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BOYS' SECONDARY MOSTA
HALF-YEARLY EXAMINATIONS 2010/2011

SUBJECT: PHYSICS **TIME: 1 HR 30 MIN**

NAME : _____ INDEX NO : _____

FORM : _____ MARK: _____

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

Waves and Optics	$v = f\lambda$	$f = \frac{1}{T}$
	$m = \frac{v}{u}$	$m = \frac{\text{height of image}}{\text{height of object}}$
	$\eta = \frac{\text{speed of light (air)}}{\text{speed of light (medium)}}$	$\eta = \frac{\text{real depth}}{\text{apparent depth}}$
Forces and Motion	$W = mg$	$v^2 = u^2 + 2as$
	$v = u + at$	$s = ut + \frac{1}{2} a t^2$
	$\text{Average speed} = \frac{\text{Total Distance}}{\text{Total time}}$	$s = \frac{(u+v)}{2} t$

For examiner's use:

Number	1	2	3	4	5	6	7	8	Total
Maximum mark	8	8	8	8	8	15	15	15	
Actual mark									

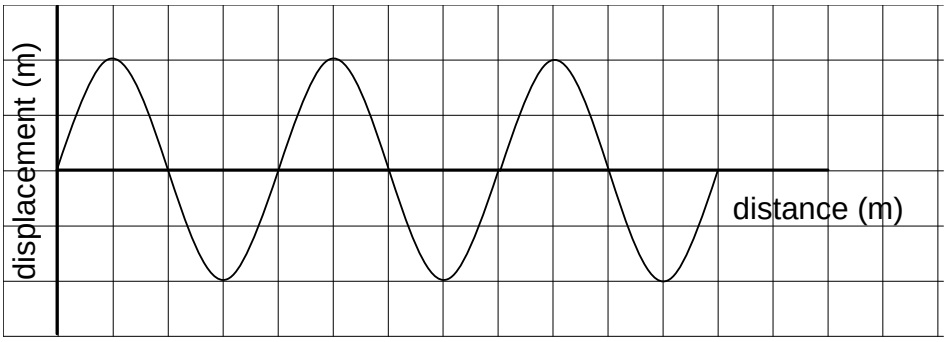
	Total Theory	Total Practical	Final Mark
Actual Mark			
Maximum Mark	**85**	**15**	**100**

SECTION A
This section carries 40 marks.

1. a) If the sides of each square on the graph represent 1 m, find the value of the:

(i) amplitude _____ m [1]

(ii) wavelength _____ m [1]



b) The greater the amplitude of a wave, the greater is its _____. [1]

c) The higher the frequency of a wave, the _____ is its wavelength. [1]

d) The speed of a wave depends on the _____ through which it travels. [1]

e) Waves in which vibrations are **parallel** to the direction of the wave are called _____ waves. [1]

f) Waves in which vibrations are **perpendicular** to the direction of the wave are called _____ waves. [1]

g) Find the velocity of a wave having a frequency of 6 Hz and a wavelength of 0.3 m. _____ [1]

2. The table below shows waves making up the electromagnetic spectrum.

Gamma	**X-rays**		**Visible Light**		**Microwaves**	**Radio**

a) Fill in the **two** missing radiations in the table above. [2]

b) Name **three** common properties of electromagnetic waves.

(i) _____

(ii) _____

(iii) _____

[3]

c) Which electromagnetic wave has the **shortest wavelength**?

_____ [1]

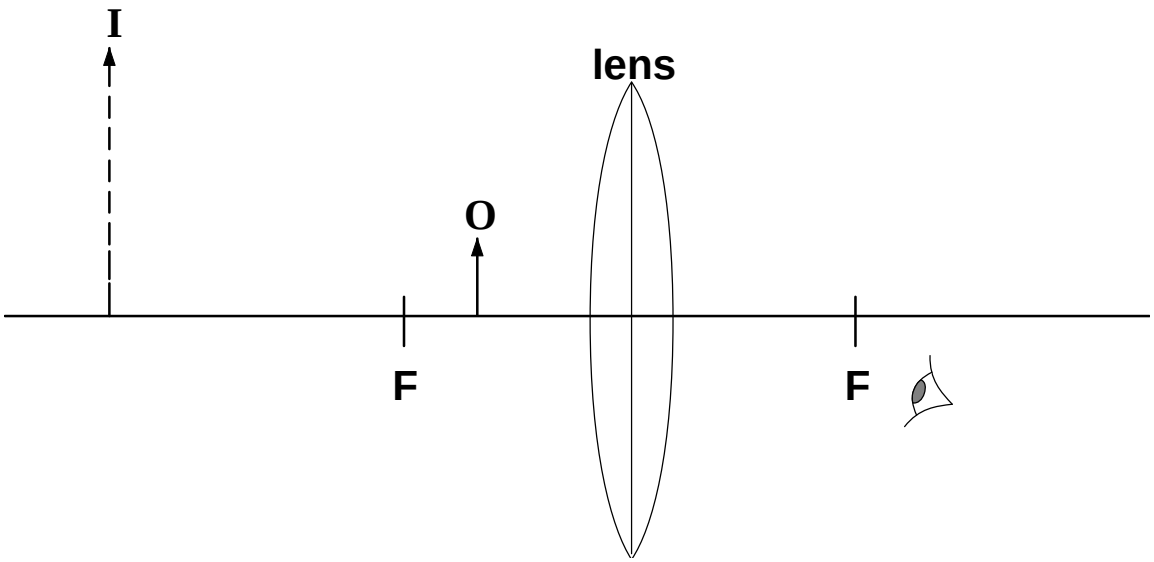
d) Which electromagnetic wave has the **highest frequency**?

_____ [1]

e) Give a use for ultraviolet radiation _____

_____ [1]

3. The ray diagram below is incomplete.



a) Add the missing rays to the ray diagram above. [2]

b) Name **three** properties of the image formed.

(i) _____

(ii) _____

(iii) _____

[3]

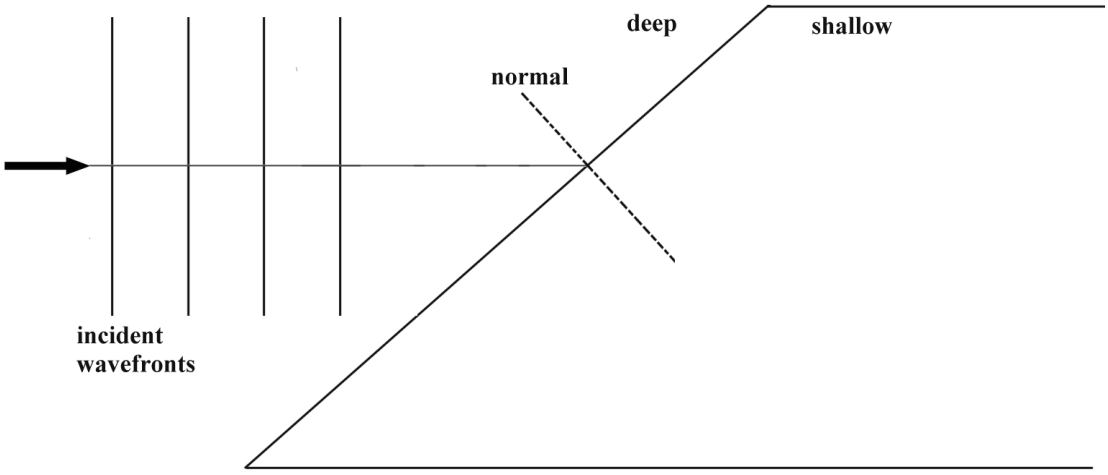
c) Give a suitable use for the ray diagram.

_____ [1]

d) Calculate the magnification of the lens.

_____ [2]

4. The diagram below shows water wavefronts approaching a region of **shallow** water.



a) Complete the diagram to show the direction taken by the waves. [2]

b) *Underline the correct answer:*

What happens to each of the following as the waves enter the shallow water?

(i) **wavelength** (increases, decreases, remains the same).

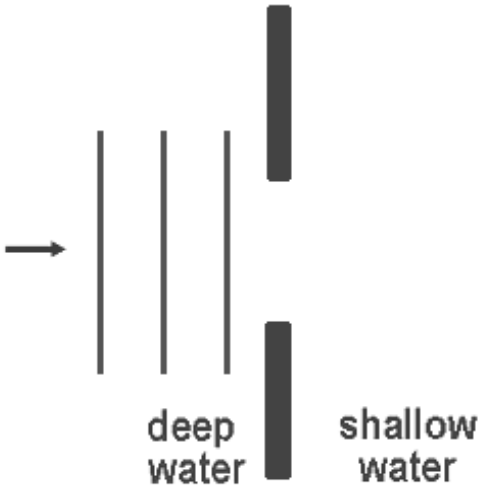
(ii) **frequency** (increases, decreases, remains the same).

(iii) **velocity** (increases, decreases, remains the same). [3]

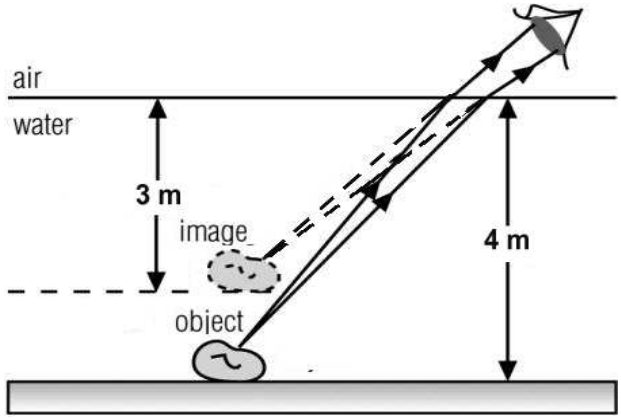
c) What is the name of the apparatus used to study water waves in the lab?

_____ [1]

d) Now, the wavefronts are directed towards a gap and enter again a region of **shallow water.** Complete the diagram by drawing the resulting wavefronts. [2]



5. An object immersed in water appears to be at a different depth.



a) *Underline the correct answer:*

(i) This occurs because of an effect called (diffraction, reflection, refraction). [1]

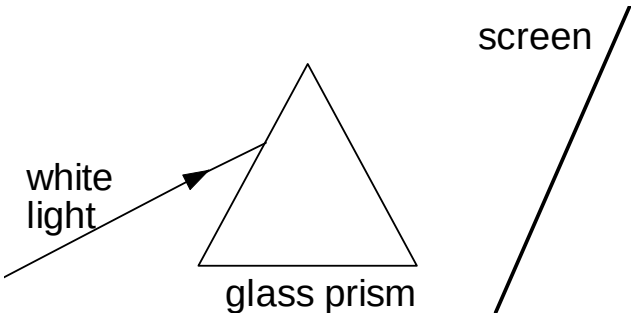
(ii) As the light rays pass from water to air, their speed (increases, decreases, remains the same). [1]

b) Use values in the diagram to calculate the refractive index of water.

_____ [2]

c) When white light passes through a triangular prism, it splits up into seven different colours.

(i) This effect is called _____, [1]



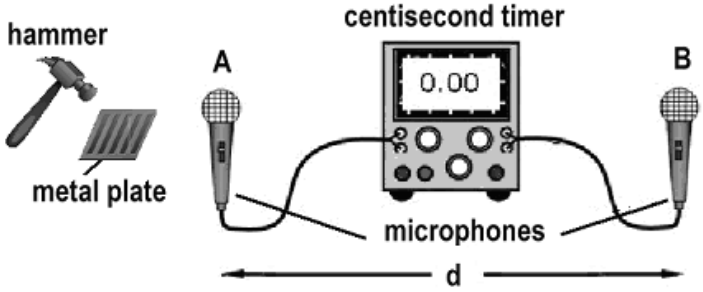
(ii) Complete the diagram to show the path taken only by the red and violet rays. Mark clearly their position on the screen. [2]

(iii) Name the invisible radiation which forms just above the red light.

_____ [1]

SECTION B
This section carries 45 marks.

6. The speed of sound in air can be measured very accurately by using the setup below.



a) When the hammer hits the metal plate, the sound first reaches microphone A, making the timer _____. When the sound reaches microphone B the timer _____. The distance between the microphones is measured with a _____. The formula _____ is then used to find the speed of sound in air. [4]

b) Why is this timing method much more accurate than using a stopwatch?

_____ [2]

c) A student decides to change several times the distance between the microphones. Each time he notes the time taken by the sound to travel that distance.

Distance between microphones (m)	0.10	0.20	0.30	0.40	0.50	0.60
Time in milliseconds (ms)	0.29	0.59	0.88	1.18	1.47	1.76

(i) Plot a graph of **Time** on the y-axis against **Distance** on the x-axis. [5]

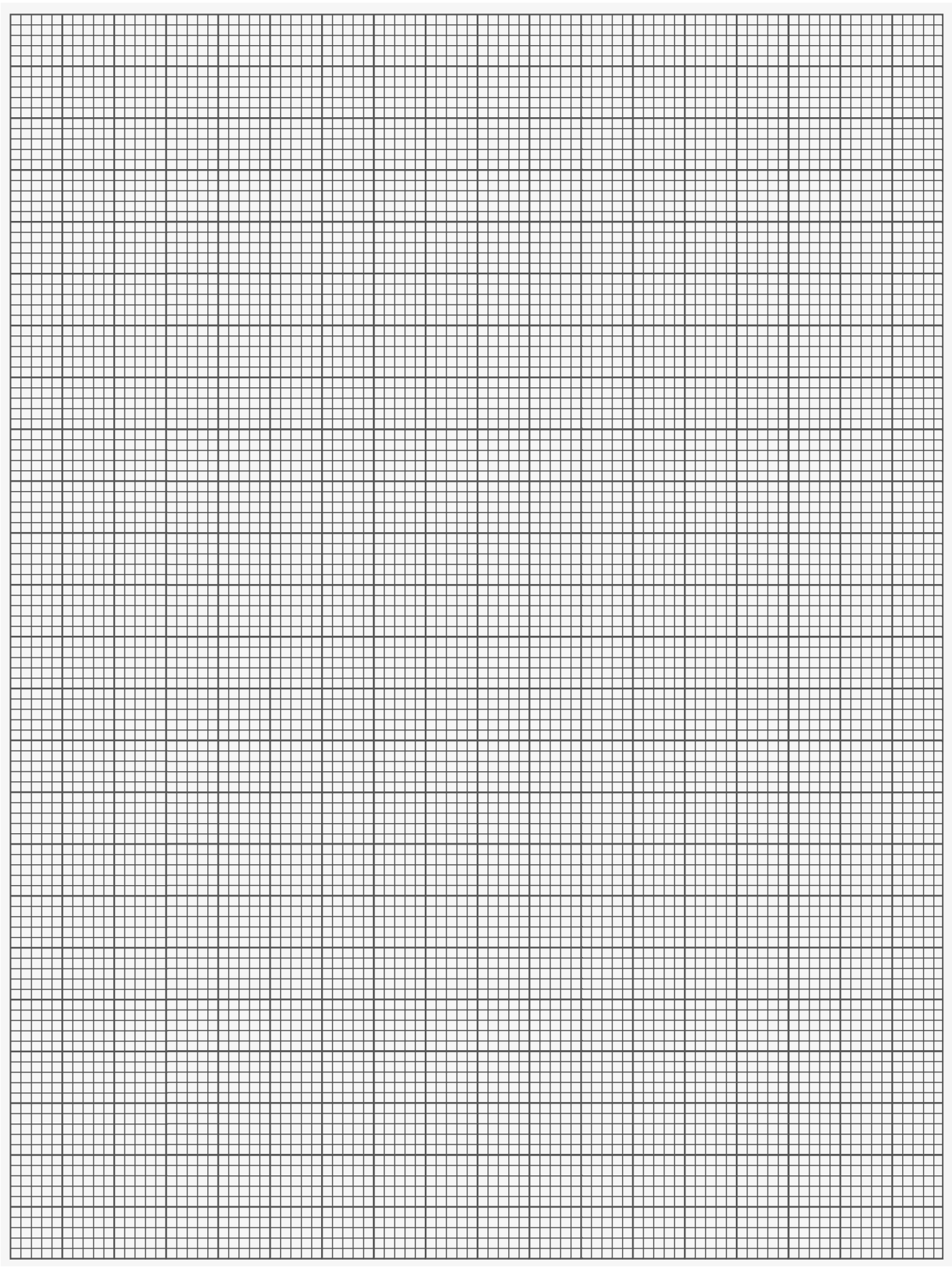
(ii) If one millisecond = 0.001 seconds, use values in the table to calculate the speed of sound in air.

_____

_____ [3]

d) Why is it impossible to carry out this experiment in a vacuum?

_____ [1]



7. a) We can only hear sounds that are in a certain frequency range.

(i) What is the normal range of hearing for human beings?

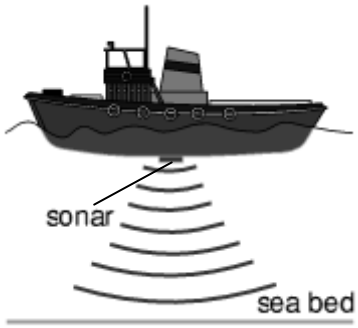
_____ [2]

(ii) What is the name given to sounds whose frequencies are so high that humans cannot hear?

_____ [1]

(iii) A ship uses its sonar to send such sound waves to measure the depth of the sea. The speed of these waves in sea water is 1500 m/s. If it takes 3 seconds for the reflected sound to be detected, find the depth of the sea.

_____ [3]



b) Sounds can differ in pitch or in loudness. The diagram below shows a <u>vibrating</u> tuning fork next to a microphone which is connected to an oscilloscope.

<u>Fill in the missing blanks using the words given underneath. Not all the words given need to be used.</u>

amplitude compressions velocity frequency rarefactions wavelength

The sound produced by the tuning fork reaches the microphone by means of _____ and _____ of air particles. The pitch of the vibrating tuning fork depends on the _____ with which it vibrates. If the tuning fork is struck hard, then the loudness of the sound increases because the _____ of the sound waves increases.

[4]

c) A tuning fork of frequency 512 Hz produces the trace shown in Figure 1.

(i) Draw on Figure 2, the shape of the trace, if the tuning fork is **struck harder**. [2]

(ii) Draw on Figure 3, the shape of the trace, if a tuning fork of frequency 256 Hz (half the frequency) is used instead and is **again struck hard as in Figure 2**. [3]

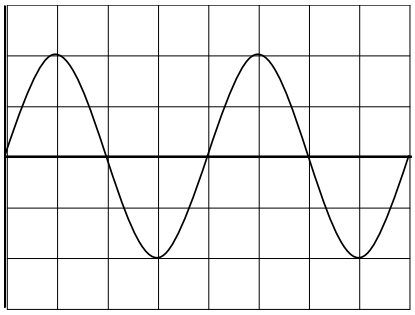


Figure 1

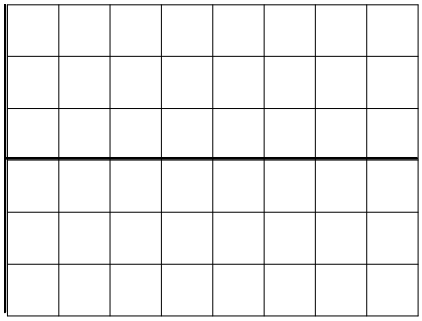


Figure 2

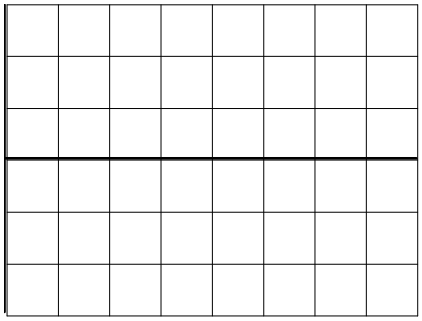


Figure 3

8. The following questions are about motion.

a) *<u>Fill in with the appropriate word.</u>*

(i) When the speed of an object **does not change**, we say that the object moves at _____ speed and its acceleration is ____ m/s^2. [2]

(ii) When the speed of an object **decreases**, we say that the object _____. [1]

b) An athlete starts <u>from rest</u> and manages to run a 100m race in 9.8 seconds.

(i) The initial velocity of the athlete is ____ m/s. [1]

(ii) Calculate his average speed.

_____

_____ [2]

c) A woman is driving her car at a speed of 12 m/s. She increases the speed of her car uniformly to 15 m/s in 6 seconds.

(i) Calculate the acceleration of the car.

_____ [3]

(ii) Calculate the distance moved by the car.

_____

_____ [2]

d) She now drives <u>from rest</u> a distance of 300m, while accelerating uniformly at $2m/s^2$.

(i) Calculate the final velocity at the end of the 300m.

_____

_____ [2]

(ii) Calculate the time taken to cover this distance.

_____

_____ [2]

END OF PAPER