



General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Road Safety, Radioactivity
and Earth in Space

Module 6

Higher Tier

[GSC62]

MONDAY 14 NOVEMBER 2011

2.30 pm–3.15 pm



Centre Number

71

Candidate Number

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

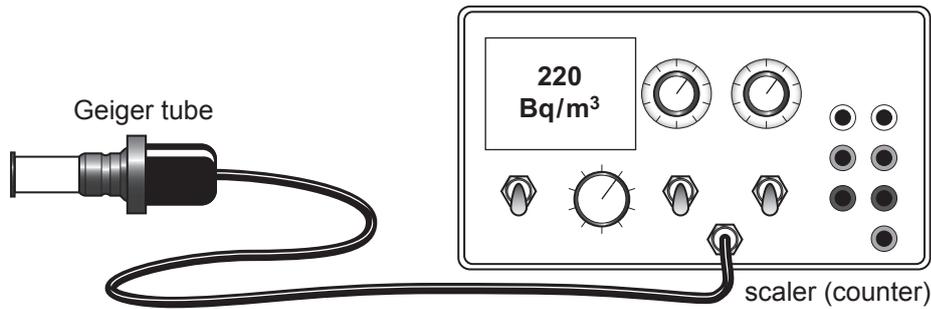
Question Number	Marks
1	
2	
3	
4	
5	
6	

Total
Marks

1 (a) Below are some statements about radon gas.

- Radon is a radioactive gas that comes mainly from the ground
- Radon can enter houses and build up to dangerous levels
- The average radon level in Northern Ireland is 20 Bq/m^3
- Once the radon level reaches an **action level**, which is ten times the average, the householder should take steps to reduce it

A householder set up a radiation counter to measure the background level of radon in his house.



(i) Use the information provided to explain fully why this householder should be concerned with this reading.

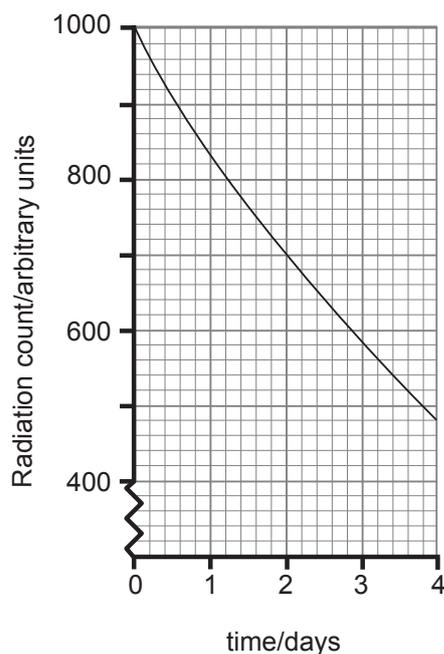
[2]

(ii) Explain fully how breathing in radon gas can be harmful to health.

[2]

Examiner Only	
Marks	Remark

(b) The graph below shows how the count rate of radioactive radon changes with time.



(i) Use the graph to find the half-life of radon.

_____ days [1]

(ii) After how many days will the radiation count have fallen to 250 arbitrary units?

_____ days [1]

(c) Explain fully why a nucleus may be radioactive.

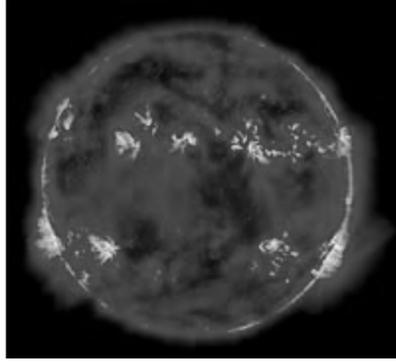
 _____ [2]

(d) Explain fully why some fresh fruits such as strawberries are treated with radiation.

 _____ [2]

Examiner Only	
Marks	Remark

2 The Sun is the nearest star to Earth.



© NASA

(a) Describe fully how the Sun was formed.

[3]

(b) The Sun is about 25 000 light years from the centre of our galaxy. Explain fully what is meant by the term light year.

[2]

(c) Scientists have discovered new planets many light years from Earth. Suggest how scientists search for extra-terrestrial life on these new planets.

[1]

Examiner Only

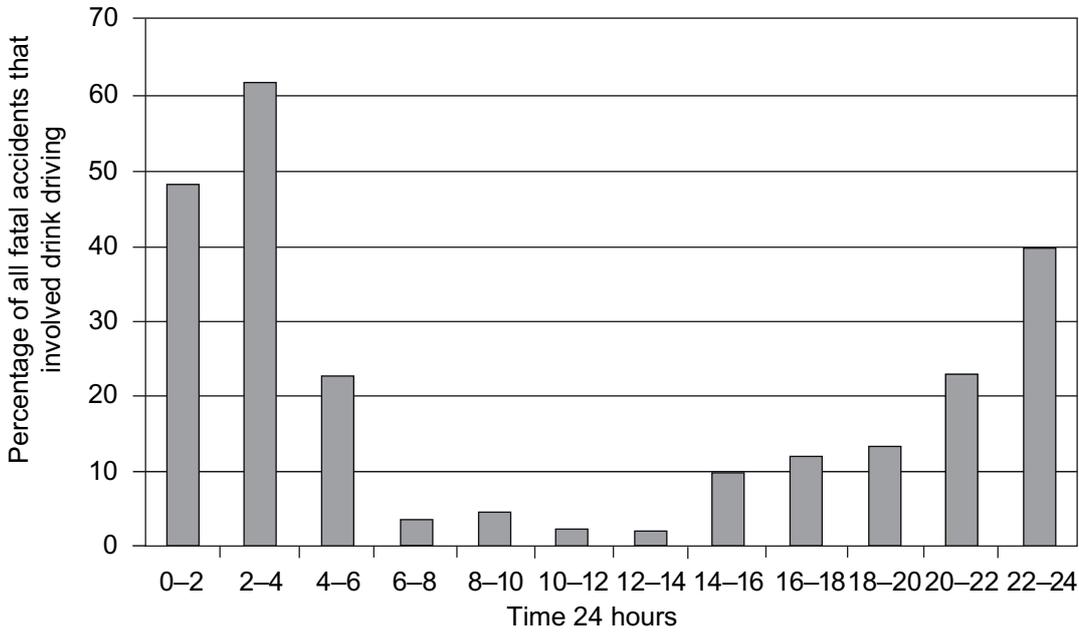
Marks Remark

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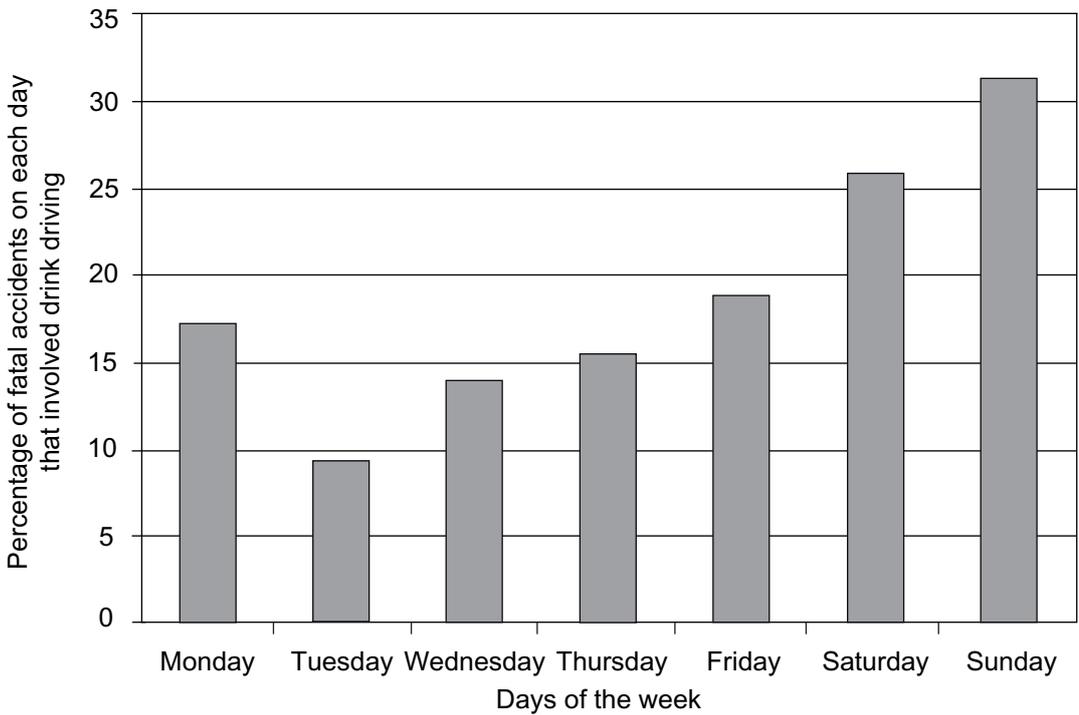
- 3 The graphs below show the percentage of all fatal accidents which involved drink driving at different times of the day and different days of the week.

Examiner Only	
Marks	Remark

Graph A



Graph B



© Crown Copyright - Road Safety Research Report 75 Fatal Vehicle Occupancy Collision
Dept of Transport HMSO Feb 2007

- (c) The table below shows the change in price for a litre of diesel in Northern Ireland.

Year	Price per litre/p
2010	123.6
2009	110.8
2008	109.1
2007	105.8
2006	92.6

- (i) The Government take 62% of the cost of a litre of fuel in tax. Give two advantages and two disadvantages of the Government's decision to raise money through these taxes.

Advantages:

1. _____

2. _____

Disadvantages:

1. _____

2. _____

[4]

- (ii) Apart from tax what has been the major cause for the rise in the cost of diesel since 2006?

_____ [1]

Examiner Only	
Marks	Remark

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- 4 Nuclear medicine uses radioactive tracers which emit gamma rays, for example, iodine to study the thyroid gland. The table below shows three forms of radioactive iodine.

Form of iodine	Half-life	Radiation emitted
iodine-123	13 hours	gamma
iodine-128	25 minutes	beta
iodine-129	15 700 000 years	beta and gamma

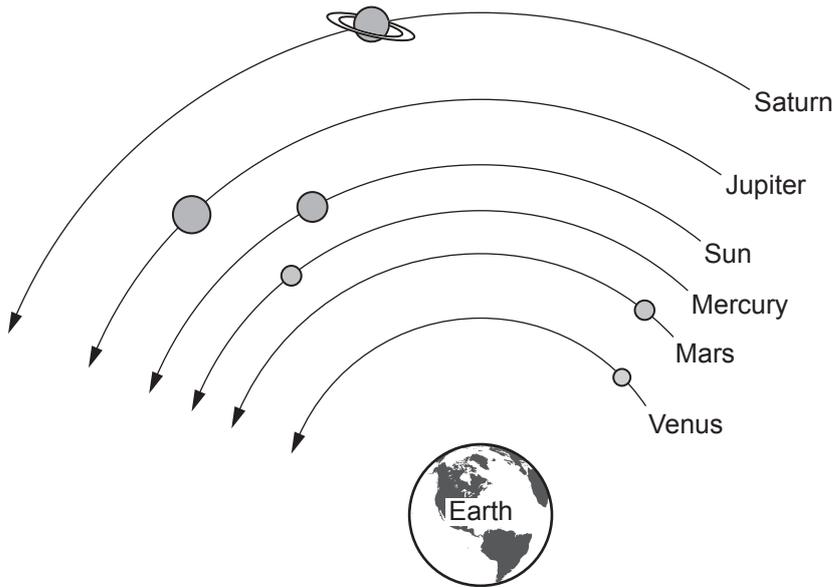
Explain fully why iodine-123 is the most suitable radioactive tracer to study the thyroid gland.

[3]

Examiner Only

Marks Remark

(b) The diagram below shows the Geocentric model of our Solar System.



When this model was proposed only six of the eight planets were known. State **two** other differences between this model and the model we know today.

[2]

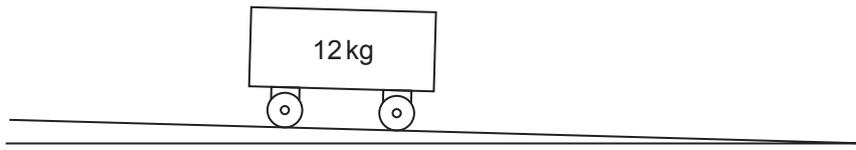
Examiner Only	
Marks	Remark

(c) Use the diagrams to explain fully what was observed and how this supports the idea of a 'Big Bang' start to the Universe.

[3]

Examiner Only	
Marks	Remark

- 6 A truck of mass 12 kg is placed on a very slight slope as shown in the diagram below. The truck does not move.



- (a) (i) State, in terms of forces, why the truck does not move.

_____ [1]

- (ii) The slope is now increased and the truck begins to accelerate. Explain fully, in terms of forces, why it accelerates.

_____ [3]

- (b) At the bottom of the slope this truck has a momentum of 62.4 kgm/s.

Use the following equation:

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

to calculate its velocity at this point.

Velocity _____ m/s [2]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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