Question Number	Answer	Mark
*15a	This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content	

Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points	Max linkage mark available	Max final mark
6	4	2	6
5	3	2	5
4	3	1	4
3	2	1	3
2	2	0	2

1	1	0	1
0	0	0	0

The following table shows how the marks should be awarded for structure and lines of reasoning
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	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

Guidance on how the mark scheme should be applied: The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points which is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning). If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages).

Indicative content
- <u>Magnetic field</u> perpendicular to velocity of particles
- Magnetic force on particles perpendicular to velocity
- Particles experience centripetal acceleration/force so they undergo circular motion
- Alternating potential difference between dees changes direction while particle in dees
- Particle accelerated by <u>electric field</u> between dees
- (Electric) field in correct direction so that force on particle further increases speed

(6)

15b	• Apply factor of 1.6×10^{-19} C for energy unit conversion	1	
	• Use of $E_k = p^2 / 2m$	1	
	• Use of $r = p / Bq$	1	
	• $B = 1.2$ T	1	(4)
	Example of calculation $E_K = 16 \times 10^6 \times 1.6 \times 10^{-19}$ C $= 2.56 \times 10^{-12}$ J 2.56×10^{-12} J $= p^2 / 2 \times 6.6 \times 10^{-27}$ kg $p = 1.8 \times 10^{-19}$ N s 0.47 m $= 1.8 \times 10^{-19}$ N s $/ B \times 2 \times 1.6 \times 10^{-19}$ C $B = 1.2$ T		
	Total for Question 15		**10**