Name of the Student:_____
Max. Marks : 17 Marks **Time : 17 Minutes**

Mark Schemes

Q1.

(a) forces (within the star) are balanced
if specific forces are mentioned they must be appropriate

1

(b) (i) bigger the mass (of the star) the shorter the 'main sequence' period
accept bigger the star the shorter the time

1

(ii) any **one** from:

- insufficient evidence
- do not know (exact) amount of hydrogen in star
  accept do not know (exact) mass of star
- time too long (to measure directly)
- may be other factors (not yet known) that determine length of 'main sequence' period
- values are based on theory / calculation

1

(iii) faster than

1

larger stars have a shorter 'main sequence' period so they must have the faster (rate of) nuclear fusion
there must be a link between shorter 'main sequence' and nuclear fusion, this may be implied from the first marking point

1

the end of 'main sequence' happens as the hydrogen in (the core of) a star is used up
or
(since) they use up hydrogen at a faster (rate)
accept more massive stars (are brighter so) release energy faster

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance, and apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1-2 marks)
There is a basic description of what happens to a star much larger than the Sun after the 'main sequence' period.
OR
Two stages are correctly named and are in the correct sequence.

Level 2 (3-4 marks)
There is a clear description of what happens to a star much larger than the Sun after the 'main sequence' period.
AND
At least two stages are correctly named and are in the correct sequence.

Level 3 (5-6 marks)
There is a detailed description of what happens to a star much larger than the Sun after the 'main sequence' period.
AND
At least three stages are named, in the correct sequence. There are no additional incorrect stages given.

Examples of the points made in the response:

extra information

- (the core of the) star runs out of hydrogen
- (the star) expands (to form)
- (the star) cools (to form)
    - *the core shrinks*
    - *helium starts to fuse to form other elements*
- a red supergiant

  accept super red giant
  *do **not** accept red giant*

    - (outer layers) explode
        - *fusion of lighter elements to form heavier elements (up to iron)*
- as a supernova
    - elements heavier than iron are formed

      accept heaviest elements are formed

    - core shrinks
- becoming a neutron star
    - if mass large enough (core collapses)
- (to form) a black hole

  if a correct description and sequence for a star the same size as the Sun and much bigger than the Sun given without clearly indicating which is which is limited to Level 2

6

[12]

Q2.

(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]