ST THOMAS MORE COLLEGE
GIRLS SECONDARY
SANTA LUCIA
HALF-YEARLY EXAMINATIONS – FEBRUARY 2012

Index Number

Form: 4 | Physics | Time: 1hr 30mins

Name: …….. Class: …….

Answer ALL questions in the spaces provided on the Examination Paper.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

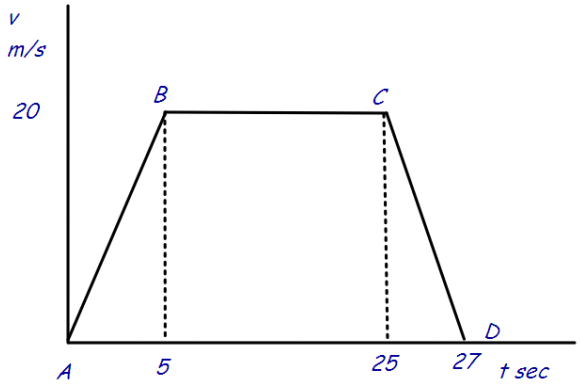
Equations		
Motion	**Average speed** $= \frac{\text{total distance}}{\text{total time}}$ $M = mv$	$v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$ $s = \frac{(u+v)t}{2}$
Forces	$F = ma$	$W = mg$

Marks Grid: For the Examiners' use ONLY

Question	1	2	3	4	5	6	7	Th.	Prac	Total	**Final Mark %**
Mark	10	10	10	10	15	15	15	85	15	100	100
Score											

<u>Section A</u>: Answer all questions in this section. This section carries 40 marks

1. The following velocity / time graph shows the motion of a racing car



a. Interpret each part of the graph

(i) AB _____[1]

(ii) BC _____[1]

(iii) CD _____[1]

b. Calculate;

(i) the acceleration

_____

_____

_____[4]

(ii) the total distance travelled

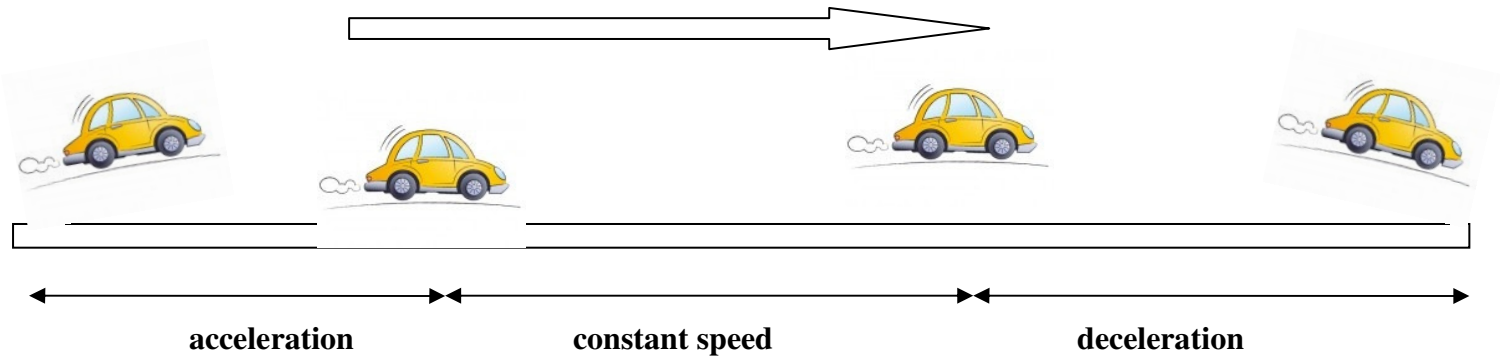
_____

_____

_____

_____[3]

2.



Jeremy sets off to work in his new car. From rest, he accelerates with a uniform acceleration of 3 m/s^2 for 10s, travelling a distance of 150m in this time. He then continues at this velocity for 500m. When the traffic light ahead turns red, he presses the brake and finally comes to rest uniformly in the next 30s. Calculate;

a) the maximum velocity the car reaches in the first 10s;

_____

_____

_____[2]

b) the total distance travelled by the car before stopping at the red light;

_____

_____

_____[3]

c) the total time taken by the car to travel this distance;

_____

_____

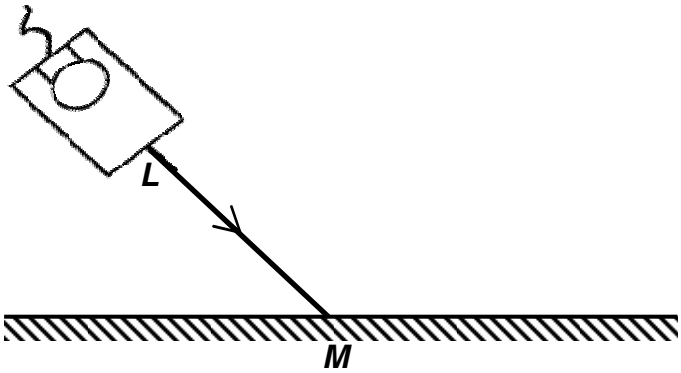
_____[3]

d) the average velocity of the car during this part of the journey to work;

_____

_____[2]

3a. Sabrina used a raybox to direct a ray of light LM to a mirror as shown in the following diagram:



i. Draw the normal, at the point of incidence. [1]

ii. Draw the reflected ray. [1]

iii. Mark the angle of incidence ***i***. [1]

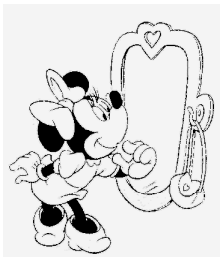
iv. Mark the angle of reflection ***r***. [1]

v. Sabrina labelled line LM as _____ [1]

vi. Sabrina measured the angle of incidence and angle of reflection. She noticed that:

_____ [1]

b) Sabrina placed her 'Minnie Mouse' soft toy ('the object') in front of a mirror.



List four properties of the image formed in the mirror: [4]

i. _____

ii. _____

iii. _____

iv. _____

4. Kevin wanted to go for a ride on his speed boat so he put his life jacket on.

a) The total weight of Kevin and his speed boat is 15700N.
What is the size of the upward force of the water on the speed boat with Kevin in it? Give a reason for your answer.

_____

_____[2]

b) Kevin then switches his engine on and started driving the speed boat. In terms of forces involved, explain how Kevin can drive the speed boat;

i) at constant acceleration;

_____

_____[2]

ii) at constant speed.

_____

_____[2]

c) Kevin finally switched his speed boat off but it continued to move forward in a linear motion for a considerable distance before it bumped into another speedboat with a force of 700N.

Explain why the speed boat did not stop immediately.

_____

_____[2]

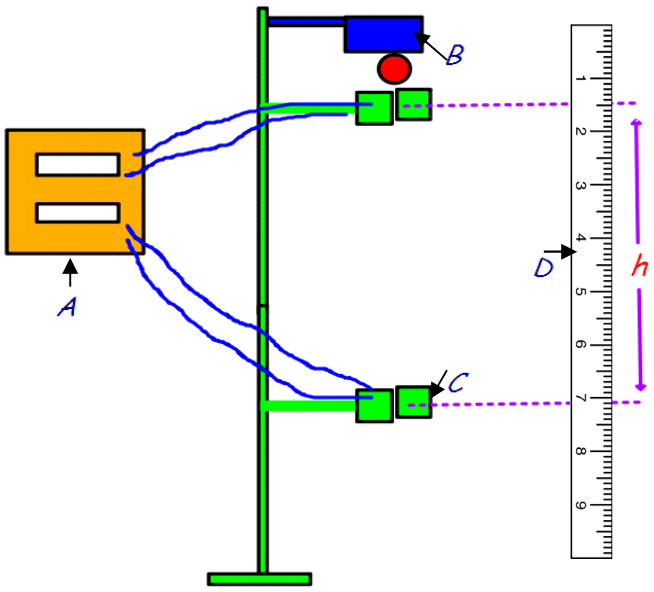
d) What was the force acting on Kevin's speed boat when it hit the other speed boat? Explain your answer.

_____

_____[2]

<u>Section B</u>: Answer all questions in this section. This section carries 45marks.

5. ***This question is about free fall***



a. Label the above diagram;

(i) A _____[1]

(ii) B _____[1]

(iii) C _____[1]

(iv) D _____[1]

b. In the above experiment to measure the acceleration due to gravity, a steel ball of mass 100g was released from rest from a height of 95cm. The time of fall was found to be 0.43 seconds.

i. What is the weight of the steel ball?

_____

_____[1]

ii. What is the height of release in metres?

_____

_____[1]

iii. Calculate the value of the acceleration due to gravity.

_____

_____

_____[3]

c. The value obtained is different from the true value of the acceleration due to gravity. Name two precautions that would help to obtain a more accurate result.

_____

_____[2]

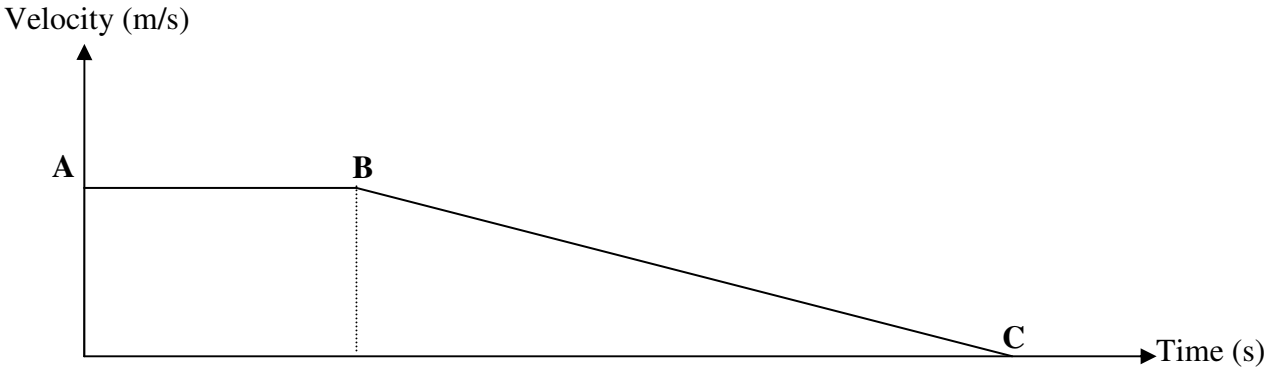
d. The experiment was repeated with a steel ball of mass 300g. Would the value of time and acceleration increase, decrease or remain the same.

(i) Time_____[2]

(ii) Acceleration_____[2]

6. This question is about motion and momentum.

a) Anton is driving and brakes to avoid hitting a dog who crosses the road in front of him. The graph below shows the change in velocity of the car until it stopped.



(i) Which part of the graph represents the :

- Thinking distance ? _____
- Braking distance ? _____

[2]

(ii) Give two factors which affect thinking distance.

_____

_____[2]

(iii) The car moves 16m before Anton presses the brake, and another 38m before it stops completely. What is the total stopping distance of the car?

_____

_____[1]

b) Jacob and Jason, both of mass 50 kg, are riding a tandem bicycle of mass 30kg, at a constant speed of 3 m/s.

(i) State the Principle of Conservation of Momentum.

_____

_____

_____[2]

(ii) Calculate the total momentum of the bicycle and cyclists.

_____

_____

_____[2]

c) Jason lets go and falls off the back of the bicycle while it is still moving. He lands on the ground with zero velocity, but Jacob keeps pedalling and the bicycle keeps moving.

(i) What is the total momentum of Jason when he hits the ground?

_____[1]

(ii) What is the momentum of Jacob and the bicycle after Jason falls off?

_____[1]

(iii) Calculate the velocity with which Jacob and the bicycle continue moving after Jason falls off.

_____

_____

_____[2]

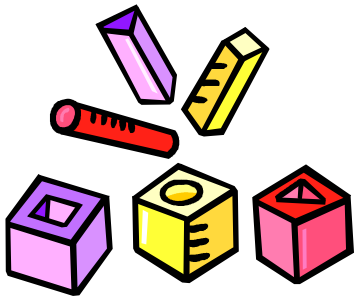
(iv) A modern car with a rigid passenger safety cage has zones at the front and rear which are designed to crumple in a crash. Explain why crumple zones should reduce passenger injury in a car crash.

_____

_____

_____[2]

7. A constant force is exerted on wooden blocks of different masses. The acceleration produced was found each time. The table below gives the acceleration produced on the different masses.



Mass **m(kg)**	0.075	0.1	0.2	0.3	0.4	0.6	0.8
Acceleration **a (m/s^2)**	32	24	12	8	6	4	3
1/mass **1/m(1/kg)**							1.25

a) Complete the table and work out the value of 1/mass for each mass. [3]

b) On the graph paper, draw the graph of acceleration (m/s^2) on the y-axis against 1/mass (1/kg) on the x-axis. [5]

c) What is the relationship between the acceleration produced and the mass of the block?

_____[1]

d) What is the acceleration on a block of mass of 0.5kg?

_____

_____[1]

e) From the graph or otherwise, find the force on the wooden blocks.

_____

_____[2]

f) The force applied is increased on the wooden blocks and the whole experiment repeated all over again. On the graph paper, show how the new graph obtained will be and label it A. Explain your answer.

_____

_____[3]