SECONDARY SCHOOL ANNUAL EXAMINATIONS 2005

Educational Assessment Unit – Education Division

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

Name: _____ **Class:** _____

Answer the questions in the spaces provided on the Examination Paper.
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)

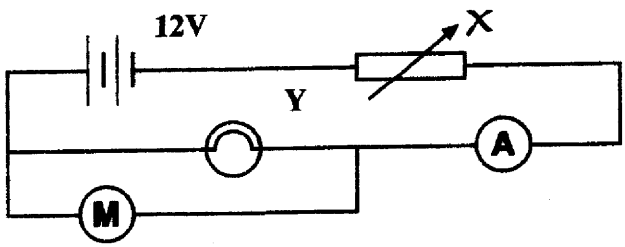
(d) A thermostat switches off the supply when the temperature reaches 70^0 C. What happens if the thermostat is left out of circuit?

_____ (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)

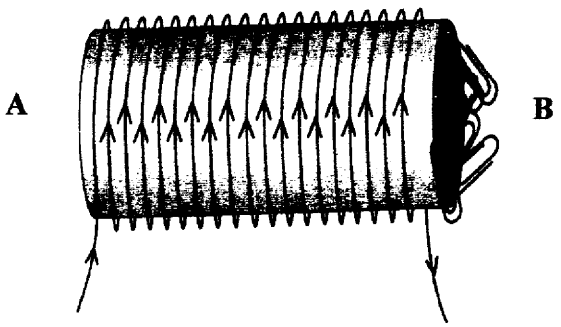
(ii) the reading of meter A

_____ (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)

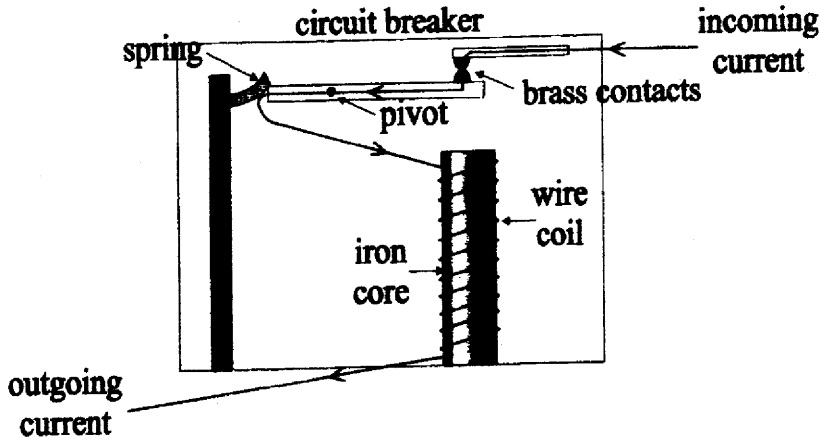
(ii) End A is a _____ pole. (1 mark)

(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

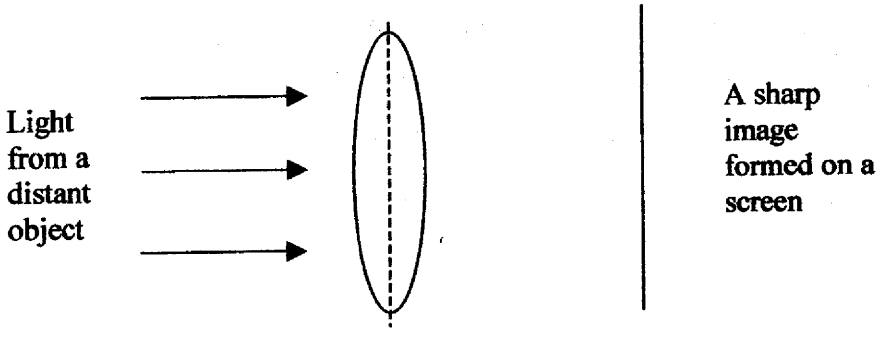
_____ (2 marks)

(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. Each question carries 15 marks.

7 **This question is about lenses and prisms**

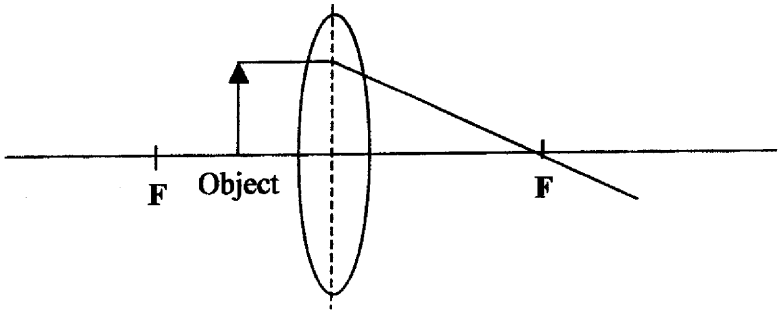
A student needs to find the focal length of a converging lens using the following set up.



(a) (i) On the diagram continue the rays of light to show how the image on the screen is formed. (3 marks)

(ii) Show on the diagram the distance corresponding to the focal length. (1 mark)

(b) The lens above is used as a magnifying glass as shown

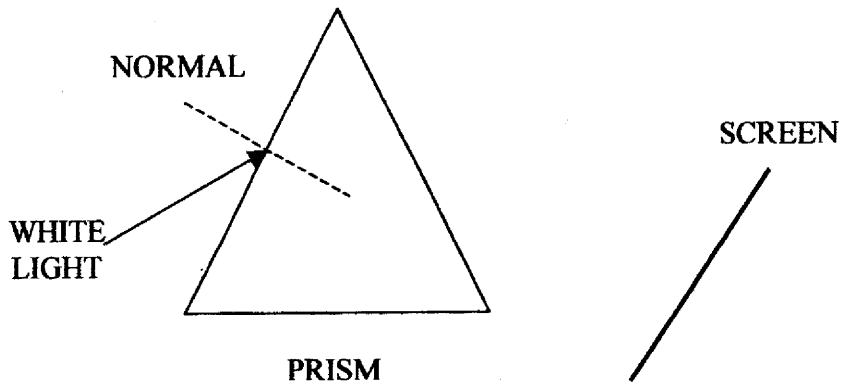


(i) Complete the diagram and draw the image formed. (4 marks)

(ii) Now look at the image formed. Write down TWO properties of the image.

_____ _____ (2 marks)

(c) The student took a glass prism and directed a strong beam of white light to show dispersion.



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

(ii) As light enters the prism, dispersion and _____ occur. (1 mark)

(iii) Mark with an IR the position of the infra red rays on the screen. (1 mark)

(iv) What instrument would be used to detect the position of the IR.

_____ (1 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. The temperature of the containers was measured while they cooled. Container A is **unwrapped** while B is **wrapped in cotton.** A table with the results is shown below.

Time/minutes	Temperature of A in ^{0}C	Temperature of B in ^{0}C
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 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 70^0C to 65^0C?

Container A _____ Container B _____ (2 marks)

(c) Name TWO other materials which could replace cotton as a heat insulator.

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

(d) Tick the box corresponding to the relevant answer. (4 marks)

Closing the containers with a lid reduces losses	Correct	Not correct
Using similar **metal** containers reduces losses	Correct	Not correct
If the room becomes cooler, the temperature of the hot water drops more quickly.	Correct	Not correct
The final temperature of the hot water will be 40^0C even when room temperature is 10^0C?	Correct	Not correct

9. **This question is about electromagnetic induction.**

(a) A toy train fitted with a bar magnet on top of it, is pulled at high speed through a solenoid wound on a cardboard tube. The solenoid is connected to an electric bell.

(i) The bell rings while the train moves through the solenoid because _____ in the solenoid. (3 marks)

(ii) Would the bell ring while the train is at rest in the middle of the solenoid? _____. Why? _____ (2 marks)

(iii) The bell can be made to sound louder by _____ number of turns of the solenoid, and moving the train _____. (2 marks)

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

(i) Does the transformer operate on d.c.? _____ (1 mark)

(ii) Why does a practical transformer heat up during use?

_____ (2 marks)

(iii) If the primary coil contains 3600 turns, what is the number of turns on the secondary coil?

_____

_____ (2 marks)

(iv) Assuming all power in the primary coil of the tansformer is transferred to the secondary coil, and a current of 0.1A flows in the primary, what is the current in the secondary coil?

_____

_____ (3 marks)