edexcel

Mark Scheme (Results)

June 2011

360Science

GCSE Physics
Structured Paper P3 (5049/01)

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

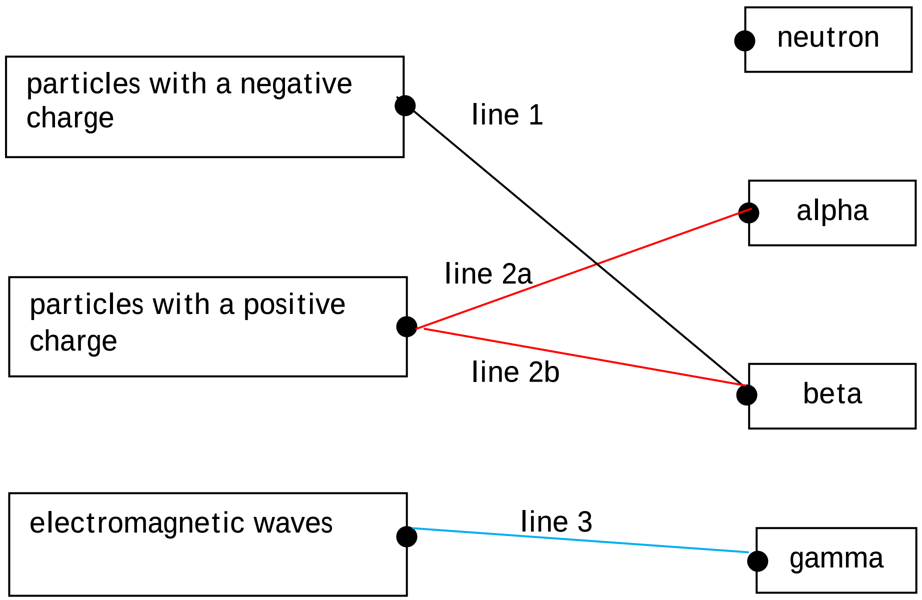
For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Mark Scheme that require the help of a subject specialist, you may find our **Ask The Expert** email service helpful.

Ask The Expert can be accessed online at the following link:
http://www.edexcel.com/Aboutus/contact-us/

Alternatively, you can contact our **Science Advisor** directly by sending an email to Stephen Nugus on ScienceSubjectAdvisor@edexcelexperts.co.uk.
You can also telephone 0844 576 0037 to speak to a member of our Subject Advisor team.

June 2011
Publications Code UG028538

Question Number	Correct Answer	Acceptable Answers	Reject	Mark
1	**description**  **Note:** from top box ……....line 1; from middle box….either line 2a or lines 2a AND 2b; from lower box …….line 3; more than 1 line from top 1….loses that mark more than 1 line from lower box……loses that mark		**radiation**	**(3)**

Question Number	Answer		Acceptable answers	Ignore	Reject	Mark
2(a)	**Note:** 7 / 8 correct = 4 marks 5/6 correct = 3 marks 3/ 4 correct = 2 marks 1/ 2 correct = 1 mark					
	the following words should be ringed arm ; carbon dioxide ; detectors / from ; reflected ;	replaced by finger (tip) oxygen emitters / to transmitted/	finger, ear, O_2 / O / O^2 LED / diode(s) / transmitters absorbed / passed through / detected / received			**(4)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
2(b)(i)	the pulse ;	pulse rate heart / heart beat / heart rate arterial blood / pumped blood	mention of blood flow venous		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
2(b)(ii)	idea of counting number of pulses in given time period (converting to pulse rate in minute)/eq ;		refs to heart monitors		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
3(a)(i)	0.8 (s)				**(1)**

Question Number	Answer		Acceptable answers	Ignore	Reject	Mark
3(a)(ii)			e.c.f from (a)(i)			
	substitution	f= 1/T=1/0.8	1.25 (Hz) for 1 mark			
	evaluation	(1.25 x 60 =) 75	bald correct ans = 2 marks allow alternative methods			**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
3(b)	(second degree) heart block ;		other possible answers from key		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
4(a)	X in top right hand "box" of graph;	dot in this box with an X marked nearby			**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
4(b)	alpha ;				**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
4(c)	loses/releases energy ; PLUS any **one** from: 1. undergoes (more) rearrangement ; 2. becomes stable ; 3. no change in p or n number/eq;	no p lost/ no n lost	refs to • (electronic) charge • electrons • mass • 'nucleus stays the same' • Confusion with PET scanner		**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
5(a)	Any **three** from: 1. (particles) moving ; 2. randomly ; 3. colliding ; 4. with side of (balloon) ; 5. (exerting) force ;	must be in the context of particles....air is insufficient...allow molecules/atoms allow have kinetic energy hitting, bumping into	bald 'energy' freely impacts with other particles push		**(3)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
5(b)(i)	290 (K) ;	290.15 (K)			**(1)**

Question Number	Answer		Acceptable answers	Ignore	Reject	Mark
5(b)(ii)	$\frac{101 \times 2.1}{290} = \frac{102 \times 2.2}{T_2}$; $T_2 = \frac{102 \times 2.2}{101 \times 2.1} \times 290$; = 306.8 (K) ; **Note:** allow substitution and transpose in either order allow e.c.f from (a)(i) bald correct answer = 3 marks	**substitution** **transpose** **evaluation**	allow ans which rounds to 307		incorrect equation	**(3)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
6(a)	Any **one** from: 1. electron(s) ; 2. quark(s) ; 3. neutrino(s) ;	anti-particles any specified quark correct symbols			**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
6(b)	(+) 2/3 (e) - 1/3 (e) ;;	Allow sensible use of thirds factor **OR** correct signs for 1 mark			**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
6(c)	u changes to d ; p changes to n ;	allow uud $\rightarrow$udd/eq p number decreases by 1, n number increases by 1	• positrons emitted from nucleus • refs to electrons		**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
6(d)	Any **three** from: 1. (F-18/isotope) attached to glucose/ glucose goes to site; 2. beta+ annihilates electron ; 3. (2) gamma produced ; 4. 2 gamma in opposite directions ; 5. detected simultaneously ; 6. 'triangulation' idea ;	check diagram for details biological details for 1 mark max β^{+} annihilates β^{-} at 180 ^{o}	react		**(3)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
7(a)	first and second reflection accurately drawn; decent progression down tube without light escape from fibre on the sides;				**(2)**

<table>
<tr><th>Question Number</th><th colspan="2">Answer</th><th>Acceptable answers</th><th>Ignore</th><th>Reject</th><th>Mark</th></tr>
<tr><td rowspan="2">7(b)(i)</td><td colspan="2">For 2 marks
= 0.8 /5x10⁻⁹ ;;</td><td rowspan="2">800/5 gets 1 mark

must correctly change 800mJ to 0.8 J and 5ns to 5 X10⁻⁹ to get the second mark</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">(2)</td></tr>
<tr><td>substitution

evaluation of the powers</td><td>(power =)8 / 5 ;

correct use of powers of 10 ;</td></tr>
</table>

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
7(b)(ii)	time for pulse is very small ;	gap time is (much) longer than pulse time allow to be shown by calculation	references to • danger to patient • energy loses as heat/light • confusion with body’s pulse		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
7(b)(iii)	sensible suggestion e.g. 1. idea of limiting damage to (nearby) skin (cells) 2. to allow doctor to move to next section of tattoo 3. 0.8 W is sustainable from power supply (160MW is not)	preventing damage/burns to skin	implication of radioactive damage or ionisation		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
7(b)(iv)	3.2×10^{12} (W/m^2) ;; CAO for 1 mark, a sub of 'a power/an area' must be seen e.g. $\frac{160\ 000\ 000}{5 \times 10^{-5}}$; OR $\frac{160}{5 \times 10^{-5}}$			incorrect equation	**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
7(b)(v)	increases; by factor of 4;	for 1 mark only more concentrated / doubles	stronger refs to power		**(2)**

Question Number	Answer		Acceptable answers	Ignore	Reject	Mark
8(a)	$2.08 \times 10^{-15} = V \times 1.60 \times 10^{-19}$; $V = \frac{2.08 \times 10^{-15}}{1.60 \times 10^{-19}}$; 13 000 (V) ;	**substitution** **transpose** **evaluation**	Sub or transpose in either order $\frac{\text{k.e.}}{\text{charge}}$ (=V)			**(3)**

Question Number	Answer		Acceptable answers	Ignore	Reject	Mark
8(b)	1.25×10^{18} X 1.60×10^{-19} ; 0.200 (A) ;	**substitution** **evaluation**	no of e (per s) X charge I=ne/t	ans as fractions		**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
8(c)	2.08×10^{-15} X 1.25×10^{18} ; 2600 (J) ; **OR** ans to(a) x ans to (b); 2600(J);	k.e. of one e X no of e / s statement that first line is > 2500 (voltage X current) statement that this is > 2500 evaluated ecf			**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(a)	Any **two** from: 1. any one problem associated with radioactivity / benefit of ultrasound; 2. any 2nd problem associated with radioactivity / benefit of ultrasound; 3. comparison of time required ; 4. benefit of ultrasound based on line 2 of the table 5. non-invasive or non-intrusive	allow perception of danger US is non-ionising ultrasound is quicker • ultrasound is cheaper • personnel in clinic not need to be as well trained / skilled/qualified • easier for patient to get to clinic	• **repeat of the data in the stem** • real time image • soft tissue • locally		**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(b)	Any **two** from: 1. ultrasound wave emitted from probe / to thyroid ; 2. **reflects** from nodules (to probe); 3. (at the boundary of) different densities of material; 4. idea that image is synthesised from (reflected) data; 5. reason for use of gel;	check diagram for details allow for nodules body / tissues / inside (of body) time analysed (reflected) waves build up image at PC/on screen		for both marks implication that US is radioactive for MP4 implication that US is transmitted	**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(c)(i)	iodine -123;	'123'			**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(c)(i)	Consequential marking Any **one** from: 1. half life is the **shortest;** 2. energy emitted is not too high and not too low ; 3. gamma emitted (not beta)	• **most** suitable half life • half life is **only** 13 hrs • energy emitted is most suitable	• **repeat of the data in the stem** • comments on production method		**(1)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(c)(ii)	iodine-131....no mark Any **two** from: 1. correct discussion/mention of type of source or ionisation needed ; 2. correct discussion of <u>energy</u> level needed in the context of beta; 3. correct comparison of half life needed; 4. correct discussion of production method linked to hospital; If the isotope is incorrect, then max of 1 mark	Gives off beta-minus has a high ionisation <u>energy</u> is high	• comments about gamma • power or strength • high levels		**(2)**

Question Number	Answer	Acceptable answers	Ignore	Reject	Mark
9(c)(iii)	any 2 right for 1 mark; any 4 right for 2 marks; all 6 right for 3 marks; $^{124}_{54}Xe + ^{\boxed{1}}_{\boxed{0}}n \rightarrow ^{125}_{\boxed{54}}Xe \rightarrow ^{\boxed{125}}_{53}I + ^{\boxed{0}}_{\boxed{1}}\beta+$			-1 in β+ lower box	**(3)**

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com
Order Code UG028538 June 2011

For more information on Edexcel qualifications, please visit
www.edexcel.com/quals

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE