SECONDARY SCHOOL ANNUAL EXAMINATIONS 2006

Educational Assessment Unit – Education Division

FORM 5 PHYSICS TIME: 1h 45min

Name: _____ **Class:** _____

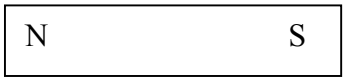
Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You might find the following list of formulae useful.

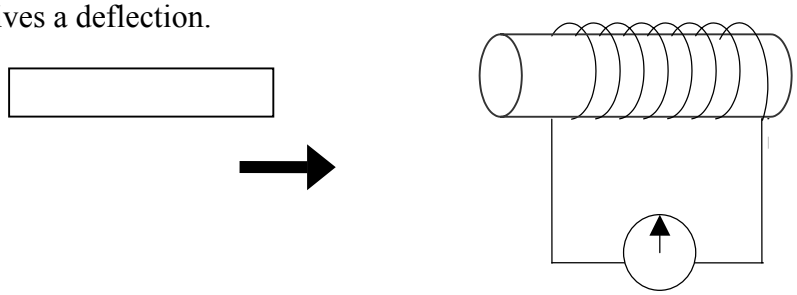
Density	$m = \rho V$	
Pressure	$P = \rho gh$	$F = pA$
Energy and Work	$PE = mgh$	$KE = \frac{1}{2} mv^2$
	$E = Pt$	$W = Fs$
Force	$F = ma$	$W = mg$
Motion	$\text{Average Speed} = \frac{\text{Total Distance}}{\text{Total Time}}$	$v = u + at$
	$s = \frac{(u + v)t}{2}$	$s = \frac{1}{2} a t^2$
	$\text{Momentum} = mv$	
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.

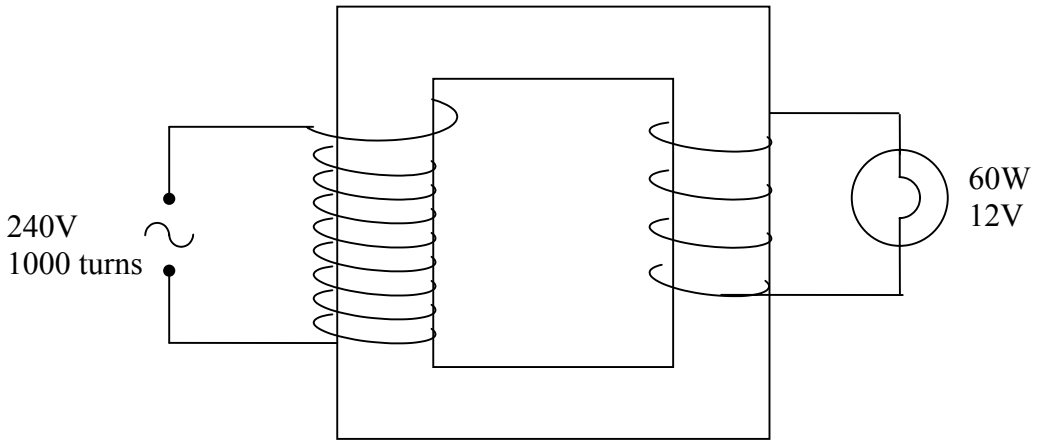
i) What is this type of orbit called? _____ [1]

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]

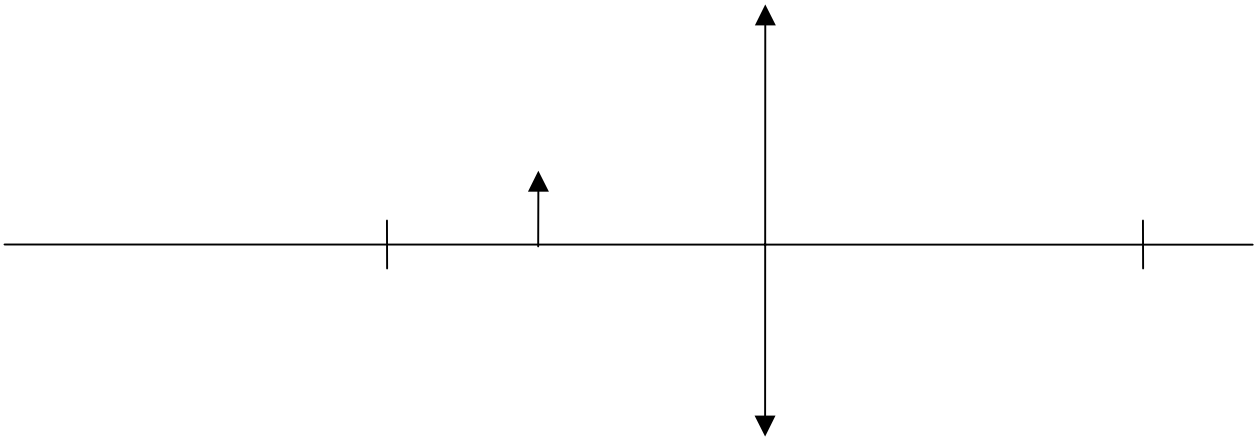
c) State the two factors that pressure acting at a point depends on [2]

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]

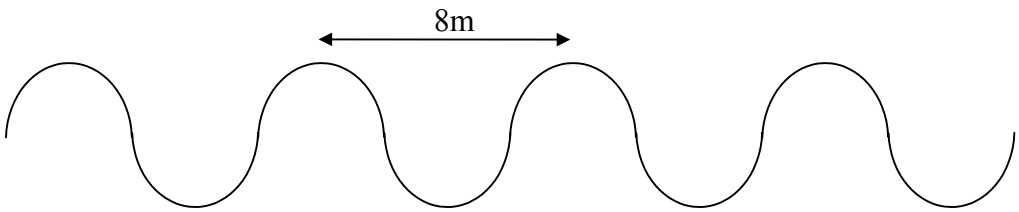
i) _____ ii) _____

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]

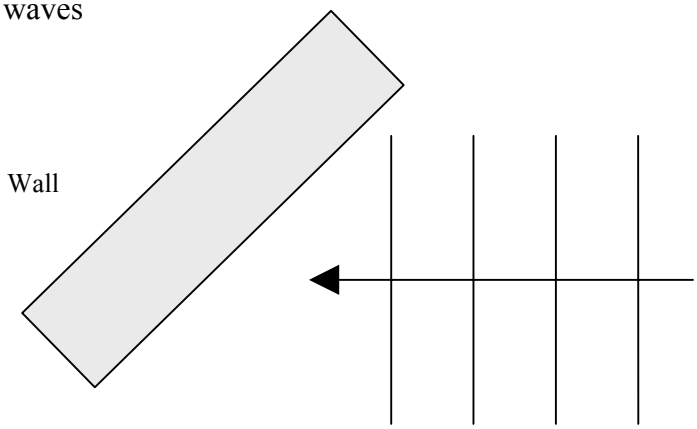
6 Mark and his dad go fishing with their boat. Mark counted 4 waves every 2 seconds and the distance between two crests was approximately 8m.



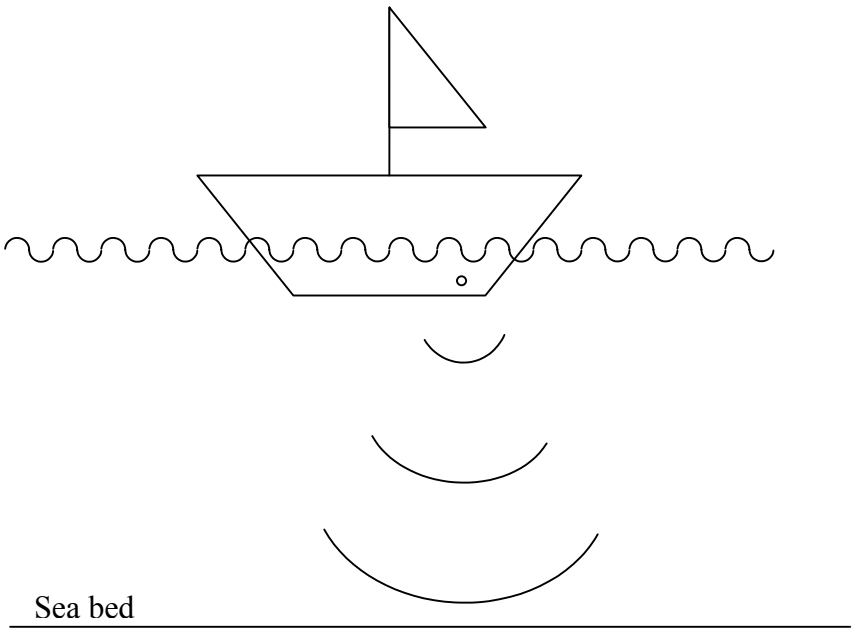
a) What is the frequency of the waves? [1]

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

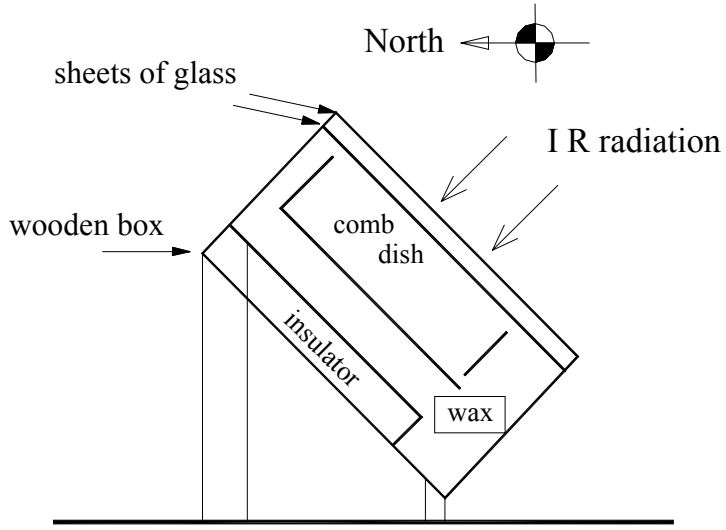


i) If the speed of the wave in water is 1463m/s and the wave was reflected after 0.2s, find the distance between the boat and the seabed. [3]

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^{o}C. Since pure beeswax melts at about 65^{o}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 The heat energy from the sun is also known as IR. What does IR mean? (Write it in full). _____ [1]

The heat must not escape from the box. So the box is made of wood not metal. Complete by giving a reason why:

ii Wood is used because _____ [1]

iii Metal is not used because _____ [1]

iv Give one reason why the inside of the box is painted black and not silver

_____

_____ [2]

b i Explain how the glass allows heat energy from the sun to enter the box but does not allow it to leave._____

_____

_____ [4]

ii This method of trapping heat energy from the sun is called:

_____ [1]

iii Why is this method environment friendly? _____

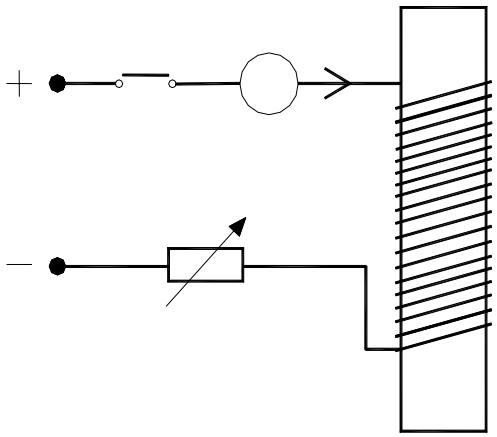
_____

_____ [3]

iv Name one other example of trapping solar heat energy in this manner.

_____ [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.

a i Name: component X. _____ [1]

ii component Z _____ [1]

b When the switch is closed current flows through the electromagnet and is then able to pick up iron staples but not copper staples.

i Draw arrows on the turns on the above diagram to show the current direction. [1]

ii Is the magnetic pole at Y North or South? _____ [1]

iii Give one reason why the electromagnet, when switched on, cannot attract copper objects. _____

_____ [1]

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	2	2.5	3
Staples (strength)	0	7	16	32	41	48

i Plot a graph of staples/strength (y-axis) against current (x-axis). Draw the best straight line. [6]

ii How many staples can the electromagnet pick up at 1.5A? _____ [1]

iii Why do some points not lie on the graph?

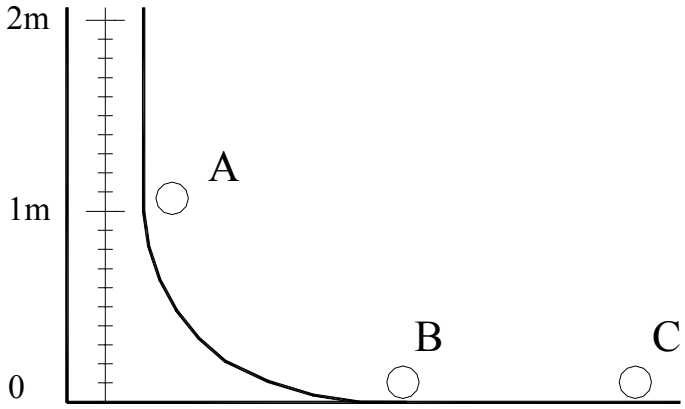
_____ [1]

iv Since the graph is a straight line through the origin (0,0), what can you conclude about the current and the strength of the electromagnet ?

_____

_____ [2]

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



′ = 10m/s^2

horizontal rough ground

The above setup tries to find how the braking distance changes with the speed of a car. The ball represents the speeding car while the friction on the horizontal rough ground represents the friction of the brakes.

a i Complete: The ball at position A has _____ energy. [1]

ii Using the data given above and: energy = mgh, find its value in joules.

_____

_____ [3]

iii Name the energy the ball has at B. _____ [1]

iv If the ball does not lose any energy as it falls from A to B, how much energy does it have at B? _____ [1]

v When the ball stops at position C all this energy changes to _____ [1]

b The ball at position B has a velocity of about 4.5m/s

i What can be done so that the ball may have a faster speed at B?

_____

_____ [2]

ii Explain how the speed of the ball at B may be measured?

_____

_____ [2]

c Someone thinks that if the ball has faster speeds at B, it will travel longer distances on the rough ground. Describe a simple experiment to investigate this statement. (Give the method and the quantities measured).

_____

_____

_____

_____

_____

_____ [4]