PHYSICS 3 Summer 2015
Foundation Tier

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)			2	Hydrogen (1) Helium (1)	H He		h HE he
		(b)			4	LHS: red giant (1), white dwarf (1) RHS: supernova (1), black hole (1)			Any words not in box
		Total Mark			6				

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)			2	Appropriate field lines on both sides (at least 2 above and 2 below) (1) Direction arrows (north → south) (1)	Lines that touch / cross at the poles		Crossing or touching lines above and/or below Lines that don't start at either pole
		(b)	(i)		3	1 mark for each one correct. Upwards moving wire – points to +2 Other 2 diagrams – points to 0			
			(ii)		2	Move the metal rod faster / quicker (1) Make the magnets stronger / stronger magnetic field (1)	Move magnets closer together / more conductive metal bar / wider magnet / thicker metal bar / shorter metal bar		Use a coil of wire, bigger magnet, longer metal bar / more metal bars / curved magnets
		(c)	(i)		1	Alternates between + and -			The ammeter needle keeps moving back and fore / up and down / it will change
			(ii)		2	The wire moves up through the field and then down/changes its direction of travel through the field (1) So current is <u>induced / generated</u> one way and then the other (1) **The 2nd mark can only be awarded if it is linked to the 1st mark.**	Wire cuts field to induce a current (1)		
		Total Mark			10				

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FT	HT								
3		(a)	(i)		2	27 (1) 350 (1)			
			(ii)		3	Plots (2) no tolerance allow **ecf** on 350 K Straight line joining plotted points (1) ± ½ small square tolerance	A curve if **ecf** applied for the last point		
			(iii)		2	Show the line extended backwards **to the origin** (1) Reading of pressure consistent with their intercept (1)	1 mark if answer of 0 with no extrapolated line shown		Answer of 0 if extrapolated line does not go through 0
			(iv)		2	Pressure increases with temperature / positive correlation (1) In a uniform way (1)	Award 2 marks: [Directly] proportional / as one doubles the other doubles too		
		(b)			2	12 (1) × 80 = 960 [N] (1)			
		Total Mark			11				

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FT	HT								
4		(a)			2	Ticks in bottom 2 boxes Lose 1 mark for each extra tick			
		(b)			3	Any number of TIR shown (1) **or** 3 TIR shown (2) Straight line joining outgoing ray (1)			
		(c)			4	Refract (1) Travel along the boundary (1) Totally internally reflect / TIR (1) Totally internally reflect / TIR (1)			
		Total Mark			9				

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)	(i)		2	0.1 × 8 (1) 0.8 [kg m/s] (1)			
			(ii)		1	- 0.6 [kg m/s]			+0.6
			(iii)		1	Total momentum before collision = + 0.2 [kg m/s] (**ecf** from parts (i) &(ii) probably giving an answer of +1.4)			
			(iv)		1	Same answer as (iii)			
			(v)		2	$v_B = \frac{0.2}{0.2}$ 1 mark for the numerator (**ecf** from (iv)) 1 mark for the denominator (i.e. 0.2)	If no workings shown: Award 2 marks for an answer of 1 [m/s] Award 2 marks for an answer of 7 [m/s] when **ecf** applied		
		(b)	(i)		2	$t = \frac{(0-8)}{-160}$ 1 mark for the numerator of (0 - 8) **or** (8 - 0) 1 mark for the denominator of -160 **or** 160 respectively	If no workings shown: Award 2 marks for an answer of 0.05 Award 1 mark for an answer of -0.05		
			(ii)		2	Force = 1.6 [N] (1) To the left / opposite [direction to force applied to B] (1)	In the negative vector / velocity direction (for second mark) Accept = -1.6 [N] for both marks Award 1 mark for: force on A is equal and opposite / same size and opposite		Force is backwards / same size
		Total Mark			11				

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
6		(a)	(i)		1	Gravity **and** radiation / pressure			
			(ii)		1	Forces are balanced / they are balanced	Equal and opposite / forces cancel each other out		The same / equal / because it has a supply of hydrogen / its balanced
		(b)	(i)		1	$^{1}_{1}\mathrm{H} + {}^{1}_{1}\mathrm{H} + {}^{1}_{1}\mathrm{H} + {}^{1}_{1}\mathrm{H} \rightarrow {}^{4}_{2}\mathrm{He} + {}^{0}_{1}\mathrm{e} + {}^{0}_{1}\mathrm{e}$	$4\,{}^{1}_{1}\mathrm{H} \rightarrow {}^{4}_{2}\mathrm{He} + 2\,{}^{0}_{1}\mathrm{e}$		
			(ii)		3	<u>Four</u> hydrogen [nuclei] / protons <u>join / fuse</u> (1) to form a helium [nucleus] (1) and <u>two</u> positrons (1)	Antielectron instead of positron		Positive electron / react / bond / collide / alpha particle
		(c)			1	Energy / gamma is released	They annihilate / destroy each other / cancel each other out	An explosion takes place	They neutralise each other
		Total Mark			7				

Question Number				
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7			6	**Indicative content:** Conduction in solids occurs because the atoms are regularly positioned and are close together. The atoms in the hot part of the solid vibrate faster than those elsewhere. They pass on their energy to their neighbours by collisions and so the energy travels through the solid. In metals this is improved by free electrons which move at speed from the hot region, colliding with metal ions in the lattice, transferring their energy in the process. Convection occurs in gases because the particles in the hotter region have more energy and push each other further apart in violent collisions. This region becomes less dense and rises above the cooler region setting up a circulating current, transferring thermal energy to all parts of the gas. **5-6 marks** The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar. **3-4 marks** The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar. **1-2 marks** The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar. **0 marks** The candidate does not make any attempt or give a relevant answer worthy of credit.
		Total Mark	6	