JUNIOR LYCEUM ANNUAL EXAMINATIONS 2005

Educational Assessment Unit – Education Division

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

Name: _____ **Class:** _____

Answer the questions in Section A in the spaces provided on the Examination Paper. Answer those in Section B on the foolscaps provided. All working must be shown. The use of the calculator is allowed.

Where necessary, take the acceleration due to gravity, $g = 10\ m/s^2$

SECTION A. Answer all questions in this Section. This section carries 55 marks.

1. Each of the following can be labelled either a MASS or a WEIGHT.

is measured in newtons	is caused by the pull of gravity
is the amount of matter	is not a force
produces an acceleration	is smaller on the moon than on the Earth
is measured in kgs	

Fill up the table below (2 have been filled up for you). (5 marks)

MASS	WEIGHT
is not a force	is measured in newtons

2. This diagram shows the electromagnetic spectrum.

Gamma rays	X-Rays	Ultraviolet	Visible light	Infra red	Microwaves	Radio waves

(a) Give ONE property common to all. _____ (1 mark)

(b) Name ONE type of radiation which:

(i) has a shorter wavelength than ultraviolet _____(1 mark)

(ii) has a lower frequency than infrared _____ (1 mark)

(c) Which type of radiation is used:

(i) to carry information along optic fibres _____

(ii) in TV remote controls _____

(iii) to locate bone fractures _____

(3 marks)

(d) State one similarity and one difference between light and sound

Similarity _____

Difference _____

(2 marks)

(e) Which type of radiation is mostly associated with skin cancer?

_____ (1 mark)

(f) A typical radio wave has a wavelength of 300m and travels at a speed of 3.0×10^8 m/s (300 000 000 m/s). Calculate its frequency.

_____ (1 mark)

3. (a) A hot water metal tank which is NOT insulated loses heat mostly by

_____ (1 mark)

(b) Name ONE material which you think is suitable to insulate the outside walls of the tank. _____ (1 mark)

(c) At a particular time, the water tank holds 10kg of water which was heated electrically to a temperature of 70^0 C. After the heater has been switched off, the temperature of the hot water drops to 65^0 C. The specific heat capacity of water is 4200 J/kg ^{0}C.

(i) Calculate how much heat energy was lost

_____

_____ (3 marks)

(ii) Give a reason why the heater should be placed at the bottom of the tank.

_____ (2 marks)

(d) A thermostat switches off the supply when the temperature reaches 70^0 C.

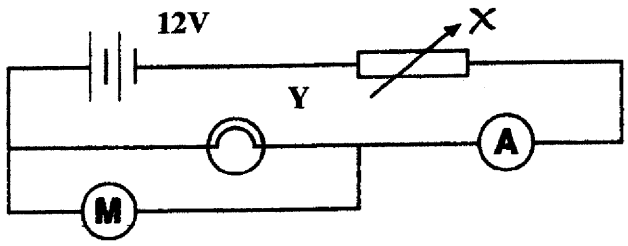
What happens if the thermostat is left out of circuit?

_____ (1 mark)

(e) Name two advantages of using a heat-resistant plastic tank instead of a metal one.

(i) _____ (ii) _____ (2 marks)

4 The following circuit was set up.



(a) What type of component is:

(i) X _____

(ii) Y _____ (2 marks)

(b) What type of meter is M? _____ (1 mark)

(c) The resistance of X is 1 ohm and of Y is 5 ohms, while the battery supplies a p.d. of 12 volts. Calculate,

(i) the total circuit resistance

_____ (2 marks)

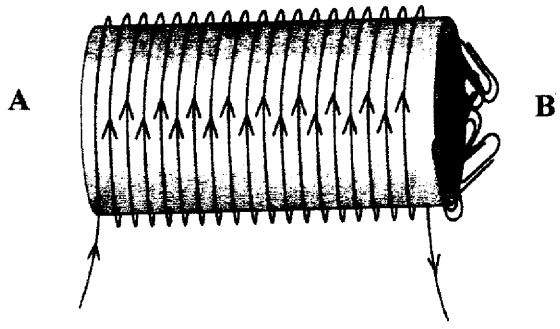
(ii) the reading of meter A

_____ (2 marks)

(iii) the reading of meter M

_____ (3 marks)

5. The diagram illustrates an electromagnet.



(a) (i) Which of the following is a suitable material for the core?

Plastic, iron, steel. _____ (1 mark)

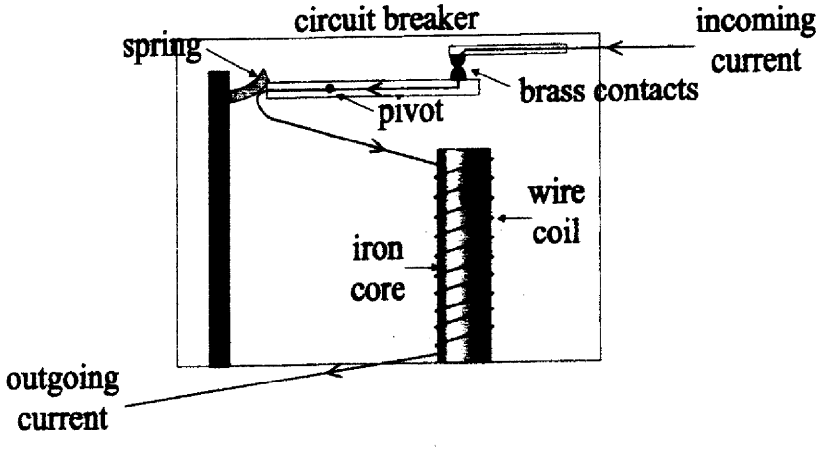
(ii) End A is a _____ pole. (1 mark)

(ii) Explain what will happen when the current is switched off.

_____

_____ (2 marks)

(b) The following diagram shows a circuit for a resettable fuse. Study the circuit and answer these questions.



The fuse is designed to stop the flow of current when it becomes too large.

(i) Give two factors that can increase the strength of the electromagnet

_____ (2 marks)

(ii) Describe briefly how the fuse (circuit breaker) works

_____

_____

_____ (3 marks)

(iii) Why is it called a 'resettable fuse'.

_____

_____ (1mark)

6 (a) Artificial satellites orbit the Earth for several purposes, TWO of which are

(i) _____

(ii) _____ (2 marks)

(b) The force that keeps them in orbit is called _____ . (1 mark)

(c) A geostationary satellite orbits the Earth every _____ and is suitable for _____. (2 marks)

(d) Weather and spying satellites are placed at a low orbit so that

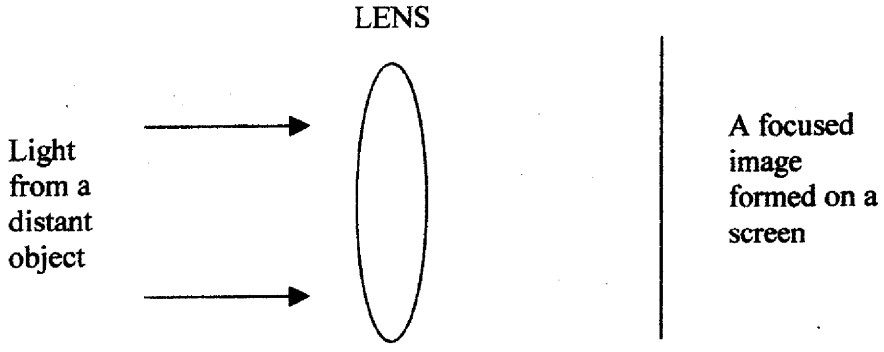
_____ (2 marks)

(e) Planets move round the _____ in nearly _____ orbits. The further a planet is from the sun the _____ it takes to complete one orbit. (3 marks)

SECTION B. Answer all questions in this section on the foolscap provided. This section carries 45 marks.

7 **This question is about lenses and dispersion of white light by a prism.**

A student needs to find the focal length of a converging lens using the following set up.



(a) (i) Copy the diagram on the foolscap provided and draw rays of light to show how the image is formed. (2 marks)

(ii) Which distance must be measured in order to find the focal length? Show this distance on your diagram. (1 mark)

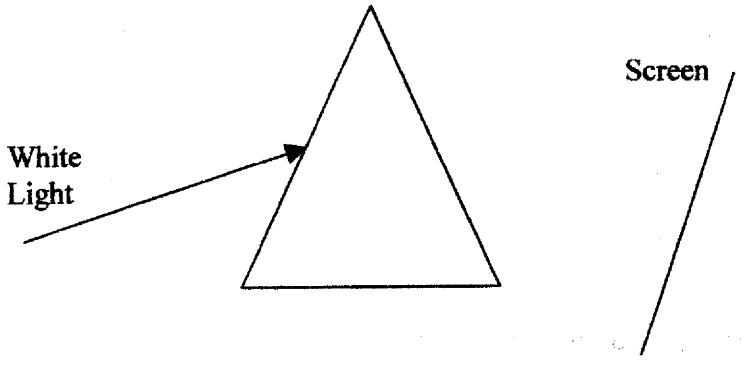
(b) The lens was found to have a focal length of 10cm. An object is placed 5cm in front of the lens. Sketch a ray diagram (not to scale) to show how the image is formed. Represent the object by an arrow. You are advised to draw the principal axis and to mark the principal focus F on both sides of the lens. (4 marks)

(c) A magnified image is formed.

(i) Write down TWO other properties of the image. (2 marks)

(ii) State whether the object should be moved towards or away from the lens to obtain a larger image. (1 mark)

(d) The student now took a glass prism and directed a strong narrow beam of white light to demonstrate dispersion.



(i) Complete the ray diagram and label clearly the red and the violet rays. (2 marks)

(ii) Which of the two colours, red or violet, has the faster speed in glass? (1 mark)

(iii) Mark the position of infrared on the screen. (2 mark)

8 This question is about heat transfer and insulation.

In an experiment to test the insulating properties of cotton, equal masses of hot water were poured into 2 similar **glass** containers A and B, and the water temperature was measured at intervals while it cooled. Container A is **unwrapped** while container B is **wrapped in cotton.**

The table of results is displayed below.

Time/min	Temp(^{0}C) of container A	Temp (^{0}C) of container B
0	70	70
1	64	67
2	60	64.5
3	57	62
4	55	60
5	53.5	58.5

(a) (i) Plot a graph of the temperature (Y-axis) against time for container A.

(ii) On the same axes, plot another graph of temperature against time for container B. (7 marks)

(b) How long did each container take to cool from 70^{0}C to 65^{0}C? (2 marks)

(c) In another experiment, 2 similar **metal** containers C and D were used instead of the glass containers. **Container C is unwrapped while container D is wrapped in cotton.**

(i) Select the correct answer for the likely temperatures of C and D after a time of 5 minutes. (2 marks)

C	50^0C	D	55^0C
C	54^0C	D	59^0C
C	55^0C	D	60^0C

(ii) On the same axes, sketch graphs, on the **foolscap** provided, to show the temperature of the water in containers C and D as they cool. Label your graphs.

(4 marks)

9 **This question is about electromagnetic induction**

(a) A model train is pulled with a string at high speed into a cardboard tube. A bar magnet is fixed to the top of the train. A coil of insulated wire is wound around the tube and is connected in series to a buzzer which gives out a sound when a current flows through it.

(i) Explain why the buzzer sounds while the train passes through the tube. (3 marks)

(ii) Would the buzzer sound if the train stopped in the tube? Explain your answer. (2 marks)

(iii) Suggest TWO ways to make the buzzer sound louder without dismantling the solenoid. (2 marks)

(b) The train is now fitted with a 12V, 24W electric motor. A transformer is needed to operate the train from the 240V mains supply.

(i) Draw a labelled diagram of a practical transformer and label the primary and secondary coils. (4 marks)

(ii) If the primary coil contains 3600 turns, calculate the number of turns in the secondary coil. (2 marks)

(iii) Assuming that the transformer is 100% efficient, and the current in the primary coil is 0.1A, find the current in the secondary coil. (2 marks)