

Subtopic: The life cycle of a star

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Q1.(2020)

a)

(force of) gravity

fusion

b)

distance = speed × time

or

$s = vt$

c)

$$1.5 \times 10^{11} = 3.0 \times 10^8 \times t$$

$$t = \frac{1.5 \times 10^{11}}{3.0 \times 10^8}$$

$$t = 500 \text{ (s)}$$

d)

- fusion (processes in stars) produce new elements
- cloud of gas / hydrogen **and** dust **OR** nebula
- pulled together by gravity
- causing increasing temperature (to start the fusion process)
- (to become a) protostar
- hydrogen nuclei fuse to form helium nuclei
- and the star becomes main sequence
- hydrogen begins to run out
- helium nuclei fuse to make heavier elements
- up to iron
- the star expands (to become a)
- red super giant
- (the star collapses rapidly) and explodes
- called a supernova
- creating elements heavier than iron
- and distributing them throughout the universe
- leaving behind a neutron star
- or a black hole.

e)

Temperature

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Q2.(2021)

a)

gravitational force inwards and
forces as a result of fusion
reactions outwards

are in equilibrium / balanced

b)

(the star will) expand to become
a red giant

(the star will) collapse to
become a white dwarf

(the star will) cool to become a
black dwarf

Q3.(2022)

all stars:

- form in a cloud of gas and dust (nebula) by gravity – mostly hydrogen
- forms a protostar
- fusion begins
- fusion of small nuclei into larger nuclei (hydrogen into helium)
- main sequence star – stable period where gravitational forces (inwards) balance forces (outwards) due to fusion processes

comparisons:

- stars about the same size as the Sun expand to become a red giant, stars much bigger than the Sun expand to become a red super giant
- stars about the same size as the Sun contract (and temperature increases) to become a white dwarf, stars much bigger than the Sun explode in a supernova
- stars about the same size as the Sun (cool to) become a black dwarf, stars much bigger than the Sun become either a neutron star or black hole

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Q4.(2024)

Betelgeuse

Q5.(2024)

- fusion occurs at high temperatures
- fusion produces new elements
- hydrogen nuclei fuse to form helium nuclei
- hydrogen (in the core) begins to run out
- helium nuclei fuse to make heavier elements
- up to iron
- some massive stars become supernovae
- creating elements heavier than iron