NAME: Which 12 weeks? 1 2 3

# USING BERNOULLI'S CONSTANT DESIGN, BUILD, & TEST PAPER AIRPLANES

**Flight model #12 /40**


PRACTICE PROBLEM for

NAME: Which 12 weeks? 1 2 3

**Mass of the Plane = ___4.5__grams**

**Longest hangtime = _____4.8_ seconds Longest distance flew = __23.5_ meters**

$$= \boldsymbol{density} = \frac{\boldsymbol{mass}}{\boldsymbol{volume}} = \frac{\qquad}{\mathbf{58.17cm^3}} =$$

**Here is your formila. Plug in your numbers for the best plane**

$$\boldsymbol{v_{f\,final_{Velocity}}} = \frac{\boldsymbol{distance(meters)}}{\boldsymbol{time(seconds)}} = \quad [\boldsymbol{insert\ your\ numbers\ below}]$$

$$\boldsymbol{V_{final}} = \frac{\textbf{23.5 meters}}{\text{4.8 seconds}} = \_\_\_\_\_$$

$$\boldsymbol{Convert\_v_f\_to\_miles\_per\_hour}: (\boldsymbol{v_f \times 2.23 = mph})$$

$$(\_\_\_\_\_)(\mathbf{2.23}) = \_\_\_\_\_$$

$$\boldsymbol{Bernoulli's\_Constant = P + \frac{1}{2}pv^2 + pgh}$$

*YOU must include the formula and the numbers. Units are not needed for THIS problem only*

Bernoulli's Constant is = _____

P =14.7

½ = 0.5

ρ =

V =

g =

h =

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*Minimum passing flight is one plane MUST clear 8.0meters once*

*You MUST Highlight your BEST longest flight*

| What design was different | Flight # | Distance Traveled (meters) | Time of Flight (seconds) | Observations Describe what happened to the plane during flight. Directions, flight, etc… | Velocity (Distance ÷ Time) | Velocity (mph) ($v_f$ x 2.23) |
|---|---|---|---|---|---|---|
| DAY 1 Standard model Note about plane | **1.** | | | | | |
| | **2.** | | | | | |
| | **3.** | | | | | |
| | **4.** | | | | | |
| | **5.** | | | | | |
| | **6.** | | | | | |
| AVE D1 | | | | | | |
| DAY 2 Standard model Note about plane | **7.** | | | | | |
| | **8.** | | | | | |
| | **9.** | | | | | |
| | **10.** | | | | | |
| | **11.** | | | | | |
| | **12.** | | | | | |
| AVE D2 | | | | | | |
| DAY 3 Standard model Note about plane | **13.** | | | | | |
| | **14.** | | | | | |
| | **15.** | | | | | |
| | **16.** | | | | | |
| | **17.** | | | | | |
| | **18.** | | | | | |
| AVE D3 | | | | | | |
| DAY 4 Standard model Note about plane | **19.** | | | | | |
| | **20.** | | | | | |
| | **21.** | | | | | |
| | **22.** | | | | | |
| | **23.** | | | | | |
| | **24.** | | | | | |
| AVE D4 | | | | | | |

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*Minimum passing flight is one plane MUST clear 8.0meters once*

*You MUST Highlight your BEST longest flight*

| What design was different | Flight # | Distance Traveled (meters) | Time of Flight (seconds) | Observations Describe what happened to the plane during flight. Directions, flight, etc… | Velocity (Distance ÷ Time) | Velocity (mph) ($v_f$ x 2.23) |
|---|---|---|---|---|---|---|
| DAY 5 Standard model Note about plane | **25.** | | | | | |
| | **26.** | | | | | |
| | **27.** | | | | | |
| | **28.** | | | | | |
| | **29.** | | | | | |
| | **30.** | | | | | |
| AVE D5 | | | | | | |
| DAY 6 Standard model Note about plane | **31.** | | | | | |
| | **32.** | | | | | |
| | **33.** | | | | | |
| | **34.** | | | | | |
| | **35.** | | | | | |
| | **36.** | | | | | |
| AVE D6 | | | | | | |
| DAY 7 Standard model Note about plane | **37.** | | | | | |
| | **38.** | | | | | |
| | **39.** | | | | | |
| | **40.** | | | | | |
| | **41.** | | | | | |
| | **42.** | | | | | |
| AVE D7 | | | | | | |
| DAY 8 Standard model Note about plane | **43.** | | | | | |
| | **44.** | | | | | |
| | **45.** | | | | | |
| | **46.** | | | | | |
| | **47.** | | | | | |
| | **48.** | | | | | |
| AVE D8 | | | | | | |

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| What design was different | Flight # | Distance Traveled (meters) | Time of Flight (seconds) | Observations Describe what happened to the plane during flight. Directions, flight, etc… | Velocity (Distance ÷ Time) | Velocity (mph) ($v_f$ x 2.23) |
|---|---|---|---|---|---|---|
| DAY 9 Both Rutters down | **49.** | | | | | |
| | **50.** | | | | | |
| | **51.** | | | | | |
| Both Rutters up | **52.** | | | | | |
| | **53.** | | | | | |
| | **54.** | | | | | |
| | | | | | | |
| DAY 10 Left up right Rutters down | **55.** | | | | | |
| | **56.** | | | | | |
| | **57.** | | | | | |
| | | | | | | |
| Right up Left Rutters down | **58.** | | | | | |
| | **59.** | | | | | |
| | **60.** | | | | | |
| | | | | | | |
| DAY 11 | **61.** | | | | | |
| | **62.** | | | | | |
| | **63.** | | | | | |
| | **64.** | | | | | |
| | **65.** | | | | | |
| | **66.** | | | | | |
| | | | | | | |
| DAY 12 NEW PLANE | **67.** | | | | | |
| | **68.** | | | | | |
| | **69.** | | | | | |
| | **70.** | | | | | |
| | **71.** | | | | | |

**MASS (in grams) of BEST plane: VOLUME (in $cm^3$) of BEST plane: 58.17$cm^3$ Bernoulli's Constant=$P+\frac{1}{2}pv^2+pgh$**

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$Bernoulli's\_Constant = P + \frac{1}{2}pv^2 + pgh$ SHOW YOUR WORK

P =14.7

½ = 0.5

ρ =

V =

g =

h =

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# Enrichment Science Lab Report

| KEY TERMS/ QUESTIONS | NOTES |
|---|---|
| **TITLE** | **Design and test flight of Paper Airplanes** |
| **Introduction:** | **In this lab you will need to use the scientific method to design, build, test, and redesign paper airplane.** |
| **Problem: (you complete)** | *Minimum passing flight is one plane MUST clear 8.0meters once* |
| **Hypothesis: (you complete)** +2 | |
| **Materials:** | **Paper, stop match, ruler** |
| **Procedures:** | **See Lab sheet for directions (*Minimum Flight distance: 8 meters*)** |
| **Data:** | **YOU need to show ALL work for the Calculations**<br>1 centimeter = 0.393 7 inch 1 meter = 3.28 feet<br>$Bernoulli's\_Constant\_is\_P = air\_pressure = 14.7$<br>$gravity(g) = 9.8\,^{meters}/_{second}$; $Height\_of\_Flight = 5.94 meters$<br>$WHICH\_PLANE\_DID\_YOU\_USE?$ _____<br>$Mass\_of\_plane =$ _____ $grams$<br>$p = density = \frac{mass}{volume} = \frac{(see\_above)}{58.17 cm^3}$<br>$v_{final}\_final\_Velocity = \frac{distance(meters)}{time(seconds)}$<br>$= - - - - - - - - - -$<br>$Convert\_v_f\_to\_miles\_per\_hour: (v_f \times 2.23 = mph)$<br>$Bernoulli's\_Constant = P + \frac{1}{2}pv^2 + pgh$ |
| **Graph:** | **See Back of THIS lab report.** |

SUMMARY

**Conclusion:** +4

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$WHICH\_PLANE\_is\_the\_BEST$? _____

**Mass of the Plane = _____grams**

**Longest hangtime = _____ seconds**

**Longest distance flew = _____ meters**

**** complete the flolowing calculations about your plane**
**UNITS must be included to receive credit**

$$p = density = \frac{mass}{volume} = \frac{}{58.17cm^3} =$$

**Here is your formila. Plug in your numbers for the best plane**

$$v_{f_{final_{Velocity}}} = \frac{distance(meters)}{time(seconds)} = \ [insert\ your\ numbers\ below]$$

$$V_{final} = ---------- = \_\_\_\_\_$$

+4

$$Convert\_v_f\_to\_miles\_per\_hour: (v_f \times 2.23 = mph)$$

$$(\_\_\_\_\_)(2.23) = \_\_\_\_\_$$

+10

$$Bernoulli's\_Constant = P + \frac{1}{2}pv^2 + pgh$$

*YOU must include the formula and the numbers. Units are not needed for THIS problem only*

= P + ½ p $v^2$ + p g h

= 14.7 + ( 0.5 ) ( 9.8 ) ( 5.94)

+3 Bernoulli's Constant is = _____