Diploma Programme
Programme du diplôme
Programa del Diploma

Astronomy
Standard level
Paper 1

Specimen paper

Candidate session number

45 minutes

Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all of the questions.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- A clean copy of the astronomy data booklet is required for this examination paper.
- The maximum mark for this examination is **[30 marks].**

Answer **all** questions. Write your answers in the boxes provided.

The Stars

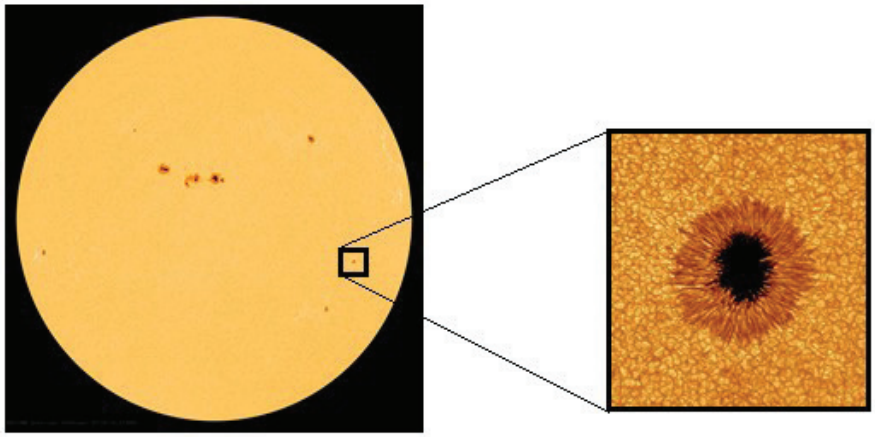
1. Define the following **two** terms. [2]

Chromosphere: . . . . . .
. . . . . .

Light Year: . . . . . .
. . . . . .

2. The solar activity can be followed by observing the sunspots on the photosphere (see **Figure 1**)

Figure 1: Sunspots on the surface of the Sun.



[Source: https://www.nasa.gov and http://voices.nationalgeographic.com]

The timescale over which the Sun's activity cycle varies is often incorrectly said to be 11 years. State the correct period for the cycle and explain the error commonly made. [3]

Correct period: . . . . . years.

Explanation: . . . . . .

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3. Two stars, A and B, have the same spectral type but luminosities of $L_{\mathrm{A}} = 10^{3} L_{\odot}$ and $L_{\mathrm{B}} = 10^{-3} L_{\odot}$.

What is the approximate ratio of their radii, $\frac{R_A}{R_B}$? [3]

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The Planets

4. For electromagnetic radiation of wavelength 21 cm, calculate the frequency. [2]

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5. Briefly explain how it is thought the Moon formed around the Earth. [3]

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6. An extinction event is one which produces a sharp decrease in the number of species in a relatively short period of time. Mass extinctions affect an unusually large number of species in a short period.

In the past 550 million years there have been five major events where at least 50 % of the planet's animal species died!

For such mass extinctions to occur, the following two factors are required:

1. Long-term pressure on the eco-system.
2. A sudden catastrophe towards the end of the period of pressure.

The following table gives some factors which could possibly combine to result in a mass extinction event. Complete the following table by ticking **one** box in each row to indicate if the factor is either long-term or short-term. [2]

Possible factors contributing to a mass extinction event		
Factor	**Long-term factor**	**Short-term factor**
Asteroid impact		
Continental drift		
Supernova event		

Galaxies

7. Define the following **two** terms. [2]

Redshift: . . . . . .
. . . . . .

HII region: . . . . . .
. . . . . .

8. Briefly explain what is known as *the winding dilemma*. [2]

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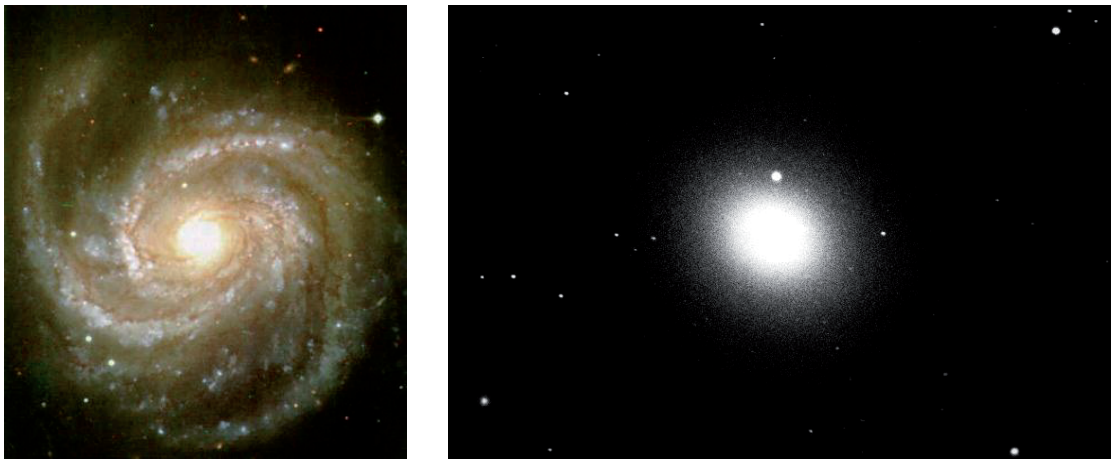
9. **Figure 2** shows two of the four main types of galaxy. Using the Hubble classification for naming galaxies, state, in a word, what types of galaxies are shown. [2]

Figure 2: Two different types of galaxy



M100 M49

[Sources: https://apod.nasa.gov and http://messier.seds.org]

M100: . . . . . .

M49: . . . . . .

10. The flattening factor for an elliptical galaxy has not been seen to be greater than 0.70. For this value, calculate the ratio of the semi-major to semi-minor axis. [2]

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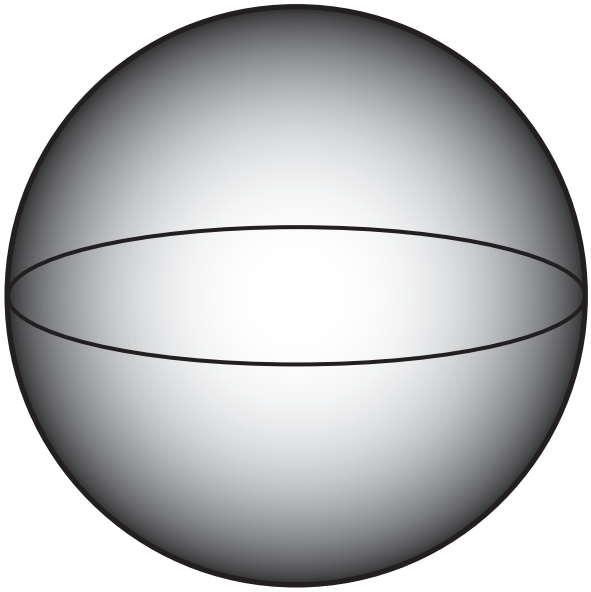
Cosmology

11. Theoretically, the shape of spacetime could be shown by considering parallel lines, the internal angles of a triangle and the circumference of a circle. For the spacetime shown in **Figure 5**, indicate the result of such tests with a single tick in each row below the figure. [3]

Figure 5: Possible shape for spacetime



	Stay parallel	Diverge	Intersect
Parallel lines:			
Internal angles of a triangle:	Less than 180^{o}	Equal to 180^{o}	Greater than 180^{o}
Circumference of a circle:	Less than $2\pi r$	Equal to $2\pi r$	Greater than $2\pi r$

12. Using Hubble's constant, calculate the age of the universe. [2]

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13. State **two** pieces of evidence supporting the Big Bang. [2]

Evidence 1: . . . . . .

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Evidence 2: . . . . . .

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Please **do not** write on this page.

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