

Astronomy
PAPER 2: Telescopic Astronomy

Wednesday 21 June 2023 – Morning

Diagram Booklet

In the boxes below, write your name, centre number and candidate number.

Surname					
Other names					
Centre Number					
Candidate Number					

INSTRUCTIONS

There may be spare copies of some diagrams in case you need them.

THIS DIAGRAM BOOKLET **MUST BE RETURNED WITH THE
QUESTION PAPER AT THE END OF THE EXAMINATION.**

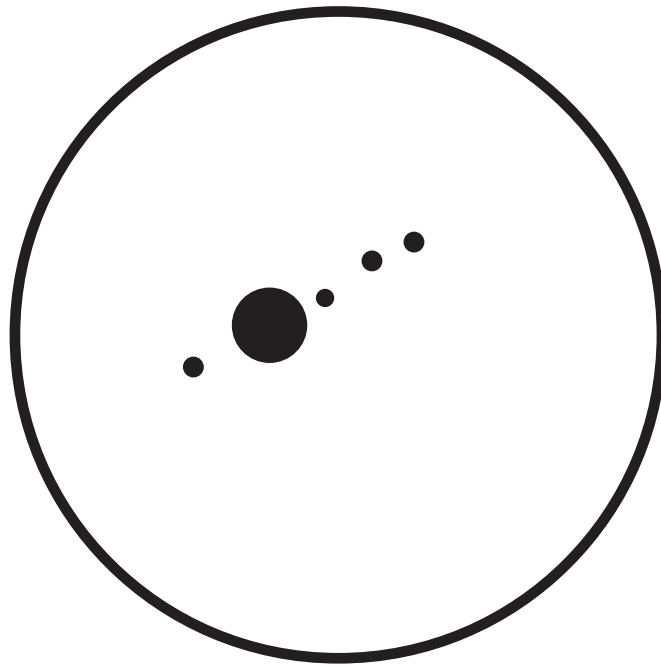
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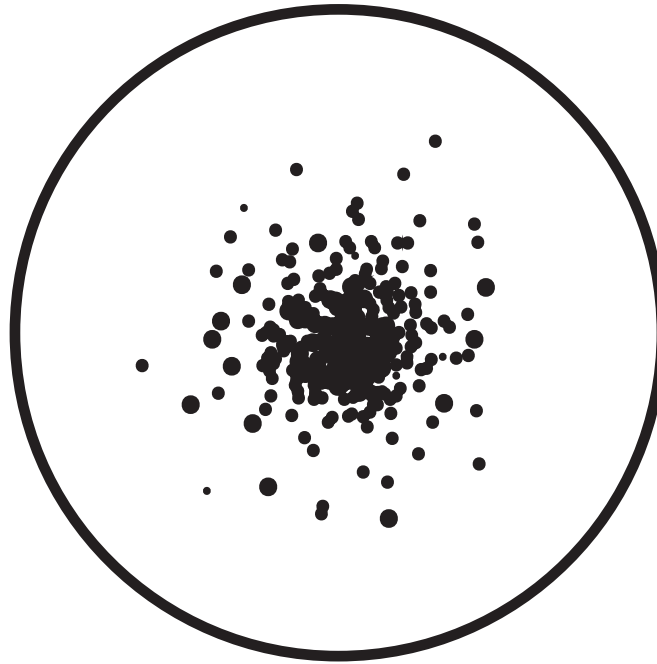
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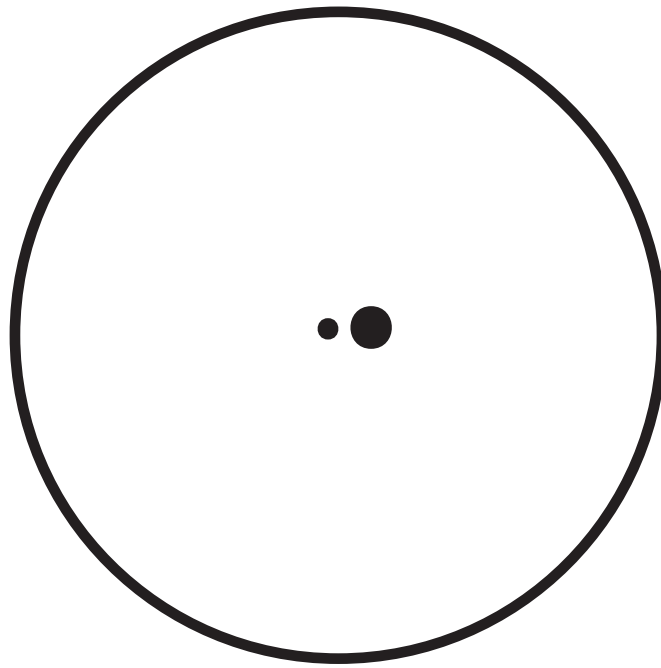
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27	Question 5(b)(i)
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29	Question 6(b)

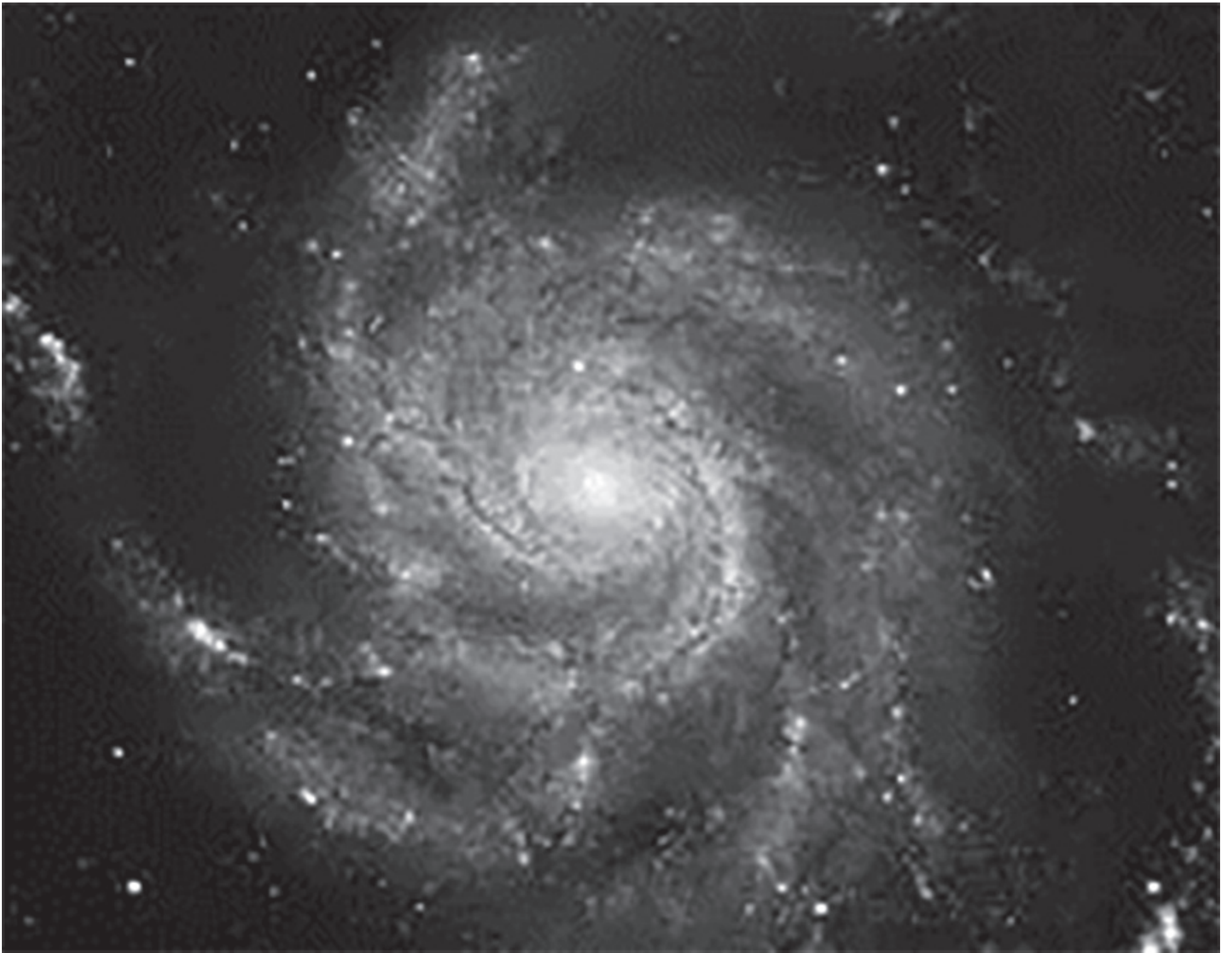
Question 1(a)(i)**FIGURE 1**

Question 1(a)(ii)**FIGURE 2**

Question 1(a)(iii)**FIGURE 3**

Question 1(b)(i)

FIGURE 4



Question 1(b)(ii)**FIGURE 5**

Question 1(b)(iii)

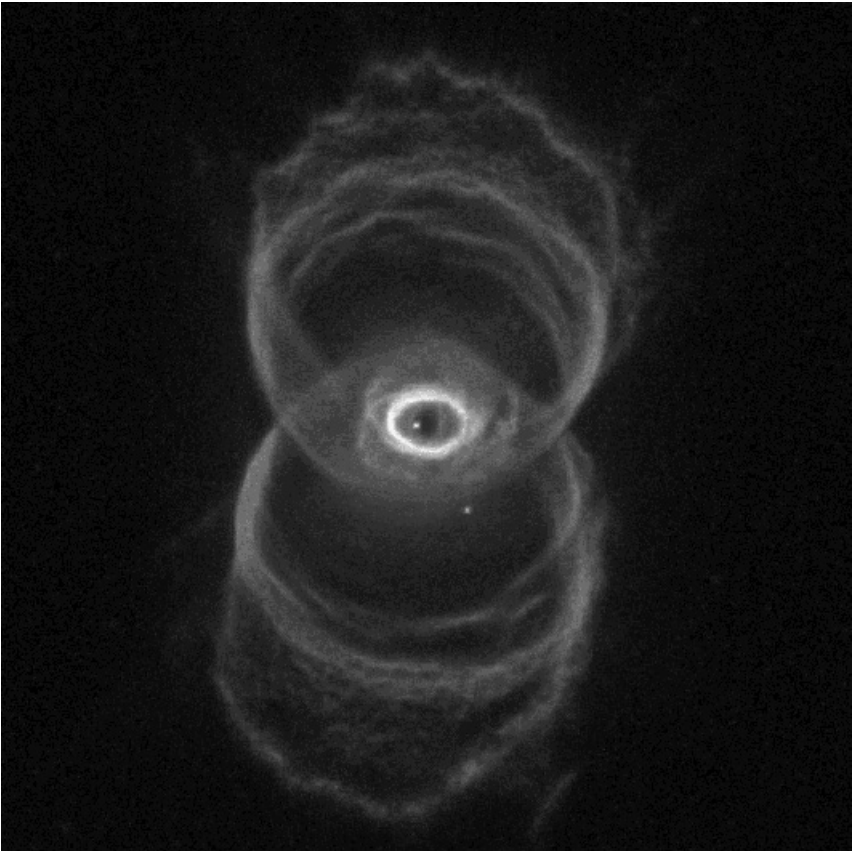

FIGURE 6



Question 2(d)**FIGURE 7**

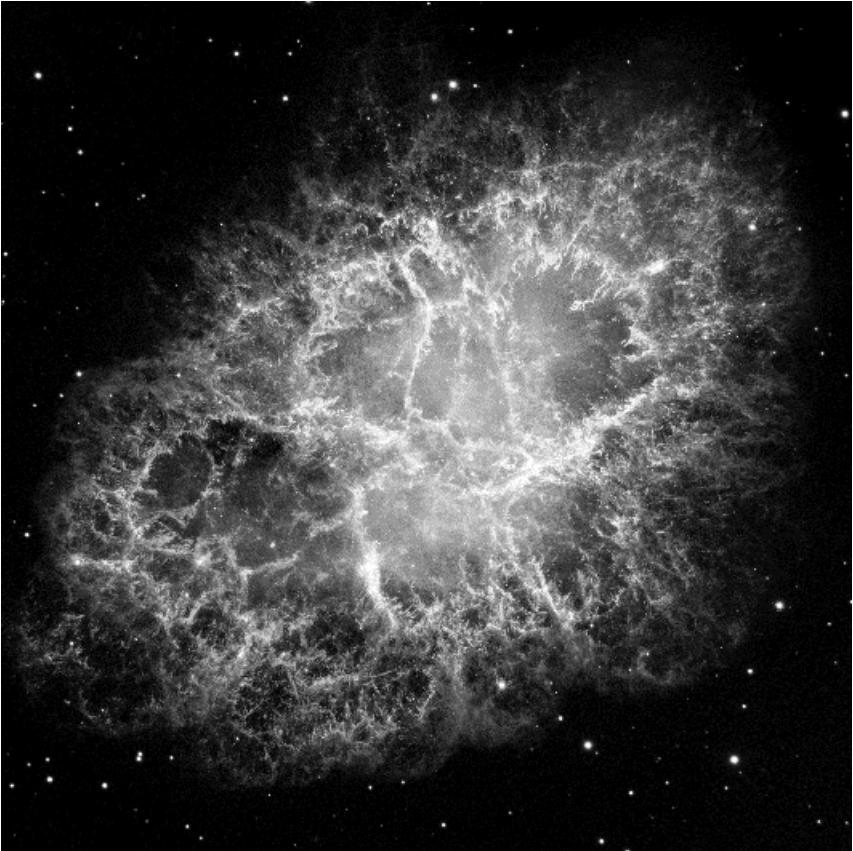

Question 4(a)

TABLE 1

Type of nebula	Image (taken with visible light)
planetary	
absorption	

(continued on the next page)

4(a) continued.

Type of nebula	Image (taken with visible light)
supernova remnant	
emission	

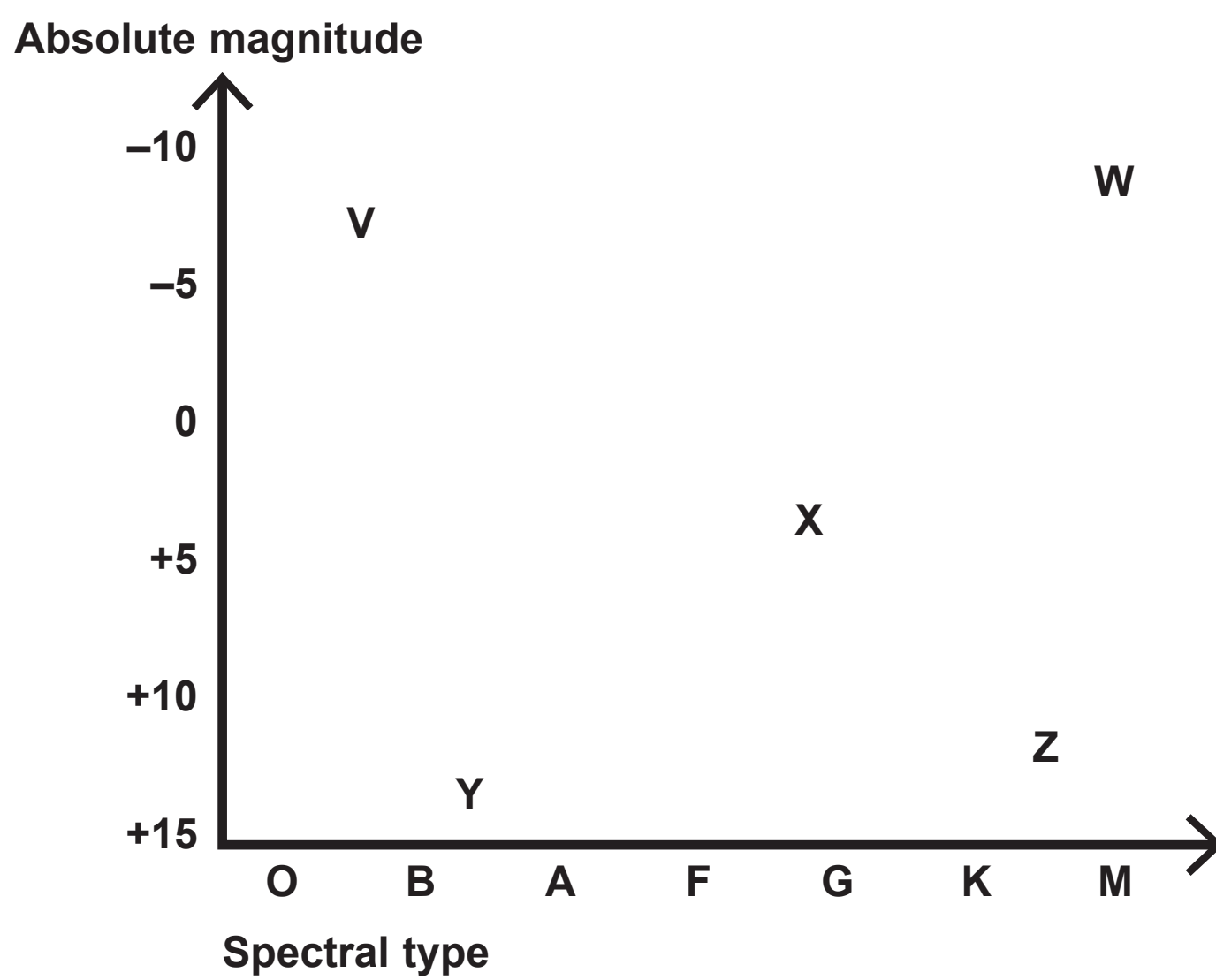
Question 4(a)(iv)

FIGURE 8



Question 4(b)

FIGURE 9



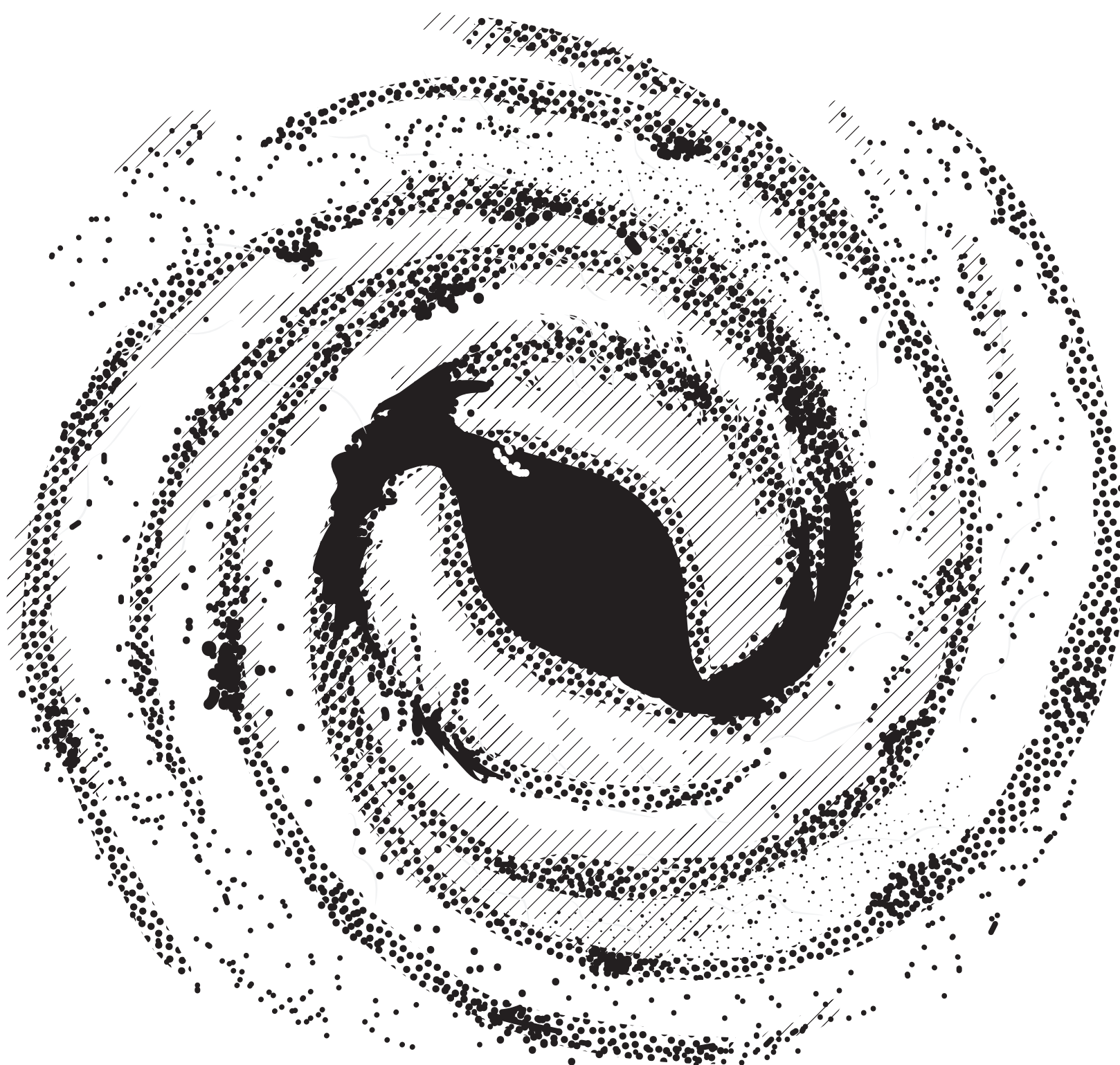
Question 5(b)(i)

FIGURE 10



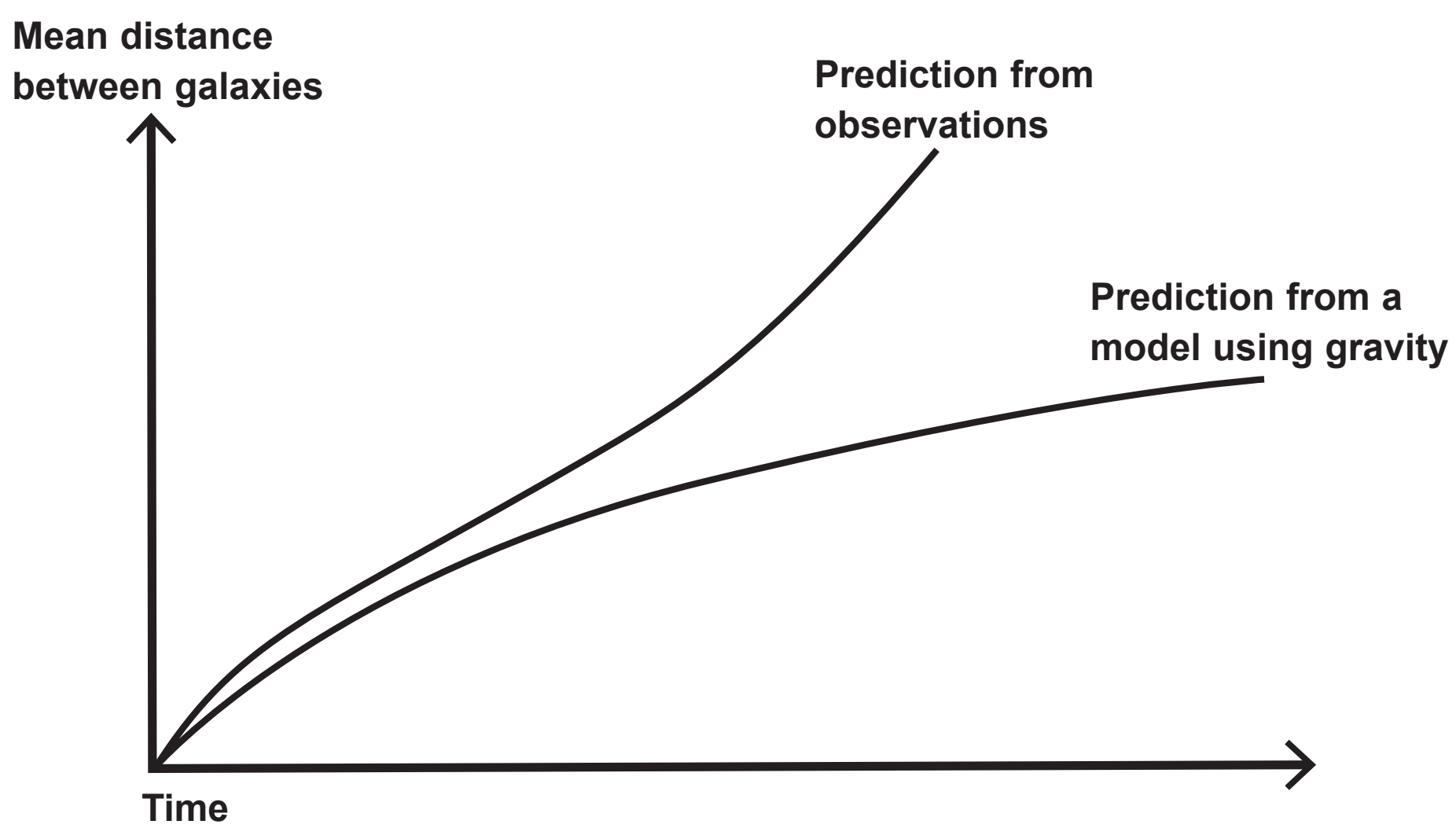
Question 5(b)(ii)

FIGURE 11



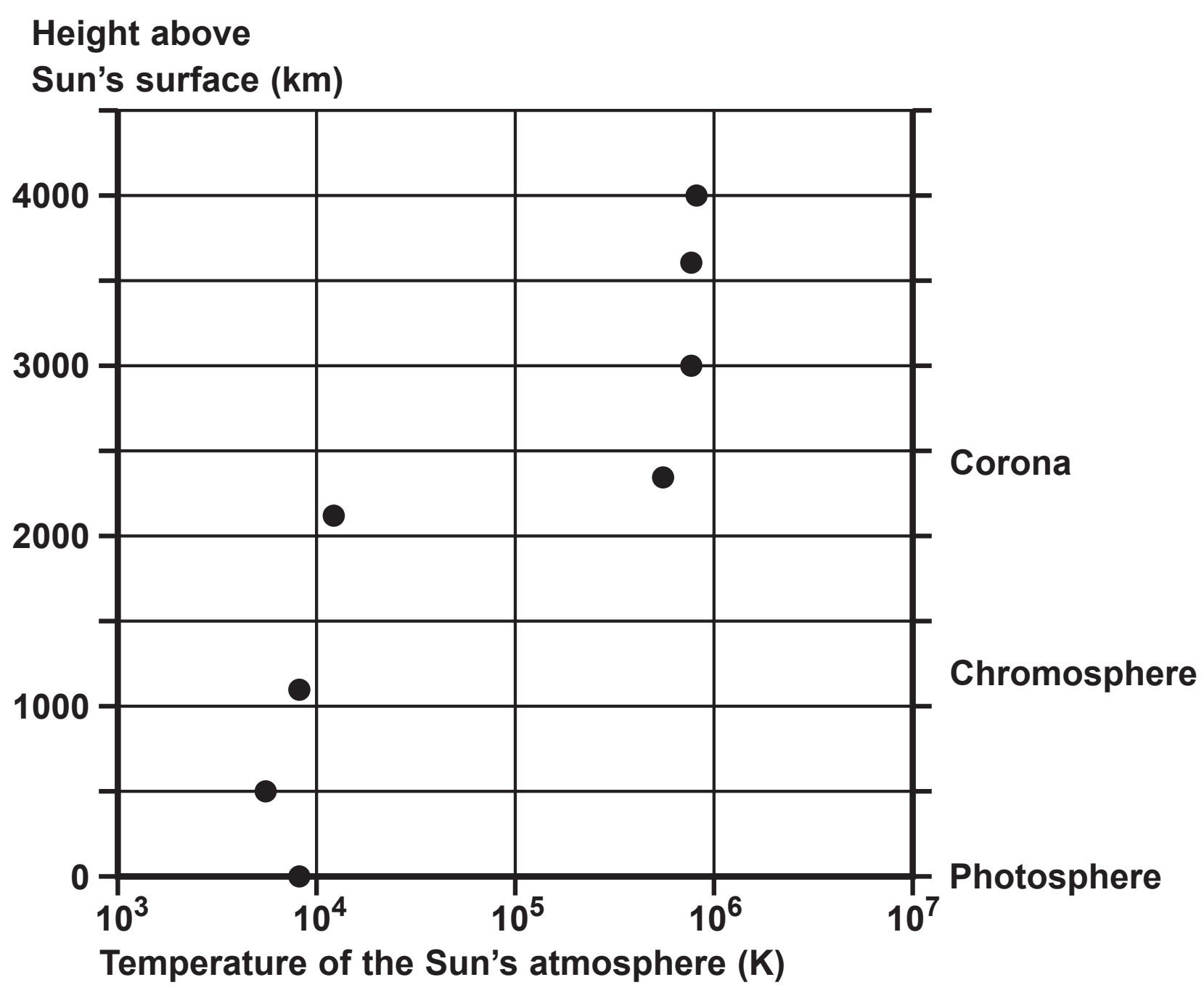
Question 5(c)

FIGURE 12



Question 6(b)

FIGURE 13



Question 7(b)

FIGURE 14

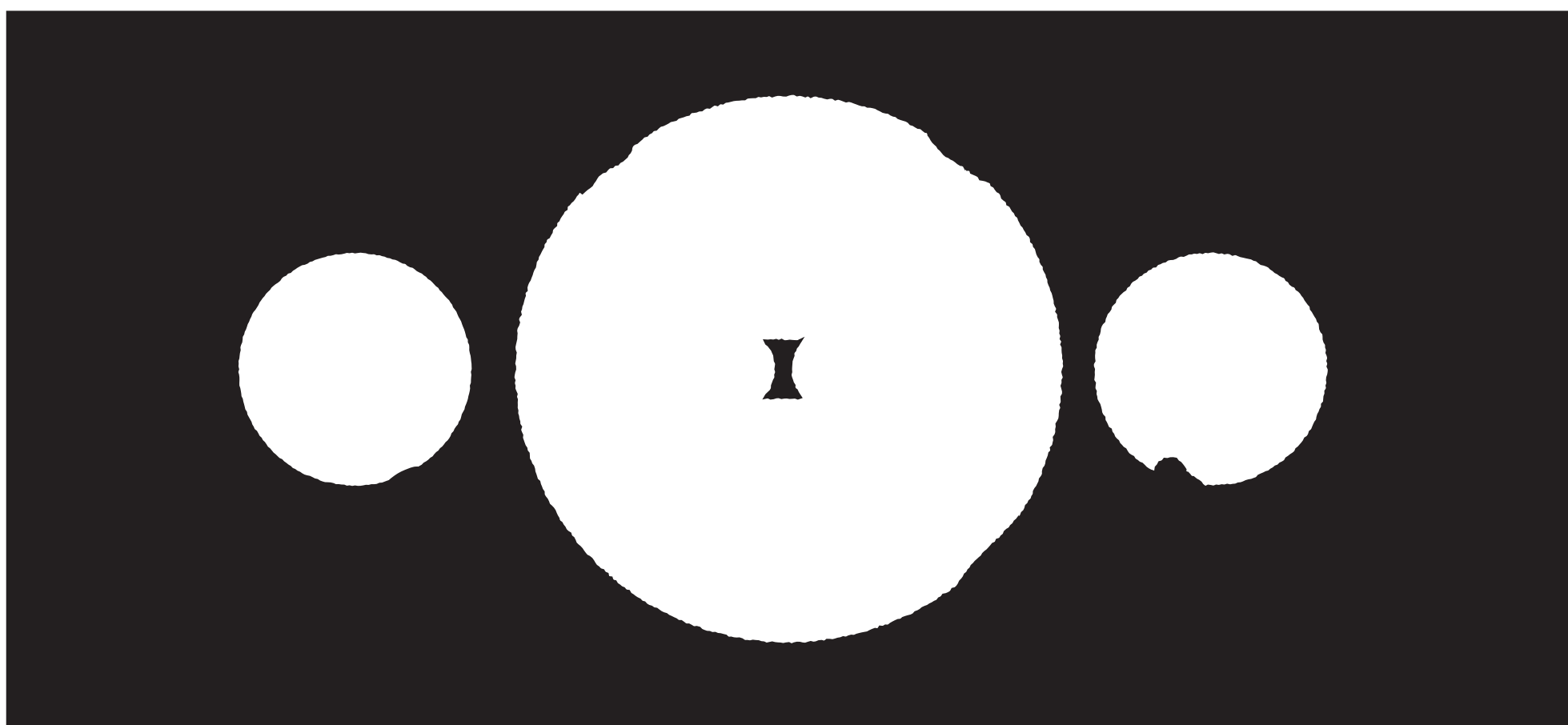
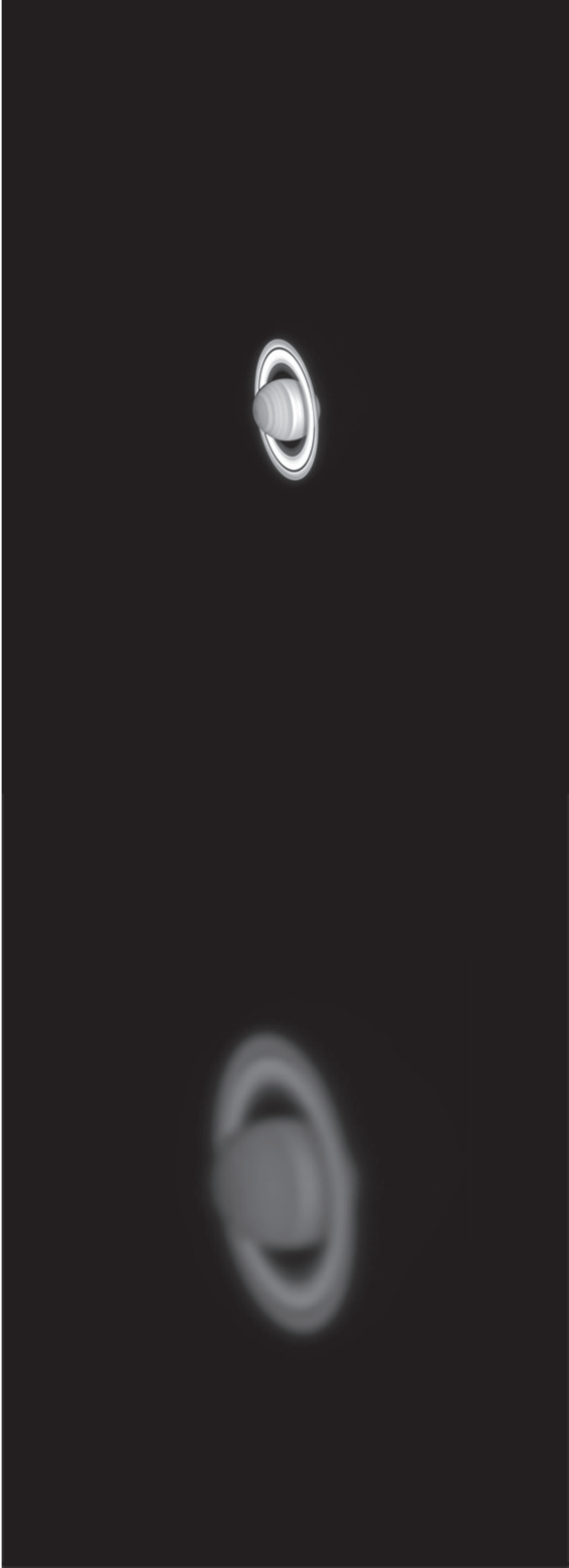
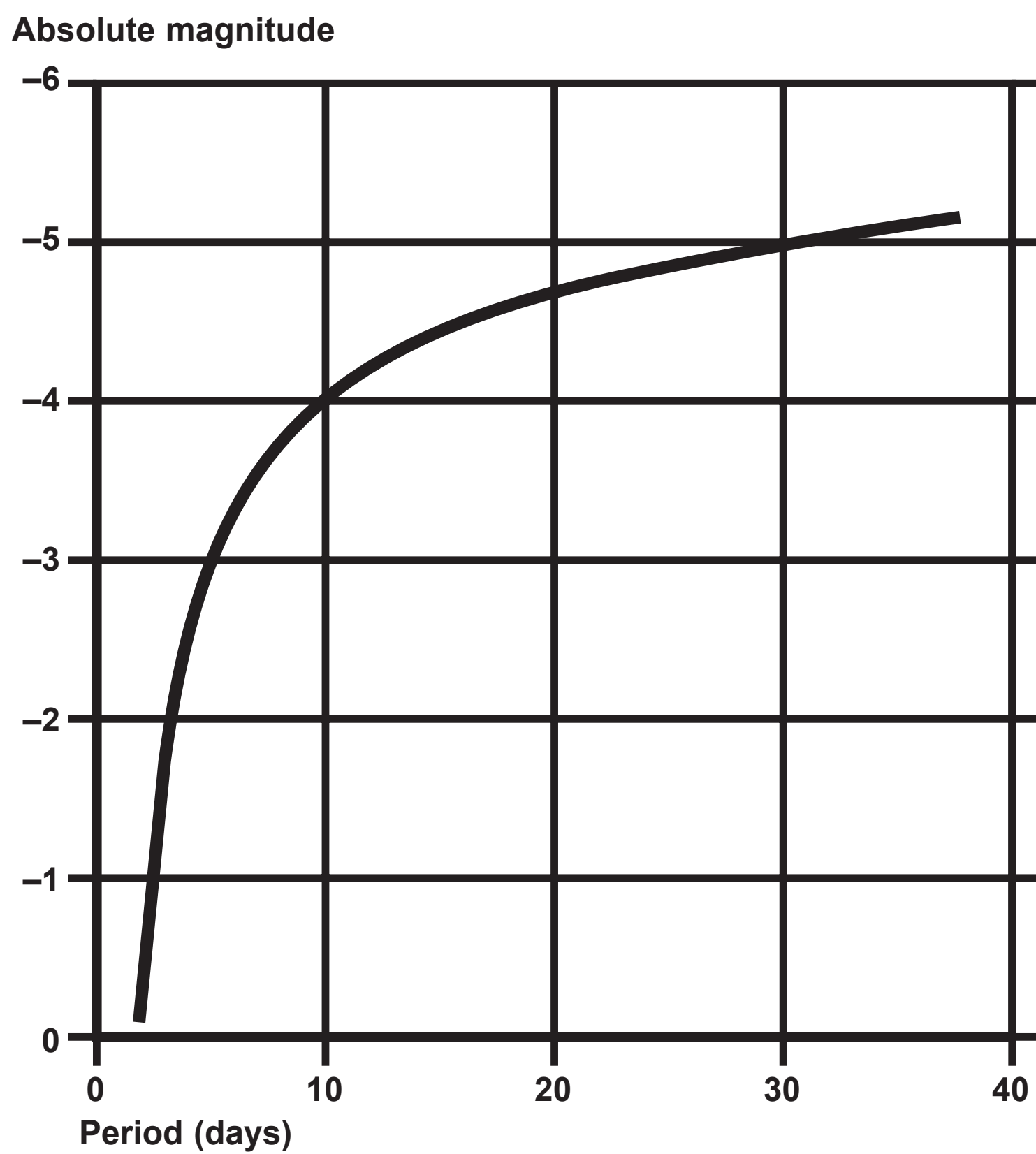


FIGURE 15

PHOTOGRAPH OF SATURN TAKEN BY TELESCOPE 1 PHOTOGRAPH OF SATURN TAKEN BY TELESCOPE 2

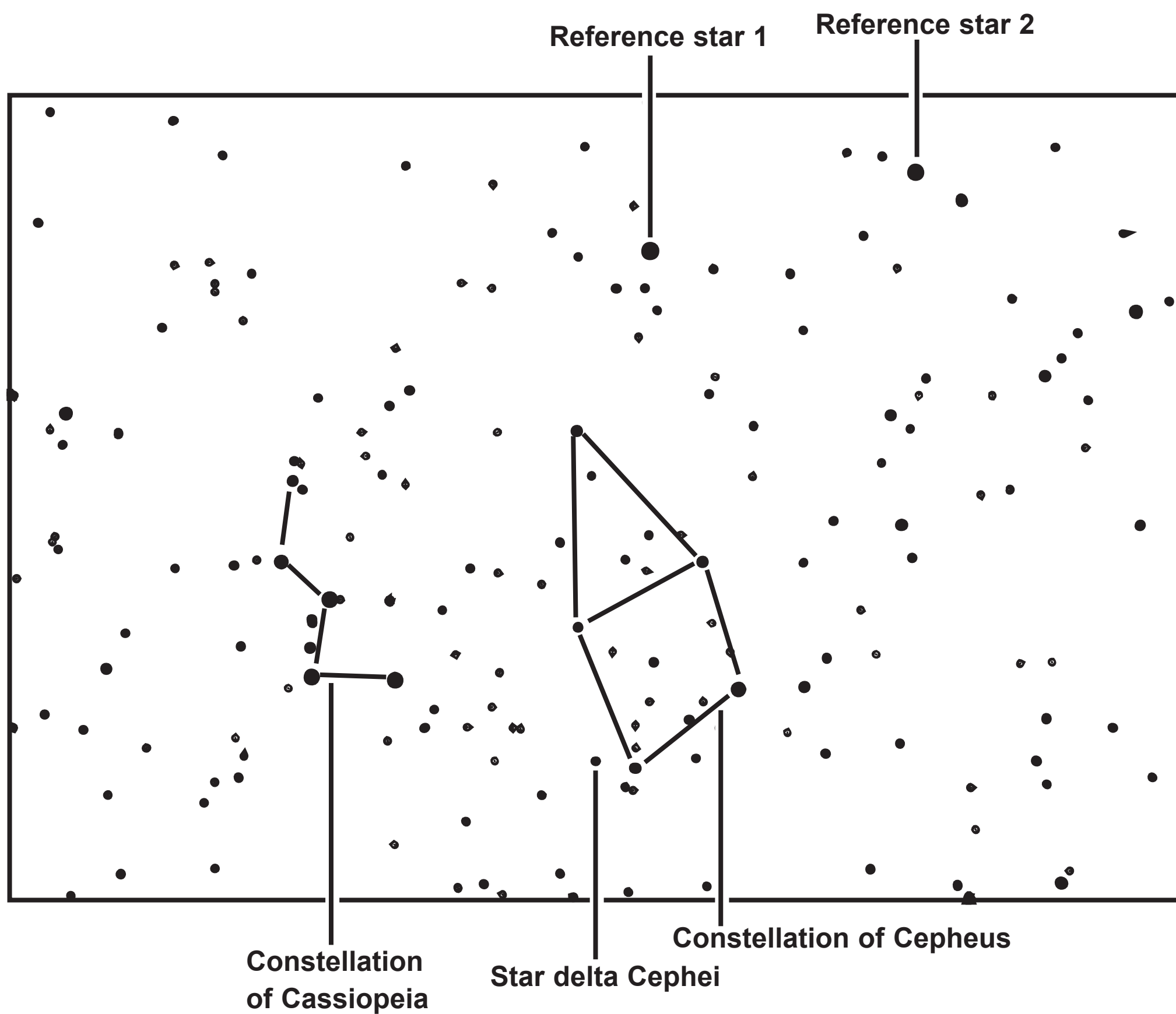


uestion 8(b)
FIGURE 16



Question 8(c)

FIGURE 17



Question 9(b)**FIGURE 18**

TABLE 4

Star	Apparent magnitude	Absolute magnitude	Spectral type	Orbital distance between star and planet (AU)
A	2	-5	G3	10
B	5	-8	O8	1
C	12	5	F9	1
D	8	13	B5	25

Question 10(b)

TABLE 5

Object	Redshift for close objects	Redshift for distant objects
galaxies	small	large
quasars	no quasars close to us	large

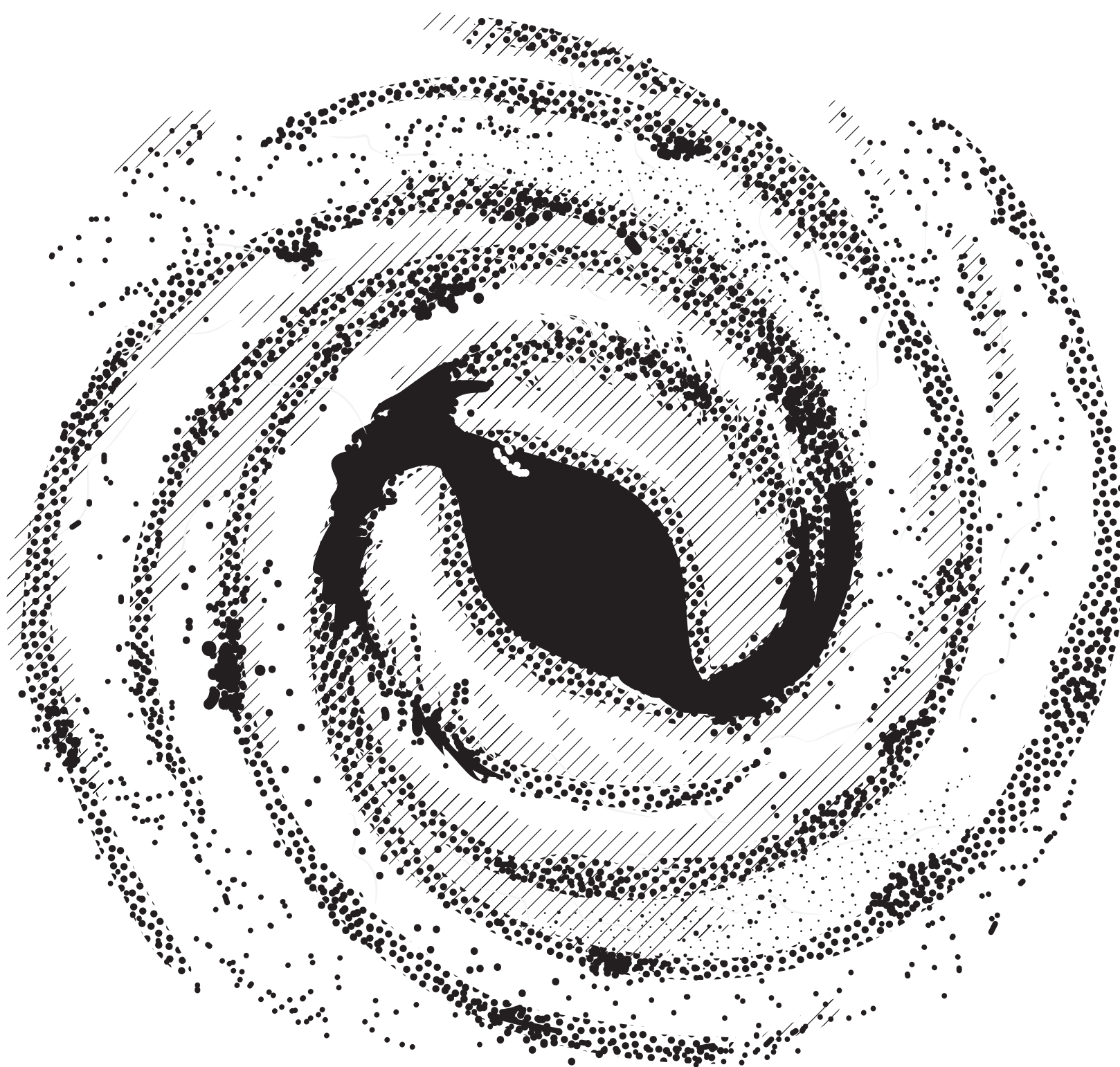
Question 10(d)

‘The first quasar was discovered using a radio telescope. However, astronomers could not pin-point which star-like object was emitting this radio signal. In 1962, the Moon passed through this region of the sky, causing an occultation and blocking the radio source. This fortunate event allowed astronomers to identify the quasar, using optical telescopes.’

Question 5(b)(i)**FIGURE 10**

Question 5(b)(ii)

FIGURE 11



Question 6(b)

FIGURE 13

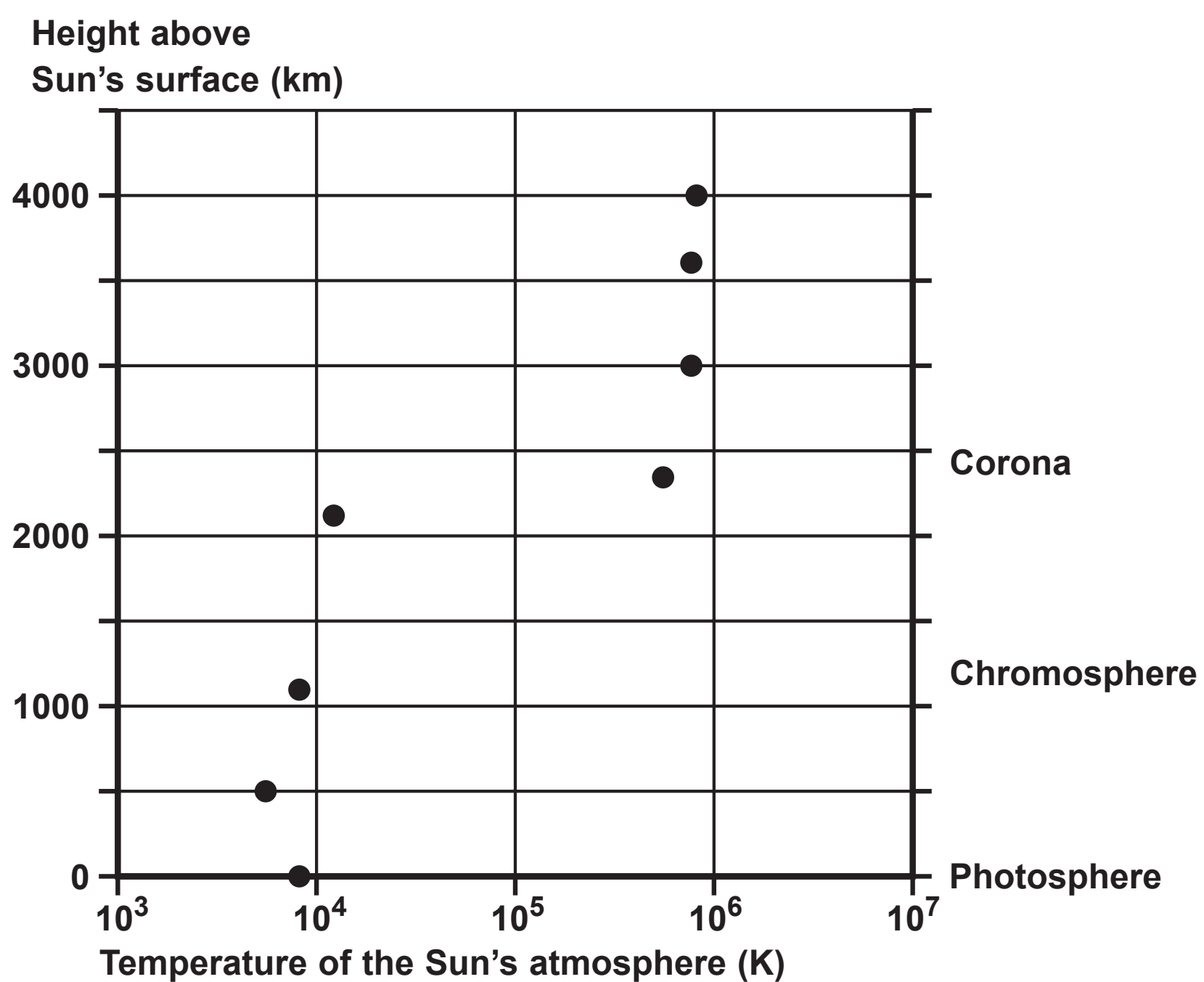


IMAGE CREDITS

Figure 4

Source: Credit: Heidi Schweiker, WIYN, NOAO, AURA, NSF

Figure 5

Credit: Heidi Schweiker, WIYN, NOAO, AURA, NSF

Figure 6

Credits: NASA/Johns Hopkins APL/Naval Research Lab/Parker Solar Probe/Brendan Gallagher

Figure 7

Source: <http://blog.lumpydarkness.com/2014/08/star-trails-attempt.html>

Table 1

CREDITS: Raghvendra Sahai and John Trauger (JPL), the WFPC2 science team, and NASA

Source: <https://www.eso.org/public/images/eso0202a/>

Source: NASA

Source: Karol R - <https://www.astrobin.com/338343/?nc=user>

Figure 14

Source: <http://www.erasmatazz.com/library/the-mind/history-of-thinking/the-scientific-revolution/galileo-gets-the-ball-rolli.html>

Figure 18

Credit: ESO