WJEC 2014 Online Exam Review

GCSE Science Unit 2 Higher Tier 4782-02

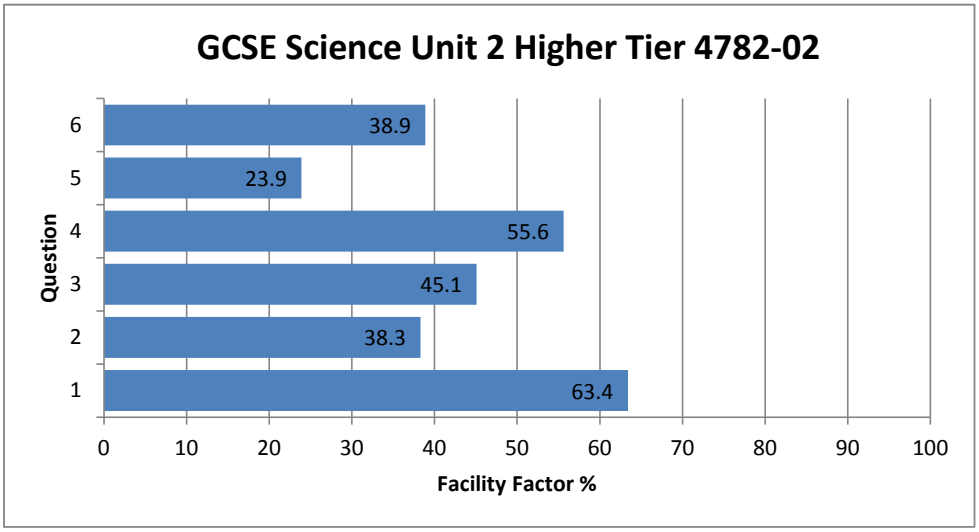
All Candidates' performance across questions

Question Title	N	Mean	S D	Max Mark	F F	Attempt %
1	49	8.2	1.9	13	63.4	100
2	47	3.1	1.3	8	38.3	95.9
3	49	4.1	1.3	9	45.1	100
4	49	5	1.6	9	55.6	100
5	49	1.7	1.2	7	23.9	100
6	49	5.4	2.5	14	38.9	100

2

4

6



Examiner only

2. *(a)* Complete the following table about the extraction of iron in the blast furnace. [3]

Raw material	Chemical name	The purpose of the raw material
limestone	calcium carbonate	Removes impurities which form the waste called slag
hot air	oxygen	Allows the coke to burn
coke	carbon	....
haematite	....	....

Examiner only

(b) The table below shows information about the materials required for the production of **one tonne** of iron.

Complete the table to calculate the total cost of producing **one** tonne of iron. [3]

Raw material	Mass needed (tonnes)	Cost per tonne of raw material (£)	Cost in producing one tonne of iron (£)
iron ore	1.75	60.50	.....
coke	0.25	120.90	30.22
limestone	0.25	.....	20.00
hot air	4.0	2.25	9.00
		Total cost	£ .....

(c) Aluminium is also extracted from its ore. Explain why aluminium cannot be extracted in a blast furnace using coke (carbon). [2]

.....

.....

.....

8

Turn over.

Examiner only

2. *(a)* Complete the following table about the extraction of iron in the blast furnace. [3]

Raw material	Chemical name	The purpose of the raw material
limestone	calcium carbonate	Removes impurities which form the waste called slag
hot air	oxygen	Allows the coke to burn
coke	carbon	Provides carbon ~~to allow~~ which burns and reacts with iron oxide. Causes reduction.
haematite	Iron Oxide	Molten iron is made when heated by blasts of hot air. Also, impurities are made. and oxygen is removed

Examiner only

(b) The table below shows information about the materials required for the production of **one tonne** of iron.

Complete the table to calculate the total cost of producing **one** tonne of iron. [3]

Raw material	Mass needed (tonnes)	Cost per tonne of raw material (£)	Cost in producing one tonne of iron (£)
iron ore	1.75	60.50	34.57
coke	0.25	120.90	30.22
limestone	0.25	5	20.00
hot air	4.0	2.25	9.00
		Total cost	£ 93.79

(c) Aluminium is also extracted from its ore. Explain why aluminium cannot be extracted in a blast furnace using coke (carbon). [2]

Aluminium cannot be extracted from its ore in the blast furnace using reduction as it is to hard. Instead, electrolysis is used.

Examiner only

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Raw material	Chemical name	The purpose of the raw material
limestone	calcium carbonate	Removes impurities which form the waste called slag
hot air	oxygen	Allows the coke to burn
coke	carbon	burns forming the carbon gas to start the reaction.
haematite	Iron ore	When heated ~~from~~ molten iron comes from this in the blast furnace which can then be solidified into iron.

Examiner only

(b) The table below shows information about the materials required for the production of **one tonne** of iron.

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Raw material	Mass needed (tonnes)	Cost per tonne of raw material (£)	Cost in producing one tonne of iron (£)
iron ore	1.75	60.50	105.87
coke	0.25	120.90	30.22
limestone	0.25	80	20.00
hot air	4.0	2.25	9.00
		Total cost	£ 165.09

(c) Aluminium is also extracted from its ore. Explain why aluminium cannot be extracted in a blast furnace using coke (carbon). [2]

It cannot be extracted in this way as aluminium is higher than carbon on the reactivity series. It must instead be extracted through electrolysis.

8

4782 020007

Examiner only

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Raw material	Chemical name	The purpose of the raw material
limestone	calcium carbonate	Removes impurities which form the waste called slag
hot air	oxygen	Allows the coke to burn
coke	carbon	The coke removes the iron from the iron ore because it is more reactive.
haematite	Iron oxide $Fe_2 + O_3$	Is the final thing left over when the extraction is completed. The oxide just have to be removed.

Examiner only

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coke	0.25	120.90	30.22
limestone	0.25	80 ~~2·50~~	20.00
hot air	4.0	2.25	9.00
		Total cost	£ 71·20

(c) Aluminium is also extracted from its ore. Explain why aluminium cannot be extracted in a blast furnace using coke (carbon). [2]

Aluminium is more reactive than carbon therefore has to be extracted from it's ore using electrolysis

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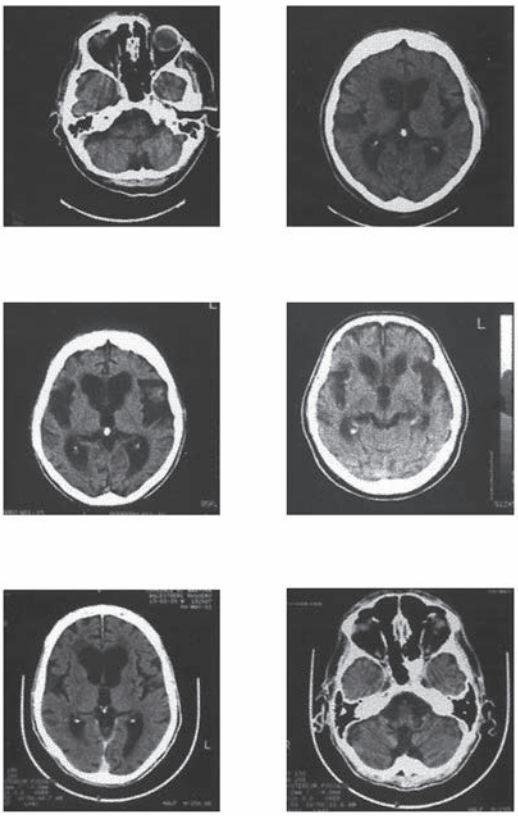
4782 020007

Examiner only

4. Huntington's is an inherited genetic disease caused by a dominant allele and is not usually diagnosed until 35 to 45 years of age. The diagnosis is usually confirmed by genetic testing and CAT scan.



(a) Give **three** reasons why a CAT scan is used in the diagnosis of Huntington's. [3]

1. .....

.....

2. .....

.....

3. .....

.....

Examiner only

(b) (i) Complete the Punnett square to show the offspring produced by a heterozygous father and a mother who does not suffer from Huntington's. [3]

	.....	.....
.....	.....	.....
.....	.....	.....

(ii) Calculate the chance that their first child will suffer from Huntington's. [1]

..... %

(c) Explain what advice could be given to this couple to avoid the possibility of producing a child suffering with Huntington's. [2]

.....

.....

.....

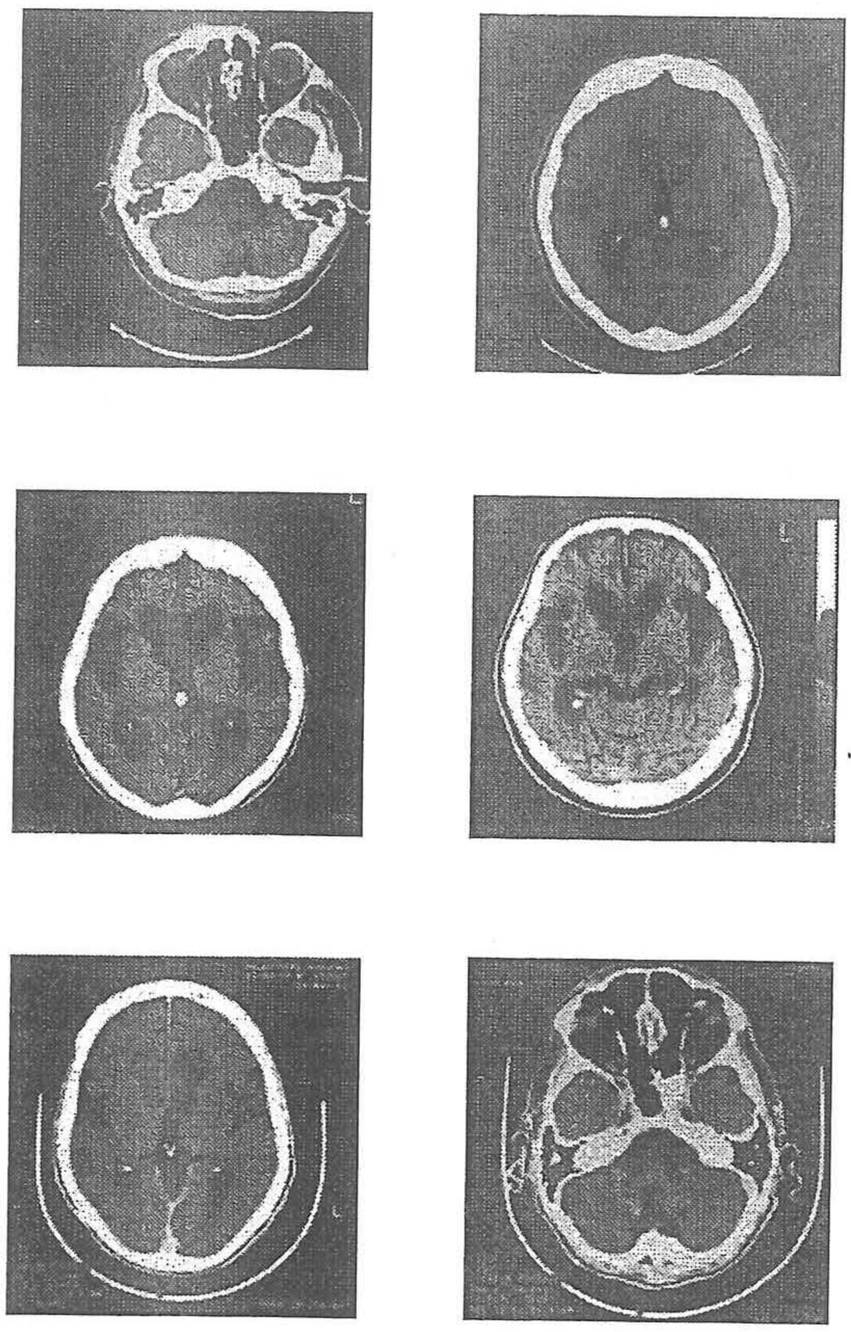
.....

9

Turn over.

Examiner only

4. Huntington's is an inherited genetic disease caused by a dominant allele and is not usually diagnosed until 35 to 45 years of age. The diagnosis is usually confirmed by genetic testing and CAT scan.



(a) Give **three** reasons why a CAT scan is used in the diagnosis of Huntington's. [3]

1. Can view image from different angles

2. Gives a 3-D view

3. Makes it easy to detect Huntington's

Examiner only

(b) (i) Complete the Punnett square to show the offspring produced by a heterozygous father and a mother who does not suffer from Huntington's. [3]

Gametes	N	n
n	Nn	nn
n	Nn	nn

(ii) Calculate the chance that their first child will suffer from Huntington's. [1]

50 %

(c) Explain what advice could be given to this couple to avoid the possibility of producing a child suffering with Huntington's. [2]

The couple could adopt a child instead of having one that could potentially have Hintington's. Another option is IVF or using a surrogate

9

Examiner only

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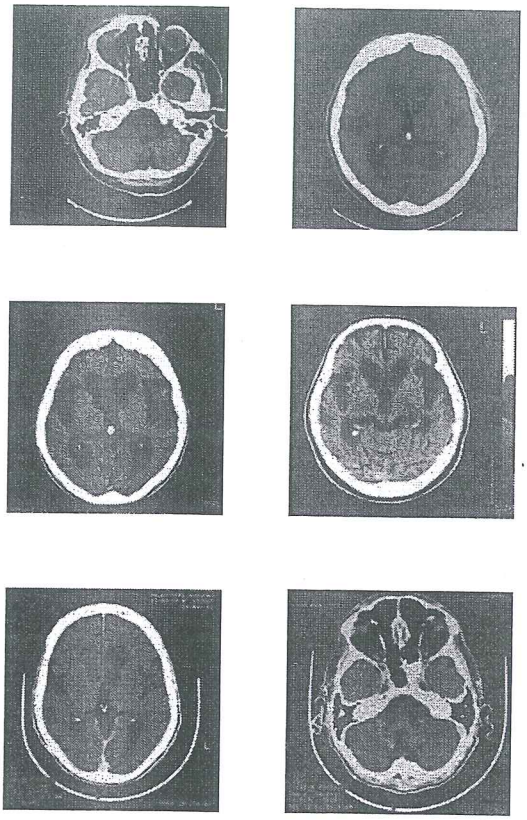

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2. Gives a 3-D view ✓
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Examiner only

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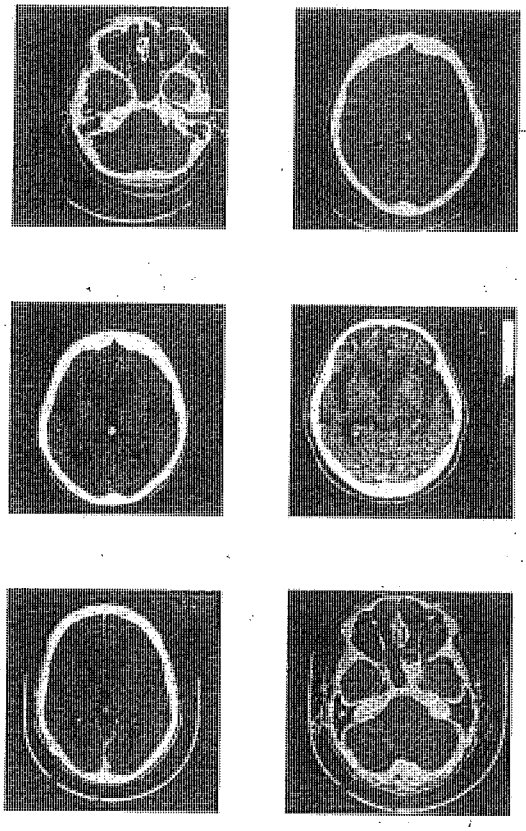

(a) Give **three** reasons why a CAT scan is used in the diagnosis of Huntington's. [3]

1. Images are 3D, we are able to see more of the brain.
2. X-rays are used *to create a clear image of the brain.
3. Huntingtons disease mainly affects the brain.

*all around the body

Examiner only

(b) (i) Complete the Punnett square to show the offspring produced by a heterozygous father and a mother who does not suffer from Huntington's. [3]

gametes	h	h	father
H	Hh	Hh	
h	hh	hh	

mother

(ii) Calculate the chance that their first child will suffer from Huntington's. [1]

50 %

(c) Explain what advice could be given to this couple to avoid the possibility of producing a child suffering with Huntington's. [2]

As huntingtons is an inherited disease, advising the couple to look into IVF or adoption could be an option. This would decrease or completely eliminate the chance of the child developing huntingtons.

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Examiner only

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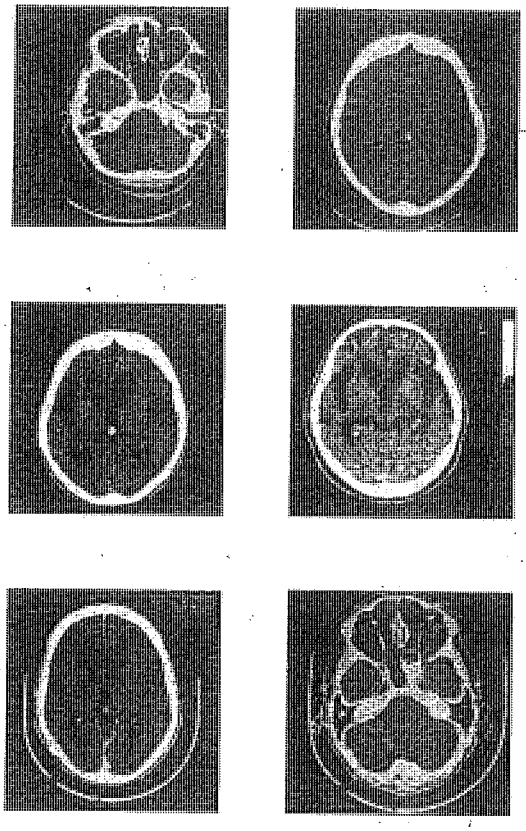

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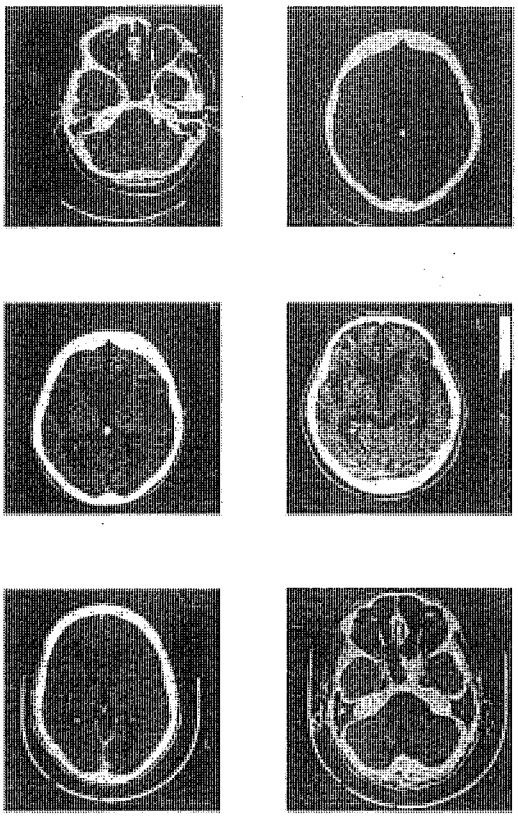

(a) Give **three** reasons why a CAT scan is used in the diagnosis of Huntington's. [3]

1. Huntingtons affects the brain therefore a CAT scan can take images from different angles.
2. To form a 3d image
3. The image clearly shows if the pateint has huntingtons

Examiner only

(b) (i) Complete the Punnett square to show the offspring produced by a heterozygous father and a mother who does not suffer from Huntington's. [3]

H=H
Hh
hh

	H	h
h	Hh	hh
h	Hh	hh

(ii) Calculate the chance that their first child will suffer from Huntington's. [1]

50 %

(c) Explain what advice could be given to this couple to avoid the possibility of producing a child suffering with Huntington's. [2]

~~The advice I would~~ The advice that could be given is that the couple may want to think about other ways about having children such as IVf or adoption.

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Examiner only

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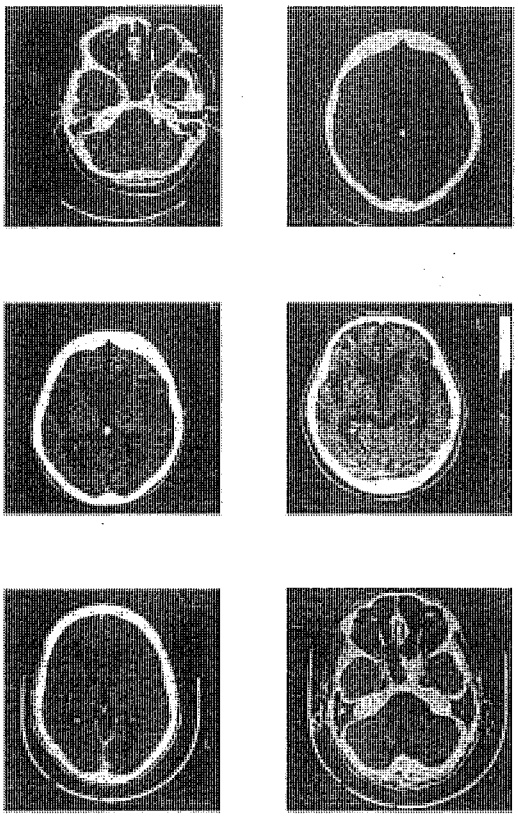

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Examiner only

6. The image of the thyroid gland below is from a gamma camera.

(a) Describe how iodine-123 is used to generate an image from the gamma camera. Your answer should refer to: [6 QWC]

- how it is administered;
- detecting the radiation;
- formation of the image.

Examiner only

(b) The table below shows some isotopes of iodine.

Radio-isotope	Symbol	Half-life
iodine-111	^{111}I	2.5 seconds
iodine-123	^{123}I	13.2 hours
iodine-131	^{131}I	8 days

(i) State what is meant by the term *half-life*. [2]

.....

.....

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

Fraction =.....

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

.....

.....

.....

(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

.....

.....

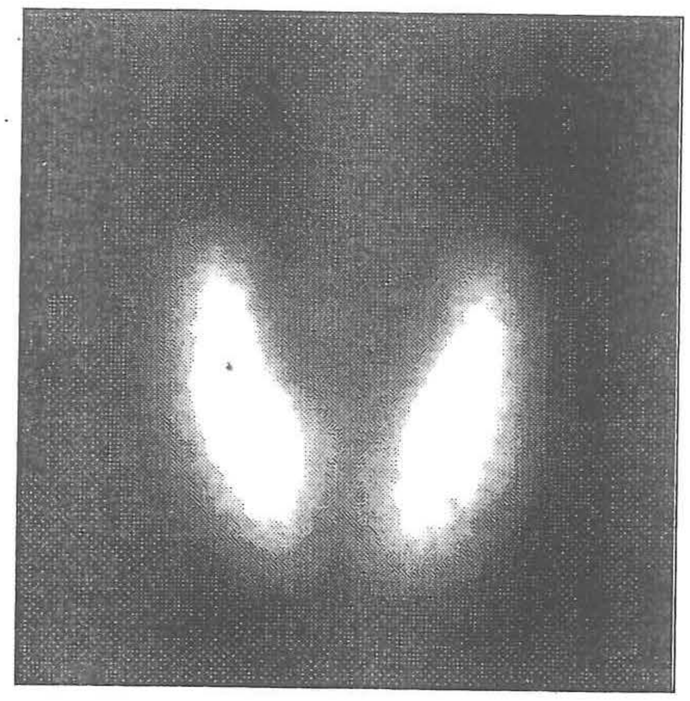
.....

14

END OF PAPER

Examiner only

6. The image of the thyroid gland below is from a gamma camera.



(a) Describe how iodine-123 is used to generate an image from the gamma camera. Your answer should refer to: [6 QWC]

- how it is administered;
- detecting the radiation;
- formation of the image.

Iodine-123 can either be injected or drank by the patient. The radio-isotope is then inside the body. This could be referred to as internal radiotherapy. The Iodine may be tagged so that is finds the part of the body needed to be looked at. ~~Radiation is then given off and detected by the gamma camera.~~ The camera can then piece together an image, so we can detect what is wrong.

The radio-isotope is then absorbed by the thyroid gland. It then emits radiation which is picked up by the gamma camera

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iodine-131	^{131}I	8 days

(i) State what is meant by the term *half-life.* [2]

The time in which the count rate of the radio isotope decreases by 50%

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

1 = ~~13·2~~

$\frac{1}{2}$ 13·2 $\frac{1}{4}$ 26·4 $\frac{1}{8}$ 39·6

$\frac{1}{16}$ = ~~52·8~~ $\frac{1}{32}$

Fraction = $\frac{1}{32}$

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

The half life is long enough to ~~Lette~~ detect the problem, but not to long that the patient is radioactive for does. This could cause the patient and other people around him to be ill.

(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

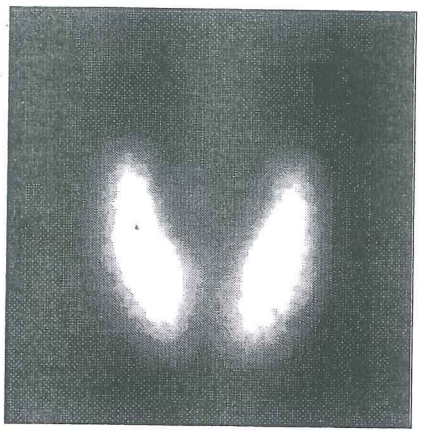
To many gamma camera investigations could leave the patient exposed to radiation. This could then damage or kill healthy cells, causing the patient to be ~~ill~~ ill or die.

14

END OF PAPER

Examiner only

6. The image of the thyroid gland below is from a gamma camera.



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(i) State what is meant by the term *half-life*. [2]

The time in which the count rate of the radio isotope decreases by 50%

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

~~1 = 13·2~~

$\frac{1}{2}$ 13·2 $\frac{1}{4}$ 26·4 $\frac{1}{8}$ ~~39·6~~

$\frac{1}{16}$ ~~= 52·8~~ $\frac{1}{32}$

Fraction = ~~$\frac{1}{2}$~~ $\frac{1}{32}$

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

The half life is long enough to ~~Iate~~ detect the problem, but not to long that the patient is radioactive for does. This could cause the patient and other people around him to be ill

(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

To many gamma camera investigations could leave the patient exposed to radiation. This could then damage or kill cancer cells, causing the patient to be ~~ill~~ ill or die.

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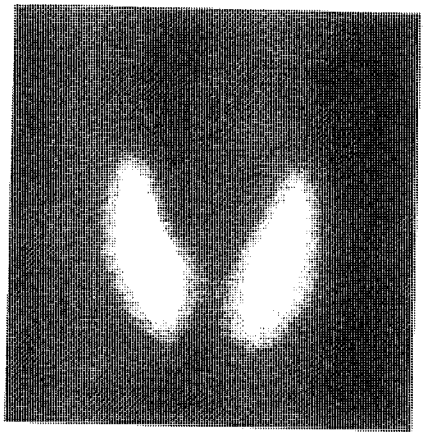
END OF PAPER

Examiner only

6. The image of the thyroid gland below is from a gamma camera.



(a) Describe how iodine-123 is used to generate an image from the gamma camera. Your answer should refer to: [6 QWC]

- how it is administered;
- detecting the radiation;
- formation of the image.

Iodine-123* is administered either through injection or injestion. After this, the iodine-123 targets the specific organ. The gamma camera then, using gamma rays, picks up the radiation given off from iodine-123 and uses x-rays to form an image of the organ it has targeted. This can be used to detect/observe things such as cancer growth/development in cancers.

* is a radioaltive isotope.

Examiner only

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iodine-131	^{131}I	8 days

(i) State what is meant by the term *half-life*. [2]

The time it takes for the known mass of a radioactive substance to decrease by 50%.

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

13.2 = $\frac{1}{2}$

26.4 = $\frac{1}{4}$

39.6 = $\frac{1}{8}$

52.8 = $\frac{1}{16}$

66 = $\frac{1}{32}$

Fraction = $\frac{1}{32}$

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

It lasts just long enough for the patient not to be harmed by the radioactivity during the treatment.

(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

Gamma cameras use ionising radiation. Large doses of the radiation can be harmful and lead to cancers or cell mutations.

END OF PAPER

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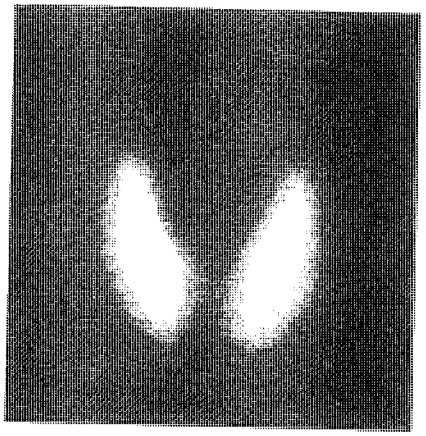


(a) Describe how iodine-123 is used to generate an image from the gamma camera. Your answer should refer to: [6 QWC]

- how it is administered;
- detecting the radiation;
- formation of the image.

Iodine-123* is administered either through injection or injestion. After this, the iodine-123 targets a specific organ. The gamma camera then, using gamma rays, picks up the radiation given off from iodine-123 and uses x-rays to form an image of the organ it has targeted. This can be used to detect/observe things such as cancer growth/development in cancers.

* is a radioaltive isotope.

Examiner only

(b) The table below shows some isotopes of iodine.

Radio-isotope	Symbol	Half-life
iodine-111	^{111}I	2.5 seconds
iodine-123	^{123}I	13.2 hours
iodine-131	^{131}I	8 days

(i) State what is meant by the term *half-life*. [2]

The time it takes for the known mass of a radioactive substance to decrease by 50%.

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

13.2 = $\frac{1}{2}$

26.4 = $\frac{1}{4}$

39.6 = $\frac{1}{8}$

52.8 = $\frac{1}{16}$

66 = $\frac{1}{32}$

Fraction = $\frac{1}{32}$

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

It lasts just long enough for the patient not to be harmed by the radioactivity during the treatment.

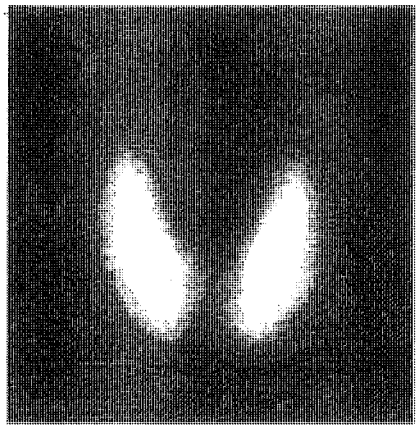
(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

Gamma cameras use ionising radiation. Large doses of the radiation can be harmful and lead to cancers or cell mutations.

END OF PAPER

Examiner only

6. The image of the thyroid gland below is from a gamma camera.



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Examiner only

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Half life is the term used to describe how long it takes for radiation to decrease by 50% making it safe.

(ii) Calculate the **fraction** of the original amount of iodine-123 that would be left in the body after 66 hours. [2]

13·2h = 1/2
26·4h = 1/4
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52·8h = 1/16

66h = 1/32

Fraction = 1/32

(iii) Iodine is absorbed by the thyroid. Explain why iodine-123 is the most suitable for this technique. [2]

Iodine-123 is most suitable for this technique because it is in the body long enough to do its job but has a half life that makes it safe for the patient to leave after a short time

(iv) Explain why a patient should only have a limited number of gamma camera investigations in a year. [2]

A patient should only have a limited number of gamma camera investigations in a year because radiation is not safe. If they had to have alot of investigations the radiation would build up and become dangerous, maybe even cause cancer.

END OF PAPER

Examiner only

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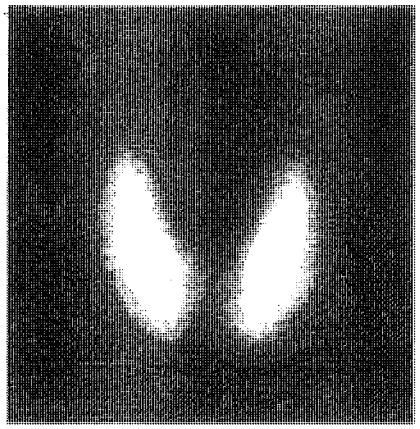

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