



UNIVERSITY OF CAPE TOWN EXAMINATION ANSWER BOOK

All answer books must be numbered

Number of books handed in	01
Number of this book	01

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Date 09/06/2025

Degree/Diploma/Certificate for which you are registered (e.g. BA BSc) MSc in Astrophysics & space sciences

Course code and description ACB
(to be copied from the heading on the Examination Paper)

Paper No 01
(to be copied from the heading on the Examination Paper)

Venue: SEMINAR ROOM

FOLD

(Fold over on dotted line and seal with stickers supplied.)

Surname MAKOFANE
(In block letters)

First Name(s) MANKELE
COMFORT

Student ID KFMANO02

FOLD

EVERY CANDIDATE must enter below the book number and the number of each question answered (in the order in which it has been answered); leave columns (3) and (4) blank.

1	2	3	4
Book Number	Question Number	Internal	External
	2	7	
	4	0	
	5	5	
		12	
Examiner's Initials		SBP	

STUDENTS ARE TO READ THE IMPORTANT NOTES AND WARNINGS ON THE BACK COVER.

Any dishonesty will render the candidate liable to disqualification and to disciplinary action.

5a/

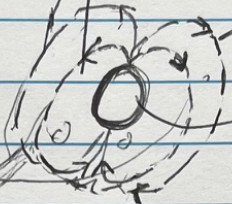
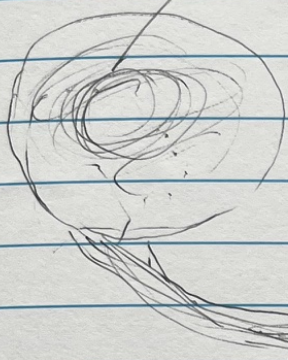
✓ Secondary star

✓ Flowing material in the field lines.

✓ Magnetic field lines.

✓ primary / polar star

✓ flowing material



5

5

Because of high density of the material $\Rightarrow$
~~the~~ the material is optically thick $\Rightarrow$
less of energy can escape. The build-up of
the heat leads to inner disc outburst, more
energy released.

o b). For both inner and outer outburst, there
are bright spots observed during the outbursts.

o

4/a/

- Binary system of less massive and massive stars.
- The separation between the stars decreases and the Roche-lobe of the less massive (big) companion fills.
- The gravity ~~from~~ due to the massive companion pulls the material, hence the material overflows into ~~the Roche~~ its Roche-lobe.
- The material, is now propelled into the massive companion; ~~spiralling around~~ spiralling around it.
- The material flowing into massive companion/primary star forms a disc around it.
- The material in the inner disc orbits at a faster speed to adjust for the angular momentum.
- ~~As the result, temperature rises in the inner disc, again there is high viscosity, more~~
- Because of more material in the inner disc, there is ~~more~~ high viscosity, ~~more~~ $\rightarrow$ more friction between the material $\Rightarrow$ temperature rise.

The surrounding cloud of material drags the stars and reduces their energy.

- As the results, the stars orbits in inside direction causing the separation between the stars to reduce. (from $\sim 100 R_0$ to R_0). ✓

- The stars now, becomes the propeller of the cloud material, expelling the material out.

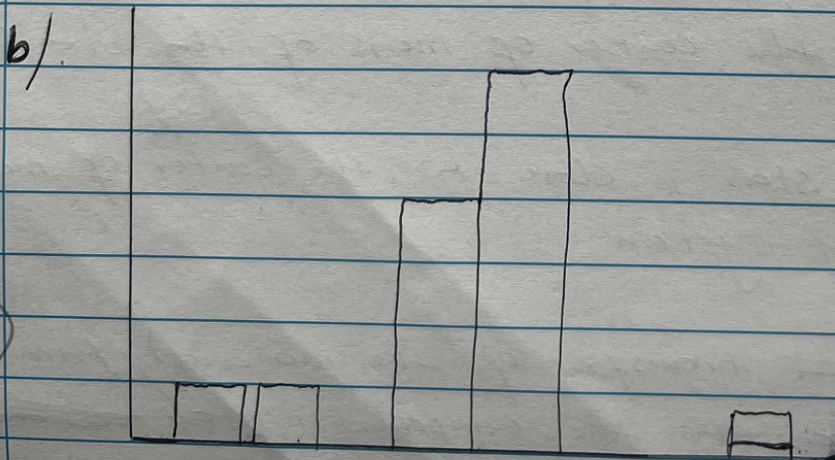
- The expelled cloud material becomes planetary nebula.

- And the naked star binary system because cataclysmic variables.

⑦

- if the ~~distance~~ separation distance between the stars is still large; ~~either~~ becomes either: white-dwarf / red-dwarf binaries.

Orbital period distribution.



⑧

2/a/.

- Stars are born in pairs (binaries, triples, et.).
Separated by large radius. (distance); unlike our Sun.
- Massive stars evolve faster than less massive stars.
- Massive stars exhaust their hydrogen in the core and move/evolve to the red-giant stage.
- Due to this, the core shrink due to the no balance between the pressure and ~~grav~~ gravitational energy/pull ~~at the~~ in the core.
- The temperature ~~so~~ rises and pressure builds-up due to the continuous gravitational pull at the center.
- The hydrogen shell burning ignites; the outer layers expands, which fills the Roche-lobe and expands to the center of mass of the binaries.
- The massive star is close to the center of mass of the binary system.
- There is ~~mass~~ transfer of the material from the massive star to the companion star ~~at the~~.
- The binary system orbits within the cloud of the material.