

Boys' Secondary Schools
HALF-YEARLY EXAMINATIONS 2009/2010

FORM: 4	PHYSICS	Time: 1hr30mins
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Name: _____ Class: _____

You may find these formulae useful:

$$\text{Velocity} = \frac{\text{distance}}{\text{time}}$$

$$a = \frac{v - u}{t}$$

$$F = ma$$

$$\text{Momentum} = \text{mass} \times \text{velocity}$$

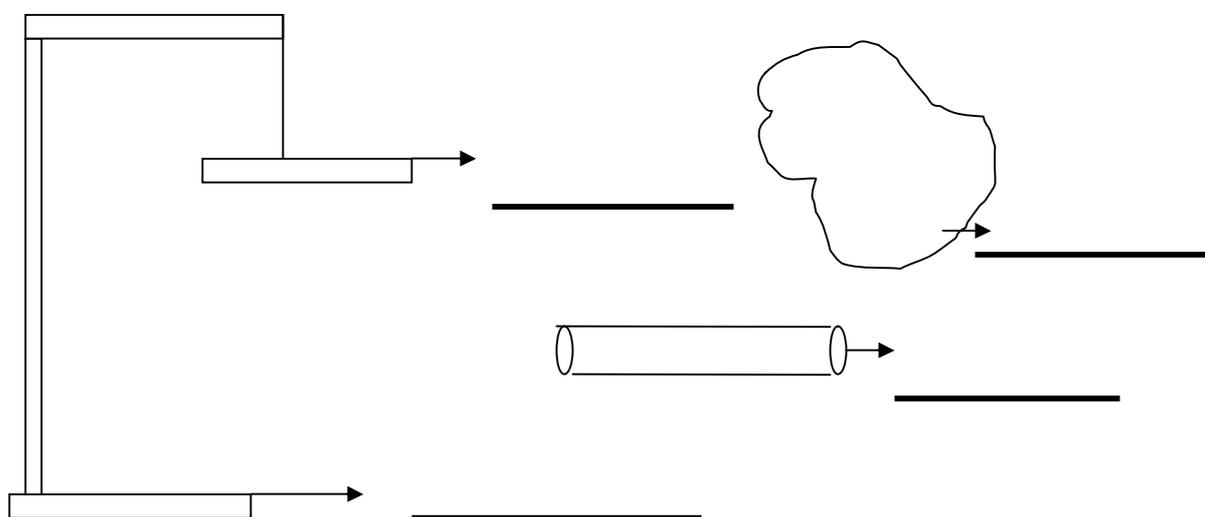
$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

Section A: This section carries 40 marks. You must answer all the questions. Where necessary, take the value of g as 10m/s^2 .

1. This question is about **STATIC ELECTRICITY**

A. The following apparatus was used to investigate charges. Label the apparatus in the diagram below in the spaces provided:



(5 marks)

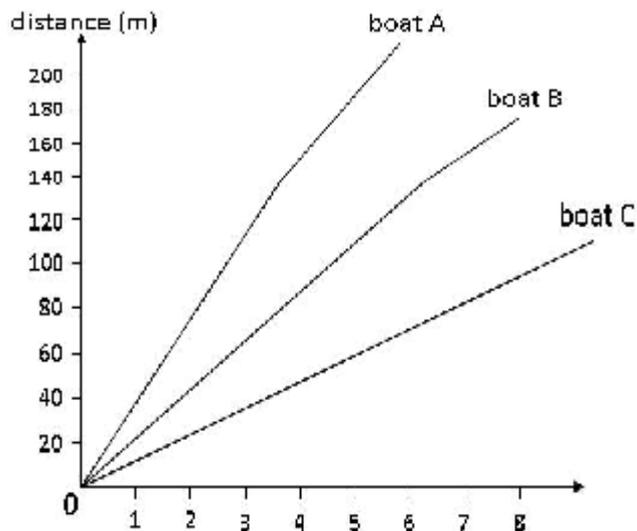
B. After charging, the rods were brought next to each other as shown in the diagram above. What happened in each of these cases:

Rod 1	Rod 2	Result
Charged Perspex	Neutral Rod	
Charged Polythene	Neutral Rod	
Charged Perspex	Charged Perspex	
Charged Polythene	Charged Perspex	

(4 marks)

2. This question is about DISTANCE-TIME GRAPHS

The following distance-time graphs show the top speed reached by 3 speed boats.



A. Which of the boats travelled:

i. with the highest speed? _____

ii. with the lowest speed? _____ (2 marks)

C. From the graph, find the speed for Boat B.

_____ (2 marks)

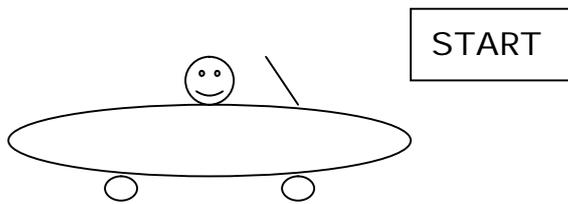
D. Using your answer in C above, find the time taken by Boat B to cover 240m.

_____ (2 marks)

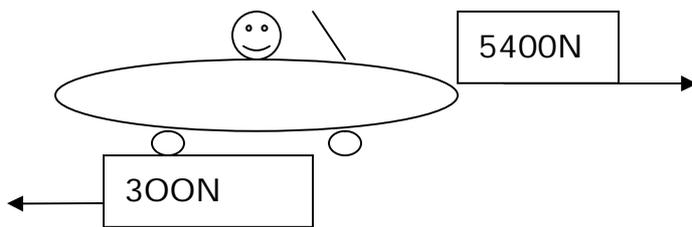
3. This question is about NEWTON'S LAWS

A. Describe the motion of the dragster during the following stages of the race.

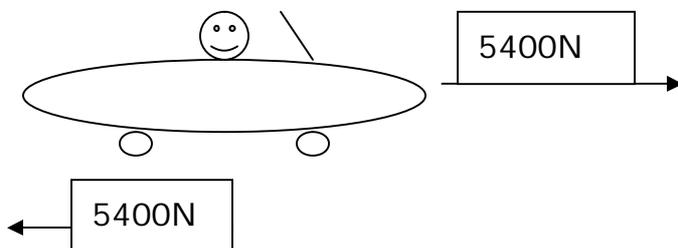
STAGE 1:



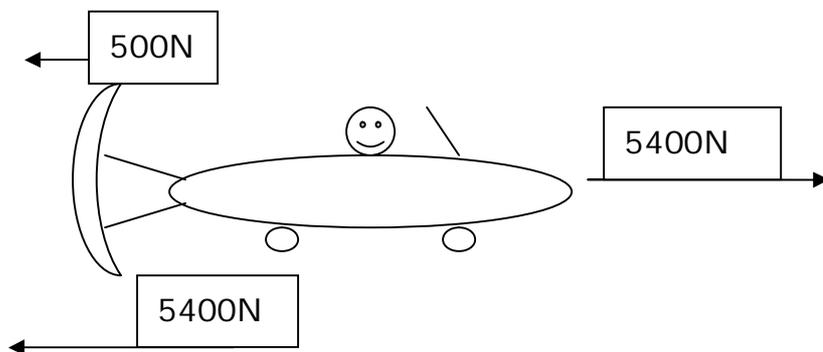
STAGE 2:



STAGE 3:



STAGE 4:



(4 marks)

B. If the dragster starts from rest and reaches a final velocity of 25m/s in 5s, find the acceleration.

(2 marks)

C. Calculate the mass of the dragster if the resultant force on it during the acceleration is of 5100N.

(2 marks)

4. This question is about EQUATIONS OF MOTION

A boy standing on a balcony hits a bottle which takes 3s to reach the ground.



A. What is the initial velocity of the ball? _____ m/s (1 mark)

B. Since the object falls freely, its acceleration is _____ m/s² (1 mark)

C. Find the velocity with which the bottle hits the ground.

(2 marks)

D. Find the distance through which the ball falls.

(2 marks)

5. This question is about MOMENTUM

During a game of *bocci*, a man throws a wooden block of mass 2kg towards a stationary wooden ball of mass 0.5kg with a velocity of 6m/s. The impact sets the ball moving with a velocity of 8m/s.



A. What type of collision is this? _____

B. What are the units of momentum? _____
(2 marks)

C. Find the momentum of:

i. the wooden block before the collision _____

ii. the wooden ball before the collision _____
(4 marks)

D. What is the total momentum

i. before the collision? _____

ii. after the collision? _____
(2 marks)

E. Find the velocity of the block after the collision.

(3 marks)

Section B: You must answer all the questions in this section. Each question carries 15 marks.

1. This question is about velocity-time graphs

The table below shows the motion of a test car.

Velocity m/s	0	4	8	12	12	12	12	6	0
Time/s	0	1	2	3	4	5	6	7	8

A. Plot a graph of velocity on the y-axis against time on the x-axis. (6 marks)

B. Describe the motion of the test car between:

i. 0 - 3s: _____

ii. 3 - 6s: _____

iii. 6 - 8s: _____

(3 marks)

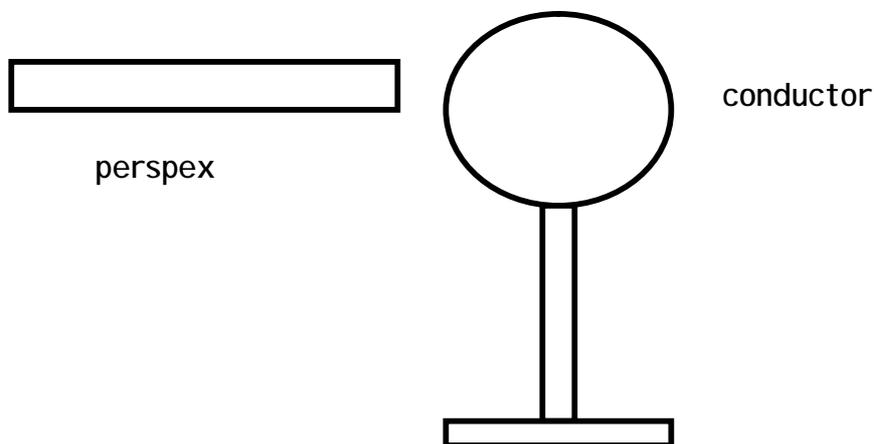
C. Find the deceleration.

(2 marks)

D. Calculate the total distance travelled by the test car during the journey.

(4 marks)

2. This question is about STATIC ELECTRICITY



A. The perspex in the diagram above is charged. Draw the charges on it.

(2 marks)

B. Draw the distribution of charges on the conductor. (2 marks)

C. Name one method by which the perspex strip can be charged.

(1 mark)

D. The sphere is earthed for a short time. What charge would you expect to find on the conductor after it is earthed?

(2 marks)

E. Underline the correct words in the brackets:
This happens because (electrons, protons) move from the (conductor, Earth) to the (Earth, conductor).
(2 marks)

F. What charge would you expect to find if the perspex is removed before earthing the conductor?

(2 marks)

The diagram below shows an aeroplane passing under a charged cloud during a thunderstorm.

G. Draw the charges on the negatively-charged cloud. (1 mark)

H. Draw the distribution of charges on the aeroplane when it passes under the charged cloud. (2 marks)



H. What happens to the charge on the plane when it is no longer under the cloud?

(1 mark)

3. This question is about **MOMENTUM**

A stuntman of mass 70kg riding a motorbike of mass 430kg crashes into a wall.



- A. Find the total mass of the stuntman and the motorbike.

(2 marks)

- B. Find their momentum before the collision if they are moving with a velocity of 6m/s.

(3 marks)

- C. What is their momentum after the crash? _____
(1 mark)

- D. What is the change in momentum? _____
(2 marks)

The stuntman always wears **foamed clothing** during the stunts.

- D. Explain how this clothing prevents him from getting injured.

(3 marks)

- E. If $\text{Force} = \frac{\text{change in momentum}}{\text{time}}$, find the force exerted if his clothing make him stop in 0.8s

(2 marks)

- F. Would the time of impact increase or decrease if he was wearing normal clothing without any foaming?

(2 marks)