St. Ignatius College
Boys Secondary School, Ħandaq

Half-Yearly Examination 2011

2

Form 4 **PHYSICS** **Time: 1 hr 30 min**

Name: _____ **Class:** _____

1	2	3	4	5	6	7	8	Paper	Practicals	Total

Answer all the questions in the spaces provided on the Examination Paper.
Where necessary take the acceleration due to gravity, g = 10 m/s^2.
You may find some of these formulae useful.

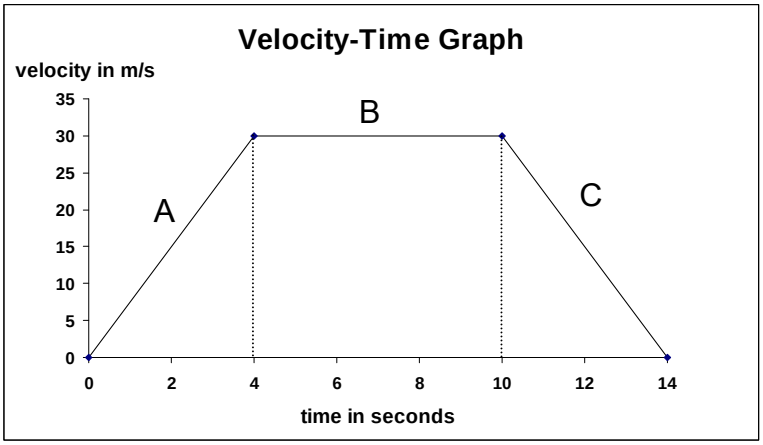
Area of a triangle = ½ (base x height) **Area of trapezium = ½ h (sum of parallel sides)**

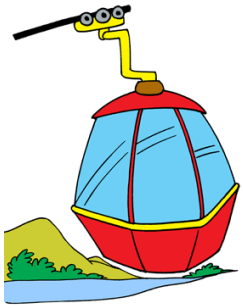
v = s / t **v = u + at** **s = ½ a t^2** **W = mg** **F = ma**

momentum = mass x velocity **v = f λ**

Section A

1. A cable car moves between two stations. The speed of a cable car varies as shown.





With the help of the graph find:

(a) the initial velocity of the cable car _____ (1 mark)

(b) the maximum velocity of the cable car _____ (1 mark)

(c) the acceleration of the cable car during the first 4 seconds of motion

_____

_____

(2 marks)

(d) in part B of the graph the cable car is moving with constant _____ (1 mark)

(e) the deceleration of the cable car during its last 4 seconds of motion;

_____

_____

(2 marks)

(f) the distance travelled by the car between the two stations.

_____

_____

_____

(3 marks)

2. An athlete accelerates uniformly from rest during the first 40m of a 120m race.

(a) What is the runner's initial velocity?

_____

(1 mark)

(b) If the athlete takes 5 seconds to run 40m;

(i) What is his speed at the end of the 40m?

_____

_____

_____

(3 marks)

(ii) Find his acceleration.

_____

_____

(2 marks)

(c) After the first 40m, the athlete continues the race at uniform velocity.

(i) Calculate the time he takes to finish the race.

_____

_____

(2 marks)

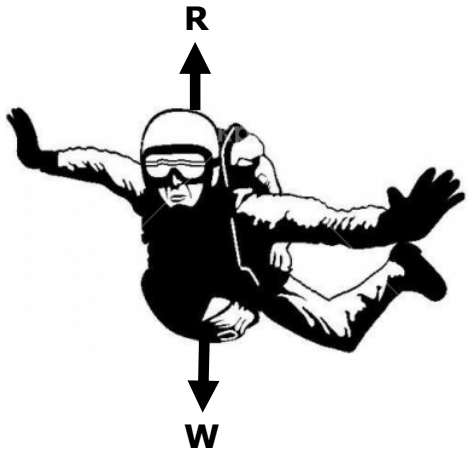
(ii) Find the total time he takes to run the race.

_____

_____

(2 marks)

3. (a) What is the initial acceleration of the sky diver? _____ (1 mark)



(b) Complete:

(i) W represents the _____

(ii) R represents the _____

(iii) Both forces are measured in _____ (3 marks)

(c) As the sky diver accelerates downwards

(i) Which of the two forces is greater? _____ (1 mark)

(ii) Which of the above two forces increases as he speeds down? _____ (2 mark)

(d) Eventually the sky diver moves down at a constant speed.

(i) What is, now, the resultant (net) force acting on the sky diver? _____ (2 marks)

(ii) Underline below the correct relationship between the forces R and W as the sky diver falls at constant speed.

R > W R = W R < W

(1 mark)

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4. (a) The figure below shows a simplified version of a rocket.

(i) "When two or more bodies act on each other, their total momentum remains constant, providing there is no external force acting." This is called the Principle of Conservation of _____

(1 mark)

(ii) We can find the momentum of a moving object by multiplying its _____ by its velocity. (1 mark)

(iii) The units of momentum are _____. (1 mark)

(b) A spaceship fires 100 kg of fuel as hot gases moving at 20 000 m/s. If the mass of the spaceship is 40 000 kg calculate:

(i) The momentum of the gases;

_____

_____

(2 marks)

(ii) The momentum of the spaceship;

_____

_____

(2 marks)

(iii) The speed of the spaceship.

_____

_____

(3 marks)

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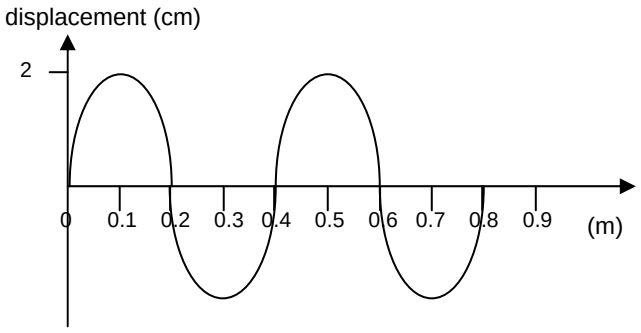
5. (a) The graph below shows a progressive wave travelling along a string. If the frequency is 10 Hz, find:



(i) the wavelength of the wave _____ (2 marks)

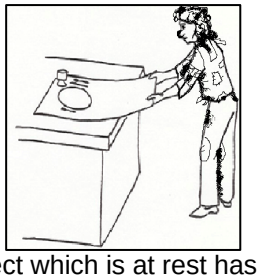
(ii) the velocity of the wave _____ (2 marks)

(iv) the amplitude of the wave _____ (2 marks)

(b) The wave on the diagram above is a _____ wave. A sound wave, on the other hand is a _____ wave. The upper part of the wave is called the _____ and the lower part of the wave is called the _____.

(4 marks)

Section B



6. ***This question is about Newton's Laws and Momentum.***

a) A clown pulled off the table cloth with a jerk from a table prepared for dinner. The utensils on it did not fall off. Fill in the blanks correctly.

The utensils do not fall off the table since by Newton's _____ Law an object which is at rest has a reluctance to move called _____. This makes the utensils remain at rest. (2 marks)

b) The clown was travelling home in a car of total mass 800 kg at 10 m/s. At a crossing, he brought the car to rest in 10 seconds. Find:

i) the deceleration.

_____

_____ (2 marks)

ii) the average braking force.

_____

_____ (2 marks)

c) It rained in the afternoon and he noticed that raindrops fell at a constant speed to the ground even when they are pulled down by the force of gravity? Could this be true?

Fill in correctly: While the rain drops fall to the ground there are two forces acting on it. When these two forces become _____ in size the rain drop moves with a constant speed also called its _____ _____. (3 marks)

c) Then the clown of mass 50 kg, running at 2 m/s, jumps on to a stationary trolley of mass 10 kg, and both move together along a long corridor in a supermarket. Calculate:

(i) The momentum of the trolley before the clown jumps on it. _____ (1 mark)

(ii) The clown's momentum just before jumping on to the trolley

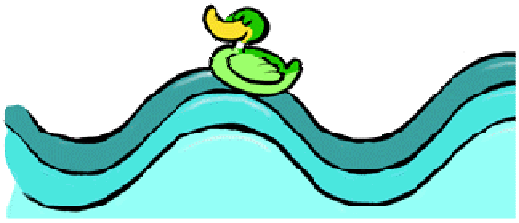
_____ (2 marks)

(iii) Calculate the total mass moving after Ryan jumps on to the trolley _____

(1 mark)

(iv) Calculate the common velocity of Ryan and the trolley as they both travel together along the long corridor. (2 marks)

7. This question is about water waves.



Two students set up a ripple tank in the laboratory to study the properties of waves.

(a) Waves are set up in the ripple tank. A small floating object goes up and down 5 times per second. The wave crests produced are 10 cm apart.

(i) The frequency of the wave = _____ Hz (1 mark)

(ii) The wavelength of the wave = _____ m (1 mark)

(iii) Calculate the velocity of the wave.

_____

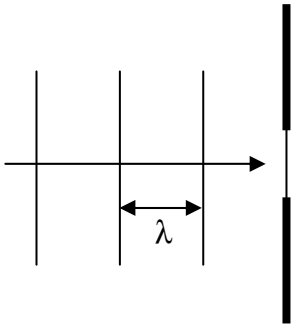
_____

(2 marks)

(b) The students now produced straight waves to study the behaviour of waves when passing through gaps.

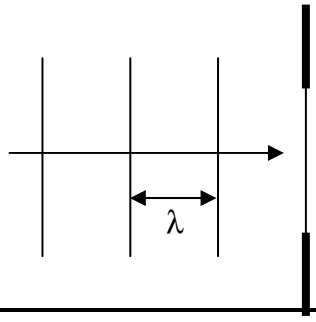
(i) Explain how you would produce a straight water wave. *Underline the correct answer in the brackets*: A straight water wave can be produced by moving (up, roughly, to the left) and (slowly, down, to the right) a (straight block, spherical object) against the surface of the water. (3 marks)

(ii) The students place a barrier with a gap as shown below. Draw the shape of the wavefronts after passing through the gap. (3 marks)



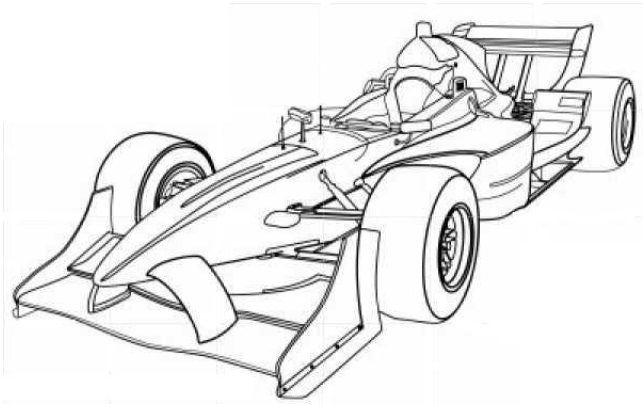
(iii) *Underline the correct word between the brackets*: This spreading of water waves when passing through a gap is referred to as (reflection, refraction, diffraction). (2marks)

(iv) In the space provided below draw a barrier with wavefronts (as in the diagram above) but this time passing through a larger gap. Then draw the shape of the wavefronts after passing through the wide gap. (3 marks)



8. This question is about distance and velocity.

The table below represents the distance travelled by a sports car plotted against time:



Time/s	0	2	4	6	8	10	12	14	16
Distance/m	0	10	20	30	40	50	60	70	80

(a) Plot on the graph paper provided a graph of **distance** on the Y-axis against **time** on the x-axis. (6 marks)

(b) *Underline the correct answer*:

The car is (at rest, acceleration, moving with constant speed or decelerating)

(2 marks)

(c) What is the distance travelled by the car in the first:

(i) 3 seconds? _____

(ii) 9 seconds? _____

(2 marks)

(d) At what time the car travelled:

(i) 25 metres? _____

(ii) 65 metres? _____

(2 marks)

(e) Calculate the speed of the car.

(3 marks)