ST.FRANCIS SECONDARY SCHOOL

HALF YEARLY SPECIMEN PAPER

FORM 3	**PHYSICS**	TIME: 2 hrs

Name:_____   **Class:** _____

Answer all questions on the exam paper. In calculations <u>show all steps </u>in your working. The use of scientific calculators is allowed.

Wherever necessary take 'g' = 10 N/kg

Optics	$\eta = \dfrac{\text{speed of light in air}}{\text{speed of light in medium}}$	$\eta = \dfrac{\text{real depth}}{\text{apparent depth}}$
Forces & Motion	W = mg	Average speed $= \dfrac{\text{Total Distance}}{\text{Total Time}}$
Density	m = ρ V	

Question	1	2	3	4	5	6	7	8	9	Total
Mark	12	10	8	10	13	8	14	8	17	100
Score										

1.**This question is about measurements**

(a) Fill in the missing information: (9)

Quantity	Symbol	S.I. Unit	Instrument
Mass		kg	
Time	t		
Length			Ruler
Volume of a liquid			

(b) John has been given a strange "monster" toy as a present for his birthday. He can keep the toy only on one condition that he needs to find its **volume.** The toy has a strange shape so he has to think of something quick !! He looked through the garage and he found a bucket, a container with which volumes of water could be measured and a string. Help John find a way to work out the **volume** of the toy. (3)

_____
_____
_____
_____
_____
_____

2. This question is about earth and space.
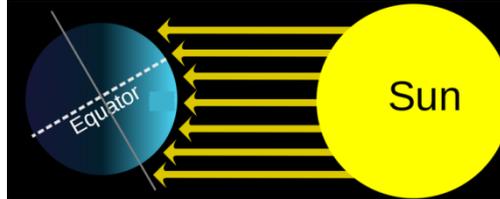
(a) Complete the following:

The earth takes one _____ to go once around its own axis while it takes

one _____ to go once around the sun.   The force of _____ keeps

the earth rotating around the sun.   (3)

(b) Why do we have day and night?   (2)

_____

_____

(c) Give **two** reasons why the earth experiences different seasons?   (2)

_____

_____

(d) In the above diagram is the Southern hemisphere experiencing summer or

winter? _____   (1)

(e) Explain how you arrived to your answer in (d) above.   (1)

_____

(f) In the above diagram draw the position of the earth when the Southern

hemisphere will experience winter.   (1)

3. **This question is about density**.

Matthias and Susan were at the sea-side and they were playing with a large empty bottle. The bottle is filled with air.

(a) The mass of the air and the bottle is 22.55g. The mass of the bottle is 20g.

    i.   Calculate the mass of air in the bottle in g.   (1)

_____

_____

   .

    ii.   Given that the density of the air is 0.001275g/cm^3, calculate the volume of

         the bottle in cm^3.   (2)

_____

_____

_____

    iii.   Give the volume of the bottle in m^3.   (1)

_____

_____

They then put four holes in the empty bottle and pretended it was a submarine. They used two metal knives to keep the bottle balanced. They placed a balloon inside the bottle that can be blown up using the pipe that is sealed well at the bottle opening.
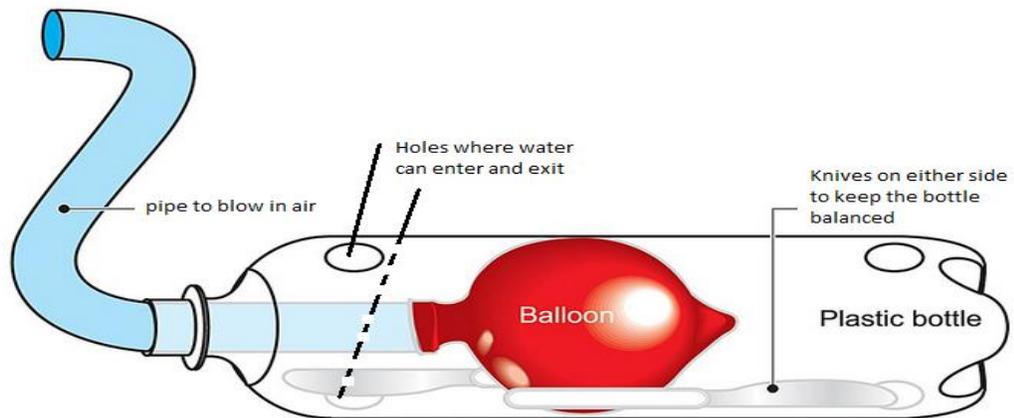
(b) Initially they did not blow up the balloon and the bottle sank in water. Give two reasons why the bottle sinks in water referring to density where possible. (2)

(i)_____

(ii) _____

(c) (i) What do you think happened when Susan blew up the balloon? (2)

_____

_____

(ii) Why did this happen? (2)

_____

_____

_____

4. This question is about optics.

Paolo and Veronica were playing at the park and they observed how the water coming out from the hole in the ground was all lit up even though it followed a curved path.

They tried to replicate the same situation at home as shown below using a laser beam through a bottle of water with a hole such that a curved stream of water came out of the bottle.

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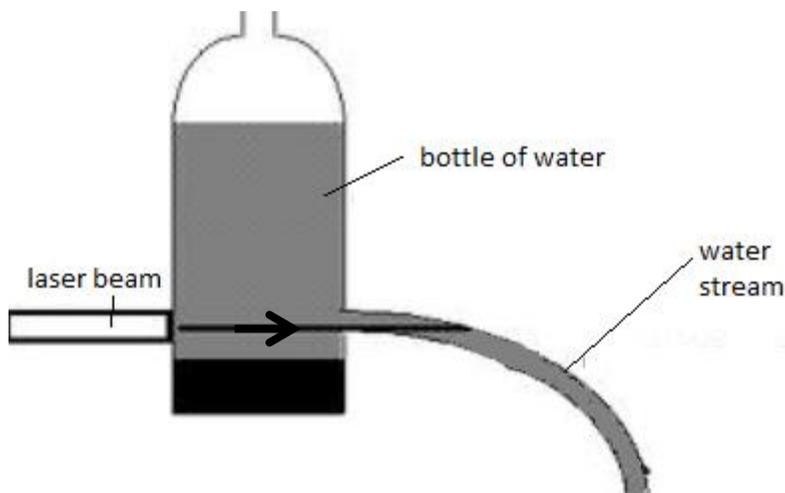
(a) What light phenomenon occurred not to allow the light beam to leave the water stream but to continue to pass through it? (1)

_____

(b) What condition did Paolo and Veronica ensure so that this light phenomenon takes place? (1)

_____

_____

(c) Complete the path followed by the laser beam through the water stream. Draw and label your normals. (3)

(d) What other condition is necessary for this phenomenon to occur. (1)

_____

_____ _____

(e) Mention **two other** applications where the phenomenon you mentioned in (a) is used in everyday life. (2)

_____

_____

_____

5. This question is about forces

a) Label the forces that act in the following systems: (4)

(choose one paper to draw forces acting on it)

b) Mark wanted to find the weight of an apple using the apparatus shown. After attaching the apple he read the scale and found that the value was 1.5

i.   Give the name of the apparatus Mark is using. _____(1)

ii. State the units for the weight of the apple. _____(1)

iii. Using the information given, work out the mass of the apple. (Make sure you right down the units for your answer and show your working)(3)
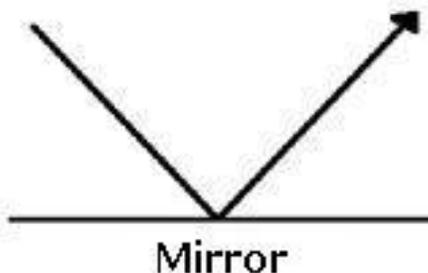
_____

_____

c) The apple was attached by a string.

i.   Which two balanced forces are keeping the apple hanging in place. (2)

_____

ii. If a much larger object was attached and the downward force became too big for the upward force to support, explain what would happen. (2)

_____

6. This question is about reflection of light.

a) The diagram shows a ray of light being reflected off a mirror.

Mirror

On the diagram:
i.   Draw in the normal.   (1)
ii.   Label the incident ray and the reflected ray.   (2)
iii.   Mark the angle of incidence with an 'i' and the angle of reflection with an 'r'.
                                                                                                      (2)

b)
i.   State the law of reflection which compares the sizes of angles i and r.   (1)

_____

ii.   Give two characteristics of the image formed in the mirror.   (2)

_____

_____

7. __This question is about Earth and Space.__

a) The Earth, planets and our Sun all form part of a galaxy in the Universe.

    i.   Give the name of this galaxy. (1)

_____

    ii.   The Sun is a star.

Give **one** main difference between a star and a planet.   (2)

_____

_____

b) There are five planets which are further away from the Sun than Earth.

    i.   Give the name of **two** such planets.   (2)

_____   _____

    ii.   Give **two** differences when comparing one of the planets mentioned above to the planet Earth.   (2)

_____

_____

_____

    iii.   There are certain characteristics which all planets have. Explain why Pluto is no longer considered one of the planets.   (2)

_____

_____

c) Some of the planets have moons. Moons can be referred to as natural satellites.

   i.   What is a satellite and what do all types of satellites have in common? (2)

_____

_____

    ii.   Satellites can also be artificial. Give **two** ways in which artificial satellites are helpful. (2)

_____

_____

    iii.   Satellites are kept in orbit around the Earth by the Earth's gravitational pull. State **one** way how the gravitational force between two objects can be made larger. (1)

_____

_____

8. This question is about periscopes and total internal reflection

Periscopes are well known to be used in submarines in order to be able to view the surface of the water without the submarine actually surfacing. However, while researching a project for school, Peter also found out that periscopes are used in war tanks. Peter's teacher asked the class to build up a periscope.

a) Can you help Peter to position the mirrors at the correct angle inside the periscope? (2)

b) Draw a ray of light to show how it is turned to reach the user's eye in order to be able to see through the periscope. (2)
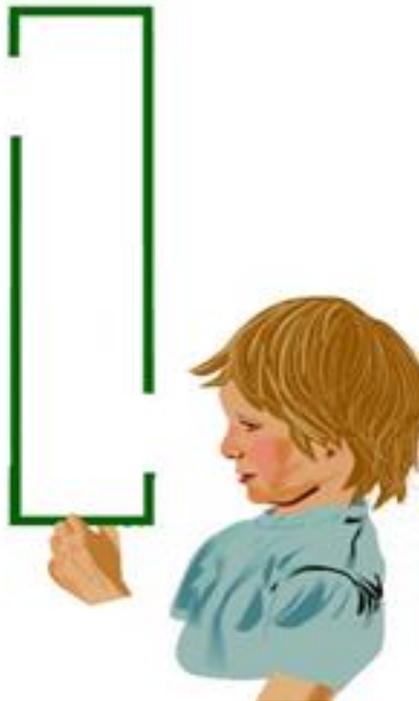
b) What is happening to the light ray in order to make it turn inside the periscope? (2)

_____

_____

c) While researching for the periscope project, Peter met the words total internal reflection. When does this phenomenon happen? (2)

_____

_____

_____

9. This question is about light travelling in different media.

(a) Draw a **well-labelled diagram** of the setup necessary for the experiment you can carry out to show the behavior of light through a rectangular glass block. Also draw the path the ray of light follows through and out of the glass block.   (2)

(b) State **2** precautions that you have to consider when doing this experiment.   (2)

_____
_____
_____
_____

(c) Fill in the following conclusion:

A ray of light bends _____ the normal as it enters the glass and _____ from the normal as it leaves the glass block. When light travels from air to glass a phenomenon called _____ occurs. This is because the _____ of light in _____ is faster than the _____ of light in _____ (7).

(d) Refractive index of a material is a measure of the change in speed of light as it passes from air into the material. If the speed of light in air is equal to 3×10^8 m/s and the speed of light in water is equal to 2.24×10^8 m/s, calculate the refractive index of water.

(2)

_____

_____

_____

(e) Explain what exactly is happening in the diagram.   (3)

_____

_____

_____

_____
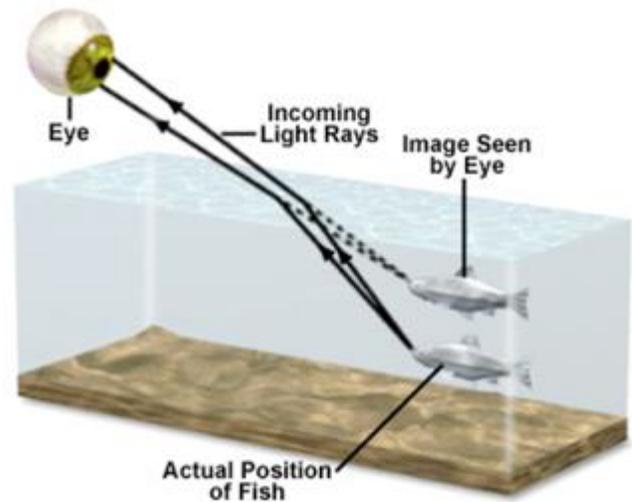
End of Paper!

Go back and check your work!