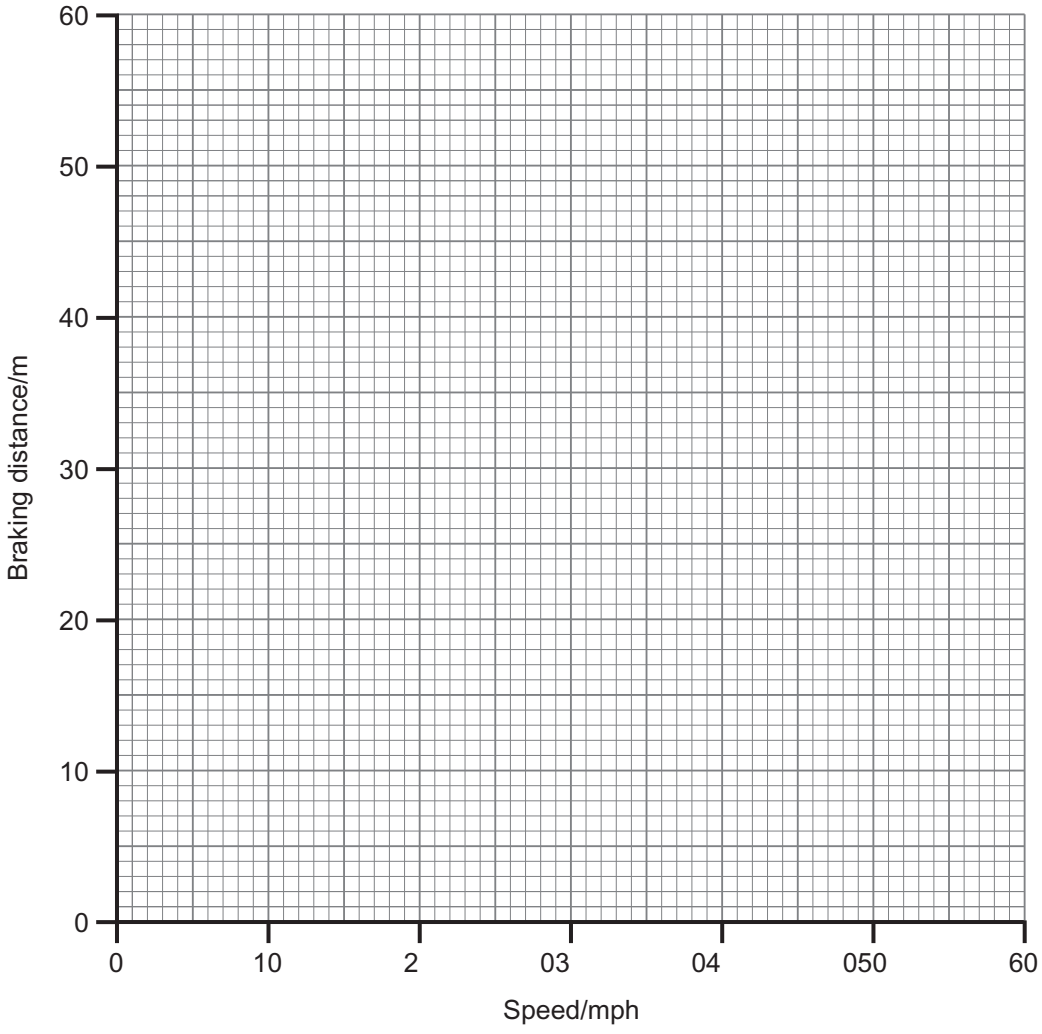
For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
Total Marks	

Examiner Only	
Marks	Remark

1 **(a)** The table below gives information about the braking distance at different speeds.

Speed/mph	Braking distance/m
20	6
30	14
40	24
50	38
60	54

(i) Use the information in the table to plot and draw a line graph on the grid below.



[3]

(ii) Describe a trend shown by these results.

_____

_____ [1]

(b) Apart from speed give **one** other factor that will increase the braking distance. Explain your answer in terms of forces.

Examiner Only

Marks	Remark

_____

_____

_____ [2]

(c) The photograph below shows a car which was involved in a collision. The front has collapsed to help reduce injuries.

© TRL Ltd / Science Photo Library

What name is given to the front part of a car which collapses in this way? Suggest how this helps reduce injuries to the driver.

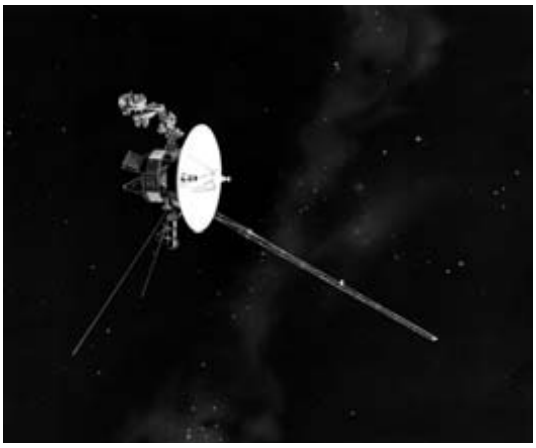
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

2 The picture below shows the spacecraft Voyager 1 on its journey to the edge of the Solar System and beyond.



© NASA / JPL / Science Photo Library

(a) Explain fully why it is unlikely that this spacecraft will reach any planet outside our Solar System.

_____

_____

_____ [2]

(b) Space exploration is very expensive. Suggest **two** reasons why scientists continue to explore space.

_____

_____

_____ [2]

(c) Explain fully the formation of the Sun.

_____

_____

_____

_____

_____ [3]

BLANK PAGE

(Questions continue overleaf)

Examiner Only	
Marks	Remark

3 The table below shows the number of deaths caused by road accidents during 2010, in various age groups, in Northern Ireland.

Age	Male	Female
16–24	14	1
25–34	10	3
35–44	4	1
45–54	7	3
55–64	2	2
65+	5	1

(a) State **two** trends shown by this data.

1. _____

_____

2. _____

_____ [2]

(b) Police officers often look at the diameter of a person's pupil to detect if they have taken drugs. The images below show the effect of cannabis and ecstasy on pupil diameter.

(i) Use the chart below to find the diameter of the pupil of a person who has taken cannabis.

Diameter of pupil/mm																
1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0
•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

_____ mm [1]

(ii) Explain fully why a driver taking drugs may increase the chance of being involved in a car crash.

Examiner Only

Marks	Remark

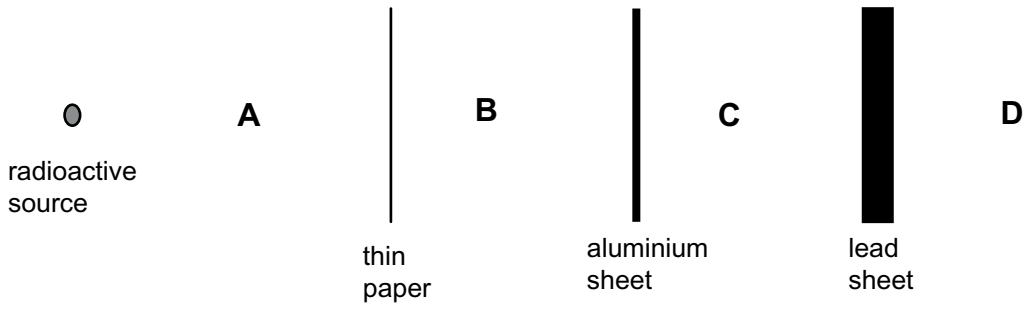
_____

_____

_____ [2]

Examiner Only	
Marks	Remark

4 **(a)** The radioactive source shown below emits alpha, beta and gamma radiation. Detectors placed at A, B and C show that different types of radiation have reached these points from the source.



(i) Complete the table below giving **all** the type(s) of radiation found at each position (A, B and C).

Position	Type(s) of radiation
A	
B	
C	

[3]

(ii) There is no radiation from the source at position D. However, a small amount of radiation is still detected. Why is some radiation still detected at D?

_____ [1]

(iii) Explain fully why some atoms are described as radioactive.

_____

_____ [2]

(b) A radioactive material has a half-life of six days.

(i) Explain fully what is meant by the term “half-life”.

_____

_____ [2]

(ii) If this radioactive material has a mass of 180 g, what mass of radioactive material will be left after 12 days?

_____ g [1]

Examiner Only	
Marks	Remark

5 The photograph below shows a hydrogen fuelled car.

©GIPHOTOSTOCK / Science Photo Library

(a) Describe and explain **one** environmental and **one** economic reason why manufacturers are designing cars which run on hydrogen.

Environmental _____

_____

_____

Economic _____

_____

_____ [4]

(b) The car above has a mass of 1810 kg and its momentum is 54 300 kg m/s.

Use the equation:

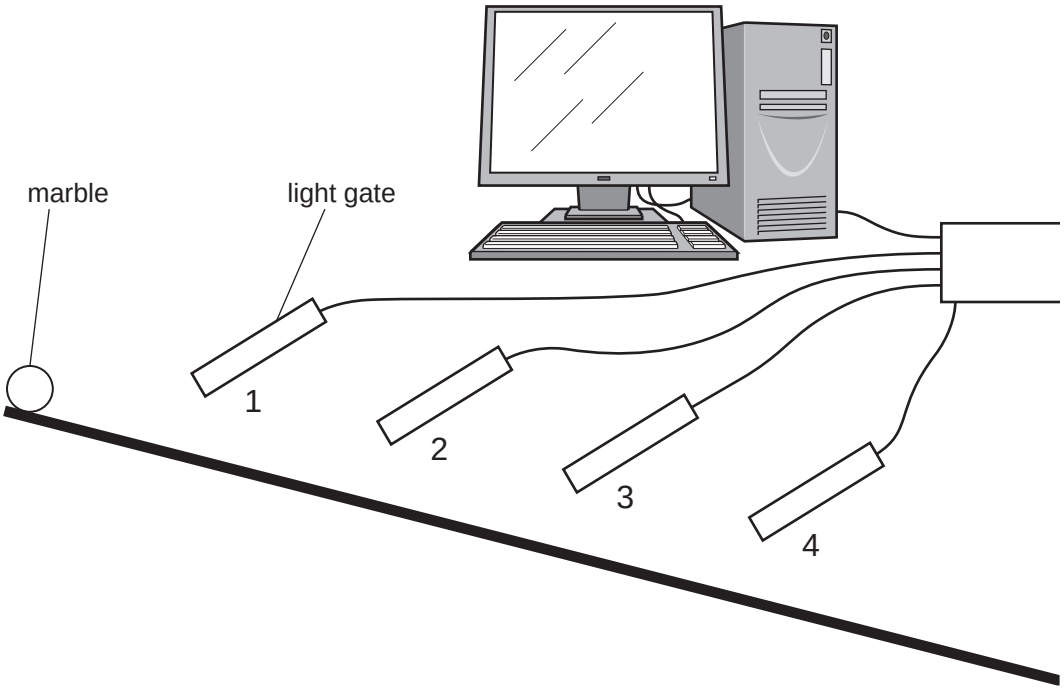
momentum = mass × velocity

to calculate its velocity.
(Show your working out.)

_____ m/s [2]

Examiner Only	
Marks	Remark

6 Colin investigated the speed of a marble travelling on a track using the apparatus shown below.



(a) The instantaneous speed was measured at each light gate, 0.2 m apart. The results are shown below.

Light gate	Distance from start/m	Time/s	Instantaneous speed/m/s
1	0.2	0.38	0.6
2	0.4	0.60	0.9
3	0.6	0.78	1.3
4	0.8	0.88	2.1

(i) Explain fully, in terms of forces, why the speed of the marble increases as it moves down the track.

_____

_____

_____

_____ [3]

(ii) Explain fully how the acceleration of the marble between light gate 1 and light gate 4 can be calculated.

_____

_____

_____

_____ [3]

(iii) Use the equation:

$$\textbf{average speed} = \frac{\textbf{total distance}}{\textbf{time taken}}$$

to calculate the average speed of the marble between light gates 2 and 4.
(Show your working out.)

_____ m/s [2]

(b) Car speed can be measured using instantaneous or average speed cameras. Explain fully why many safety campaigners promote the use of average speed cameras.

_____

_____

_____ [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

112907