

Exercise walk-through

8.1

Our solar system and the life cycle of a star (4.8.1.1–4.8.1.2)

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Exercises 2.1·2.3

2.1 List the contents of the solar system. [4]

2.2 Explain what keeps a main-sequence star stable. [2]

2.3 Where do elements heavier than iron form, and how do they reach us? [2]

Exercises 2.1·2.3

2.1 List the contents of the solar system. [4]

2.1 One star, the Sun; eight planets; dwarf planets; natural satellites – moons – orbiting planets.

2.2 Explain what keeps a main-sequence star stable. [2]

2.2 The inward pull of gravity is balanced by the outward pressure from fusion – the two forces are in equilibrium, so the star neither collapses nor expands.

2.3 Where do elements heavier than iron form, and how do they reach us? [2]

2.3 In a supernova – the explosion of a massive star; the explosion distributes them throughout the universe.

Exercises 3.1·3.2

3.1 Describe the life cycle of a star much more massive than the Sun.

[5]

3.2 The table lists three stars.

Star	Relative mass
X	$0.9 \times \text{Sun}$
Y	$1.0 \times \text{Sun}$
Z	$20 \times \text{Sun}$

(a) State the final stage of each star.

[3]

(b) Explain how star Z creates and distributes new elements.

[3]

Exercises 3.1·3.2

3.1 Describe the life cycle of a star much more massive than the Sun. [5]

3.1 Nebula of dust and gas pulled together by gravity; protostar forms and heats as it contracts; main sequence – fusion of hydrogen, balanced by gravity; red supergiant when the hydrogen runs out; supernova, leaving a neutron star or, for the most massive, a black hole.

3.2 The table lists three stars.

Star	Relative mass
X	$0.9 \times \text{Sun}$
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(a) State the final stage of each star. [3]

(b) Explain how star Z creates and distributes new elements. [3]

3.2 (a) X: white dwarf; Y: white dwarf; Z: neutron star or black hole after a supernova.

(b) Fusion in Z builds elements up to iron; elements heavier than iron form during the supernova explosion; the explosion throws them out, distributing them throughout the universe.

Exercise 3.3

3.3 “The Sun was formed from a nebula.” Describe the sequence from nebula to main sequence, naming the force involved and the event that begins the main sequence. [4]

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3.3 A nebula – a cloud of dust and gas – is pulled together by gravitational attraction; the contracting cloud forms a protostar that heats up; when the temperature is high enough, fusion begins; the star joins the main sequence, with fusion pressure balancing gravity.