

- M1.(a)** red-shift 1
- (b) the further away from the Earth, the faster a galaxy is moving 1
- (c) **strength** as the balloon expands the dots get further apart, representing the galaxies moving apart 1
- weakness** dots are only on the surface of the balloon, galaxies are throughout the universe or there is a limit to how far the balloon can expand 1
- (d) both theories suggest that the Universe is expanding 1
- (e) new evidence / observations that cannot be explained by Theory 1  
*accept specific example of new evidence ie CMBR* 1

[6]

- M2.(a)** wavelength correctly shown 1

- (b) (i) increased 1
- decreased 1
- (ii) 17-18 inclusive 1
- evidence of measurement divided by 3 or mean of 3 separate measurements 1
- mm  
*accept cm if consistent with answer* 1
- (c) (i) red shift 1
- (ii) moving away 1
- (iii) the furthest galaxies show the biggest red shift 1
- (meaning that) the furthest galaxies are moving fastest 1
- (so the) Universe is expanding

1

(extrapolating backwards this suggests that) the Universe started from an initial point

1

(iv) cosmic microwave background radiation  
*allow CMBR*

1

[13]

M3. (a) Y

*accept cannot be X as size is increasing*

1

shows Universe expanding

*this scores if Y or Z is chosen*

*accept exploding outwards*

1

from a (very small) point

*this only scores if Y is chosen*

*accept from zero (size)*

*answers in terms of planets*

*negate the last two mark points*

1

(b) (i) both the 'big bang' and 'steady state' theories

1

(ii) (new) evidence that supports / disproves a theory

*accept proves for supports*

**or**

(new) evidence not supported by current theory

*accept there may be more evidence supporting one (theory)  
than the other (theory)*

*accept new evidence specific to this question eg  
measurement of CBR*

**or**

*some types of star only found in distant parts of Universe  
(steady state suggests should be same throughout Universe)*

1

[5]