KULLEĠĠ SAN BENEDITTU
Secondary School, Kirkop

HALF YEARLY EXAMINATION – 2014/2015

Track 2

FORM 4	PHYSICS	TIME: 1h 30min

Name: _____ **Class:** _____

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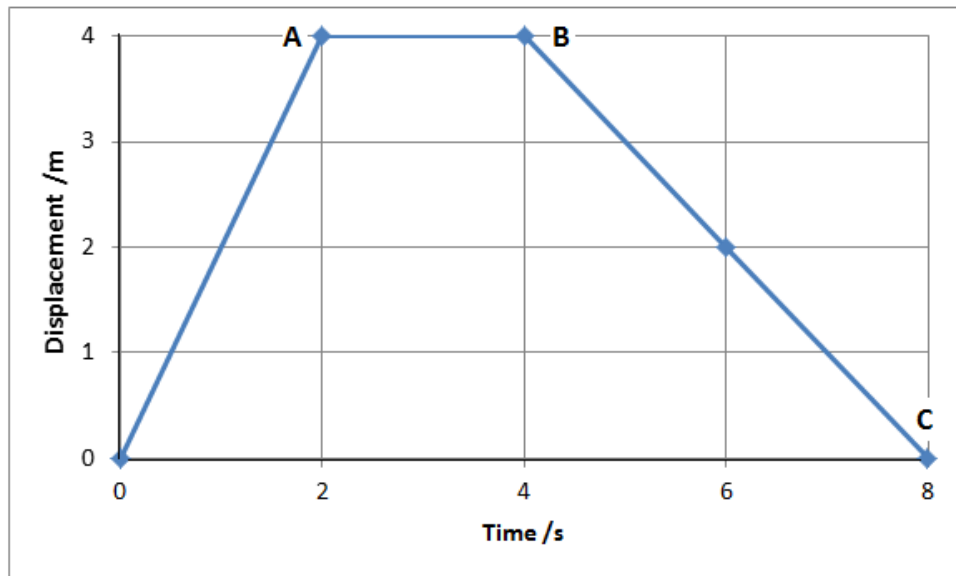**Where necessary take acceleration due to gravity, g to be 10m/s^2.**

Forces & Motion	**W = mg**	**F = ma**
	v = u + at	**s = ut + ½ at^2**
	s = $\frac{(u+v)t}{2}$	**v^2 = u^2 + 2as**
	Average speed = $\frac{\text{Total distance}}{\text{Total time}}$	**Area of trapezium = ½ (a+b)h**
Waves	**v = f λ**	**f = $\frac{1}{T}$**
	m = $\frac{\text{image distance}}{\text{object distance}}$	**m = $\frac{\text{height of image}}{\text{height of object}}$**
	η = $\frac{\text{real depth}}{\text{apparent depth}}$	**η = $\frac{\text{speed of light in air}}{\text{speed of light in medium}}$**

Question	1	2	3	4	5	6	7	8	Theory Mark	Practical Mark	Global Mark
Max. Mark	8	8	8	8	8	15	15	15	85	15	100
Mark											

Section A:

1. This question is about linear motion.

The graph shows how the displacement of a fun-train varies with time in the first 8s of its journey.

a) Describe the motion of the fun-train between

  i) OA: _____ [1]

  ii) AB: _____ [1]

  iii) BC: _____ [1]

b) How long did the whole journey take? _____ [1]

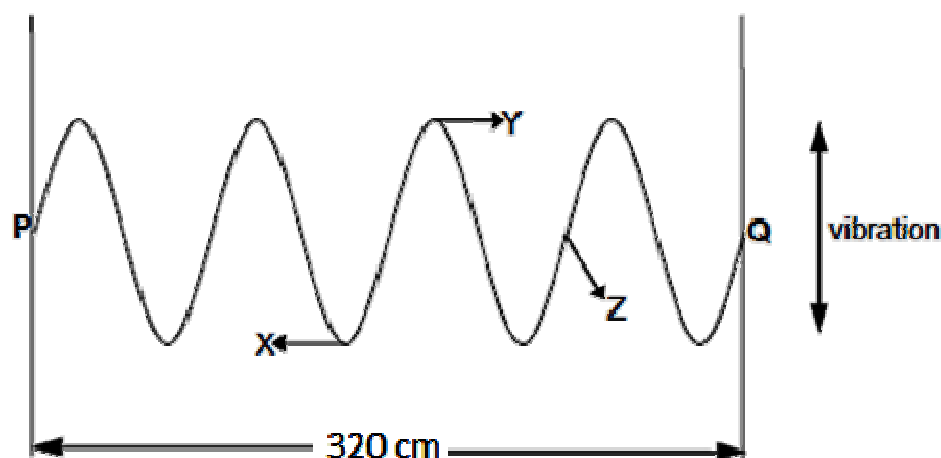c) What is the velocity of the fun-train during the first 2s?

  _____

  _____ [2]

d) How far does the fun-train travel in the first 4s?

  _____ [2]

2. This question is about properties of waves.

The diagram below represents a transverse wave travelling along a rope held firmly at end P and moved up and down at end Q.

(a)   On the above diagram mark:

   (i)   The **amplitude** of the wave and label it **A**.   [1]

   (ii)   The **wavelength** of the wave and label it **L**.   [1]

(b)   Draw a circle around one of the letters **X**, **Y** and **Z** which shows the point that represents the **crest** of the wave.   [1]

(c)   Use the information given in the diagram to determine:

   (i)   the number of complete waves.
   _____   [1]

   (ii)   the wavelength of the wave in **metres**.
   _____
   _____   [1]

(d)   Calculate the **frequency** of vibration in **Hz**, given that the wave velocity is 4m/s.

   _____
   _____   [2]

(e)   Calculate the **periodic time T** of the wave, using the equation $T = \dfrac{1}{f}$

   _____   [1]

3. **This question is about refraction.**

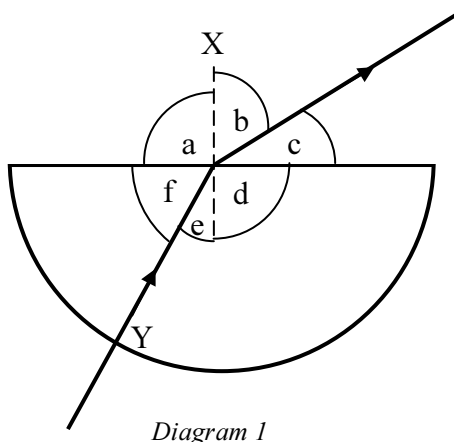(a)   The diagram shows a ray of light directed at a semi-circular glass block.

Diagram 1

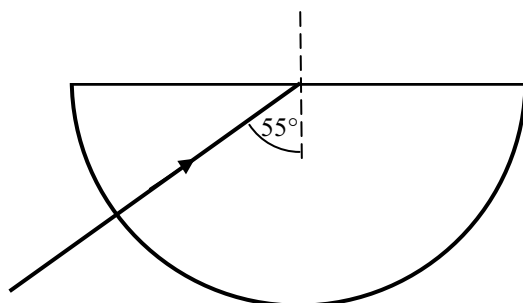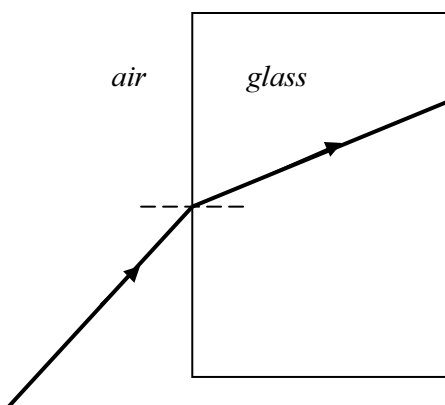*Diagram 2*

(i)   Name line **X**. _____ [1]

(ii)   Which angle is the angle of incidence?   _____ [1]

(iii)   Name angle **b**. _____ [1]

(iv)   At point Y, light passes from air to glass but refraction does not take place. Why does this happen?

_____ [1]

(v)   In diagram 2, the ray of light falls on the semi-circular glass block at an angle of 55°. Complete the diagram to show what happens to the ray. (*The critical angle for glass is 42°*) [1]

(b)   A student uses a glass block to investigate how a ray of light passes through it.

air   *glass*

(i)   On the diagram draw the refracted ray as it goes out of the glass block.

[1]

(ii)   Fill in with the appropriate words:
away from, towards

When light passes from air to glass it is refracted _____ the normal.

When light passes from glass to air it is refracted _____ the normal. [2]

4. **This question is about the electromagnetic spectrum.**

(a) Name two properties common to all electromagnetic waves.

(i) _____ [1]

(ii) _____ [1]

Ultra violet	Microwaves	Visible light	X-rays	Infra-red	Gamma rays

(b) Name **one** type of electromagnetic radiation from above that:

(i)	causes suntan		[1]
(ii)	is used for satellite communication		[1]
(iii)	is emitted by a warm object		[1]
(iv)	can be used to treat cancer patients		[1]

(c) Visible light travels through space at **3 x 10^8 m/s**. The Sun is **1.5 x 10^{11} m** away.

How many seconds does it take visible light to get from the Sun to Earth? Include in your answer the equation you are going to use. Show clearly how you get to your final answer.

_____

_____

_____ [2]

5. **This question is about sound waves.**

(a)   Fill in with the following words. Each word may be used **once** or **not at all**.

Echo	*medium*	*wavelength*	*pitch*
Compressions	*longitudinal*	*frequency*	*loudness*
Transverse	*rarefactions*	*vacuum*	*speed*

Sound waves are _____ waves. These waves are formed from _____ and _____. The material that the sound wave moves through is called a _____. Sound cannot travel through a _____.
The _____ of a sound wave is a measure of how many times an object vibrates per second. Objects that vibrate with a high frequency produce sounds with a high _____. Sometimes sound waves bounce off a hard surface producing an _____.
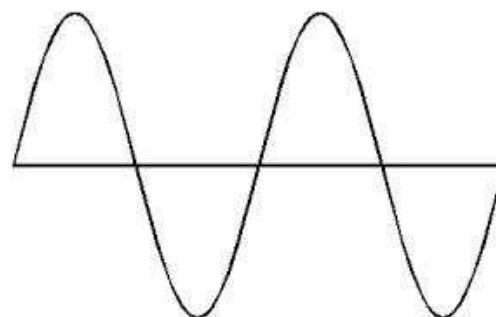
[4]

(b)   Both light and sound waves are types of waves. Give one example from real life to show that light travels faster through air than sound.

_____

_____ [2]

(c)   The diagram shows sound waves produced by a tuning fork.

On the same diagram, draw waves which have the **same frequency** but are **less loud**.
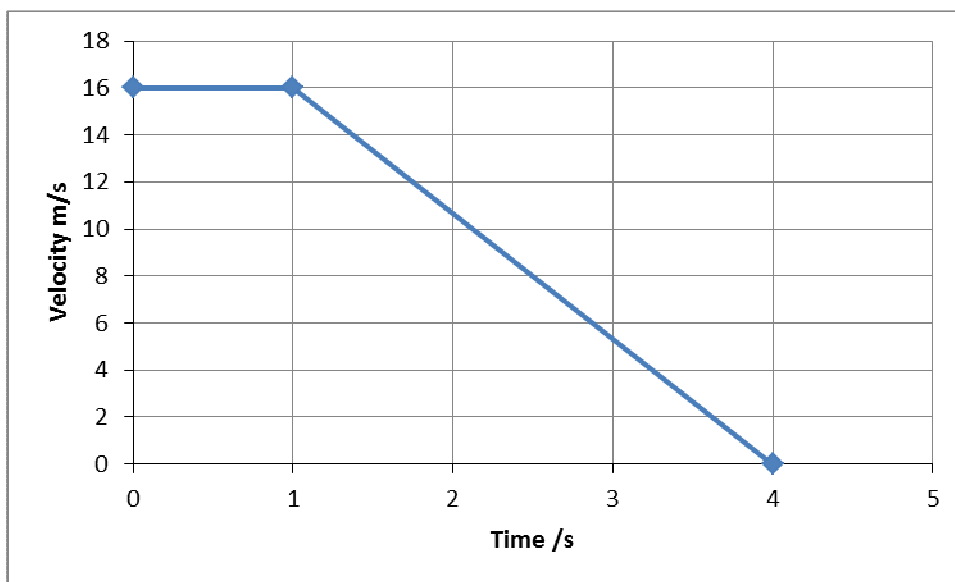
[2]

Section B:

6. This question is about linear motion.

Samuel is driving and sees a cat crossing the street. The graph below shows how the speed of the car changes with time from the moment he sees the cat crossing the street until he brings the car to a complete stop.

(a) The reaction time of the driver is _____ seconds. [2]

(b) If Samuel is drunk the reaction time would be _____. [1]

(c) Underline the correct answer: During the first second, the car is (*moving at constant speed, decelerating*). [1]

(d) During the next three seconds, the car is (*moving at constant speed, decelerating*). [1]

(e) Calculate the distance covered by the car during the thinking time.

_____

_____ [2]

(f) Calculate the distance covered by the car during braking.

_____

_____ [2]

(g) Total stopping distance = Thinking distance + _____ distance [1]

(h)   Calculate the total stopping distance.

_____

_____   [1]

(i)   If the cat was 42m away when Samuel saw it, would it have been hit by the car?
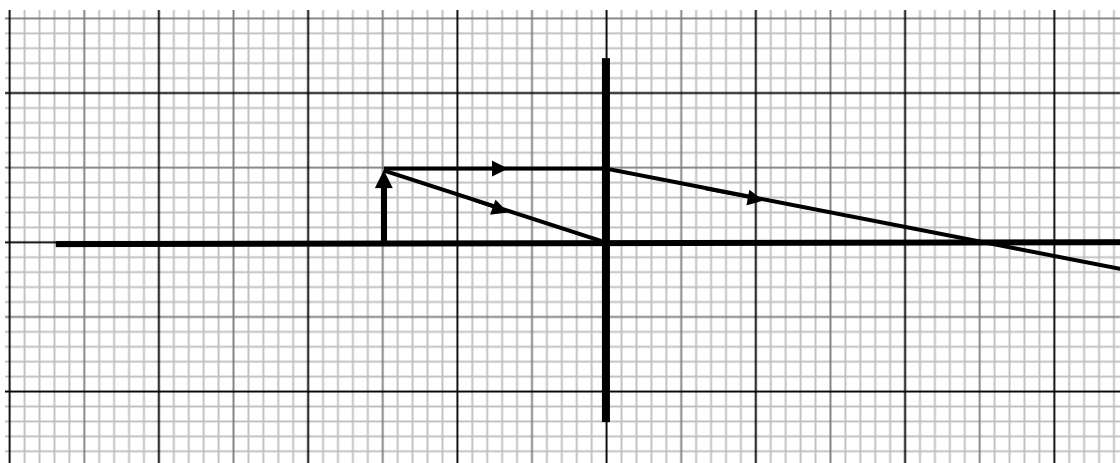
_____   [1]

(j)   State whether the following statements are **TRUE** or **FALSE**.

- Poor brakes affect the thinking distance. _____   [1]
- If it is raining, the braking distance increases. _____   [1]
- If Samuel drives at a lower speed, both thinking and braking

  distance decrease. _____   [1]

7.   This question is about lenses.

An object of height 1cm is placed 3cm in front of a convex lens of focal length 5cm. Two rays of light are drawn from the object to the lens.

(a) Mark the position of the **focus** with the letter **F**.   [1]

(b) **Choose the right word:**

A convex lens (*diverges, converges*) rays of light.

The distance from the lens to the focus is called the
(*focal length, wavelength*)

The image produced by a convex lens depends upon the distance of the
(*object, image*) from the lens.   [3]

(c) Continue the ray that is passing through the centre of the lens. [2]

(d) These two rays do not meet. Continue the rays to find the position of the image. [2]

(e) Underline the characteristics of the image.

Upright, real, magnified, inverted, diminished, virtual [3]

(f) Measure the height of the image. _____ cm [1]

(g) Using **m = $\frac{h_i}{h_o}$** , calculate the magnification of the image.

_____

_____ [2]

(h) Mention a practical use of this type of lens as used in the above arrangement.

_____ [1]

8. **This question is about magnification of a lens and sound waves.**

(a) A converging lens is used to produce an image of an illuminated object. The image distance for different object distance positions are recorded in the table below.

Object distance u/cm	10	12	14	20	30	40
Image distance v/cm	60	40	30	20	15	13

(i) On the graph paper provided, plot a graph of **image distance v** (*y*-axis) against the **object distance u** (*x*-axis). Draw a smooth curve. [5]

(ii) Use your graph to find the object distance when the image distance is 25 cm.

_____ [1]

(iii) Calculate the **magnification** of the lens when the image distance is 25 cm.

_____

_____ [2]

(iv)   **Underline** the correct answer:

From the graph, it can be concluded that the image distance is (***directly, inversely)*** proportional to the object distance.   [1]

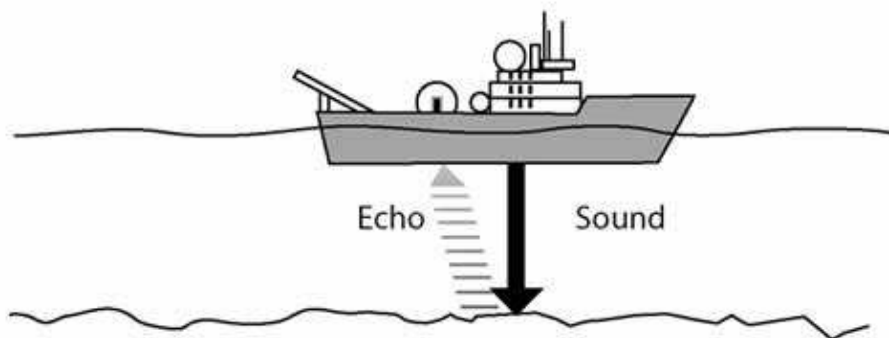(b)   Some animals produce a sound which is too highly pitched for humans to hear.

(i)   What is this type of sound called?

_____   [1]

(ii)   Underline **ONE** of the following frequencies which is within the hearing range of human beings.

10Hz   12 000Hz   30 000Hz   [1]

(c)   A ship has an echo sounder that sends out signals that are received back from the seabed directly below the ship 3 seconds later.

(i)   If the sea is 2250 m deep at this point, how far has the sound wave travelled from the moment it was emitted by the ship until its echo was received back?

_____

_____   [1]

(ii)   Calculate the speed of sound in seawater.

_____

_____

_____   [3]

END OF EXAM