

Question number	Answer	Notes	Marks
6 (a)	a (large) collection of (billions of) stars;	allow solar systems for stars	1
(b)	D (the universe); A is not the correct answer because a nebula is a gas cloud B is not the correct answer because a red giant is a star C is not the correct answer because a solar system consists of a star and planets		1
(c) (i)	galaxy A is moving towards Earth; galaxy B is moving away from Earth; galaxy B is moving faster than galaxy A;	allow 1 mark for galaxies moving in opposite directions if neither of these marks scored	3
(ii)	correct evaluation of $\Delta\lambda$; substitution into $\Delta\lambda/\lambda = v/c$; rearrangement; evaluation; $\Delta\lambda = (657.81 - 656.45 =) 1.36 \text{ (nm)}$ $1.36/656.45 = v/3 \times 10^8$ $(v =) 1.36 \times 3 \times 10^8 / 656.45$ $(v =) 620\,000 \text{ (m/s)}$	allow ECF from incorrect $\Delta\lambda$ if clear from working can be in nm or m -1 if 657.81 used as λ allow 3 marks max. if galaxy A used, giving $v = 109\,681...$ $729\,693...$, $731\,473...$ score 2 marks $620\,239$ etc. scores 3 marks allow $621\,524$ etc.	4

Total for Question 6 = 9 marks