

- 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]