



Pre Evaluation Dragster Design 2005



Directions For Numbers 1-25 : Read each of the following multiple-choice items and the possible answers carefully. Mark the letter of the correct answer on your answer sheet or as instructed by your teacher. **Remember: Make no marks on this test.**

For Numbers 1-4 , use the Model Dragster Specifications to choose the best answer.

Model Dragster Specifications

Dragster body

One-piece, all-wood construction. Any type of lamination will result in disqualification. No add-ons such as body strengtheners, fenders, plastic canopy, exhausts, or air foils may be attached to or enclosed within the vehicle. Fiberglass or shrink wrap are considered body strengtheners and cannot be used on car body or wheels for any reason. Two (2) or more like or unlike pieces of wood glued together are not considered one-piece, all-wood construction.

	MINIMUM	MAXIMUM
DB1.Body length	200mm	305 mm
DB2 Body height with wheels		75 mm
DB3.Body mass (completed car without CO ₂)	55 g	
DB4.Body width at axles, front and back	35 mm	42 mm
DB5.Vehicle total width (including wheels)		90 mm

Power plant (CO₂ cartridge hole)

The power plant hole must be at the farthest point at the rear of the car and must be drilled parallel to the racing surface to assure proper puncture of the CO₂ cartridge. A minimum of 3mm thickness around the entire power plant hole must be maintained on the dragster for safety.

P1.Hole depth	50 mm	52 mm
P2.Safety zone thickness	3 mm	
P3.Chamber diameter	19 mm	20 mm
P4.Lowest point of chamber diameter to race surface (with wheels)	26 mm	40 mm

Eye Screws

Dragsters must have two screw eyes per car that meet tolerances, no more. Screw eyes must not make contact with the racing surface. The track string must pass through both screw eyelets, which are located on the center line of the bottom of the car. Glue may be used to reinforce the screw eyes. It is the responsibility of the car designer/engineer to see that the eye screw holes are tightly closed to prevent the track string from slipping out. As with all adjustments, this must be done prior to event check in.

ES1.Inside diameter	3 mm	5 mm
ES2.Distance apart (at farthest points)	150 mm	270 mm

Wheels

A dragster must have exactly four (4) wheels, each of which separately must meet the regulations in W2 and W3 below. All four wheels must touch the racing surface at the same time. All wheels must roll. Wheels must be made entirely from plastic. Dimensions must be consistent for the full circumference of the wheel.

W1.Wheel diameter	30 mm	40 mm
W2.Wheel width	2 mm	18 mm

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- 1** What may be used to reinforce the attachment point of the screw eyes to the dragster body?
- A Glue
 - B Duct tape
 - C Masking tape
 - D Plastic
- 2** According to the Dragster Design Specifications, why must you maintain a minimum of 3 mm thickness around the entire CO₂ cartridge hole?
- A The CO₂ cartridge would not fit properly.
 - B The CO₂ cartridge could break through the body and cause injury.
 - C The completed dragster would be below the minimum standard for mass.
 - D The completed dragster would look awkward.
- 3** The specifications require that the dragster wheels be made entirely of:
- A Wood.
 - B Fiberglass.
 - C Plastic.
 - D Aluminum alloy.
- 4** The rules require that the dragsters mass be measured in:
- A Ounces.
 - B Pounds.
 - C Kilograms.
 - D Grams.
- 5** The main advantage of developing a shell dragster instead of a rail dragster is:
- A Increased stability.
 - B Reduced weight.
 - C Ease of construction.
 - D Reduced drag.
- 6** Prior to production, in the Design Process, which of the following are in the proper sequence?
- A Thumbnail, rough sketch, working drawing
 - B Thumbnail, working drawing, rough sketch
 - C Working drawing, thumbnail, rough sketch
 - D Thumbnail, rough sketch, working drawing
- 7** Which test would be **BEST** to determine if the CO₂ dragster's wheels and axles are rolling properly?
- A Data wind tunnel
 - B Visual wind tunnel
 - C Roll ramp
 - D Digital scale
- 8** While keeping the same design, which material would provide the opportunity to produce the lightest CO₂ dragster?
- A Balsa
 - B Pine
 - C Bass
 - D Oak

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When compared to rail dragsters, shell dragsters tend to have:

- A No frontal area.
- B Equal frontal area.
- C Less frontal area.
- D More frontal area.

10

If you were trying to reduce the mass of your dragster, which axle materials would be **BEST**?

- A Aluminum tubing
- B Aluminum welding rod
- C Steel
- D Brass

11

The main advantage of using lightweight wheels on your CO₂ dragster is:

- A Reduced rotating mass.
- B Reduced vehicle mass.
- C Increased stability.
- D Approved appearance.

12

As your CO₂ dragster goes down the track, friction that decreases speed occurs everywhere **EXCEPT** between the:

- A Wheels and racetrack.
- B CO₂ Cartridge and car body.
- C Axles and car body.
- D Screw eyes and guide string.

13

You are preparing to do the final sanding on your dragster body before painting. Which of the following would be **BEST** to use?

- A Wood Prep
- B Belt sander
- C Wood file
- D Sandpaper

14

During initial stage of cutting out your model, it is **BEST** to use the band saw to cut:

- A Directly on the pattern line.
- B Slightly smaller or within the pattern line.
- C Slightly larger or outside of the pattern line.
- D The top view pattern line first.

15

Laminar flow is the result of:

- A Increased frontal area.
- B Bernoulli's principles.
- C Air flowing turbulently around a CO₂ dragster.
- D Air flowing smoothly around a CO₂ dragster.

16

If it took your dragster 1 second to race down the 65 foot track, approximately what was its speed in mph?

(Hint: [(Feet / seconds)*3600] / 5280 = mph)

- A 39.457
- B 44.318
- C 47.236
- D 51.312

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- 17** Listed below is the mass of the individual components of a dragster. What would be the total mass in grams of the completed dragster?

Completed body: 39 grams

Front wheels: 3 grams each

Rear wheels: 5 grams each

Axles: 1.5 grams each

Screw eyes: 0.5 grams each

- A 51
- B 54
- C 58.5
- D 59

- 18** Reducing rotating mass (all parts that must turn or rotate) is critical in improving the performance of a dragster. Below is the mass of the individual components of a dragster. What is the total of the rotating mass in grams if the wheels are solidly attached to the axles?

Completed body: 39 grams

Front wheels: 3 grams each

Rear wheels: 5 grams each

Axles: 1.5 grams each

Screw eyes: 0.5 grams each

- A 8
- B 11
- C 16
- D 19

- 19** Each of the dragsters are identical except for total mass. The mass and elapsed time (ET) are listed for dragsters 1, 3, and 4. What is your estimate in seconds for the ET of dragster 2?

<u>Dragster</u>	<u>Mass (grams)</u>	<u>ET (seconds)</u>
1	50	0.95
2	55	?
3	95	1.40
4	100	1.45

- A 1.00
- B 1.25
- C 1.35
- D 1.50

- 20** Each dragster is identical except for total mass. Which dragster would have the fastest time?

- A Dragster A, mass 55 grams
- B Dragster B, mass 67 grams
- C Dragster C, mass 73 grams
- D Dragster D, mass 75 grams

- 21** Fins similar to shark fins create what **UNDESIREABLE** effect on a CO₂ dragster?

- A Stability
- B Drag
- C Guidance
- D Lift

- 22** Placing the wheels inside the shell of the car results in:

- A Increased drag.
- B Increased stability.
- C Improved aerodynamic efficiency.
- D Increased frontal area.

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23 Real racing cars use negative lift to increase traction. Negative lift on a CO₂ Dragster would result in:

- A Increased friction
- B Increased speed.
- C Decreased friction.
- D Decreased stability.

24 What shape has the **LEAST** amount of drag?



25 After you have completed your dragster, which of the following specifications may change from day-to-day.

- A Body length
- B Vehicle total width
- C Body mass
- D Eye screw distance

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?	⊙	Answer/ Scale	Objective	?	⊙	Answer/ Scale	Objective
1	1	A	DD04.03 Technology	14	14	C	DD04.03 Technology
2	2	B	DD04.03 Technology	15	15	D	DD04.03 Technology
3	3	C	DD04.03 Technology	16	16	B	DD04.01 Math
4	4	D	DD04.03 Technology	17	17	D	DD04.01 Math
5	5	D	DD04.03 Technology	18	18	D	DD04.01 Math
6	6	D	DD04.03 Technology	19	19	A	DD04.01 Math
7	7	C	DD04.03 Technology	20	20	A	DD04.01 Math
8	8	A	DD04.03 Technology	21	21	B	DD04.02 Science
9	9	C	DD04.03 Technology	22	22	C	DD04.02 Science
10	10	A	DD04.03 Technology	23	23	A	DD04.02 Science
11	11	A	DD04.03 Technology	24	24	D	DD04.02 Science
12	12	B	DD04.03 Technology	25	25	C	DD04.02 Science
13	13	D	DD04.03 Technology				

Minimum points
required to achieve
mastery category

Total questions on test: 25

Objectives measured: 3	Items	Points	●	◐	Questions measuring this objective
DD04.03 Technology	15	15	11	10	1 2 3 4 5 6 7 8 9 10 11
DD04.03 Technology					12 13 14 15
DD04.01 Math	5	5	4	3	16 17 18 19 20
DD04.02 Science	5	5	4	3	21 22 23 24 25
Totals		25	19	16	

DD04

? = Test Question Number ⊙ = line on GP Form

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Items used in test

?	Item name	?	Item name	?	Item name
1	DD04.03.00.14	10	DD04.03.00.06	18	DD04.01.00.03
2	DD04.03.00.13	11	DD04.03.00.08	19	DD04.01.00.05
3	DD04.03.00.15	12	DD04.03.00.07	20	DD04.01.00.04
4	DD04.03.00.11	13	DD04.03.00.10	21	DD04.02.00.01
5	DD04.03.00.12	14	DD04.03.00.09	22	DD04.02.00.03
6	DD04.03.00.03	15	DD04.03.00.04	23	DD04.02.00.05
7	DD04.03.00.05	16	DD04.01.00.01	24	DD04.02.00.04
8	DD04.03.00.01	17	DD04.01.00.02	25	DD04.02.00.02
9	DD04.03.00.02				

DD04

? = Test Question Number ● = line on GP Form