Teacher Notes

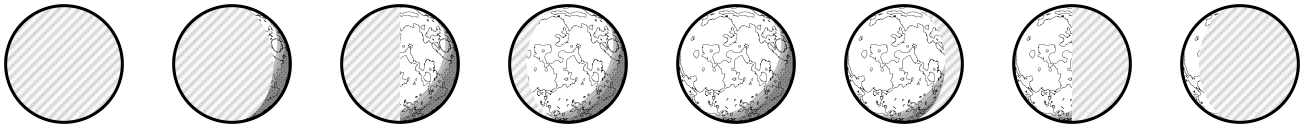
Unit 1 · Earth, Moon & Sun · Ages 9–14. Each page works on its own. Mix levels freely: ★ Explorer (ages 9–10), ★★ Navigator (11–12), ★★★ Commander (13–14). Figures are rounded; gravity is shown relative to Earth.

Page	Activity	Level	Time	Materials / notes
2	Think First & Briefing	★	20 min	KWL chart: revisit the last column at the end of the unit.
3	The Moon Goes Around	★★	25 min	Pencils; discuss why we always see the same face.
4	Moon Phase Memory Game	★	20 min + play	Scissors; two or more players.
5	Math Lab 1 · Time Zones	★★/★★★	30 min	Calculator for the last two items.
6	Seasons	★★	30 min	Ruler for the graph; connect points with a line.
7	Eclipse Detective	★★	30 min	Optional: flashlight and two balls. Never look at the Sun.
8	Word Search	★	15 min	Words also go backward.
9	Inside the Sun	★★/★★★	30 min	Calculator.
10	Tides	★★/★★★	30 min	Ruler for the bar graph.
11	Shadow Clock	★★	45 min + 6 hours sun	Sunny day; stick, clay, chalk, ruler, watch.
12	Moon Journal	★/★★	4 weeks, 5 min a night	Needs a clear evening sky; use a calendar to track dates.
13	Logic Lab	★/★★★	25 min	Pencil and calculator.
14	Create	★	30 min	Colored pencils, paper circles and string for the mobile.
15	Unit Review	★–★★★	25 min	Quiz out of 20 points.
16	Mission Log	★	10 min	Self-assessment.

Eclipse safety: never look at the Sun directly; use certified eclipse glasses. Tide times in the sample table are illustrative.

Pages 2–7

Page 3 · Moon phases



A New Moon · **B** Waxing Crescent · **C** First Quarter · **D** Waning Gibbous · **E** Full Moon · **F** Waning Gibbous · **G** Last Quarter · **H** Waning Crescent

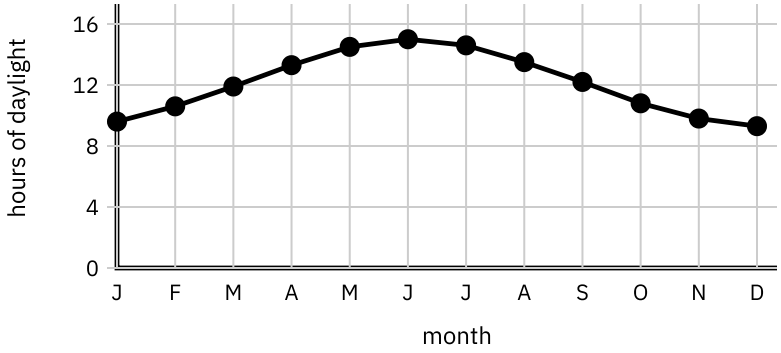
1. Letter **A** — **New Moon**. 2. **29½** days.

Page 5 · Time zones

1) **15°**; **90°**. 2) Chicago **2:00 PM**, Denver **1:00 PM**, Los Angeles **12:00 PM**. 3) **5:00 PM**. Clocks: 3:00 PM · 2:00 PM · 1:00 PM · 12:00 noon. 5) **12:30 PM**; **10:00 PM**. 4) 57 ÷ 15 = **3.8** → **about 4**. ★★★ 24,901 ÷ 24 = **1,038 mph**; 365 × 24 = **8,760**; 584,000,000 ÷ 8,760 = **66,667 mph**.

Page 6 · Seasons

1) Summer **C**; Winter **A**; Spring **B**; Fall **D**. 2) Most: **June**; least: **December**; 15.0 − 9.3 = **5.7 h**. 3) **Winter — Argentina is in the Southern Hemisphere, leaning away from the Sun in July**.

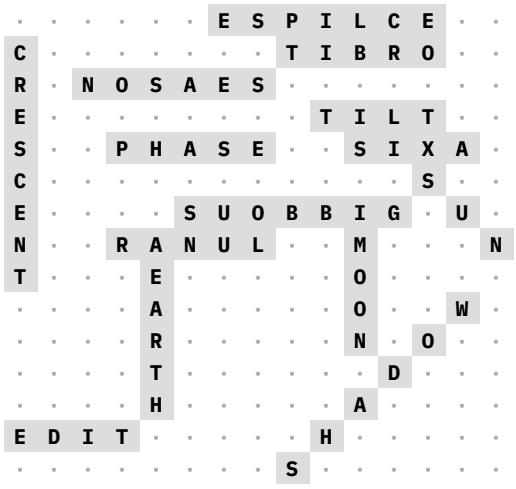


Page 7 · Eclipses

2) **New Moon**; **Full Moon**. 3) **The Moon's orbit is tilted about 5°, so the Moon's shadow usually misses Earth (and Earth's shadow misses the Moon).**

Pages 8–15

Page 8 · Word search



Page 9 · Inside the Sun

A **Corona**, B **Photosphere (surface)**, C **Convection zone**, D **Radiative zone**, E **Core**. 1) 864,000 ÷ 7,918 = **109.1**. 2) 93,000,000 ÷ 186,282 = **499 s** ≈ **8 min 19 s**. 3) 238,855 ÷ 186,282 = **1.3 s**. 4) **About 8 minutes 20 seconds — the last light is already on its way**.

5) 5,500 × 9 ÷ 5 + 32 = **9,932 °F**; 15,000,000 × 9 ÷ 5 + 32 = **27,000,032 °F** (about 27 million). 6) **333,000 lb**.

Page 10 · Tides

1) **12 h 25 min**. 2) 5.8 − 0.6 = **5.2 ft**. 3) 3:10 AM + 50 min = **4:00 AM**. Strong (spring) tides: New and Full Moon; weak (neap) tides: First and Last Quarter.

Page 13 · Logic

St	**Mo**	Su	**Ea**
Su	**Ea**	St	Mo
Mo	St	Ea	**Su**
Ea	Su	**Mo**	St

864,000 ÷ 2,159 = **400**; 93,000,000 ÷ 238,855 = **389** (both about 400). C) **Sun (makes its own light) · tide · phase · reflect**. Task 3: the Moon's apparent size will shrink as it recedes, so it will no longer cover the whole Sun.

Page 15 · Review (20 points)

1. New = all dark; First Quarter = right half lit; Full = all lit; Last Quarter = left half lit (4). 2. a **F — the tilt of the axis causes seasons**; b **T**; c **T** (3). 3. **8:00 AM**; **75°** (3). 4. 6.0 − 0.4 = **5.6 ft**; **about 4:25 PM** (3). 5. **The Sun makes its own light (nuclear fusion); the Moon reflects sunlight** (2). 8. rotate **B**, revolve **A**, umbra **C**, tide **D** (2). 6–7. Open answers, 2 points each, scored by reasoning. *(Without a tilt there would be almost no seasons.)*