GOZO COLLEGE

Track 3

Half Yearly Examinations for Secondary Schools 2012

FORM 4 **PHYSICS** **TIME: 1h 30min**

Name: _____ **Class:** _____

Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

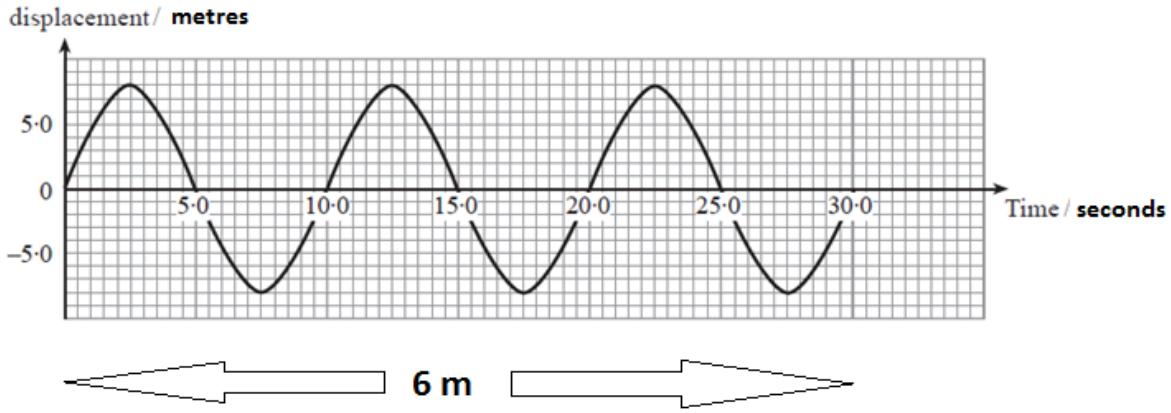
Forces	$W = mg$	
Motion	$v = u + at$	$s = ut + \frac{1}{2} a t^2$
	$s = \frac{(u+v)}{2} t$	$v^2 = u^2 + 2as$
	Average speed = $\frac{\text{Total distance}}{\text{Total time}}$	
Optics	$n = \frac{\text{speed of light (air)}}{\text{speed of light (medium)}}$	$n = \frac{\text{real depth}}{\text{apparent depth}}$
	$m = h_i/h_o$	$m = v/u$
Others	Area of triangle = ½ b h	Area of trapezium = ½ (a + b) h
Waves	$v = f \lambda$	$f = \frac{1}{T}$

Number	1	2	3	4	5	6	7	8	Total
Maximum mark	8	8	8	8	8	15	15	15	85
Actual mark									

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

SECTION A
This Section carries 40 marks.

1. The following is a graph of a wave. Deduce from the graph



a) The number of waves. _____ waves [1]

b) The amplitude of the wave. _____ [1]

c) The wavelength of the wave. _____ [1]

d) The periodic time of the wave. _____ [1]

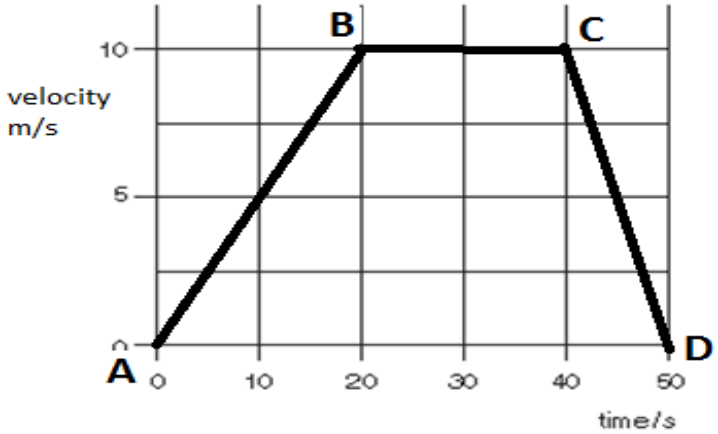
e) Calculate the frequency of the wave. [2]

_____

f) Calculate the speed of the wave. [2]

_____

2. The graph shows the movement of a car over a period of 50 s.



a) Describe the motion of the car between [3]

AB-_____ BC- _____

CD-_____

b) Calculate the acceleration of the car during AB? [2]

_____

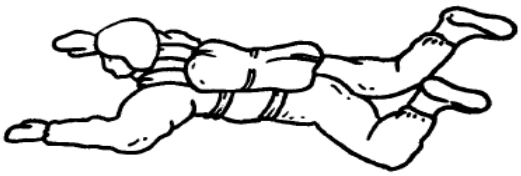
_____

c) Calculate total distance covered by the car? [3]

_____

_____

3. A sky-diver is falling freely as shown



a) What is the sky diver initial velocity? [1]

_____

b) State the value of the sky-diver's acceleration during free fall. [1]

_____

c) Calculate the velocity of the sky diver after 6 seconds. [2]

_____

d) Calculate the distance fallen after 6 seconds. [2]

_____

e) What happens to the acceleration of the sky diver when he opens the paruchute? Explain? [2]

_____

_____

4. The radio station Gozo1 transmits at a frequency of 73.7 MHz.

a) What do the symbols 'MHz' mean? [1]

_____

b) What is the wavelength of the radio waves transmitted by Gozo 1 radio station, given that the velocity of electromagnetic waves is 3×10^{8} m/s? [2]

_____

c) Give **two** properties of radio waves which distinguish them from sound waves. [2]

_____

_____

d) **Ultrasound** can be used to obtain information about the internal structure of the body. If the wave travels with a speed of 1590 m/s in the muscle calculate the thickness of the muscle if the echo is received after 0.1 milliseconds. (0.0001s) [1]

_____

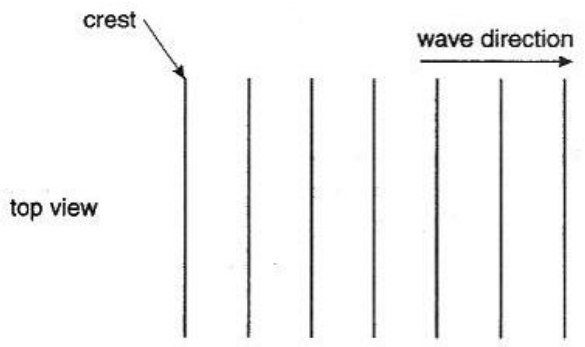
e) Name **one other** type of wave, which can be used to obtain information about the internal structure of the body. [1]

_____

f) Give a possible reason why this type of wave is never used with unborn babies or toddlers. [1]

_____

5. Susan is experimenting with water waves in a ripple tank. The diagram shows a top view and a side view of a wave. A wave crest is marked.



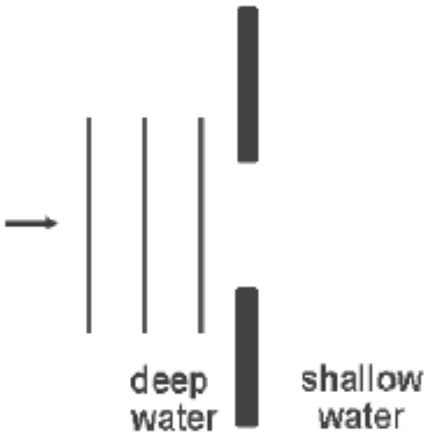
a) How many waves are there in the above diagram? [1]

_____

b) If the wave has a velocity of 4 cm/s and a wavelength of 2 cm calculate the frequency of the wave ? [1]

_____

c) Complete the diagram below to show how the water waves behave when passing through this barrier from **deep** to **shallow** water. [2]



d) What are the two processes happening to the waves as they pass through the boundary into the shallow water? [2]

_____

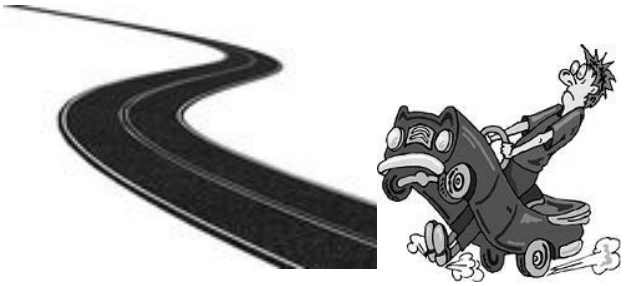
_____

e) What happens to the the wavelength and frequency as the waves travel into shallow water? [2]

Wavelength - _____

Frequency - _____

SECTION B
This Section carries 45 marks.



6. The following table is taken from the Highway Code and gives data for 'Typical Stopping Distances' of a car when braking on a dry road.

Speed m/s	Thinking distance m	Braking distance m	Stopping distance m
8.9	**6**	**6**	**12**
13.4	**9**	**14**	**23**
22.4	**15**	**38**	**53**
31.3	**21**	**75**	**96**
40.0			

a) Calculate the 'thinking time' for a speed of **22·4 m/s.** [2]

b) A car of mass 450 kg is travelling at a speed of **31·3 m/s** when the driver makes an emergency stop. Calculate the deceleration of the car. [3]

c) Calculate the thinking distance when the car is moving at **40 m/s.** [2]

d) Calculate the braking distance when the car is moving at **40 m/s** if it takes 5 seconds to stop the car. [2]

e) Find the stopping distance when the car is moving at 40 m/s. [2]

f) Name two factors that can affect the thinking distance. [2]

g) Name two factors that can affect the braking distance. [2]

7. A ship is sinking in the dark as shown below.

The sailors on the ship fire a distress flare into the air. It explodes with a bang and a bright flash of light.

A lifeboat crew hear the bang and see the flash, but not at the same time.

a) State which reaches the lifeboat first, the bang or the flash, and give a reason. [2]

_____

_____

b) The speed of sound in air is 340 m/s. Complete the following table to show how far a sound wave has travelled 2, 3, 4 and 5 seconds after the sound was made. [4]

Time elapsed /s	0	1	2	3	4	5
Distance travelled /m	0	340				

c) Draw the graph of distance travelled on **y axis** against time on **x axis** for the sound wave. [5]

d) The time interval between seeing the flash of light and hearing the bang is 4.2 s. Use your graph to find how far away the lifeboat is from the flare.

[2]

_____

e) From the graph state the relationship between distance travelled and time of a sound wave. [2]

_____

8. In a physics laboratory, a student wants to find the focal length of a convex lens. The student is given a sheet of white paper, a metre ruler and a lens.

a) Explain how the student could measure the focal length of the lens using this equipment. [3]

_____

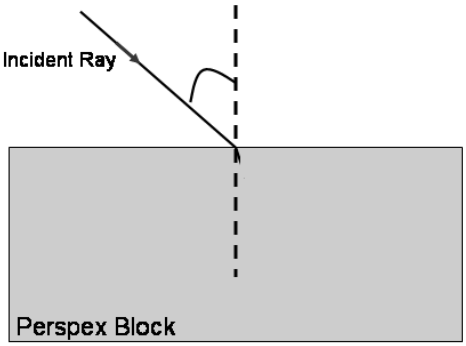
_____

_____

b) Describe two characteristics of the image formed by this lens. [2]

_____

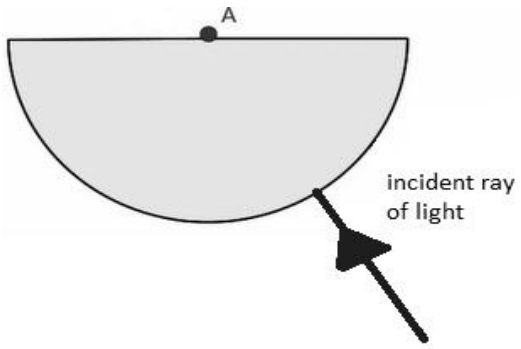
c) A ray of light is incident on a rectangular Perspex block. Continue the path of the ray of light as it passes into the block and out again. [2]



d) Mark clearly the angle of refraction. [1]

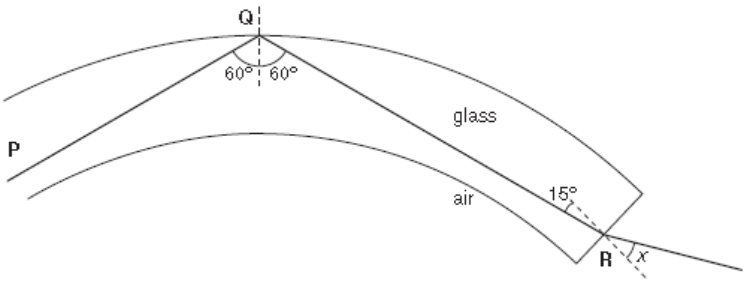
e) The diagram below shows a ray of light entering a glass block hitting point A at an angle of 35° with the normal. Complete the diagram to show the path of the ray of light through the block and after it emerges from the block. [2]

[2]



f) The diagram below shows a ray of light **PQR** passing along a simple optical fibre.

(i) Explain why the ray **PQ** does not leave the optical fibre at **Q**. What do we call this effect? [2]



(ii) Explain why the ray **QR** changes direction at **R**. [2]

(iii) State one advantage of optical fibres rather than copper wires for carrying telephone communications. [1]