

# **Grade 12 Earth and Space Science**

SES4U

Qinghao Hu

December 3, 2025

# Contents

<b>1</b>	<b>Unit 1: Astronomy</b>	<b>2</b>
1.1	Episode 1: Standing up in the Milky Way . . . . .	2
1.2	Episode 4: A Spacetic Odyssey . . . . .	3
1.3	Measuring the Universe . . . . .	4
1.3.1	Some important constants . . . . .	4
1.3.2	Unit Conversion . . . . .	4
1.3.3	Radar . . . . .	4
1.3.4	Parallax . . . . .	4
1.4	Cepheid Variable Stars, Redshift and Hubble's Law . . . . .	5
1.4.1	Apparent Magnitude and Absolute Magnitude . . . . .	5
1.4.2	Cepheid Variable stars . . . . .	5
1.4.3	Determining absolute magnitudes using Cepheid Variables . . . . .	6
1.4.4	Hubble's Law . . . . .	6
1.4.5	Redshift . . . . .	6
1.4.6	Overall summary of this section . . . . .	6
1.5	Cosmology . . . . .	8
1.5.1	Some stupid theories . . . . .	8
1.5.2	Is our Universe finite? . . . . .	8
1.6	Developments in Cosmology . . . . .	9
<b>2</b>	<b>Our Solar System</b>	<b>11</b>
2.1	The Wonders of the Solar System . . . . .	11
2.2	Newton's Law of Gravitation . . . . .	13
2.3	Kepler's Law of Planetary Motion . . . . .	14
2.3.1	Kepler's first law . . . . .	14
2.3.2	Kepler's second law . . . . .	15
2.3.3	Kepler's Third Law . . . . .	15
2.4	Sun-Earth-Moon System . . . . .	16
2.4.1	Earth's Rotationsc . . . . .	16
2.4.2	Earth's Orbit . . . . .	16
2.4.3	Tide . . . . .	16
2.4.4	Eclipses . . . . .	16
2.4.5	SOLAR ECLIPSE . . . . .	17
2.5	The wonders of the Solar System: Episode: 5 . . . . .	18
<b>3</b>	<b>Earth's Material &amp; Geological Process</b>	<b>19</b>
3.1	Earthquakes . . . . .	20
3.1.1	Terminology . . . . .	20
3.1.2	Waves . . . . .	20

## **Chapter 3**

# **Earth's Material & Geological Process**

## 3.1 Earthquakes

### 3.1.1 Terminology

**Definition 3.1.1** (Focus). *Where the earthquake starts.*

**Definition 3.1.2** (Epicentre). *The location on the surface directly above the surface.*

**Definition 3.1.3** (Seismographs). *Instrument used to record the motion of the ground during an earthquake*

**Definition 3.1.4** (Seismogram). *The graph which is recorded by the seismograph*

The tools can allow us to measure the intensity of earthquakes! The scale that is commonly used is called the Richter Scale

The scale involves measuring the amplitude of the largest wave at a specific distance from the epicentre

*Remark.* Richter Scale is a quantity way to measure the intensity of the earthquake

### 3.1.2 Waves

These waves are ranked by their speed:

#### Body wave

**Definition 3.1.5** (P-Wave). *Parallel to the direction of the wave (forward + backward)*

**Definition 3.1.6** (S Wave). *Perpendicular to the direction of the wave (side by side)*

#### Surface wave

**Definition 3.1.7** (Love wave). *Like water wave*

**Definition 3.1.8** (raylight). *Rotate under ground*