JUNIOR LYCEUM ANNUAL EXAMINATIONS 2006

Educational Assessment Unit – Education Division

FORM 5 **PHYSICS** **TIME: 1h 45min**

Name: _____ **Class: _____**

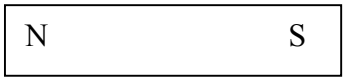
Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You might find the following list of formulae useful.

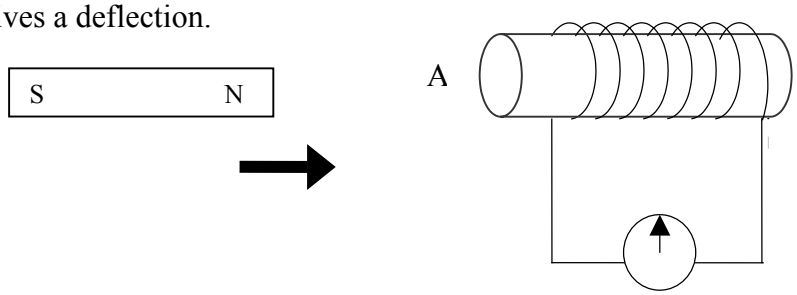
Density	$m = Pv$	
Pressure	$P = \rho gh$	$F = pA$
Energy and Work	$PE = mgh$	$KE = ½ mv^2$
	$E = Pt$	$W = Fs$
Force	$F = ma$	$W = mg$
Motion	$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$	$v = u + at$
	$s = \frac{(u + v)t}{2}$	$s = ½ a t^2$
	Momentum = mv	
Electricity	$Q = It$	$W = QV$
	$V = IR$	$R = R_1 + R_2 + R_3$
	$P = IV = I^2R = \frac{V^2}{R}$	$R \ \alpha \ \frac{1}{A}$
Electromagnetism	$\frac{N_1}{N_2} = \frac{V_1}{V_2}$	
Heat	$H = mc\Delta\theta$	
Waves	$v = f\lambda$	

SECTION A: Answer all questions in the spaces provided. This section carries 55 marks.

1. a) Draw the magnetic field around the bar magnet [1]



b) In the diagram below, when the magnet is moved into the coil, the galvanometer gives a deflection.



i) What happens when the magnet is stopped? [1]

_____

ii) What happens when the magnet is moved in the opposite direction? [1]

_____

iii) State one way of getting a larger deflection. [1]

_____

iv) When the magnet is moved **into** the coil as shown in the diagram, what pole will be induced at A? [1]

_____

2. a) Planets reflect light from the _____. [1]

b) The _____ is the Earth's natural satellite. [1]

c) All objects in the universe that have a mass attract each other with a force called _____. The greater the mass, the _____ the force. The _____ the distance they are from each other, the greater the force between them. [3]

d) A television station decides to place a satellite in orbit so that it stays at the same point over the Earth's surface.

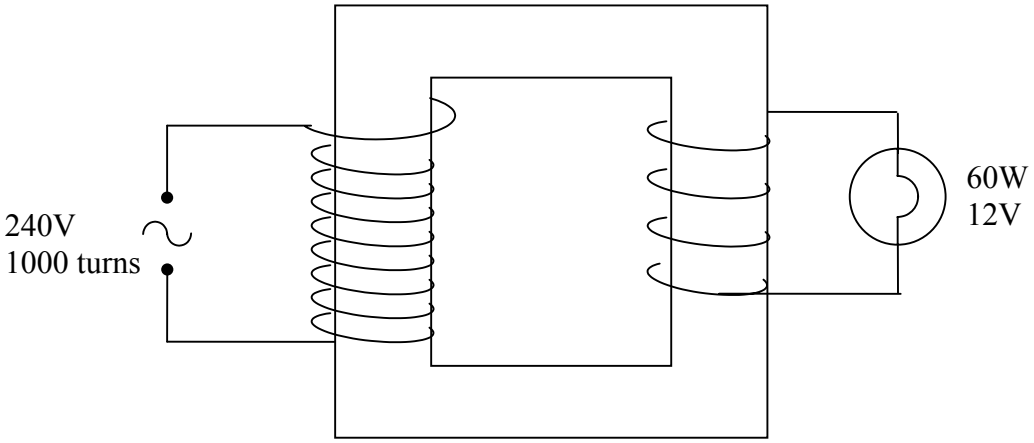
i) What is this type of orbit called? _____ [1]

ii) Where on the Earth's surface must the satellite be placed? _____ [1]

iii) How long should the satellite take to orbit the Earth once? _____ [1]

iv) Why is it important that the satellite stays at the same point above the earth? [2]

3.



a) What type of transformer is this? Explain your reasoning [2]

b) If the primary coil consists of 1000 turns, how many turns are there in the secondary? [2]

c) Calculate the current in the bulb shown in the diagram. [2]

d) Why are the coils wound on soft iron? [2]

e) What would happen if a d.c. supply is used instead of an a.c. supply? [2]

4. Ann has just bought a new pair of stiletto heeled shoes. The base area of **one** shoe is $0.005m^2$.

a) If Ann has a mass of 50kg, calculate her weight. [1]

b) Find the pressure Ann exerts on the floor when she stands on **two** feet. [3]

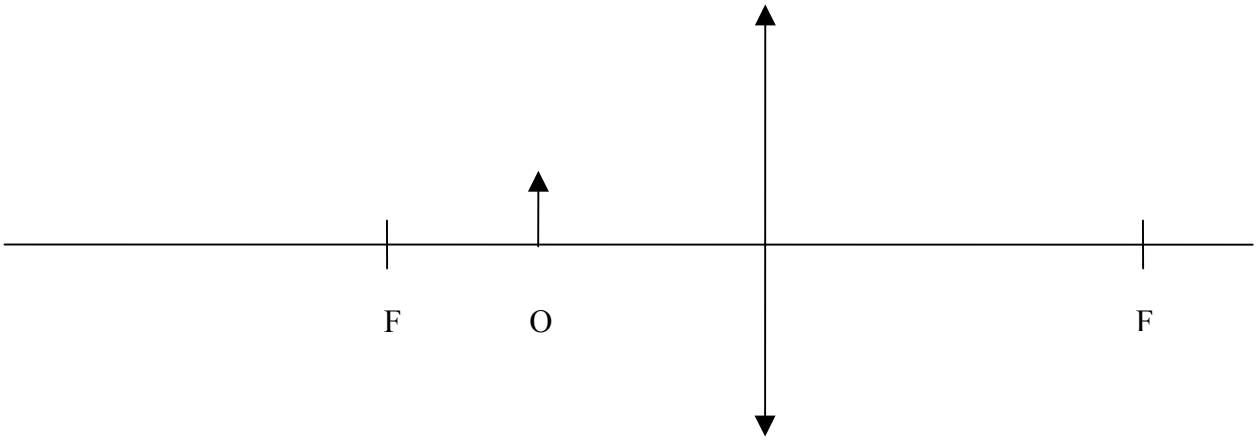
c) State the two factors that pressure acting at a point depends on [2]

i) _____ ii) _____

d) Why isn't it a good idea to wear stiletto heeled shoes on a wooden floor? [2]

e) Give an example from everyday life where it is important to have a large pressure exerted by a solid. [2]

5. To obtain the effect of a magnifying glass, an object O is placed 3cm in front of a convex lens of focal length 5cm.



a) Draw the ray diagram in order to find the image. Label the image **I** [3]

b) Besides being magnified, can you mention two other properties of the image produced? [2]

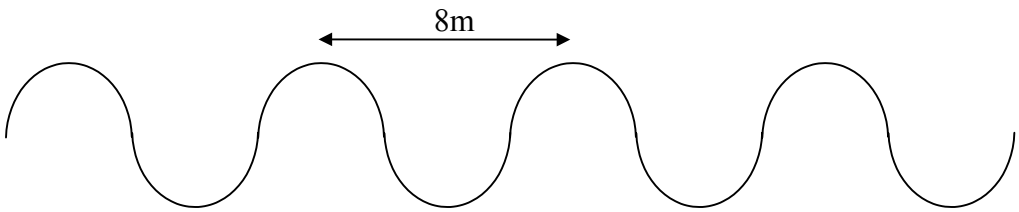
i) _____ ii) _____

c) Measure the image distance. _____ cm [1]

d) Find the magnification [2]

e) In order to obtain a more powerful magnifying glass, should a lens with a shorter or longer focal length be chosen? [2]

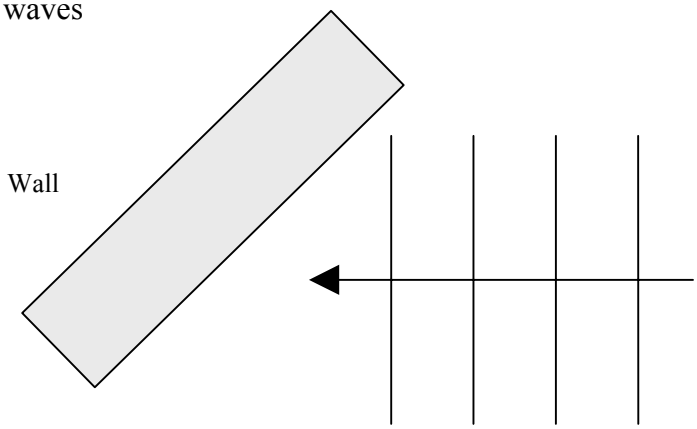
6. Mark and his dad go fishing with their boat. Mark counted 4 waves every 2 seconds and the distance between two crests was approximately 8m.



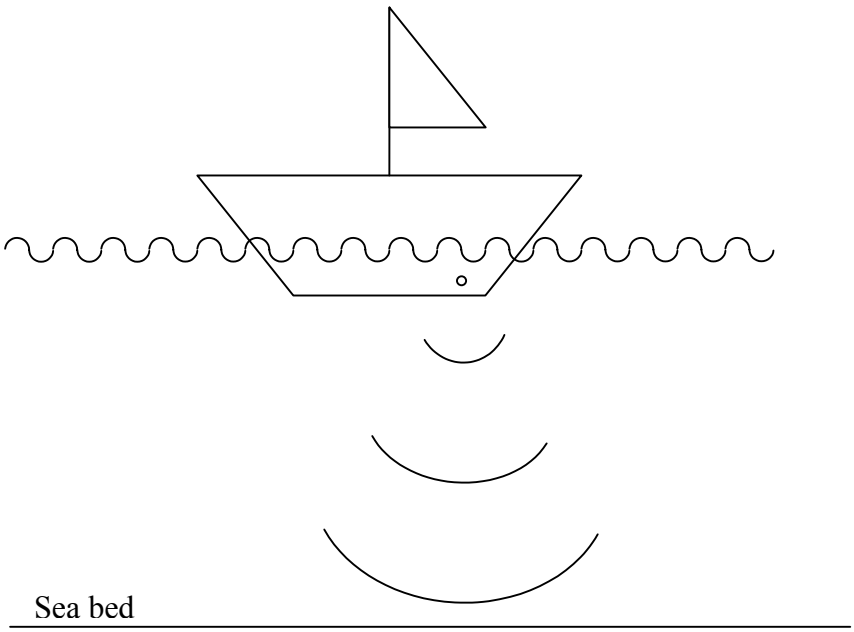
a) What is the frequency of the waves? [1]

b) Find the velocity of the water waves. [2]

c) The diagram below shows water waves as they hit a wall. Continue to draw the **reflected** waves [2]



d) Mark stopped the boat and used the sonar of his boat to find the depth of the sea. An ultrasound wave was sent towards the sea bed and the reflected waves were picked up 0.2s later

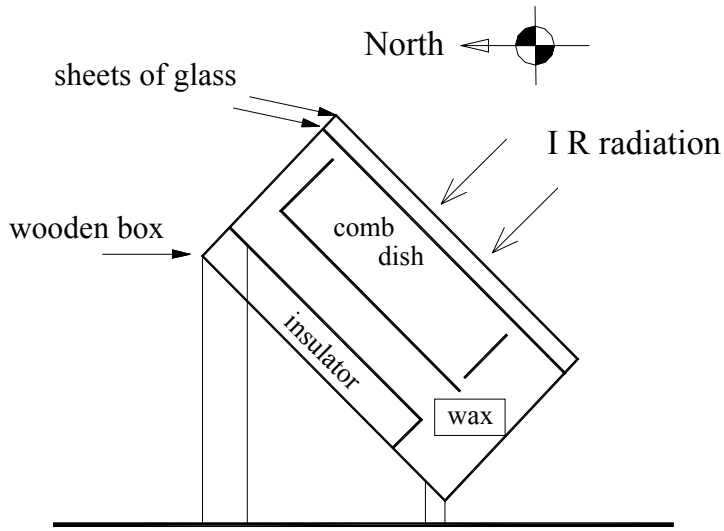


i) If the speed of the wave in water is 1463m/s and the wave was reflected after 0.2s, find the distance between the boat and the seabed. [3]

ii) The boat was not moving, however when Mark used the sonar again, the time was **decreased** drastically. What do you think happened? [2]

SECTION B Answer all questions on the sheets provided. Each question carries 15 marks.

7. This question is about using solar energy.



The above diagram shows how beekeepers in Malta use the Sun's IR rays to extract pure beeswax from old empty honeycombs. The box is called: A Solar Wax Extractor.

The box is placed in strong sunlight for several hours. The temperature inside the box rises to about 80°C. Since pure beeswax melts at about 65°C the melted wax collects in a container and then becomes solid at sunset. The pure beeswax is then removed from the box.

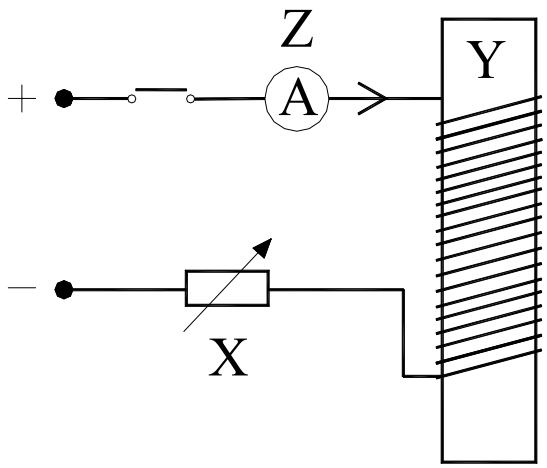
a) i What does IR mean? [1]
ii Why should the box be made of wood and not metal? [1]
iii Why is an insulator used below the comb dish? [1]
iv Why are two sheets of glass better than using one glass sheet? [2]

b) i By what process does this radiation from the Sun reaches Earth? [1]
ii Explain briefly how heat energy from the sun is trapped inside the box. [3]
iii Name the process of trapping solar heat energy in this manner. [1]

Give one reason why:
iv the inner surface of the box is painted black. [1]
v the outer surface of the box is painted white. [1]

c) i Why does the wax become solid at sunset? [1]
ii Suggest one reason why this wax extractor does not function well in cloudy weather. [1]

8. This question is about electromagnetism and the strength of an electromagnet.



The diagram shows an electromagnet. It is used to pick up iron staples. It is unable to pick up copper staples.

a) i Name component X. [1]
ii Why is it present in the circuit? [1]

b) i When the switch is closed current flows through the turns and the electromagnet is activated. Name the magnetic pole at Y. [1]
ii Why is the electromagnet unable to pick up copper staples? [1]
iii In your answer sheet draw the magnetic field of a solenoid. Show the magnetic poles, field lines and arrows to show the field direction both inside and outside the solenoid. [3]

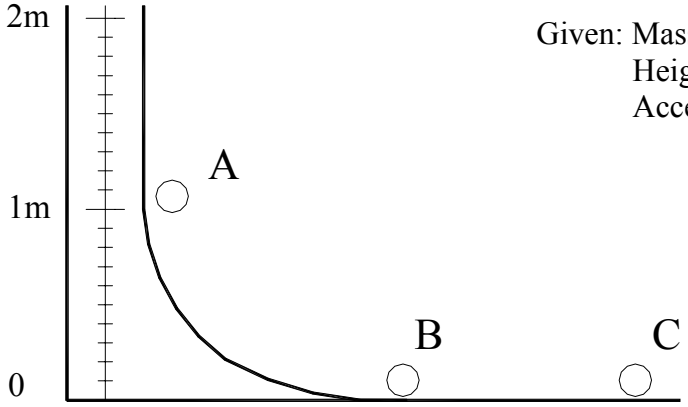
c) One method of increasing the strength of an electromagnet is by increasing the current. The strength of the electromagnet is shown by the number of iron staples picked up.

The following table shows the result of such an experiment.

I/A	0	0.5	1	1.5	2	2.5	3	3.5
Staples (strength)	0	8	15	25	32	41	40	41

i Plot a graph of staples/strength (y-axis) against current (x-axis). Draw the best straight line up to 2.5A. [5]
ii What can you conclude from the graph up to 2.5A? [1]
iii Why do some points not lie on the graph? [1]
iv Should the current be increased beyond 3.5A hoping the electromagnet may pick up 100 staples? [1]

9. This question is about energy change and the design of an experiment.



Given: Mass of ball = 0.1kg
Height at A = 1m
Acceleration due to gravity = $10 m/s^2$

horizontal rough ground

The above setup tries to find a relationship between the speed of a car and its braking distance i.e. the distance it continues moving during braking. The ball represents the speeding car and the friction on the horizontal rough ground represents the friction of the brakes.

a) i Name the energy the ball has at position A. [1]
ii Find its value, using the data given above [1]
iii Name the energy the ball has at B. [1]

b) i Assuming no energy is lost from A to B, find the velocity of the ball at B. [2]
ii Explain how the speed of the ball at position B may be increased. [2]

c) Set up an experiment to investigate how the speed at B affects the braking distance along the horizontal rough ground. Your answer should include:

i A brief explanation of the method used. [3]
ii The two quantities that need to be measured. [2]
iii The graph you need to plot (give title or name the axes). [1]
iv The expected result. [1]
v One precaution. [1]