

RELATIVISTIC TIME DILATION

PHYSICS ACTIVITY ANSWER SHEET NAME _____

DATE _____ PERIOD _____

READ AND FOLLOW THE DIRECTIONS ON THE CLASS SET WORKSHEET. USE THIS ANSWER SHEET TO COMPLETE THE DIAGRAMS AND QUESTIONS. DO NOT WRITE ON THE WORKSHEET. ALL ANSWERS WILL BE PLACED ON THIS SHEET.

GROUP #1 (PG. 130)

1. IF THE SPACESHIP TRAVELS FOR 1 HOUR AND EMITS A FLASH EVERY 6 MINUTES, HOW MANY FLASHES WILL BE EMITTED? _____
2. THE SHIP SENDS EQUALLY SPACED 6-MIN FLASHES WHILE APPROACHING THE RECEIVER AT CONSTANT SPEED. WILL THESE FLASHES BE EQUALLY SPACED WHEN THEY ENCOUNTER THE RECEIVER? _____ HOW ABOUT IF THE SHIP IS ACCELERATING WHEN SENDING FLASHES?
3. IF THE RECEIVER SEES THESE FLASHES AT 3-MIN INTERVALS, HOW MUCH TIME WILL OCCUR BETWEEN THE FIRST AND THE LAST FLASH (IN THE FRAME OF REFERENCE OF THE RECEIVER)? _____

COMPLETE FIGURE 5, WHICH SUMMARIZES CASE 3, BY FILLING IN THE BLANKS (PG. 131)

EARTH FRAME OF REFERENCE:

10 FLASHES @ 12 MIN = _____ MINUTES

10 FLASHES @ 3 MIN = _____ MINUTES

_____ MINUTES =
_____ HOURS

SPACESHIP FRAME OF REFERENCE:

20 FLASHES @ 6 MIN = _____ MINUTES =

_____ HOURS

COMPLETE FIGURE 7, WHICH SUMMARIZES CASE 4, BY FILLING IN THE BLANKS (PG. 132)

EARTH FRAME OF REFERENCE:

25 FLASHES @ _____ MIN = _____ MINUTES

_____ HOURS

SPACESHIP FRAME OF REFERENCE:

5 FLASHES @ _____ MIN = _____ MINUTES

20 FLASHES @ _____ MIN = _____ MINUTES =

_____ MINUTES =
_____ HOUR

CONCLUSION: IS THE SITUATION SYMMETRICAL; THAT IS, DO BOTH TWINS OCCUPY THE SAME REALMS OF TIME? _____ WHAT EVENT SEPARATES THE REALMS OF TIME FOR THE TRAVELING TWIN? _____ SO IS THIS TWIN-PARADOX REASONING CORRECT OR INCORRECT? _____ WHY?

CONCEPTUAL **Physical Science** PRACTICE SHEET

Chapter 30: Relativity and the Universe
Time Dilation and the Twin Trip

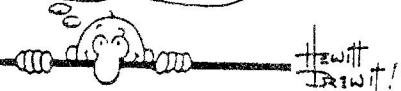
This practice sheet recaps the *twin trip* of the previous practice sheets, where a traveling twin takes a 2-hour journey while a stay-at-home brother records the passage of 2 1/2 hours. Quite remarkable! Times in both frames of reference are marked by flashes of light, sent each 6 minutes from the spaceship, and received on Earth at 12-min intervals for the ship going away, and 3-min intervals for the ship returning. Fill in the clock readings aboard the spaceship when each flash is emitted, and the clock reading on Earth when each flash is received.

SHIP LEAVING EARTH		
FLASH	TIME ON SHIP WHEN FLASH SENT	TIME ON EARTH WHEN FLASH SEEN
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

SHIP APPROACHING EARTH		
FLASH	TIME ON SHIP WHEN FLASH SEEN	TIME ON EARTH WHEN FLASH SEEN
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

THIS CHECKS: FOR $v = 0.6c$

$$t = \frac{L_0}{\sqrt{1 - (v/c)^2}} = \frac{2 \text{ HR}}{\sqrt{1 - (0.6)^2}} = 2.5 \text{ HR}$$



Hewitt
 Drew!