Question Number	Answer		Mark
14(a)	Use of upthrust = weight of fluid displaced	**(1)**	
	Use of $\rho = m / V$ [accept use to calculate density of balloon, 0.184 (kg m^{-3})]	**(1)**	
	[Correct use of $\rho_{air}gV$ to find resultant can score MP1 and MP2]	**(1)**	
	Use of $W = mg$	**(1)**	**4**
	Resultant force = 0.5 N		
	Example of calculation		
	Upthrust $U = 0.05$ m^3 $\times$ 1.20 kg m^{-3} $\times$ 9.81N kg^{-1} = 0.589 N		
	Weight $W = 9.20 \times 10^{-3}$ kg $\times$ 9.81N kg^{-1} = 0.090 N		
	Resultant force = $U - W$ = 0.589 N $-$ 0.090 N = 0.498 N		

| 14(b)* | 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 and lines of reasoning. | |
|---|---|---|

IC points	IC mark	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**

	Marks
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

Indicative content:

[Allow "net force" as synonym for "resultant force", accept U, W for upthrust and weight]

- Initially there is a resultant upward force
  Or
  Upthrust is greater than weight and initially there is no air resistance [accept "drag"]
- Balloon accelerates (upwards)
  Or
  Balloon moves (up) with increasing velocity/speed
- (Downward) air resistance force, (initially zero) increases as velocity/speed increases. (U and W are constant.)
- Resultant (upward) force decreases so acceleration decreases
- (Eventually) resultant force is zero
  Or
  (Eventually) upthrust = weight + drag
  Or
  (Eventually) the forces (on the balloon) are balanced
- Balloon moves continues to move (upwards) at constant velocity
  Or
  balloon moves (upwards) with terminal velocity/speed

6

| **Total for question 14** | | | **10** |