

Rwanda National Physics Exam S3 Collection (2002-2023)

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Physics I

011

27/07/2023 08:30 AM – 11:30 AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2022-2023

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) Write your names and index number as they appear on your registration form and **DO NOT** write your names and index number on additional answer sheets if provided.
- 2) Do not open this question paper until you are told to do so.
- 3) This paper consists of **THREE** sections: **A**, **B** and **C**.

SECTION A: This section is **compulsory**. **(55 marks)**

SECTION B: Attempt any **three** questions. **(30 marks)**

SECTION C: This section is **compulsory**. **(15 marks)**

- 4) Calculators and mathematical instruments may be used.
- 5) Use only a **blue** or **black** pen for writing and a **pencil** for drawing.

SECTION A: ATTEMPT ALL QUESTIONS (55 marks)

- 1) Choose the best alternative that completes each of the statements below:
- a) The upthrust/buoyant force exerted on a body immersed in a liquid is equal to the: **(1 mark)**
i) weight of the liquid. ii) weight of the liquid displaced.
iii) mass of the liquid displaced. iv) density of the liquid.
- b) The pressure exerted by a liquid..... **(1 mark)**
i) increases with depth. ii) decreases with depth.
iii) doesn't change with depth.
iv) is different in different directions at the same depth.
- c) Archimedes' principle holds for..... **(1 mark)**
i) liquid only. ii) gas only.
iii) both liquid and gas. iv) both liquid and solid.
- 2) State whether each of the following statements is **true** or **false**.
- a) Paint spraying is an application of electrostatics. **(1 mark)**
- b) In a thunderstorm accompanied by lightning, it is safest to run near a tree or an open ground rather than sitting inside a car. **(1 mark)**
- c) The charge distribution is dependent on the shape of the conductor. **(1 mark)**
- d) Electric potential is the amount of work needed to move a unit charge from a reference point to a specific point against an electric field. **(1 mark)**
- 3) a) List any two elements of telecommunication system. **(2 marks)**
b) What are the two main types of signals which are used in electronics? **(2 marks)**
- 4) Fill in the blanks using appropriate terms from the box.

Resistance	RI	Electric current
Potential difference	$\frac{U^2}{R}$	Time

Write only the missing term for each sub question. The symbols have their usual meanings.

- a) The formula to calculate electric power is $P = \dots$ **(1 mark)**
- b) Two factors on which the electric energy consumed by an electric appliance depend are the of the appliance and the for which the appliance is used. **(2 marks)**

- c) Ohm's law states that theacross a conductor is directly proportional to the electric current flowing through it, provided all physical conditions and temperature remain constant. **(1 mark)**
- 5) What two types of energy and their corresponding sources do you use in your home? You may use the following table. **(4 marks)**

Types of energy	Corresponding source of energy

- 6) Study the table below and suitably match the items given in column **I** with those in column **II**.
Don't copy the table, answer like this y) corresponds to vi). **(4 marks)**

Column I	Column II
a) Stable equilibrium	i) When an object in this state of equilibrium has a disturbing force applied, the centre of gravity remains at the same height and the object does not move when the disturbing force is removed.
b) Isosceles triangle lamina	ii) Its centre of gravity lies at point of intersection of the medians.
c) Rectangular lamina	iii) In this state of equilibrium, the centre of gravity of a body is at the lowest point. When the body is slightly tilted, its centre of gravity rises but the body comes back to its original equilibrium position.
d) Neutral equilibrium	iv) Its centre of gravity lies at the point of intersection of its diagonals.

- 7) a) List any two types of simple machines. **(2 marks)**
b) Name any one example of a simple machine. **(1 mark)**
- 8) a) Can a stationary magnet induce electromotive force in a coil at rest?
Explain. **(2 marks)**
- b) The Faraday's law of electromagnetic induction is expressed as follows
- $$\varepsilon = -\frac{N\Delta\Phi}{\Delta t}$$
- What does N mean? **(1 mark)**
- c) How can induced electromotive force from an AC generator be increased? **(1 mark)**

- 9) a) Rewrite the Newton's second law of motion as a vector equation. **(1 mark)**
 b) How does the acceleration due to gravity vary with the mass of an object being accelerated? **(1 mark)**
- c) Do you exert the same force on Earth as it exerts on you? Explain. **(2 marks)**
- 10) The magnification produced by a spherical mirror is -3 (minus 3). What are the four characteristics of the mirror and the image? **(4 marks)**
- 11) a) Distinguish between work and power. **(2 marks)**
 b) What will cause greater change in kinetic energy of a body? **(1 mark)**
- 12) a) Calculate the pressure that water exerts at 8 m below the surface of the water in a lake. The density of water is 1000 kg/m^3 and acceleration due to gravity is 9.81 N/kg . **(2 marks)**
 b) What force must be applied to a surface area of 0.2 m^2 to create a pressure of 150 Pa? **(2 marks)**
- 13) The velocity of an object of mass 10 kg increases from 4 m/s to 8 m/s when a force acts on it. What is the impulse applied to the object? **(2 marks)**
- 14) Some of the elements of a house electrical installation are: electric meter, electrical wires, incandescence light bulb, plug sockets, circuit breaker, fuse, wall switches.
 a) Which is more efficient, a circuit breaker or fuse? Explain. **(2 marks)**
 b) Electrical resistivity and melting points of some substances at 20°C are given below.
- | Substance | Resistivity /Ωm | Melting point /$^\circ\text{C}$ |
|------------------|---|---|
| Silver | 1.60×10^{-8} | 961.78 |
| Copper | 1.62×10^{-8} | 1084.62 |
| Tungsten | 5.20×10^{-8} | 3422.00 |
| Nichrome | 10.00×10^{-6} | 1175.00 |
- What material is used in incandescent light bulb? Justify your answer.
(An incandescent bulb works on the principle of incandescence, a general term meaning light produced by heat.) **(2 marks)**
- 15) a) State any two requirements that plants need to make their own food. **(2 marks)**
 b) What will happen to plants when left in a dark area for a long time? **(1 mark)**
 c) What will happen to plants if they are left unwatered (not supplied with water either naturally or artificially)? **(1 mark)**

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 marks)

- 16) You are provided with a certain amount of water, salt and sand.

Design a laboratory experiment whose purpose/aim is to separate the mixture of 40 g of salt and 40 g of sand. In order to obtain the sand from the mixture, salt must first be dissolved in 150 ml of water.

In your account, you should pay particular attention to:

a) Materials to be used.

(2 marks)

b) The procedure to be followed:

You should draw diagrams, showing the arrangement of your labelled laboratory materials and the measurements to be taken.

(7 marks)

c) The safety precautions to be taken.

(1 mark)

- 17) A learner cycles to school. The graph (figure1) shows the stages A to G of the journey.

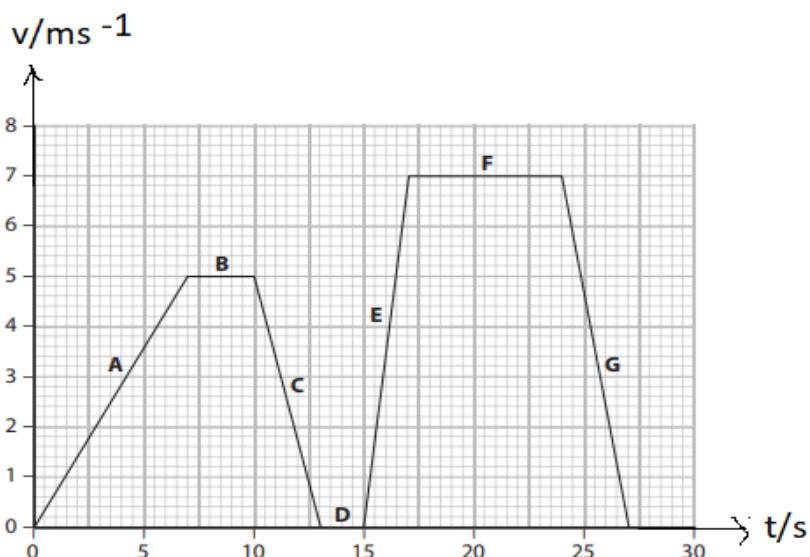


Figure 1

Analyse the graph and answer the following sub questions:

- a) Use the table below to describe the motion of the learner during the stages **B** and **D**.

Stage	Description
B	
D	

(2 marks)

- b) Find the acceleration to two decimal places for stage A.

(2 marks)

- c) Calculate the distance that the learner travels in the first 10 s.

(5 marks)

- d) The total distance travelled is 106.5 m. Show that the average speed of the journey is about 4 m/s.

(1 mark)

- 18) a) A student ties two balloons to a support with some string.

The student rubs both balloons with a dry cloth which gives the balloons a negative charge. The diagram (figure 2) shows the balloons after they were rubbed.

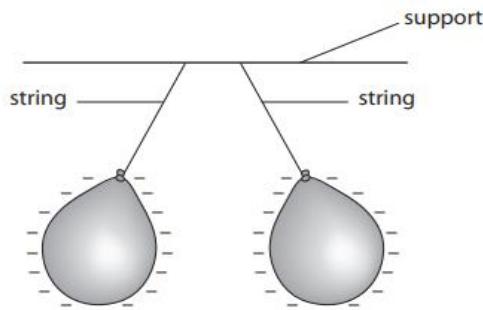


Figure 2

Use 6 terms from the box to complete the sentences.

attract

electric

electrons

repel

negative

friction

positive

protons

The balloons each other because they have the same The cloth is left with a.....electric charge. The charged particles that are transferred from the cloth to the balloons are called These balloons are charged by If somebody touches one of the balls, it becomes discharged and the balls will..... each other.

(3 marks)

- b) Two charged balloons of $+46 \text{ nC}$ and $-2.5 \times 10^{-8} \text{ C}$ are separated by a distance of 0.8 m as shown in figure 3 (not to scale).

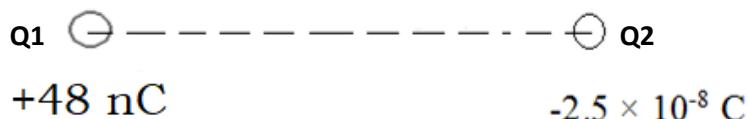


Figure 3

- i) Copy the figure and indicate the direction of the electrostatic force experienced by Q_1 due to Q_2 and the electrostatic force experienced by Q_2 due to Q_1 . **(2 marks)**
- ii) Use scientific notation to express 46 nC in C. **(1 mark)**
- iii) Use Coulomb's law to determine the electrostatic force between the two charged balloons. Coulomb's constant $k = 9 \times 10^9 \text{ Nm}^2 \text{ C}^{-2}$. **(2 marks)**
- iv) Calculate the electric potential due to an electric charge of $-2.5 \times 10^{-8} \text{ C}$ at a point located at $9 \times 10^{-2} \text{ m}$ away from it. **(2 marks)**

- 19) Study the picture below (figure 4) which shows the main parts of a refrigerator.

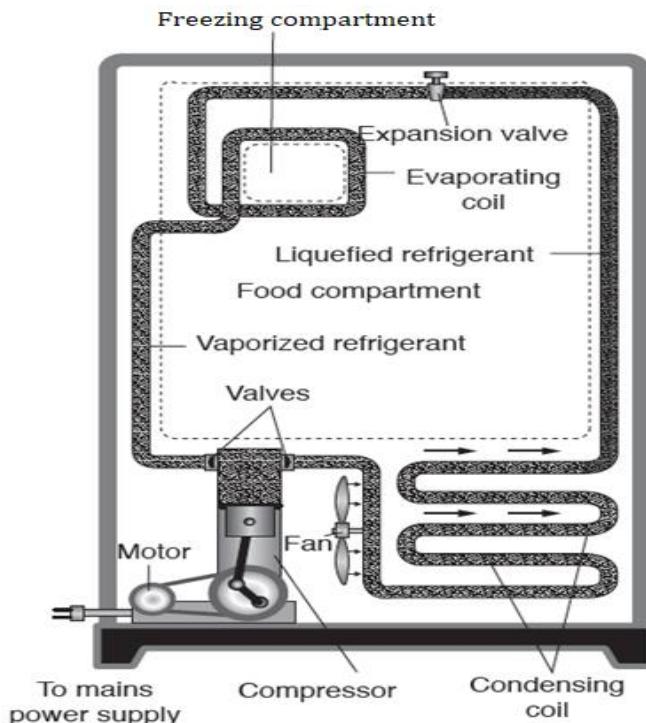


Figure 4

- a) i) Identify any three main parts of a refrigerator shown in the diagram.

(3 marks)

Where does the heat required to vaporize refrigerant come from?

(1 mark)

- b) ii) Figure 5 shows the cooling curve for 0.500 kg water put into a cold freezer of a refrigerator.

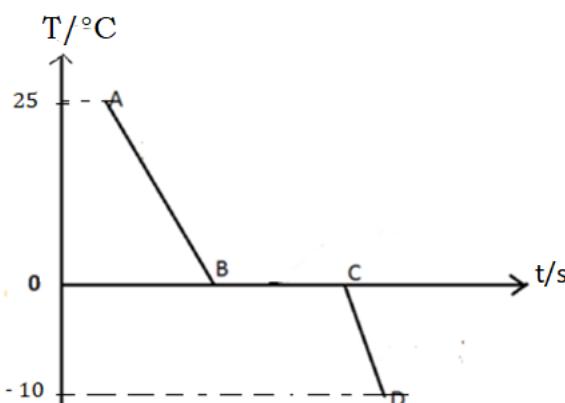


Figure 5

- i) Which portion of the cooling curve for water shown above would both liquid and solid water be present? **(1 mark)**

- ii) How much heat energy is required by a refrigerator to cool 0.500 kg of liquid water at 25°C to liquid water at 0°C?

The specific heat capacity of water is 4 200 J/kg °C. **(3 marks)**

- c) Ice at 0°C changes into liquid water at 0°C. Calculate the amount of heat required to melt 0.500 g of ice at 0°C. The specific latent heat of fusion of ice is 334 400 J/kg. **(2 marks)**

- 20) A circuit consists of $60\ \Omega$ and $30\ \Omega$ in parallel arrangement, a dry cell of electromotive force 3V and a negligible internal resistance is connected across the whole circuit as shown in figure 6.

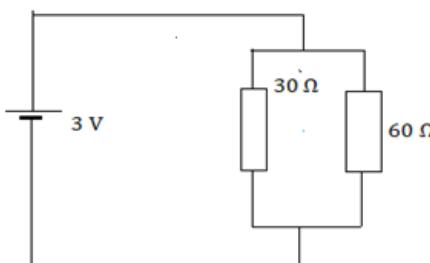


Figure 6

- a) Analyse the given electric circuit and then find:
- i) The equivalent resistance of this parallel network. **(2 marks)**
 - ii) The total electric current I in the circuit. **(2 marks)**
 - iii) The electric current I_1 through the $60\ \Omega$ resistor. **(2 marks)**
 - iv) The electric current I_2 through the $30\ \Omega$ resistor. **(2 marks)**
- b) Compare the total electric circuit and individual electric currents in the two parallel branches. Conclude. **(2 marks)**

SECTION C: COMPULSORY QUESTION (15 marks)

- 21) Investigation of the variation of atmospheric pressure with altitude has been made. The table below shows the pressure P at selected altitudes h above sea level.

Table of results

h/km	$P/10^{-2}\ \text{atm}$
0	100
5	50
10	25
15	12
20	6
25	2

- a) Plot a graph of P (y-axis) against h (x-axis). Draw a curve of the best fit.
You are advised to use a graph paper. **(6 marks)**
- b) From your graph, estimate the altitude when $P = 75 \times 10^{-2}$ atm. **(1 mark)**
- c) Use the table of results or your graph to answer the following:
 Decide which of the statements below are true or false and support your answer.
- i) The atmospheric pressure is measured using a manometer. **(2 marks)**
 - ii) Atmospheric pressure decreases as altitude increases. **(2 marks)**
 - iii) Symbol of SI unit of altitude is km. **(2 marks)**
- d) Do you think that atmospheric pressure is important?
 Why do you think so? **(2 marks)**

Physics I

011

14/11/ 2019

8:30 AM – 11:30 AM



Rwanda Education Board

ORDINARY LEVEL NATIONAL EXAMINATIONS, 2019

SUBJECT: PHYSICS

DURATION: 3 HOURS

INSTRUCTIONS :

- 1) Write your names and index number as they appear on your registration form and **DO NOT** write your names and index number on additional sheets of paper if provided.
- 2) Do not open this question paper until you are told to do so.
- 3) This paper has **THREE** sections: **A** ,**B** and **C**.

SECTION A : This section is **compulsory**. **(55 marks)**

SECTION B : Attempt any **three** questions. **(30 marks)**

SECTION C : Attempt **Only one** question. **(15 marks)**

- 4) Calculators and mathematical instruments may be used.
- 5) Use only a **blue** or **black pen** for writing and a **pencil** for drawing.

SECTION A: Attempt all questions (55 marks)

- 1) For each of the statements below, indicate **true** if it is correct and **false** if it is wrong:
- According to the kinetic theory of matter, when a gas is heated, it cannot expand. **(1mark)**
 - The freezing point of water is equal to the melting point of ice in the same atmospheric conditions. **(1mark)**
 - Temperature and heat have the same units. **(1mark)**
 - Thermal equilibrium means the condition under which two or more substances in physical contact with each other exchange no heat energy and thus they are at the same temperature. **(1mark)**
- 2) Explain the process of hydrologic cycle (water cycle) **(4 marks)**
- 3) a) Select a derived physical quantity among the following:
Time, mass, acceleration and length. **(1mark)**
- b) A piece of rock with a volume of 15 cm^3 has a mass of 45 g.
- Express its volume in m^3 **(1mark)**
 - What is its mass in kg ? **(1mark)**
- 4) A RLC series circuit consists of an inductor, a resistor, a capacitor and an alternating current generator.
Complete each of the following statements with the correct term from the words bank: increases, decreases or remains constant.
Write only the answer in your answer booklet without copying the Statement.
- If the frequency of alternating current of a generator decreases, the reactance offered by the capacitor to an alternating current **(1mark)**
 - If the frequency of alternating current of a generator decreases, the reactance offered by the inductor to an alternating current **(1mark)**
 - The resistance offered by a resistor to an alternating current when the frequency of alternating current of a generator decreases. **(1mark)**
- 5) a) What will happen to an object at rest if a force is acted upon it? **(1mark)**
b) Why do you need to wear a seatbelt in a moving car? **(2marks)**
c) Why does the moon orbit around the earth? **(1mark)**
- 6) a) A positively charged rod is brought close to one end of a neutral metallic plate without touching it.
(i) What does a neutral metallic plate mean in this context? **(1mark)**
(ii) What type of charge appears on the closest side of the plate? **(1mark)**

- (iii) Name the method of charging bodies used in this case. **(1mark)**
- b) The electric force between two charged bodies is given by:

$$F = \frac{1}{4\pi\epsilon_0} \frac{QQ'}{r^2}$$
. What does r mean in this relation? **(1mark)**
- 7) You are provided with three electric components namely:
 one ordinary diode, one resistor , one dry cell and connecting wires.
 Use the symbols of these elements to draw a complete electric circuit
 such that the ordinary diode is forward biased. **(3marks)**
- 8) a) What type of renewable energy comes from tapping heat generated
 inside the Earth? **(1mark)**
 b) Why is the use of renewable energy advantageous to people? **(2marks)**
- 9) Why are convex mirrors used as rear/back view mirrors of vehicles? **(3marks)**
- 10) a) What do you understand by the term 'Pascal's principle'? **(1mark)**
 b) Give any two applications of Pascal's principle in everyday life. **(2marks)**
- 11) The volume of 600 ml of air assumed to be an ideal gas is at 27°C.
 a) Convert 27°C and 67°C into Kelvin. **(2marks)**
 b) What is its volume at 67°C?
(Assume that the pressure of the air is kept constant). **(2marks)**
- 12) A simple machine requires 1000 J of work (work input) to raise a
 load of 500 N through a vertical distance of 1.5 m.
 Find :
 a) the work output (work done by the force of 500 N). **(2marks)**
 b) the efficiency of the machine in %. **(2marks)**
- 13) Suppose a high resistance voltmeter reads 1.5 V when connected across
 a dry cell on open circuit. It reads 1.2 V when the same battery
 is supplying a current of 0.30 A through the circuit when connected
 to a resistor of resistance R .
 Determine :
 a) The electromotive force of the battery. **(2marks)**
 b) Resistance (R). **(3marks)**
- 14) A 1000 kg car starts from rest and accelerates uniformly to a speed
 of 72 km/h during 50 seconds.
 a) Express the car's speed in m/s. **(1mark)**
 b) Show that its acceleration is 0.4 m /s². **(2marks)**
 c) Prove that the linear momentum of the car moving with a speed
 of 72 km/h is 20 000 kgm/s . **(2marks)**

15) A charge $Q=1\times10^{-11}$ C acts as a positive point charge to create an electric field at a distance of 0.05 m away.

a) Draw the electric field line created by Q at a distance of 0.05 m away. **(1mark)**

b) Determine the electric field strength created by Q at a distance of 0.05 m. (Coulomb's law constant $k=9\times10^9$ Nm²/C²) **(2marks)**

SECTION B: Attempt any three questions (30 marks)

16) The diagram below (figure 1) shows an object 2 cm tall placed at 6 cm away from a convex lens (converging lens) of focal length 3 cm.

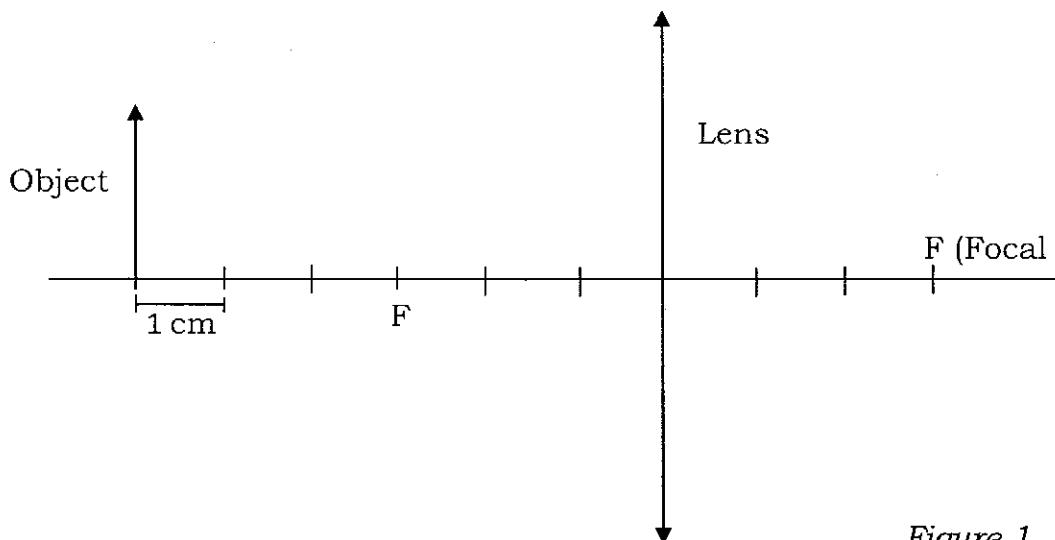


Figure 1

a) Copy the diagram and draw a ray diagram to scale (use the graph paper provided at the end of your answer booklet) to illustrate the image of the object. **(3marks)**

b) From the graph (don't use calculations), determine the:

(i) Image position. **(1mark)**

(ii) Size of the image. **(1mark)**

(iii) Properties of the image obtained. **(3 marks)**

c) Give names of two optical instruments that use convex lenses. **(2marks)**

17) In addition to your knowledge and skills, use the concept of state of equilibrium in relation to the position of centre of gravity to answer the following sub questions:

a) Explain the following types of static equilibrium:

(i) Neutral equilibrium. **(1mark)**

(ii) Stable equilibrium. **(1mark)**

(iii) Unstable equilibrium. **(1mark)**

- b) The diagram below (figure 2) shows three solid blocks (made of the same wood) A, B and C with their cross sectional areas resting on a horizontal table.

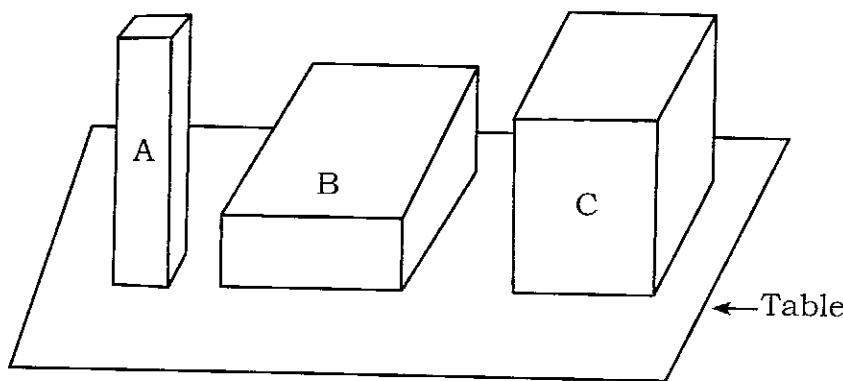
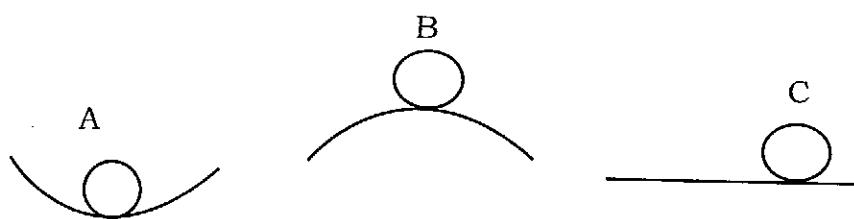


Figure 2

List the blocks in order from the least stable to the most stable and justify your answer.

(4marks)

- c) Observe the following diagrams (figure 3) and specify the type of equilibrium for each spherical object (ball) A, B and C.



(3marks)

Figure 3

- 18) a) How can you tell that an object submerged into water will sink or float on water? **(3marks)**
- b) A student uses the following apparatus (figure 4) to demonstrate pressure difference in water. The apparatus is hollow and has three short tubes at different depths. The student completely fills the apparatus with water. Water comes out through all the three side tubes.

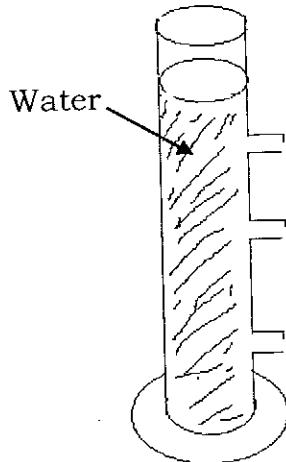


Figure 4

- (i) Copy the diagram and draw the path followed by the water you would expect to see from each side tube. **(3 marks)**
- (ii) Describe the pattern of the paths of water from the side tubes shown in your diagram. **(2marks)**
- c) Why does an object feel a buoyant force when it is submerged in a liquid? **(2marks)**
- 19) a) Differentiate between heat capacity and specific heat capacity of a substance. **(3marks)**
- b) Describe how the following modes of heat transfer take place.
- (i) Conduction of heat. **(1mark)**
 - (ii) Convection of heat. **(1mark)**
 - (iii) Radiation of heat. **(1mark)**

- c) The vacuum flask shown (figure 5) has five labelled features, each one designed to reduce heat transfer.

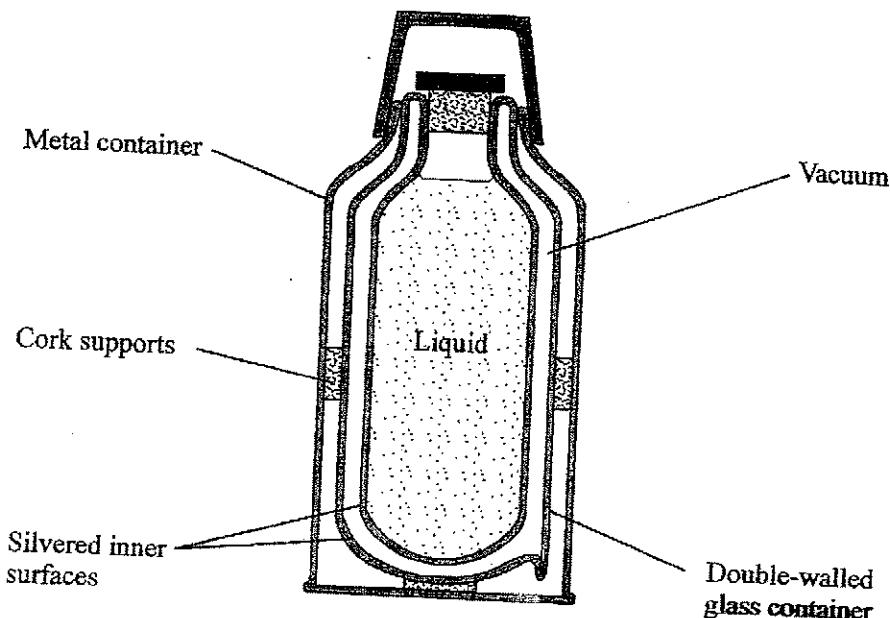


Figure 5

Analyze figure 5 shown above and answer the sub questions below.

- (i) Which labelled feature of the vacuum flask reduces heat transfer by both conduction and convection? **(1mark)**
 - (ii) Explain how this feature of the vacuum flask reduces heat transfer by both conduction and convection. **(1mark)**
 - (iii) Which labelled feature of the vacuum flask reduces heat transfer by radiation? **(1mark)**
 - (iv) Explain how this feature of the vacuum flask reduces heat transfer by radiation. **(1mark)**
- 20) a) A coil of wire is connected to a sensitive galvanometer as shown in the diagram below (figure 6).

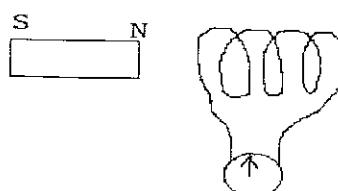


Figure 6

- (i) What is observed on the zero centre of the galvanometer when the bar magnet is stationary in the coil? **(1mark)**

- (ii) What is observed on the centre zero galvanometer when the bar magnet is moved towards the coil? **(1mark)**
- (iii) What is observed on the centre zero galvanometer when the bar magnet is moving away from the coil? **(1mark)**
- (iv) What is the cause of the observed results made when the magnet is moving towards the coil or when it is moving away from the coil? **(1mark)**
- b) Suggest two ways that may be used to increase the induced electromotive force in a coil. **(2marks)**
- c) A transformer is a device based on the principle of electromagnetic induction.
- (i) Name one electric device that uses a transformer. **(1mark)**
- (ii) The input coil of a transformer has 200 turns of a wire and is connected to a 230 V alternating current supply. What is the voltage across the output coil when it has 600 turns? **(2marks)**
- (iii) What is the benefit of using transformers in the transmission of electrical power? **(1mark)**

SECTION C: This question is compulsory (15 marks)

- 21) A student carried out an experiment in order to determine the electromotive force, E, of a dry cell.

The results were as follows:

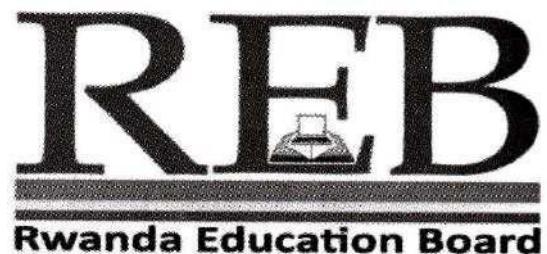
Resistance, R/Ω	Current, I/A	$\frac{1}{current}, \frac{1}{I} / A^{-1}$
2	0.385	
4	0.250	
6	0.200	
8	0.150	
10	0.125	
12	0.100	

- a) Copy and complete the table above including only R and $\frac{1}{I}$.
Round off to one decimal place for example 2.1 or 3.0 **(3marks)**
- b) Plot a graph of $\frac{1}{I}$ (vertical axis) against R (on horizontal axis) and draw the best fit straight line. **(8marks)**
- c) Determine the slope S. **(2marks)**
- d) Determine the value of E given that $E = \frac{1}{S}$ and interpret your results. **(2marks)**

PHYSICS I

011

22/11/2018 08.30 AM – 11.30 AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2018

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

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2. Do not open this paper until you are told to do so.
3. This paper consists of **three** sections **A, B and C**
 - Answer **ALL** questions in section A. **(55 marks)**
 - Answer **THREE** questions in section B. **(30 marks)**
 - Answer only **one** question in section C **(15 marks)**
4. Silent non-programmable calculators may be used.
5. You do not need the periodic Table.
6. Use only a **blue** or **black pen** for answering and a **pencil** for drawing.

SECTION A: Attempt all questions from this section. (55 marks)

1. Identify 3 renewable energy sources that are actually used in Rwanda. **(3 marks)**
2. (a) Copy and draw the magnetic field lines of force around the bar magnet below (figure 1). **(2 marks)**



Figure 1

- (b) Suppose that the bar magnet is divided into two parts as shown below (figures 2 and 3).

Bar magnet before its division

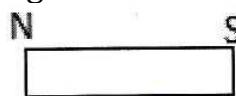


Figure 2

Bar magnet after the division

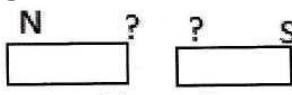


Figure 3

- Copy and name the missing magnetic poles as shown in figure 3. **(1 mark)**
(c) Propose one method that you can use to demagnetize a magnet. **(1 mark)**

3. (a) (i) Use of electricity in homes can be dangerous. Explain how a fire breakout due to an electric fault can be prevented. **(1 mark)**
(ii) Suggest a reason for power losses that might occur in electrical power transmission lines. **(1 mark)**
(iii) Determine the role of a transformer in electrical power transmission. **(1 mark)**
(b) Give two advantages of alternating current over direct current. **(2 marks)**
4. (a) Explain how the potential energy can be used to do work. **(2 marks)**
(b) What energy transformations do take place when a battery operated radio is in use? **(2 marks)**
5. For each of the following statements; indicate whether the statement is true or false.
(a) Pressure decreases when the surface area over which a force is applied decreases. **(1 mark)**
(b) A fluid applies pressure perpendicular to all sides of an object in contact with the fluid. **(1 mark)**
(c) If the weight of an object that is submerged in a fluid is 10N and the buoyant force on it is 20 N. The object will sink initially then remain underwater/submerged. **(1 mark)**

- (d) A and B are non-miscible liquids and have densities of 0.75 g/ml and 1.14 g /ml respectively. When both liquids are poured into a container, B floats on the top of A. **(1 mark)**
- (e) Buoyant force is the weight of the mass of water displaced by an immersed object. **(1 mark)**
6. (a) How can induced current be produced? **(2 marks)**
(b) Suggest two ways that may be used to increase the induced current in a coil. **(2 marks)**
7. How does a diode work as a rectifier? **(3 marks)**
8. (a) Is a wheelbarrow a simple or compound machine? Explain. **(2 marks)**
(b) The mechanical advantage of a simple machine is 4. Explain what this means. **(1 mark)**
9. (a) Kelvin temperature scale is the best scale for measuring temperature. It is more commonly used in industry and sciences. Explain the reason behind. **(1 mark)**
(b) Why does
 (i) A liquid have a definite volume but not a fixed shape? **(1 mark)**
 (ii) A gas have no fixed shape and volume? **(1 mark)**
 (iii) A solid have fixed shape and definite volume? **(1 mark)**
10. Predict what will happen when the pressure and the temperature of a fixed amount of an ideal gas decrease simultaneously. Justifications are required. **(3 marks)**
11. Pascal's principle states that when a change in pressure is applied to an enclosed fluid at rest, it is transmitted undiminished to all portions of the fluid and to the walls of its container.
(a) Specify the fundamental characteristics of the mentioned fluid. **(1 mark)**
(b) How is Pascal's principle used in everyday life? **(2 marks)**
12. A certain object weighs 294.3 N at the earth's surface. Determine the mass of the object in kilograms then in centigrams. Take $g = 9.81 \text{ m/s}^2$. **(3 marks)**
13. A force of 400 N is applied to a 40 kg object moving on a horizontal surface of which the friction force is 200 N.
(a) Find the net force acting on this body. **(1 mark)**
(b) Find the acceleration of the moving object. **(2 marks)**
14. (a) Determine the quantity of heat needed to raise the temperature of 1000 g of water from 20°C to 100°C . The specific heat capacity of water is $4.200 \text{ J.kg}^{-1}\text{.K}^{-1}$. **(2marks)**
(b) What will happen to the temperature of this quantity of water at 100°C if the heating continues? Explain your answer. **(2marks)**

15. (a) The small distance between two positive charged particles Q_1 and Q_2 placed in free space is d .
- (i) Draw the electric field lines of force between Q_1 and Q_2 . **(1 mark)**
- (ii) Name any one factor that affects the magnitude of Coulomb's force between Q_1 and Q_2 . **(1 mark)**
- (b) A point p is at 100 cm from a positive point charge $Q = 2\text{nC}$ placed in vacuum. Calculate the electric potential due to Q at p . The permittivity of free space $C_0 = 8.85 \times 10^{-12} \text{ F/m}$. **(2 marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 Marks)

16. (a) Describe an experiment to find the centre of mass of an irregular lamina like the diagram below (Figure 5). **(3 marks)**



Figure 5

- (b) Copy and label with a dot the centre of gravity of each of the following objects (figures 6, 7, 8, 9). Use the diagram to show how this centre of mass is obtained.

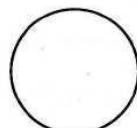
(i)



(1 mark)

Rectangular lamina (figure 6)

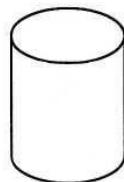
(ii)



(1 mark)

Circular object (figure 7)

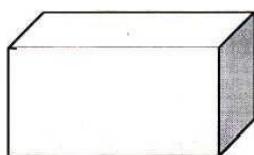
(iii)



(1 mark)

Cylindrical object (figure 8)

(iv)



(1 mark)

Rectangular parallelepiped object (figure 9)

- (c) Use the terms unstable equilibrium, stable equilibrium and neutral equilibrium to complete the following statements. Respect the order of the question when answering it and don't copy the entire statement.

(i) occurs when a simple object is placed in such a position that any slight disturbance would not change the level of its centre of mass.

(1 mark)

(ii) occurs when a simple object is placed in such a position that any slight disturbance effort would raise its centre of mass. **(1 mark)**

(iii) occurs when a simple object is placed in such a position that any slight disturbance effort would lower its centre of mass. **(1 mark)**

17. Study the following velocity-time graph of a 5 kg moving body (figure 10) and answer the questions that follow:

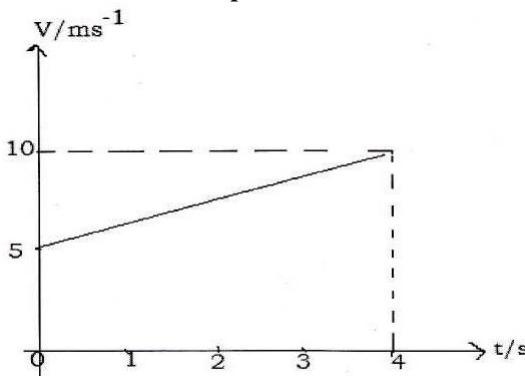


Figure 10

(a) Is this motion rectilinear motion with constant acceleration or uniform rectilinear motion? **(1 mark)**

(b) From the graph, determine the initial velocity of the body. **(1 mark)**

(c) Find the slope of the graph. This is the acceleration of the moving body. **(3 marks)**

(d) Use the result obtained from 17 (c) and plot the acceleration-time Graph. **(3 marks)**

(e) Determine the distance covered/travelled from the given Velocity - time graph. **(3 marks)**

18. The diagram below (figure 11) shows an arrow 1cm long placed at 6 cm in front of a concave mirror.

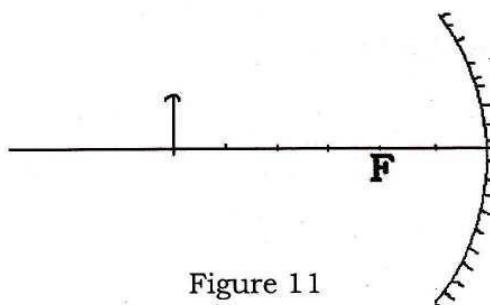


Figure 11

The focal length of this concave mirror is 2 cm.

(a) Draw a ray diagram on the graph paper provided at the end of your answer booklet to illustrate the image formation of the arrow. **(3marks)**

(b) From your graph, describe the characteristics (position, size, nature, direction) of the image obtained. **(2marks)**

(c) Use calculations to determine the position, the size, the direction and the nature of the image of the above arrow. **(3 marks)**

(d) Do your mathematical answers and the description above match the image formed by your ray diagram? Justify your answer. **(2 marks)**

19. (a) Identify the common electrical symbols below (figures 12, 13, L4)

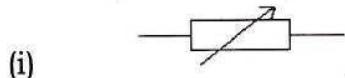


Figure 12

(1mark)

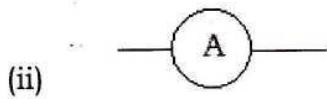


Figure 13

(1mark)

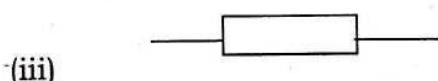


Figure 14

(1mark)

(b) You are provided with 2 resistors, 3 dry cells, a voltmeter, a switch, and sufficient number of connecting wires. Use all the given electrical components to design a circuit satisfying the condition below:

Two resistors are connected in series such that when the switch is closed; the current flows through the circuit. All the 3 dry cells are in series and the voltmeter measures the potential difference across all connected resistors. **(4marks)**

(d) The internal resistance of the dry cell in the following diagram (Figure 15) is negligible and its electromotive force, $E = 4$ V. The resistance $R = 10 \Omega$.

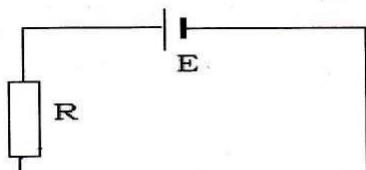


Figure 15

- (i) Find the potential difference across the 10Ω resistor. **(1 mark)**
(ii) Calculate the current passing through the circuit. **(2 marks)**

20. Describe the environmental factors that affect the growth rate of a plant and explain how they do so. N.B: These environmental factors can include both physical and chemical factors. **(10 marks)**

SECTION C: THIS SECTION IS COMPULSORY**(15 Marks)**

21. Answer this question on the graph paper provided at the end of your answer booklet. A group of students carried out an experiment to investigate how the electric current flowing through a constant resistor increases when the voltage applied to its ends increases gradually. The following table shows the results obtained

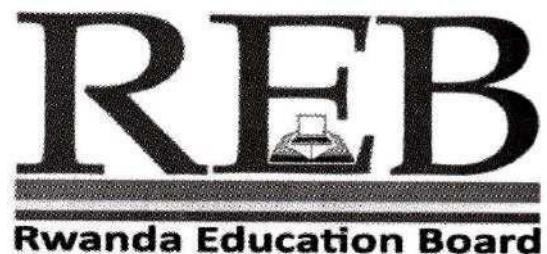
Voltage U/V	1.0	3.0	5.0	7.0	9.0	11.0
Current I/mA	1.0	2.9	5.0	6.9	9.0	11.0

- (a) Plot a graph of voltage (along y-axis) against current (along x-axis).
Draw the best fit straight line. **(8 marks)**
- (b) From your graph, determine the slope/gradient of the graph. **(2 marks)**
- (c) What does the result obtained in 21.b represent? **(1 mark)**
- (d) Predict the value of the current if the voltage reaches 16 V. Support your answer with evidence. **(2 marks)**
- (e) Explain why some values of the current do not obey the law of proportionality between current and voltage. **(2 marks)**

Physics I

011

23/11/2017 08.30 AM – 11.30 AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2017

SUBJECT: PHYSICS I

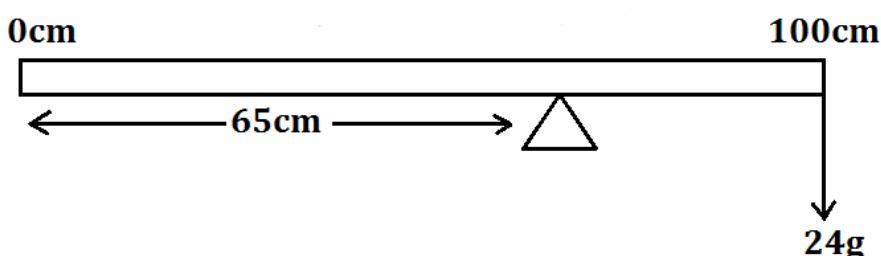
DURATION: 3 HOURS

INSTRUCTIONS:

1. Write your names and index number on the answer booklet as they appear on your registration form, and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
2. Do not open this paper until you are told to do so.
3. This paper consists of **three** sections **A, B and C**
 - Answer **ALL** questions in section A. **(55 marks)**
 - Answer **THREE** questions in section B. **(30 marks)**
 - Answer only **one** question in section C **(15 marks)**
4. Calculators and mathematical instruments may be used.
5. Use only a **blue** or **black pen** for answering and a **pencil** for drawing.

SECTION A: Attempt all questions from this section. (55 marks)

1. a) The mass of fresh milk at 20°C is 103.5g and its volume is 100cm³.
Calculate the density of fresh milk. **(2 marks)**
b) Why is it useful to know the density of fresh milk? **(1 mark)**
2. a) What is the difference between distance and displacement of a moving body? **(2 marks)**
b) A car starts from town A and travels 40 km eastwards to town B northwards from town B to town C. What is the displacement of the car from town A to town C? **(2 marks)**
3. a) Define the term " deceleration" of a moving body. **(1 mark)**
b) A car slows down from 72 km/h with a uniform deceleration of 2m/s².
How long will it take to reach 18 km/h? **(3 marks)**
4. A student with a mass of 40 kg is running with a velocity of 2 m/s.
a) Calculate the kinetic energy of the student. **(2 marks)**
b) What would be the kinetic energy of the student if the velocity was doubled? **(2 marks)**
5. a) Define the term "center of gravity of a body." **(2 marks)**
b) A uniform meter rule is balanced by the mass of 24 g at 100 cm mark while the pivot is at 65 cm mark. Calculate the mass of the meter rule. **(2 marks)**

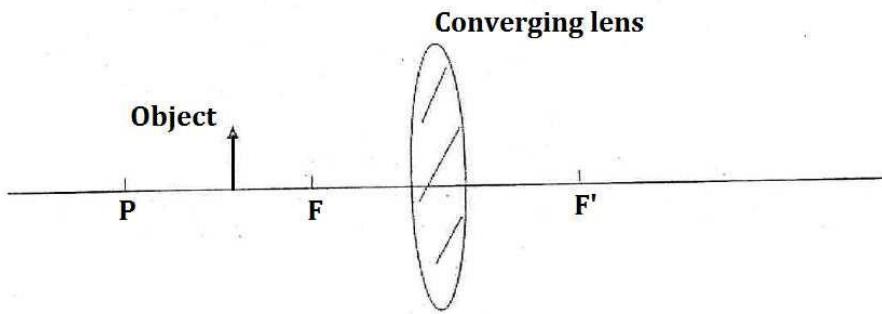


6. Two strings at right angle to each other support an object O of weight W. If the forces in the strings are 12 N and 5 N; calculate the weight W of the object. **(4 marks)**
7. a) State "Archimedes' Principle." **(2 marks)**
b) What is meant by the term "upthrust?" **(2 marks)**
8. a) What is meant by the term "viscosity?" **(2 marks)**
b) What effect does soap have on the surface tension of water? **(2 marks)**
9. a) What is meant by the term "temperature" of a substance? **(2 marks)**
b) State two applications of temperature. **(2 marks)**
10. Read each statement below and write "TRUE" if it is correct or "FALSE" if it is wrong.
a) Luminous objects radiate light. **(1 mark)**
b) Shadows and eclipses are due to the rectilinear propagation of light.

- c) Beams of light are parallel and divergent only. (1 mark)
 d) The image formed in a pinhole camera is erect (upright). (1 mark)
11. a) State Ohm's law. (2 marks)
 b) Explain why:
 (i) The ammeter measuring the current is placed in series in a circuit. (1 mark)
 (ii) The voltmeter measuring the potential difference is placed in parallel with the circuit. (1 mark)
12. Read each statement below and write "TRUE" if it is correct or "FALSE" if it is wrong.
 a) Like electric charges repel and unlike charges attract. (1 mark)
 b) An example of a conductor of electricity is a human body. (1 mark)
 c) Insulators of electricity allow charges to flow through them. (1 mark)
 d) A pointed charged conductor has a low density charge at the point. (1 mark)
13. a) Use the domain theory of magnesium to explain the magnetic behaviour of iron. (2 marks)
 b) State the difference between the magnetic properties of iron and steel. (2 marks)
14. List the energy changes which occur in each of these cases below:
 a) A match stick is struck. (1 mark)
 b) An electric lamp is switched on. (1 mark)
 c) Dry cells in a torch when the torch is switched on. (1 mark)
 d) A telephone ear piece when two people are talking on telephones. (1 mark)

SECTION B: ATTEMPT ANY THREE QUESTIONS (30 MARKS)

15. a) State "heat effects." (2 marks)
 b) Explain why the cooling unit (freezer) inside a refrigerator is placed near the top but an electric immersion heater in water tank should be near the bottom of vessel being used to heat the water. (2 marks)
 c) A clinical thermometer needs to be an accurate maximum thermometer. Briefly explain how two basic requirements are achieved. (2 marks)
16. a) Draw a convergent lens and show how it refracts an incident parallel beam of light. (2 marks)
 b) Define the term "focal length" of a lens. (1 mark)
 c) What does the power of a lens depend on? (1 mark)
 d) Copy the diagram below and use rays to show how the image of the object is formed in a convergent lens. State the properties of the image. (5 marks)



- e) State one application of a converging lens. **(1 mark)**
17. a) State any two effects of the electric current. **(2 marks)**
 b) What is a **Coulomb**? **(1 mark)**
 c) A steady current of 4A flows for 5 seconds. Find the total charge passing any point in the circuit. **(1 mark)**
 d) What effect does increase in temperature have on the resistance of the filament of a torch bulb? **(1 mark)**
 e) A student is given a 12V lamp and decides to measure the resistance of the lamp filament using the voltmeter-ammeter method. The student decides to apply various voltages to the lamp and to measure the current in each case.
 (i) Draw a circuit diagram and show clearly, where the voltmeter and ammeter are placed in the circuit. **(2 marks)**
 (ii) Two of the student's results are:

Voltmeter reading / V	Ammeter reading / A
2.0	1.0
12	2.0

Calculate the resistance of the lamp filament in each case. **(2 marks)**
 (iii) Explain why the resistance of the lamp filament is different in the two cases. **(1 mark)**

18. a) Explain why two steel needles hanging from the N pole of a magnet are not parallel. **(2 marks)**
 b) A bar magnet is heated. State the effect of its (the bar magnet) magnetic properties. How does the domain theory of magnetism explain this effect? **(2 marks)**
 c) What is a place where there is no magnetic field called? **(2 marks)**
 d) The North Pole N of a compass needle points to geographical north. Since like poles repel each other, how do you explain this fact? **(4 marks)**
19. a) What is the difference between force and pressure? **(3 marks)**
 b) State the principle of transmission of pressure in fluids. **(2 marks)**
 c) With the aid of two labelled diagrams, describe and explain the action of a "crushing can experiment." **(5 marks)**

SECTION C: THIS QUESTION IS COMPULSORY (15 marks)

20. In an experiment to determine the acceleration due to gravity g of a falling ball-bearing; the following results were obtained:

Time, t/s	t^2/s^2	Distance, h/m
1		5
2		20
3	9	45
4		80
5		125

- a) Copy the above table and complete the missing values of t^2 . (2 marks)
 - b) Plot the graph of distance h against time t^2 . (9 marks)
 - c) Find the slope, S of the graph showing clearly how you get your answer. (3 marks)
 - d) State the acceleration of gravity g . (1 mark)
21. In an experiment to determine the specific heat capacity of a substance c , the following results were obtained.

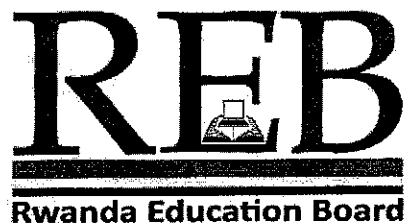
Temperature, $t/^\circ C$	Quantity of heat, Q/J
5	200
10	400
15	600
20	800
25	1000
30	1200

- a) Plot the graph of quantity of heat Q against temperature, t . (9 marks)
- b) From the graph, find the gradient S of the graph showing clearly how you get your answer. (3 marks)
- c) Use the formula $S = mc$ to determine the specific heat of substance c . Take mass m , of the substance to be 20g. (3 marks)

Physics I

011

11/11/ 2016 08.30am - 11.30am



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2016

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS :

- 1) Do not open this question paper until you are told to do so.
- 2) Write your names and index number as they appear on your registration form.
- 3) This paper has **THREE** sections: **A, B** and **C**.

SECTION A : Attempt all questions. **(55 marks)**

SECTION B : Attempt any **three** questions. **(30 marks)**

SECTION C : Attempt **Only one** question. **(15 marks)**

- 4) Calculators and mathematical instruments may be used.
- 5) Use only a **blue** or **black** pen and a **pencil**.

SECTION A : Attempt all questions (55MARKS)

- 1) Which instrument would you use to measure each of the following quantities?
 - a) The mass of a stone. **(1mark)**
 - b) The diameter of 100Frw coin. **(1mark)**
 - c) The weight of a stone. **(1mark)**
 - d) The volume of water. **(1mark)**
- 2) For each of the statements below, indicate TRUE if it is correct and FALSE if it is wrong.
 - a) Density of water is less than the density of ice. **(1mark)**
 - b) The density of ice is less than the density of water because when water freezes it expands (volume increases) while its mass remains the same. **(1mark)**
 - c) The density of ice is greater than the density of water because ice is a solid. **(1mark)**
- 3 a) What is the difference between speed and velocity of a moving body? **(2marks)**
b) How far will a cyclist travel in 2 hours if his velocity is 8m/s? **(2marks)**
- 4 a) Give one example in which friction is a disadvantage. **(1mark)**
b) Explain why wheels of bicycles turn on ball bearings. **(3marks)**
- 5 a) When a stone is thrown up, it goes up for a while and then falls down. What causes the stone to fall down? **(1mark)**
b) A stone is thrown vertically upwards with initial velocity of 20 m/s. How high does the stone rise in the air? Take $g = - 10\text{m/s}^2$ **(3marks)**
- 6 a) A boy standing on the ground exerts a force equal to his weight on that ground. If the boy's weight is 600N and the area of his shoes in contact with the ground is 120cm^2 . Calculate the pressure he exerts on the ground. **(2marks)**

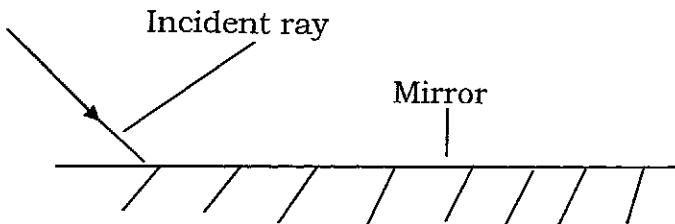
b) If the boy in 6(a) above lies flat on the ground, what effect does this position have on the pressure he exerts on the ground ? Explain your answer. **(2marks)**

7 a) Convert 20°C to Kelvin scale. **(1mark)**

b) What causes convection currents to rise when a liquid is heated? **(2marks)**

c) What is meant by "heat transfer by radiation method"? **(1mark)**

8) Copy the diagram below and show the path of the ray of light after reflection from the plane mirror. Name the reflected ray, the angle of incidence and the angle of reflection. **(4marks)**



9) The table below shows how charged objects affect each other when they are brought close to each other. Copy the table and complete it. **(4marks)**

Charge on object A	Charge on object B	Force
positive		repel
positive	negative	
	positive	attract
negative		repel

10) a) When is an object in equilibrium state? **(1mark)**

b) State the condition for a body to be in a neutral equilibrium. **(1mark)**

c) A uniform metre rule is pivoted at 50 cm mark. A force of 150N placed at 70 cm mark balances a force F placed at 20 cm. Find force F. **(2marks)**

11) a) State the law of floatation. **(2marks)**

b) A ship may travel from the sea into a river . Explain why the ship will sink deeper in the river than in the sea. **(2marks)**

12) Below are examples of changes of matter. For each change; state whether it is a physical change or a chemical change.

- a) Thermal expansion due to heating. (1mark)
- b) Burning a piece of wood. (1mark)
- c) Dissolving sugar in hot water. (1mark)
- d) Reaction between sodium and water. (1mark)

13) The Figures below are simple electric circuits. The lamp in figure 1 is normally bright.

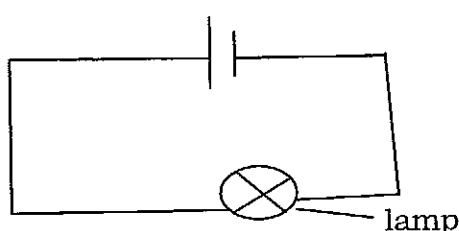


Figure 1

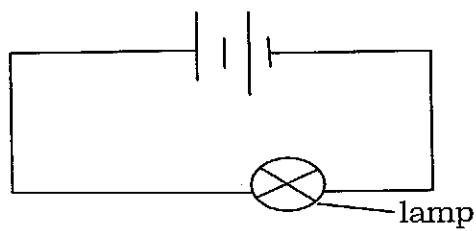


Figure 2

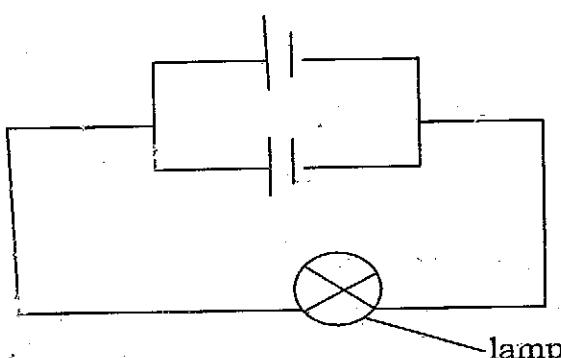


Figure 3

- a) Use the words "normal bright", "brighter than normal", "dimmer than normal bright" to describe the brightness of the lamps in Figures 2 and Figure 3. **(all three lamps are identical)** (2marks)
- b) Identify the arrangement of cells in:
 - (i) Figure 2 . (1mark)
 - (ii) Figure 3. (1mark)

14 a) What is the difference between a convex lens and a concave lens? (2marks)

- b) Which lens would you use to correct :
 - (i) long sight eye defect? (1mark)
 - (ii) short sight eye defect ? (1mark)

SECTION B : Attempt only three questions.(30marks)

- 15 a) Copy Figure 4 below and complete it to show the path of the incident ray through the water from the air. Does the ray remain straight as it travels through water? Explain your answer. **(3marks)**

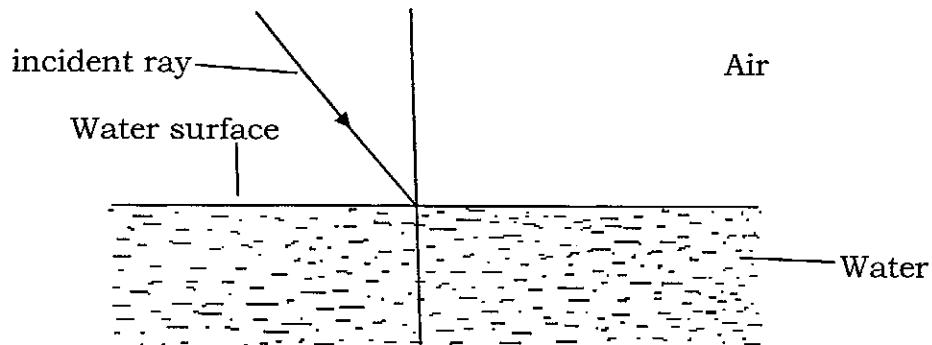
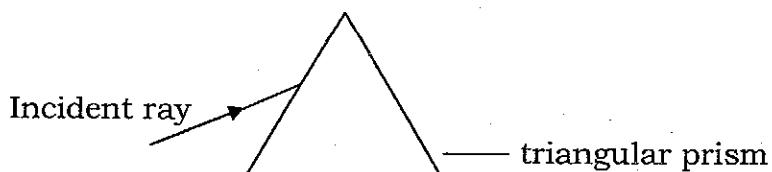


Figure 4

- b) What is meant by the "dispersion of white light"? **(2marks)**
- c) Copy the diagram below of a ray of light passing through a prism and complete it.

Show the angle of deviation. **(2marks)**



- d) Explain how a rainbow is formed. **(3marks)**
- 16 a) What is meant by "specific latent heat of fusion of a substance"? **(2marks)**
- b) How much heat will change 10g of ice water at 0°C to liquid water at 0°C ? Take specific latent heat of fusion of ice = 340 J/g . **(2marks)**
- c) i) At what temperature does evaporation occur ? **(1mark)**
ii) What causes the evaporation to happen rapidly? **(3marks)**
- d) Explain how our bodies keep temperature constant after a vigorous exercise. **(2marks)**

17 a) State effects of electric current which show its existence. **(3marks)**

b) The opposition of a conductor to current flow is called its resistance.

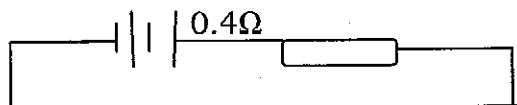
i) What effect does increasing temperature of the filament of an electric lamp have on the resistance of the filament? **(1mark)**

ii) Which has more resistance, a thin conductor wire and a thick conductor wire? **(1mark)**

c) Define the term 'electromotive force of a cell'. **(2marks)**

d) The electromotive force of two dry cells is 3.0 V. The internal resistance of each cell is 0.3Ω . A resistor of 0.4Ω is connected in series to the two cells which are arranged in series.

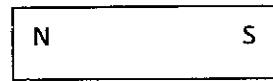
Calculate the current. (See diagram below) **(3marks)**



18) a) What is meant by a "magnetic material"? Give an example of a magnetic material. **(2marks)**

b) State any two methods of magnetizing a steel bar. **(2marks)**

c) The diagrams below are bar magnets.



Copy the diagrams and show magnetic lines of force around them. Show the neutral point on the diagrams. **(3marks)**

d) Why is it bad to heat or hammer a bar magnet? **(1mark)**

e) How is a magnet used to show geographical directions on earth? **(2marks)**

19 a) What is meant by a body moving with a uniform acceleration? **(2marks)**

b) A car travelling at 10 m/s accelerates uniformly for 5s and reaches a velocity of 20 m/s. Calculate the acceleration. **(3marks)**

c) A bus driver, travelling at 25m/s, applies his brakes and stops with uniform retardation in 20 s.

(i) What is meant by uniform retardation? **(2marks)**

(ii) Calculate the retardation.

(3marks)

SECTION C: Attempt one question (15marks)

20. In an experiment to determine the rate of change of temperature of water when the supply of heat was constant, the following results were obtained :

Time / minutes	Temperature / $^{\circ}\text{C}$
1	35
3	55
5	75
7	95
8	95
9	95

a) On a graph paper, plot a graph of temperature (along y-axis) against time (along x-axis).

(10marks)

b) Using your graph; find:

(i) The room temperature where the experiment was conducted. (1mark)

(ii) The boiling temperature of water. (1mark)

(iii) The slope (gradient) of the graph, then state the rate of change of temperature of water.

(3marks)

21) In an experiment to determine the density of steel, a number of pieces of iron with different masses were used. The volume and the mass of each piece of steel were measured. The table below shows the results obtained.

Volume / cm^3	Mass/g
2	16
3	25
4	32
5	38
6	48
7	56

a) Plot a graph of mass (along y- axis) against volume (along x – axis).

(10marks)

b) Determine the slope of the graph and show how you determine the slope.

(3marks)

c) Determine the density of the steel.

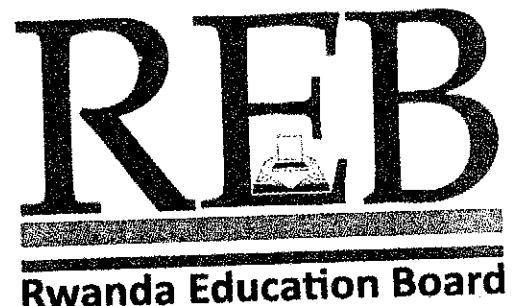
(2marks)

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Physics I

011

13/11/ 2015 08.30AM - 11.30AM



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2015

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) Write your names and index number on the answer booklet as they appear on your registration form and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
- 2) Do not open this question paper until you are told to do so.
- 3) This paper has **THREE** sections **A**, **B** and **C**.

SECTION A: Attempt **ALL** questions. **(55marks)**

SECTION B: Attempt any **THREE** questions. **(30marks)**

SECTION C: Attempt **ONLY ONE** question. **(15marks)**

- 4) Calculators and mathematical instruments may be used.
- 5) Use **only blue or black pen and pencil**.
- 6) Calculators and mathematical instruments may be used.

SECTION A: ATTEMPT ALL QUESTIONS. (55MARKS)

- 1) A piece of steel has a volume of 12cm^3 and mass of 96g.
Find the density of the steel. Express the answer in kg/m^3 . **(3marks)**
- 2) What is the difference between "distance" and "displacement"? **(3marks)**
- 3) (a) What is meant by the term "acceleration of a moving body"? **(1mark)**
(b) The velocity of a car slows down uniformly from 98 km/h to 48 km/h in 10 seconds. Calculate the deceleration of the car. **(2marks)**
- 4) Explain why standing passengers in a fast moving bus continue to move forward when the bus stops suddenly. **(3marks)**
- 5) (a) Which quantity has the same unit as energy? **(1mark)**
(b) An engine force of 5000N pulls a car 100m. Find the work done by the engine. **(2marks)**
- 6) (a) What is meant by "mechanical advantage" of a machine? **(1mark)**
(b) What does the mechanical advantage of a machine depend on? **(1mark)**
(c) Write the equation relating mechanical advantage, velocity ratio and efficiency of a machine. **(1mark)**
(d) What are pulleys used for? **(1mark)**
- 7) (a) Why is it painful to carry a heavy parcel by a thin string? **(2marks)**
(b) A block of metal produces an average pressure of 1000N/m^2 when resting on a flat surface of area 0.5 m^2 . Find the force exerted by the block. **(2marks)**
- 8) (a) Define the term "specific latent heat" of a substance. **(2marks)**
(b) 17600J is given up when 8g of steam at 100°C condenses to 8g of water at 0°C .
Find the specific latent heat. **(2marks)**
- 9) (a) Give an example of self luminous object. **(1mark)**

- (b) Define the term a “light ray”. **(1mark)**
- (c) A beam of light rays may be parallel, diverging or converging. Which type of beam of rays is produced by headlamps of a car at night? **(1mark)**
- (d) State any one property of light. **(1mark)**
- 10) (a) State the laws of reflection of light at a plane surface. **(2marks)**
- (b) What is a simple periscope made of? **(1mark)**
- (c) What is the use of a simple periscope? **(1mark)**
- 11) (a) Why are plastic materials used to cover copper wires carrying electricity? **(2marks)**
- (b) The current I passing a section of a wire is 4 coulombs per second. Calculate the quantity of charge passing the section of the wire. **(2marks)**
- 12) (a) Define the following terms:
- (i) Potential energy. **(1mark)**
- (ii) Kinetic energy. **(1mark)**
- (b) A car of mass 1000kg runs at a speed of 20m/s. Calculate the kinetic energy of the car. **(2marks)**
- 13) (a) What is the disadvantage of primary cells? **(1mark)**
- (b) What is the advantage of secondary cells? **(1mark)**
- (c) Where are secondary cells used? **(2marks)**
- 14) (a) State any two methods of making magnets. **(2marks)**
- (b) How can a magnet be demagnetized? **(2marks)**
- 15) (a) What is a magnetic field? **(1mark)**
- (b) Why are magnetic fields vectors? **(2marks)**

(c) Between two like poles of a bar magnet there is point called neutral point. What is this neutral point?

(1mark)

SECTION B: ATTEMPT THREE QUESTIONS ONLY. (30MARKS)

16) (a) State laws of refraction of light?

(2marks)

(b) Why does a ray of light travelling from air through a glass block bend towards the normal at the point where it enters the glass block?

(2marks)

(c) When white light passes through a triangular glass prism it is refracted and different colours are produced.

(i) Why is the white light split into many colours?

(1mark)

(ii) Which colour is refracted most?

(1mark)

(iii) Which colour is refracted least?

(1mark)

(iv) Name the colours in order starting with the least refracted to the most refracted.

(1mark)

(d) Which lens causes a beam of white light parallel to the principal axis:

(i) to converge to a real focus?

(1mark)

(ii) to diverge from a virtual focus?

(1mark)

17) (a) What is meant by the term "centre of gravity of a body"?

(2marks)

(b) Mention the equilibrium states of a body.

(3marks)

(c) Why is a tall person more likely to topple (fall down) when climbing a mountain than a short person?

(2marks)

(d) A uniform metre rule is balanced at the 40cm mark when a load of 3N is hung at 10cm mark. Find the mass of the metre rule. Take $g = 10\text{N/kg}$.

(3marks)

18) (a) Explain the meaning of the following terms:

(i) Temperature of a substance.

(1mark)

(ii) Heat of a substance.

(1mark)

(iii) The lower fixed point on Celsius scale of temperature.

(1mark)

- (b) Mercury and alcohol are used in thermometers.
(i) State two properties of these liquids which make them suitable for use in thermometers. (2marks)
(ii) Why is alcohol thermometer more suitable for measuring low temperatures? (2marks)
- (c) Convert 30°C to Kelvin scale of temperature. (2marks)
- (d) Why does a clinical thermometer have a constriction above its bulb? (1mark)
- 19) (a) Explain the meaning of the following terms:
(i) A good conductor of electricity. (1mark)
(ii) A bad conductor of electricity. (1mark)
- (b) Which of the following has more resistance to the flow of electric current : A long thin good conductor wire of electricity, and a short thick good conductor wire? Explain your answer. (3marks)
- (c) Three resistors of 2 Ohms, 4 Ohms and 6 Ohms are first connected in series and then disconnected and again connected in parallel. Determine the resistance:
(i) In series. (1mark)
(ii) In parallel. (2marks)
- (d) What are the advantages of connecting resistors in parallel in a simple electric circuit? (2marks)
- 20) (a) Describe the structure of a simple mercury barometer. (4marks)
- (b) A height of the mercury column in a barometer is found to be 67.0 cm at a certain place. What would be the height of a water barometer at the same place? Density of mercury is $1.36 \times 10^4 \text{ kg/m}^3$ and density of water is $1.0 \times 10^3 \text{ kg/m}^3$. (3marks)
- (c) A man blows into one end of a U - tube containing water until the levels differ by 40.0 cm. If the atmospheric pressure is $1.01 \times 10^5 \text{ N/m}^2$ and the density of water is 1000 kg/m^3 , calculate his lung pressure. (3marks)

SECTION C: ATTEMPT ONE QUESTION ONLY. (15MARKS)

- 21) The table below shows the velocity of a moving body and the time taken by the body.

Time /s	Velocity/m.s ⁻¹
0	0
1	2
2	4
3	6
4	8
5	10

- (a) Plot the graph of velocity along vertical axis and time along horizontal axis using the data given in the above table. **(10marks)**
- (b) Determine the slope of the graph. Show on the graph how you find the slope. **(3marks)**
- (c) What does the slope represent? **(1mark)**
- (d) From the graph determine the velocity of the body when time is 2.5s. **(1mark)**

- 22) In an experiment to measure the unknown resistance by the ammeter – voltmeter method, a student obtained the following results.

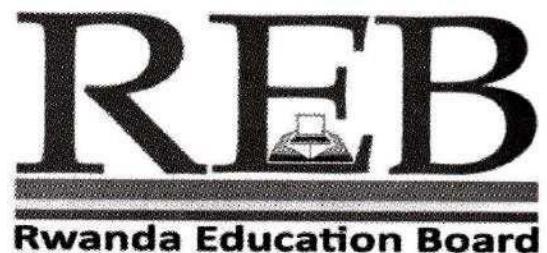
Voltmeter reading/V	Ammeter reading /A
2.0	1.0
3.0	1.5
4.0	2.0
5.0	2.5
6.0	3.0
7.0	3.5

- (a) Plot the graph of potential difference, V (y - axis) against current, I (x - axis). **(10marks)**

- (b) Determine the slope of the graph. Show on the graph how you
find the slope. **(3marks)**
- (c) State the relationship between the resistance, potential difference
and current. **(2marks)**

Physics I
011

31/ 10/ 2014 08.30 am – 11.30 am



ORDINARY LEVEL NATIONAL EXAMINATIONS, 2014

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

1. Do not open this question paper until you are told to do so.
2. This paper consists of **three** sections **A, B and C**

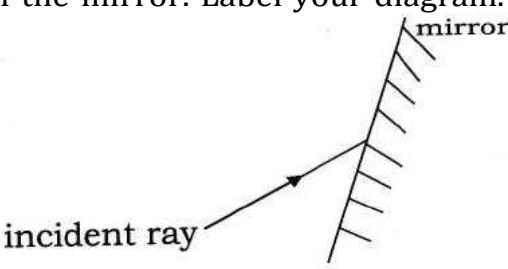
SECTION A: This section is compulsory **(55 marks)**

SECTION B: Attempt any **THREE** questions. **(30 marks)**

SECTION C: Attempt only **one** question. **(15 marks)**

3. Calculators may be used.
4. **Use only blue or black pen and pencil.**

SECTION A: Attempt all questions from this section. (55 marks)

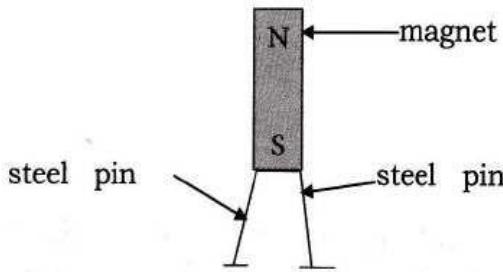
1. The following are quantities common in Physics: mass, weight, density, force, velocity and speed. Which quantities are:
(a) Vectors? (1.5 marks)
(b) Scalars? (1.5 marks)
2. Why is the density of sea water not the same as the density of distilled water? (3 marks)
3. Explain why solids have a fixed shape? Use the kinetic nature of molecules in solids to explain your answer. (3 marks)
4. Why is the sharp edge of a knife thin? (3 marks)
5. (a) What is the unit of power? (1 mark)
(b) A man lifts 50 kg of sugar through a vertical distance of 1.5 m. Calculates the work done. Take $g = 10 \text{ N / kg}$. (2 marks)
6. (a) What is the difference between displacement and distance? (2 marks)
(b) A car has a velocity of 60 km/h . How far does it travel in 20 minutes? (2 marks)
7. (a) Explain why water has maximum density at about 4°C . (2 marks)
(b) Give two reasons to explain why mercury is a good liquid for use in a thermometer. (2 marks)
8. (a) Explain why a pencil that is partly immersed in a liquid, appears bent at the surface. (2 marks)
(b) The figure below shows a ray of light travelling towards the face of a plane mirror. Copy the diagram and complete its path after leaving the surface of the mirror. Label your diagram. (2 marks)

9. (a) What factors does conduction of heat in solids depend on? (2 marks)
(b) Although the earth absorbs a lot of heat from the sun during the day, its temperature does not continue to rise every day. Explain this phenomenon. (2 marks)
10. Explain each of the following:
(a) Experiments on electrostatics do not work well on humid days. (2 marks)

(b) An uncharged metal rod causes the leaf of a charged electroscope to collapse. **(2 marks)**

11. A 1.5 V cell has an internal resistance of 0.25Ω . It is connected in series with a 0.35Ω resistor, what current flows? **(4 marks)**

12. (a) Which of the following materials are strongly attracted by a magnet: wood, iron, glass and nickel? **(1 mark)**

(b) Explain why two steel pins hang from the end of a vertical bar magnet do not hang vertically. **(3 marks)**



13. (a) Explain why, when a stone is thrown upwards it rises and then falls to the ground again. **(3 marks)**

(b) A student of mass 60 kg runs with a velocity of 2 m/s. Calculate the kinetic energy. **(1 mark)**

14. (a) Explain why, in house electric lamps are connected in parallel. **(2 marks)**

(b) A circuit consists of 6.0Ω and 3.0Ω in parallel arrangement and a p.d of 12 V is connected across the whole circuit. Calculate the current in the circuit. **(2 marks)**

15. (a) Explain why in a pin-hole camera, the size of the hole must not be too large. **(1 mark)**

(b) State properties of an image formed in a pin-hole camera. **(3 marks)**

SECTION B: ATTEMPT ANY THREE QUESTIONS. (30 marks)

16. (a) Give an example of
(i) a luminous object. **(1 mark)**
(ii) a non-luminous object **(2 marks)**

(b) Why are translucent glasses used in toilet windows? **(2 marks)**

(c) What is the difference between the principal focus of a converging lens and the principal focus of a diverging lens? Illustrate your answer using diagrams of these lenses. **(5 marks)**

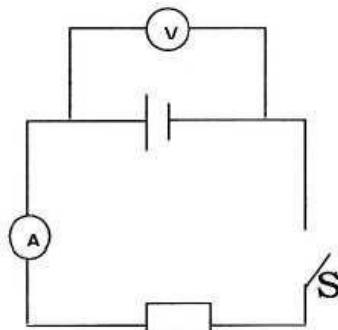
(d) Give an application of a diverging lens. **(2 marks)**

17. (a) Why do corrugated iron sheet roofs make cracking noises as a day gets hotter and as the day gets colder? **(3 marks)**

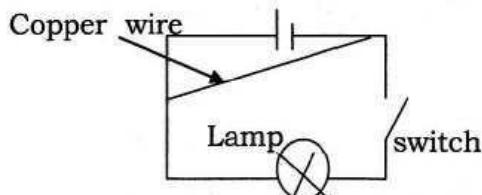
(b) Why are immersion heaters placed at the bottom of hot water tanks? **(3 marks)**

- (c) Why does milk in a bottle keep cool when the bottle stands in water in a porous pot in dry weather days? **(2 marks)**
 (d) How much heat is needed to raise the temperature by 10°C of 5 kg of a substance of specific heat capacity $300\text{J/kg.}^{\circ}\text{C}$? **(2 marks)**

18. (a) State any two effects of an electric current. **(2 marks)**
 (b) Why does a voltmeter have a high resistance while an ammeter has a low a low resistance? **(2 marks)**
 (c)



The voltmeter, V and the ammeter, A readings in the circuit above when switch S is open are 3.0 V and 0.0 A and when the switch is closed are 2.4 V and 2.0 A. Calculate the internal resistance of the cell. **(3 marks)**
 (d) The diagram below shows a lamp, a battery, a switch and a copper wire.



- (i) When the switch is on, the lamp does not give light. Explain why. **(2 marks)**
 (ii) What is this effect called? **(1 mark)**

19. (a) Calculate the pressure exerted on a level ground by a man whose mass is 70 kg and the area of his both feet is 250 cm^2 . Give the answer in Pascal (Pa). Take $g = 10\text{ N/kg}$. **(2 marks)**
 (b) Explain why water is not suitable as a barometer liquid. **(3 marks)**
 (c) Explain how it is possible to drink a fanta drink using a straw. **(3 marks)**
 (d) Why is an aneroid barometer better for measuring pressure at various altitudes? **(2 marks)**

20. (a) What is meant by term **inertia** of a body? **(2 marks)**
 (b) What is the relation between force F, mass m and the acceleration produced by a moving body? **(1 mark)**
 (c) The force in a rope pulling a body is 100 N. the mass of the body is 40 kg and the frictional force is 20 N.
 (i) Find the resultant force. **(1 mark)**
 (ii) Calculate the acceleration **(2 marks)**

- (d) State Newton's third law. **(2 marks)**
(e) Why does one feel pain when he/she boxes or hits a hard surface with a fist? **(2 marks)**

SECTION C: ATTEMPT ONLY ONE QUESTION. (15 marks)

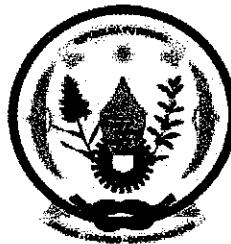
21. Describe an experiment you can carry out to determine the density of a very small piece of dry wood which has irregular shape. The piece of wood does not sink into water. **(15 marks)**
22. (a) With aid of a labelled diagram describe an experiment to show how the heat radiated from a hot object depends on the nature of the surface. **(12 marks)**
(b) State three applications of this effect. **(3 marks)**

Physics I

011

01/11/ 2013 08.30am - 11.30am

REPUBLIC OF RWANDA



RWANDA EDUCATION BOARD

ORDINARY LEVEL NATIONAL EXAMINATIONS 2013

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS :

1. Do not open this question paper until you are told to do so.
2. This paper has **THREE** sections **A, B** and **C**:

SECTION A : This section is compulsory **(55 marks)**

SECTION B : Attempt any **three** questions **(30 marks)**

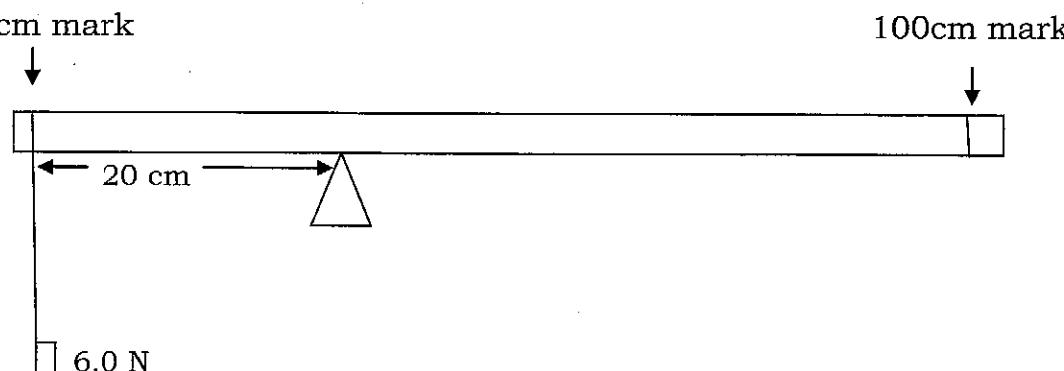
SECTION C : Attempt **Only one** question. **(15 marks)**

3. Calculators may be used.
4. Use only blue pen and pencil.

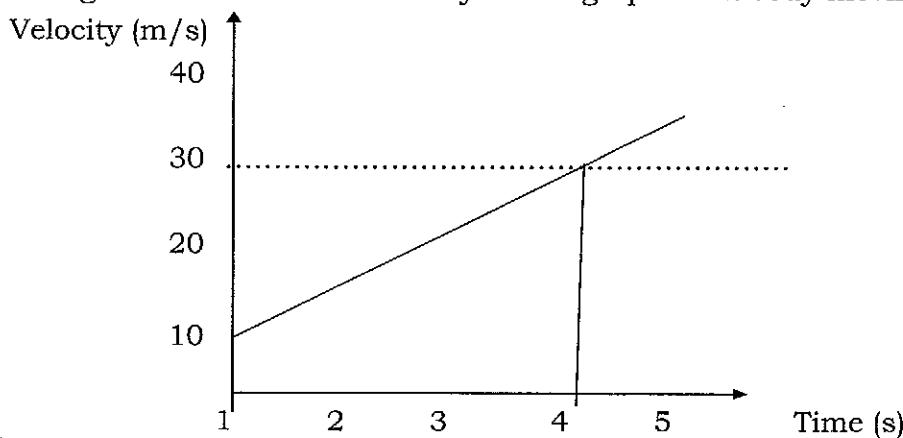
SECTION A : ATTEMPT ALL QUESTIONS (55 marks)

1. a) What is the instrument used to measure the density of milk called? **(1mark)**
b) The density of salt is 2.16 g/cm^3 . What is the volume of 216 g of salt? **(2marks)**

2. The diagram below shows a uniform metre rule balanced horizontally when a force of 6.0 N is hang at 0 cm mark. Calculate the weight of the metre rule. **(3 marks)**



3. The figure below shows a velocity – time graph for a body moving with uniform acceleration.



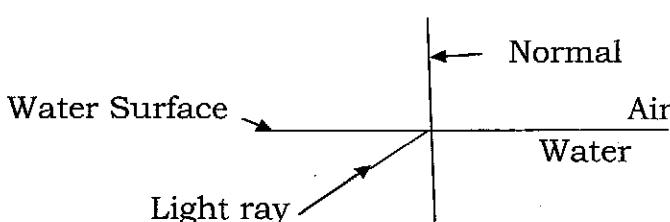
From the above graph:

- a) What is the initial velocity? (1mark)

b) What is the distance moved in 5 seconds? (2marks)

4. The mass of a rectangular block of dimensions $5\text{ m} \times 1\text{ m} \times 2\text{ m}$ is 50kg. What is the minimum pressure that it can exert? Given that 1kg exerts a force of 10N. (3marks)

5. a) Copy the diagram below and complete it to show the path of the ray of light travelling from water to air. Angle of incidence is greater than critical angle.



- b) Why does the ray of light take the path you have shown ? **(1mark)**

6. a) What is a neutral point in a magnetic field ? **(2marks)**

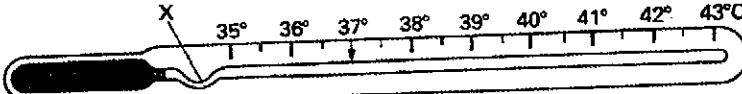
b) State any two methods of making a magnet in a laboratory. **(2marks)**

7. a) What is meant by specific latent heat of vaporization? **(1mark)**

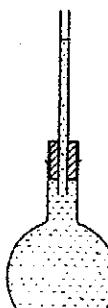
b) State two factors which affect the boiling point of water. **(2marks)**

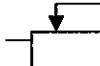
c) What is the heat needed to change 0.8 kg of water at 100°C to steam? **(2marks)**

Specific latent heat of vaporization of water = 2.26×10^6 J/kg.

8. a) What is the difference between energy and power ? **(2marks)**
 b) What is the power of a water pump which can lift 100kg of water through a vertical height of 5m in 10s. Take $g = 10\text{m/s}^2$. **(2marks)**
 c) A ball is held 2m above the ground and then released. List the energy changes which occur. **(1mark)**
9. a) State two electrical charges. **(2marks)**
 b) A positively charged rod AB is suspended horizontally at its midpoint. One end of a positively charged rod is brought just below end A. State what happens to the end A of the rod AB? **(1mark)**
 c) A current of 3A flows for 5s, what charges passes ? **(2marks)**
10. Three cells are arranged in parallel and connected to a 2 ohms resistor.
 a) Draw a simple electric circuit to represent this arrangement. **(2marks)**
 b) If each cell has a potential of 1.5V, calculate the current in the circuit. **(2marks)**
 c) If one cell is removed from the circuit, is there any change in the current in the circuit? **(1mark)**
11. a) Name two types of curved mirrors. **(2marks)**
 b) State two uses of a convex mirror. **(2marks)**
12. A measuring cylinder is filled with a liquid.
 a) What does the pressure of the liquid at the bottom depend on ? **(2marks)**
 b) If the depth of the liquid is 0.3m and the pressure it exerts at the bottom is 3000 Pa, find the density of the liquid. $g = 10\text{m/s}^2$. **(2marks)**
13. Give an example to justify that air of the atmosphere exerts force. **(4marks)**
14. The diagram below shows a thermometer used to measure the temperature of human body.
- 
- a) Name part X and state its function. **(2marks)**
 b) What happens when you place this thermometer under the tongue of a patient? **(1mark)**
 c) Why is the temperature range between 35°C – 43°C ? **(1mark)**

SECTION B : ATTEMPT ANY THREE QUESTIONS (30marks)

15. a) Name any two physical properties of matter which change with change of temperature. **(2marks)**
 b) Convert a temperature of 300 K to Celsius degrees, $^{\circ}\text{C}$. **(2marks)**
 c) Explain what is meant by the term “unusual expansion of water”. **(3marks)**
 d) Liquids expand when heated. The diagram below shows a flask full of water fitted with glass tube.
- 

- i. What happens when the flask is heated? (1mark)
- ii. What happens when you continue heating the water? (1mark)
- e) What effect does increase in pressure have on the melting point of ice? (1mark)
16. a) What are pulleys? (2marks)
- b) State two reasons why the efficiency of pulleys is always less than 100% (2marks)
- c) A pulley raises a load of sand of weight 30ON using an effort of 60N. What is the mechanical advantage of the system? (2marks)
- d) Efficiency of a machine is 80% and mechanical advantage is 4. Find the velocity ratio. (2marks)
- e) A pulley raises a load 4cm when an effort used moves 12cm. What is the velocity ratio? (2marks)
17. a) What is a lens? (2mark)
- b) State the properties of images formed in a converging lens when the object is nearer the lens than the focal point. (3marks)
- c) Give any two applications of a converging lens. (2marks)
- d) What are the characteristics of the images in a diverging lens? (3marks)
18. a) State Ohms' Law. (2marks)
- b) What voltage is needed to drive a current of 2.5A through a resistance of 2? (2marks)
- c) A voltmeter is connected in parallel in an electric circuit and an ammeter is connected in series in a circuit. Why? (4marks)
- d) i. What does the symbol below represent in an electric circuit?
- 
- ii. State the function of the symbol in d) i. (2marks)
19. a) Dry wood of weight 20N floats on water. What is the weight of the liquid displaced by the wood? (1mark)
- b) State Archimedes' principle. (2marks)
- c) A body weighs 24 N in air and when wholly immersed in water it weighs 12N. What is the relative density of the body? (2marks)
- d) A Ship is made of iron and some other materials but it does not sink into water. Why? (3marks)
- e) A balloon filled with some amount of a light gas when released, rises into air. At some point it stops rising and drifts sideway. Explain why the balloon rises and then stops rising. (2marks)

SECTION C : ANSWER ONE QUESTION ONLY (15marks)

20. a) List eight basic laboratory rules which ensure safety of pupils and the materials in the laboratory. (8marks)
- b) List any seven careers in which Physics is necessary. (7marks)
21. List five important ways in which science is useful in each of the cases below.
- a) Industries. (5marks)
- b) Work places (5marks)
- c) Our lives . (5marks)

Physics I

010

16 Nov.2012 8.30am 11. 30am

REPUBLIC OF RWANDA



RWANDA EDUCATION BOARD (REB)

ORDINARY LEVEL NATIONAL EXAMINATIONS 2012

SUBJECT : PHYSICS I

DURATION : 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A**, **B** and **C**.

Attempt **all** questions in section **A**. **(55 marks)**

Answer **any three** questions in section **B**. **(30 marks)**

Answer **only one** question in section **C**. **(15 marks)**

You may use a calculator and a mathematical instrument.

Use only a blue bic pen and a pencil for drawing only.

No other ink is allowed.

SECTION A: ATTEMPT ALL QUESTIONS (55 MARKS)

1. State three characteristics of magnetic field lines.
2. Find the magnitude of force which produces a moment of 200Nm about a fulcrum at a distance of 5.0 m from the line of action of the force. (3marks)
3. Why is a stool made with outwards slanting legs? (3marks)
4. Why is a convex mirror used as a side mirror on motor cars? (3marks)
5. A man lifts a weight of 300N through a vertical height of 5m in 10 seconds . Determine the man's power. (3marks)
6. Explain, using the kinetic theory, why the pressure of air inside a car tyre increases on a hot day. (4marks)
7. (a) Why is the density of rain water less than that of ocean water? (2marks)

(b) Calculate the density of a substance whose mass is 180g and volume 200cm^3 . (2marks)
8. (a) What is meant by the term force? (2marks)

(b) A force of 80N acts on a body and produces an acceleration of 2m/s^2 . What is the mass of the body? (2marks)
9. (a) What happens to water when it is heated

(i) from 0°C to 4°C ? (1mark)

(ii) from 4°C to 100°C ? (1mark)

(b) At what temperature does water have maximum density? Explain your answer. (2marks)
10. A battery of e.m.f 1.5V and internal resistance, r , is connected in series with a 4Ω resistor. The current in the circuit is 0.3A . Sketch a diagram to show this connection and calculate the internal resistance, r , of the battery. (4marks)
11. (a) State the principle of floatation. (1mark)

(b) Why does a balloon full of hydrogen gas rise when released? (3marks)
12. The table below shows speeds of a car accelerating on a straight road.

Time/s	0	1	2	3	4
Speed/ ms^{-1}	0	6	12	18	24

 (a) What is the acceleration of the car? (1mark)

 (b) Is the acceleration non-uniform? (1mark)

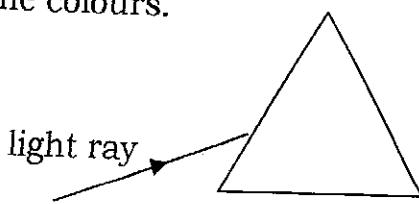
 (c) What distance does the car travel in 5 seconds ? (2marks)

13. (a) Why is water used to cool engines and radiators of vehicles? (2marks)
 (b) How much heat is needed to raise the temperature by 20°C of 4kg of a substance of specific heat capacity $300\text{J/kg}^{\circ}\text{C}$? (2marks)
14. (a) What is the coulomb? (2marks)
 (b) The current through a conductor is 6A . What is the charge which passes in 2 seconds? (2marks)
15. With aid of a diagram explain why it is possible to drink fanta from a fanta bottle using a drinking straw? (4marks)

SECTION B: ATTEMPT ANY THREE QUESTIONS. (30marks)

16. (a) What is meant by specific latent heat of vaporization? (2marks)
 (b) State two factors which affect the boiling point of water. (2marks)
 (c) Calculate the heat required to convert 0.9kg of water at 100°C to steam. Specific latent heat of vaporization of water = $2.26 \times 10^6 \text{ J/Kg}$. (3marks)
 (d) What is the difference between boiling and evaporation? (3marks)
17. (a) Differentiate a concave lens from a convex lens. (3marks)
 (b) What is meant by principal axis of a lens? (2marks)
 (c) An object is placed between the principal focus of a convex screen. Sketch a diagram to show the image formed and state characteristics of this image. (5marks)
18. (a) Which property of transmission of pressure in liquids is used in hydraulic press and hydraulic car brakes? (1mark)
 (b) What is the other unit of pressure that is the same as 1N/m^2 ? (1mark)
 (c) Name the instrument that is used to measure the pressure of the atmosphere and which does not contain a liquid? (1mark)
 (d) A hydraulic press has a large circular piston of radius 80 cm and a circular plunger of radius 10cm. A force of 200N is exerted by the plunger.
 (i) Find the force exerted on the piston. (6marks)
 (ii) State one reason why the weight of the load just raised by the piston is less than the force obtained. (1mark)
19. (a) What is the use of a fuse in an electric circuit? (3marks)
 (b) Draw a diagram showing an electric circuit consisting of one battery of voltage 1.5 V, two parallel lamps and an ammeter to read the total current flow in the circuit. Calculate the current if the resistance of each lamp is 3Ω . (7marks)

20. (a) What is meant by dispersion of light? **(2marks)**
- (b) Explain how a rainbow is formed. **(3marks)**
- (c) The diagram below is a glass prism. A beam of white light strikes the face of a prism as shown. Copy the diagram below and show how the white light is splits into its component colours. Label the colours. **(5 marks)**



SECTION C: ATTEMPT ONLY ONE QUESTION. (15marks)

21. A student carried out an experiment to determine the electrical resistance, R , of six lengths, L , of a wire. R is measured in Ohms and L is measured in metres. Below are the results obtained.

L/M	5.0	6.0	7.0	8.0	9.0	10.0
R/Ω	2.0	2.4	2.8	3.2	3.8	4.0

- (a) Plot the graph of R against L (plot R **along y-axis** and L **along x-axis**). **(9marks)**
- (b) Determine the slope (gradient) of the graph. Show on the graph how you determine the slope. **(4marks)**
- (c) Use the results from (b) above to calculate resistivity of the wire, P , given that $R = \frac{PL}{A}$ and cross section area of the wire $L = 0.50\text{mm}^2$. **(2marks)**

22. A student heated 5.0kg of water in a copper calorimeter. The student recorded the time and corresponding temperature. The table below shows the results obtained.

Time/Minutes	4	5	6	7	8	9
Temperature/°C	36	40	45	49	54	57

- (a) Plot a graph of temperature (**along y-axis**) against time (**along x-axis**). **(9marks)**
- (b) From the graph, determine room temperature. **(1mark)**
- (c) Use the graph to determine the rate of temperature change. **(5marks)**

Physics I

010

03 Nov. 2011 08.30 am – 11.30 am

REPUBLIC OF RWANDA



RWANDA EDUCATION BOARD (REB)
P.O.BOX 3817 KIGALI. TEL/FAX: 586871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2011

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

You may use a calculator and mathematical instruments.

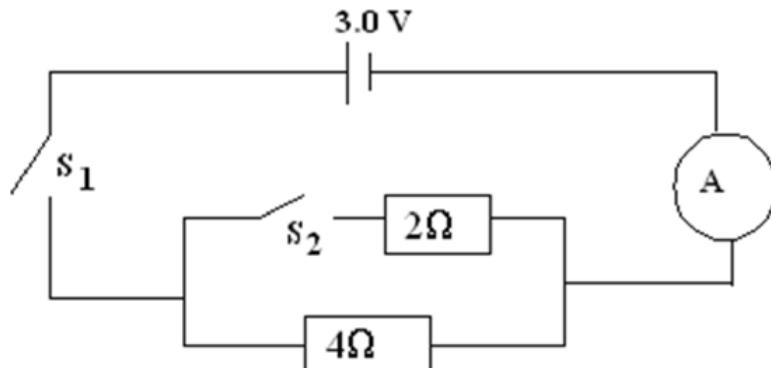
SECTION A: Attempt all questions from this section. (55 marks)

1. (a) What is meant by the term resistivity? (2 marks)
(b) Write an equation for resistivity. (1 mark)
2. State effects of electric current and give an example of each effect. (4 marks)
3. Draw a labelled diagram of a periscope and use light rays to explain how it functions. (4 marks)
4. What is the difference between a vector quantity and a scalar quantity? Give an example of each quantity. (4 marks)
5. (a) Sketch a distance-time graph showing
 (i) A motion of a body moving with uniform velocity. (2 marks)
 (ii) A body moving with non-uniform velocity. (2 marks)
(b) A car starts from rest and is accelerated uniformly at the rate of 3m/s^2 for 8 s. Find the distance travelled. (2 marks)
6. (a) Explain the term induced magnetism. (2 marks)
(b) Mention one method of demagnetizing a magnet. (1 mark)
7. Why is a tall person more likely to fall down while climbing a mountain? (4 marks)
8. Identify the interchange of energy between potential energy and kinetic energy for a swinging pendulum bob. (3 marks)
9. (a) Friction is useful in our daily lives. Mention two examples to justify this statement. (2 marks)
(b) What causes friction and how can it be prevented? (2 marks)
10. What do you understand by each of the following terms?
(a) Angular velocity. (1 mark)
(b) A period of swinging pendulum bob. (1 mark)
(c) Frequency of a swing pendulum bob. (1 mark)
11. (a) State factors influencing pressure in a liquid at a point in a liquid in equilibrium. (2 marks)
(b) With the aid of a diagram show that water finds its own level. (2 marks)
12. (a) A load 600 N is raised 0.3 m by a machine. If the effort applied is 200 N and it moves 1 m, find the efficiency of the machine. (2 marks)
(b) Why is the efficiency of a machine not a hundred percent? (2 marks)
13. Why does an iron left outside at night feel colder than a piece of dry wood? (4 marks)

14. In the electric circuit below, what will be the reading of the ammeter if S_2 is:

- (a) Open and S_1 closed?
(b) Closed and S_1 closed?

(2 marks)
(3 marks)



SECTION B: Attempt any THREE questions only. (30 marks)

15. (a) What is meant by the term real image as applied to optics. **(2 marks)**

(b) Distinguish between a concave mirror and a convex mirror. Give one application of each type of mirror. **(3 marks)**

- (c) An object is placed vertically at the center of curvature of a concave mirror.

(i) Use rays and draw a diagram to show how the image of this object is formed. **(3 marks)**

(ii) State the characteristics of this image. **(2 marks)**

16. (a) What effect does increase in pressure have on the melting point of ice? **(2 marks)**

(b) State two physical properties of water which change with temperature. **(2 marks)**

- (c) How much heat is needed to raise the temperature of a body with mass 4 kg by 8°C ? The specific heat capacity of the body is 300J/kg.K **(2 marks)**

(d) Find the amount of heat required to melt 100 g of lead initially at 25°C if the melting point of lead is 327°C . Specific heat capacity of lead is 140J/kg.K . Specific latent heat of fusion of lead is $2.7 \times 10^5 \text{ J/kg}$. **(4 marks)**

17. (a) Describe how you would use a gold leaf electroscope to determine the sign of the charges on a given charged body. **(4 marks)**

(b) Explain how an insulator gets charged. **(2 marks)**

- (c) Describe how a lightning conductor safeguards a tall building from being struck by lightning. **(4 marks)**

18. (a) What is inertia? **(2 marks)**

(b) With aid of a diagram explain how you can demonstrate inertia effect. **(4 marks)**

(c) State Newton's second law of motion. **(1 mark)**

(d) A block of mass 5000 g is pulled from rest on a horizontal frictionless surface by a constant force F. If the block travels 8 m in 2 s, find:

- (i) Acceleration **(1.5 marks)**
(ii) Force F. **(1.5 marks)**

19. (a) Differentiate between primary cells and secondary cells. **(2 marks)**
(b) What are the components of a simple direct current electric motor? **(3 marks)**
(c) Explain the term back e.m.f (electromotive force) of battery? **(2 marks)**
(d) What is the difference between a practical d.c motor and a simple d.c motor? **(3 marks)**

SECTION C: Attempt only ONE question. (15 marks)

20. Describe how you can verify the law of refraction of light (SNELL'S LAW) using the following apparatus: rectangular glass block, optical pins, plain paper, drawing pins, a ruler and a protractor. Illustrate your methods with aid of a diagram and show how you come to the conclusion. **(15 marks)**
21. Describe how you can determine the density of an irregular stone using the following apparatus: Eureka can, water, a small irregular stone, a thread, beam balance, measuring cylinder and a beaker. State sources of errors and all precautions you take to avoid errors in your experiment. **(15 marks)**

Physics I

010

04th Nov. 2010 08.30 – 11.30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O BOX 3817 KIGALI-TEL/FAX : 586871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2010

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

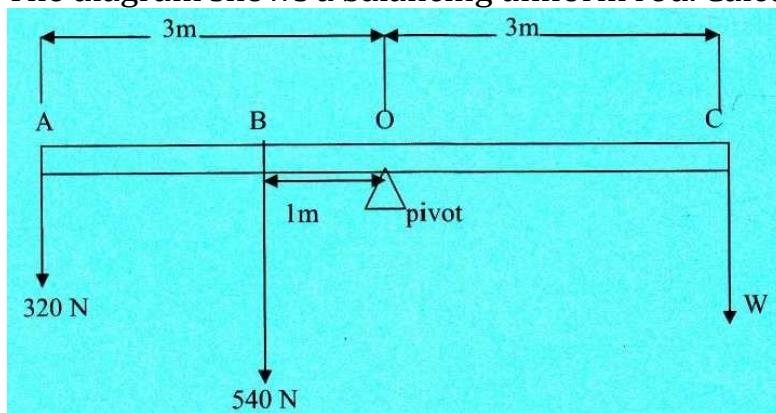
Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

You may use a calculator and mathematical instruments.

SECTION A: ANSWER ALL QUESTIONS**(55 MARKS)**

1. Explain what is meant by average speed. State the unit of average speed. **(3 marks)**
2. A force of 25 N acts on mass of 5 kg starting from the rest. Find the acceleration. **(3 marks)**
3. What is the difference between mass and weight? State the unit of each quantity. **(4 marks)**
4. Draw a cone (a) In a stable equilibrium, (b) In unstable equilibrium and (c) In a neutral equilibrium. **(3 marks)**
5. Calculate the power of a pump which can lift 300 kg of water through a vertical height of 8 m in 10 s, $g = 10 \text{ m/s}^2$. **(3 marks)**
6. (a) What is meant by the term density of body? **(2 marks)**
(b) A body has a volume of 15 cm^3 and mass of 27 g what is its density? Give the answer in kg/m^3 . **(3 marks)**
7. The diagram shows a balancing uniform rod. Calculate force W. **(4 marks)**



8. Show how a ray of light from the air passes through a glass block and explain why the ray behaves as you have shown in your diagram. **(5 marks)**
9. Draw an electric circuit composed of a dry cell, connectors, a resistors, ammeter and voltmeter to read the voltage across the resistor. **(4 marks)**
10. A student dropped iron filings into sugar bowl by accident. Explain how sugar can be separated from the mixture. **(3 marks)**
11. (a) List energy changes which occur when a torch is switched on. **(2 marks)**
b) Which are other sources of electricity other than hydroelectric power in Rwanda? **(3 marks)**

12. Two cells each having an e.m.f of 1.5 V and internal resistances of $2\ \Omega$ are connected (a) In parallel and (b) In series. Find the current in each case when the cells are connected to a $1\ \Omega$ resistor. **(4 marks)**

13. (a) State Archimedes 'principle. **(2 marks)**

b) A piece of a metal is weighed

i. In air

ii. Fully submerged in water

iii. Fully submerged in a salt solution

The results obtained, but not in correct order, were 6 N, 5 N and 8 N.

Which reading was obtained for b (i), b (ii) and b (iii)?

(3 marks)

14. Explain how heat is transferred in water. **(4 marks)**

Section B: Answer only THREE questions (30 marks)

15. (a) Define the term specific heat capacity of a substance. **(3 marks)**

(b) A piece of Aluminium of mass 600 g is heated from 25°C to 100°C . How much heat is supplied if the specific heat capacity of aluminium 900 J/kg.K ? What is the heat capacity of this metal? **(7 marks)**

16. (a) What is meant by

(i) Potential energy? **(2 marks)**

(ii) Kinetic energy? **(2 marks)**

(b) An orange of mass 80 g falls from its tree 2 m high above the ground. Calculate the potential energy of the orange before it falls its tree.

Find the kinetic energy of the orange as it hits the ground. **(6 marks)**

17. (a) Distinguish between a converging lens and diverging lens. **(3 marks)**

(b) What is meant by the term focal point of a lens? **(1 mark)**

(c) An object 1 m tall stands vertically on the principal axis of a converging lens of focal length 4 cm. Determine the nature of the image if the object is 8 cm from the optical center of the lens. **(6 marks)**

18. (a) Which instrument would you use to measure atmospheric pressure? **(1 mark)**

(b) With aid of a diagram show and explain that air of atmosphere exerts force. **(7 marks)**

(c) Calculates the pressure exerted by water at 10 m below the surface of the water in a lake. $g = 10\text{N} / \text{kg}$ and density 1000 kg/m^3 . **(2 marks)**

19. A car of mass 15000 kg travelling at 72 km/h is brought to rest in 5 s.

Find

(a) The average deceleration **(4 marks)**

(b) The average breaking force. **(3 marks)**

(c) The distance moved during the deceleration **(3 marks)**

Section C: Answer only ONE question. (15 marks)

20. (a) Draw a labelled electric diagram which you can use to determine the unknown resistor in a circuit. **(4 marks)**

(b) A student carried out an experiment to determine the resistance of a conductor.

The table shows the results obtained:

Potential difference /V	Current / A
1.2	0.6
2.2	1.1
4.0	2.0
6.4	3.2

(i) Plot a graph (potential difference along Y-axis and current along X-axis). **(7 marks)**

(ii) What law may be determined from the graph? **(1 mark)**

(iii) Find the resistance of the conductor from the graph. **(3 marks)**

21. A student carried out an experiment to determine the density of a liquid. Different masses of the liquid were measured and their respective volumes. The table below shows the results obtained.

Mass /g	Volume / cm³
4	5
8	10
12	15
16	20
20	25
24	30

(a) Plot a graph of mass (Y-axis) against volume (X-axis). **(9 marks)**

(b) Does the graph start from the origin? Explain your answer. **(4 marks)**

(c) Determine the density of the liquid from the graph.

Show on the graph how you get your answer. **(2 marks)**

Physics I

010

03rd Nov. 2009 08.30 – 11.30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O BOX 3817 KIGALI-TEL/FAX : 586871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2009

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

You may use a calculator and mathematical instruments.

Show all your working

SECTION A: ANSWER ALL QUESTIONS**(55 MARKS)**

1. (a) Why is the density of the ocean water greater than the density of rain water? **(2 marks)**
(b) 5000 cm³ of paint has a mass of 6.5 kg. Calculate the density of the paint. **(2 marks)**
2. (a) What is force? **(1 mark)**
(b) Name any 2 types of forces. **(2 marks)**
3. Give a molecular explanation of why the viscosity of some fluids decreases when the temperature of the liquids increases. **(2 marks)**
4. The hind tyres of a tractor are larger than those of a car. Give a scientific explanation for this difference. **(4 marks)**
5. The pressure in water pipe at a mouth of a tap is 3×10^3 Pa. What is the height of the water pipe? $g = 10 \text{ m/s}^2$ and the density of water is 1000 kg/m^3 . **(4 marks)**
6. A train increases its speed steadily from 10 m/s to 20 m/s in 1 minute.
Find:
(a) The average speed of the train during this time in m/s. **(2 marks)**
(b) The distance the train travels while increasing its speed. **(2 marks)**
7. A tall person is more likely to fall while climbing a mountain than a short person. Why is this possible? **(3 marks)**
8. (a) How much work is transferred when a load of 5000 N is lifted through a distance of 300 m? **(2 marks)**
(b) What is the power of a person weighing 600 N who runs up stairs in 2 s? The stairs are made of 10 steps each 15 cm high. **(2 marks)**
9. (a) Calculate the K.E for a car of mass 900 kg travelling at a speed of 30 m/s. **(2 marks)**
(b) Calculate the potential energy of a mass 900 kg that has been lifted a distance of 20 m. $g = 10 \text{ N/kg}$ **(2 marks)**
10. (a) State any two methods of heat transfer. **(2 marks)**
(b) Explain why on a cold day the metal handle bars of a bicycle feel cold than the rubber grips. **(3 marks)**
11. (a) What is the difference between boiling and evaporation? **(2 marks)**
(b) What mass of cold water at 10°C should be added to 50 kg of hot water at 90°C so that the final temperature of water is 58°C? The specific heat capacity of water is 4200 J/kg.°C. **(2 marks)**
12. (a) Which are the types of electric charges? **(2 marks)**

- (b) Find the charge when a current of 4 A flows for 5 minutes. **(2 marks)**
13. (a) Write the equation linking resistance, potential difference and current. **(2 marks)**
(b) Find the potential difference across a $20\ \Omega$ resistor if a current of 0.5 A flows. **(2 marks)**
(c) Why might a filament lamp blow at the moment you switch it on? **(1 mark)**
14. What is the use of soft iron pieces called keepers? **(2 marks)**
15. (a) What is the difference between reflection of light and refraction of light? **(2 marks)**
(b) Differentiate between regular reflection of light and diffuse reflection. **(2 marks)**
- SECTION B: Attempt any THREE questions in this section. (30 marks)**
16. (a) Differentiate between a vector quantity and a scalar quantity and give two examples of each quantity. **(4 marks)**
(b) What is meant by a non-uniform velocity? **(1 mark)**
(c) A car moving with a velocity of 10 m/s accelerates uniformly at the rate of 3 m/s^2 to reach 34 m/s Find:
i. The time taken. **(2 marks)**
ii. The distance travelled in this time. **(3 marks)**
17. (a) What is meant by
i) e.m.f of a battery **(2 marks)**
ii) Internal resistance of a battery? **(2 marks)**
(b) A battery of e.m.f 1.50 V has a terminal p.d. of 1.25 V when a resistor of $25\ \Omega$ is joined to it. Calculate the current flowing, the internal resistance r and the terminal p.d when a resistor of 10 Ohms replaces the $25\ \Omega$ resistor. **(6 marks)**
18. (a) How can you distinguish between a converging lens and a diverging one? **(4 marks)**
(b) Explain the meaning of the focal length of a lens. **(2 marks)**
(c) Draw a diagram showing how a converging lens can form a real image the same size as the object. **(2 marks)**
(d) State any two characteristics of the image formed by a diverging lens. **(2 marks)**
19. (a) What is meant by the term heat capacity of a substance? State the unit of heat capacity. **(3 marks)**
(b) The food takes longer to cook in boiling water at higher point on a mountain than at bottom of a mountain. Explain. **(4 marks)**
(c) Why does the water have maximum density at 4°C ? **(1 mark)**
(d) $9.9 \times 10^5\text{ J}$ of heat is required to change 3 kg of ice at 0°C to water at 0°C . Find the specific latent heat of fusion of ice. **(2 marks)**

20. (a) Why is electricity transmitted at high voltages? **(2 marks)**
 (b) Explain the work of transformers. **(5 marks)**
 (c) Main electricity supply is dangerous. How is it made safe to use? **(3 marks)**

SECTION C: Attempt one question from this section. (15 MARKS)

21. The table 1 represents the variation of time with velocity of moving body.

Time (s)	Velocity (m/s)
0	0
2	5
4	10
6	15
8	20

Table 1

- (a) Plot a velocity-time graph (velocity along Y-axis and time along X-axis) using the data in table 1. **(9 marks)**
 (b) Show on the graph how you determine the gradient of the graph. **(3 marks)**
 (c) Calculate the gradient. **(2 marks)**
 (d) What does this gradient represent? **(1 mark)**

22. A student heated some water and recorded temperature, $\theta^{\circ}\text{C}$, and corresponding time, t minutes. See table 2.

Time, t (minutes)	Temperature θ ($^{\circ}\text{C}$)
2	35
4	44
8	65
12	86
14	95
16	95

Table 2

- (a) Plot a graph of temperature, $\theta^{\circ}\text{C}$ (along Y-axis) against time, t minutes (along X-axis). Use data in table 2. **(9 marks)**
 (b) Draw the best fit line and show how you determine the gradient of the graph. **(3 marks)**
 (c) Calculate the gradient. **(2 marks)**
 (d) What is the initial temperature of the water? **(1 mark)**

PHYSICS I

010

03/11/2008 08.30 – 11.30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O BOX 3817 KIGALI-TEL/FAX : 586871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2008

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

You may use a calculator and mathematical instruments.

Show all your working

SECTION A: ANSWER ALL QUESTIONS**(55 MARKS)**

1. a) Which instrument would you use to measure accurately very small length as diameter of thin wire? **(1 mark)**
b) How do you determine a vernier scale which uses a millimeter scale? **(2 marks)**
2. a) Why does a piece of dry wood float on water? **(1 mark)**
b) A cylindrical metal has a diameter of 14cm and a height of 5 cm. Find its mass if its density is 19g/cm^3 . (Take $\pi = \frac{22}{7}$) Express the answer in kg. **(2 marks)**
3. a) Explain why speed is a scalar quantity while velocity is a vector quantity. **(2 marks)**
b) Give one other example of a vector quantity. **(1 mark)**
4. a) A liquid has no definite shape. Why? **(1 mark)**
b) Explain why the volume of air changes without changing its mass. **(2 marks)**
5. a) A force of 10N is exerted on the ground. The area in contact with the force is 0.002 m^2 . Calculate the pressure exerted by the force. **(2 marks)**
b) What effect does the increase of the surface area in contact with the force have on the pressure exerted in 5 (a). **(1 mark)**
6. a) State Archimedes' principle. **(2 marks)**
b) A ship of mass 1030 tons floats in sea-water. What volume of sea-water does the ship displace? Density of sea-water is 1030kg/m^3 . **(2 marks)**
7. a) Name the force which keeps a body to move in a circle. **(1 mark)**
b) What is meant by angular velocity? **(2 marks)**
c) State the unit of angular velocity. **(1 mark)**
8. a) Explain what is meant by static friction. **(3 marks)**
b) Give one reason why friction is important in our daily lives. **(1 mark)**
9. a) A force of 100N is used to push a wheel barrow 300m away. Calculate the work done by the force. **(2 marks)**
b) An electric motor is used to raise a load in a vertical height of 2.5m in 4s. Calculate the power of the motor. **(2 marks)**
10. Explain how a convection process takes place in water. Use a labelled diagram to make your answer clear. **(4 marks)**
11. a) A beaker contains 150g of water at 20°C . Three grams of ice at 0°C are added to the water which is stirred until the ice melts completely.
a) Calculate the amount of heat required to melt all the ice completely. **(1 mark)**

- b) Determine the final temperature of the mixture after all the ice has melted. Assume no heat is lost or gained by the system. Specific heat capacity of water is 4200 J/Kg, Specific latent heat of fusion of ice is 336000 J/Kg. **(3 marks)**
12. During rain, it's not good to take shelter under a tall tree. Explain why. **(4 marks)**
13. a) An electric current flows through a tungsten filament for a while. How is the tungsten filament affected by the electric current? **(2 marks)**
b) Find the resistance of the filament of a lamp rated at 12V 2.4 W. **(2 marks)**
14. a) Name any two methods of making a magnet. **(2 marks)**
b) Explain why heating a magnet demagnetizes it. **(2 marks)**
15. a) With the aid of a diagram, show how umbra and penumbra shadows are formed at the same time. **(3 marks)**
b) How do you produce the umbra shadow only? **(1 mark)**
- SECTION B: Attempt any THREE questions in this section. (30 marks)**
16. a) List all the energy changes which occur when a pendulum swings. **(3 marks)**
b) A car of mass 1000 kg moves at an average speed of 16m/s.
i) Where does the energy to move the car come from? **(1 mark)**
ii) What is the kinetic energy of the car? **(2 marks)**
c) A 50 kg stone is thrown 15m upwards into the air.
i. What will happen to the stone? Explain. **(2 marks)**
ii. Find the maximum potential energy of the stone. $G = 10 \text{ m/s}^2$. **(2 marks)**
17. a) Draw a diagram of a mercury barometer (simple barometer) and label it. **(4 marks)**
b) What would be observed if the barometer was taken up a high mountain? Explain your observation. **(4 marks)**
c) What is the difference between a mercury barometer and an aneroid barometer? **(2 marks)**
18. a) Describe how you can determine the lower fixed point of temperature and upper fixed point of temperature of a mercury thermometer. **(4 marks)**
b) Why is mercury a better liquid to use in thermometers? **(3 marks)**
c) Describe the structure of a clinical thermometer and explain how it functions? **(3 marks)**
19. a) What is the difference between altering current and direct current? **(2 marks)**
b) How does an earth wire in domestic electrical wiring stops someone from getting an electric shock? **(2 marks)**

- c) Why is a circuit breaker more efficient as a safety device than a fuse? **(2 marks)**
- d) Two resistors, 4Ω and 2Ω respectively are connected together so that the total resistance is less than 2Ω . Draw an electric circuit of the arrangement and calculate the total resistance in the circuit. **(4 marks)**

SECTION C: Answer only one question in this section. (15 MARKS)

20. a) Define the term density of a substance. **(2 marks)**
 b) State the unit of density **(1 mark)**
 c) In an experiment to determine the density of a metal, a number of pieces of the same metal are used. Their masses and corresponding volumes are in the table below.

Volume (cm³)	2	3	4	5	6
Mass (g)	18	27	36	42	54

- i) Plot these results on a graph paper. Mass should be on the Y-axis and volume on the X-axis. Indicate on the graph with letter X the result which is not correct. **(8 marks)**
 ii) Draw the graph through the correct points. **(2 marks)**
 iii) Does your graph pass through the origin? Explain your answer.
 iv) Determine the density of the metal from the graph. Show on your graph any measurements you have made in order to determine the density of the metal. **(2 marks)**

21. a) State Ohm's law. **(2 marks)**
 b) Draw a simple electric circuit you may use to verify Ohm's law. Label all the circuit components. **(3 marks)**
 c) Below are the results obtained in an experiment to verify ohm's law:

Electric current (A)	0	0.5	1.0	1.5	2.0
Potential difference (V)	0	2.0	3.0	6.0	8.0

- i) Plot these results on a graph paper. Potential difference, V must be on the Y-axis and electric current I, on the X-axis. Indicate on your graph with letter X the result which is wrong. **(8 marks)**
 ii) Determine the resistance from the graph. Show on your graph the measurements you made. **(2 marks)**

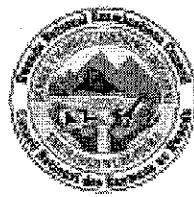
Physics III

RWANDA NATIONAL EXAMINATIONS COUNCIL

014

06 Nov. 2007

8h30 -11h30



P.O.BOX 3817 KIGALI-TEL/FAX : 586871

ORDINARY LEVEL NATIONAL EXAMINATION 2007

SUBJECT : PHYSICS III

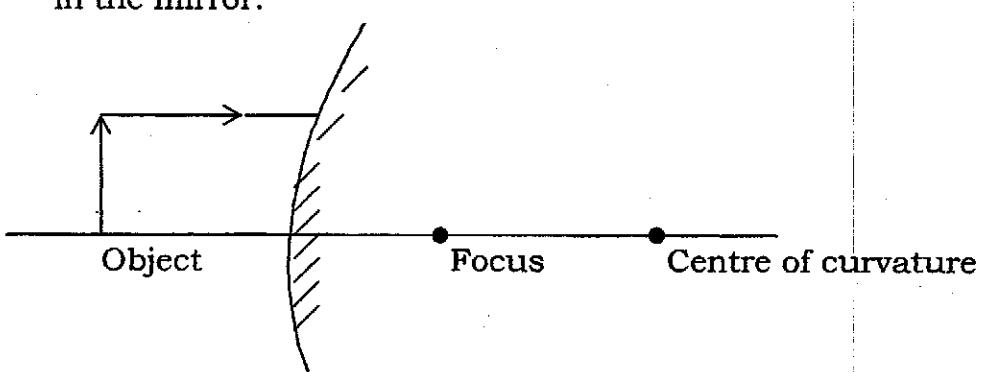
TIME : 3 HOURS

INSTRUCTIONS :

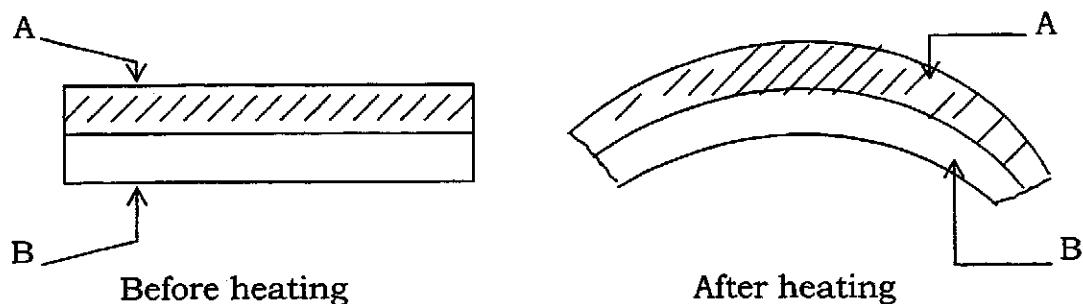
This paper has THREE sections A, B and C.

- Section A: Answer ALL questions. (55 marks)
- Section B: Answer any THREE questions. (30marks)
- Section C: Compulsory question. (15marks)
- Calculators may be used.

SECTION A: Answer all questions. (55 marks)

1. (a) What is the difference between density and relative density ? **(2marks)**
(b) Calculate the mass of 6cm^3 of copper. The density of copper is 9g/cm^3 . **(1mark)**
2. (a) What is meant by the term weight ? **(2marks)**
(b) Calculate the weight of a body whose mass is 80kg . ($g=10\text{N/kg}$). **(1mark)**
3. Air is used to fill tyres of vehicles. Why is air better than using water to fill the tyres ? **(3marks)**
4. A lady wearing high heeled shoes may damage a wooden floor. Why ? **(3marks)**
5. A uniform meter rule is freely pivoted at the 30 cm mark and it balances horizontally when a body of mass 40g is hung from the 2cm mark. Draw a force-diagram of the arrangement and calculate the mass of the meter rule. **(3marks)**
6. The diagram below shows a diverging mirror.
(a) Copy the diagram and complete it to show the formation of image in the mirror. **(2marks)**

- (b) State the nature of the image formed in the diverging mirror. **(2marks)**
7. With the aid of a diagram explain what is meant by dispersion of white light. **(4marks)**
8. Convert (a) 5°C to Kelvin scale.
(b) 373 K to Celsius scale. **(2marks)**
(2marks)

9. The diagrams below are of a bimetallic strip before heating and after heating.



(a) Explain why the strip bends as it becomes hot. (2marks)

(b) Why does the metal A bend outwards ? (1mark)

(c) Draw the bimetallic strip when it has cooled down again. (1mark)

10. (a) Define heat capacity of a substance. (2marks)

(b) A piece of iron of mass 100g cools from 90°C to 30°C.

How many joules of heat are given out ? Specific heat capacity of iron is 460 J/Kg.K. (2marks)

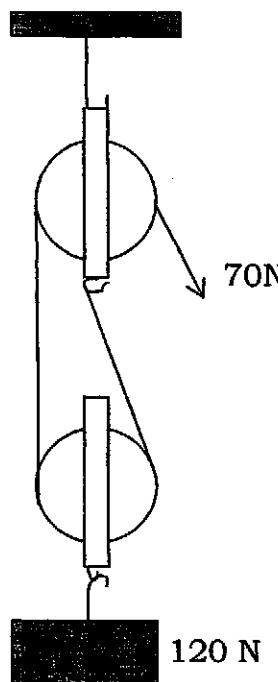
11. (a) Explain what is meant by uniform acceleration. (2marks)

(b) A car is uniformly retarded and brought to rest from a speed of 90Km/h in 20 seconds. Find its acceleration. (2marks)

12. (a) In Kigali the boiling point of water is less than 100°C. Why ? (2marks)

(b) With the aid of a diagram show that air of the atmosphere exerts a force. (2marks)

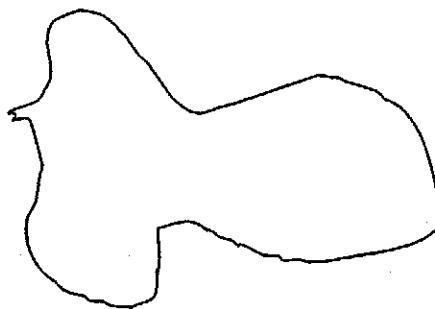
13. Observe the pulley system and answer questions below.



- | | |
|--|-------------------------------|
| (a) Determine (i) mechanical advantage
(ii) velocity ratio
(iii) efficiency. | (1mark)
(1mark)
(1mark) |
| (b) Why is the pulley system not 100% efficient? | (1mark) |
| . (a) State the law of magnetic poles. | (1mark) |
| (b) How would you test that a material is a magnet? | (2marks) |
| (c) State one property of magnets. | (1mark) |
| . Two cells each having an e.m.f of 1.5V and an internal resistance of $3\ \Omega$ are connected in parallel. Find the current when the cells are connected to a 1Ω resistor. | (4marks) |

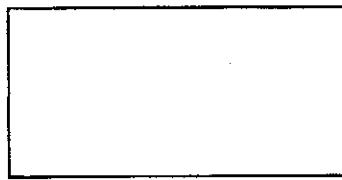
SECTION B: Answer any THREE questions. (30 marks)

16. (a) A thin sheet of cardboard is cut to the shape below. Describe with a diagram an experiment to find its centre of mass.

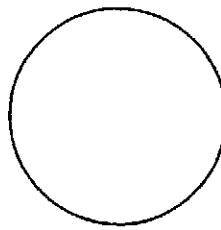


(5marks)

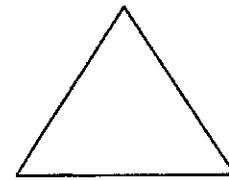
- (b) Copy and label with a dot the centre of mass of each of the three objects below.



Rectangular body



Circular body



Equilateral triangular body

(3mark)

- (c) Explain why a mechanic would choose a long spanner to undo a tight nut.

(2mark)

17. (a) List four sources of heat energy in Rwanda.

(2mark)

- (b) List energy changes which take place when an electric bell is switched on.

(4mark)

- (c) What energy changes will occur when we exert a force to lift a weight?

(2mark)

- (d) Which is the energy source of most liquid and gaseous fuels ?

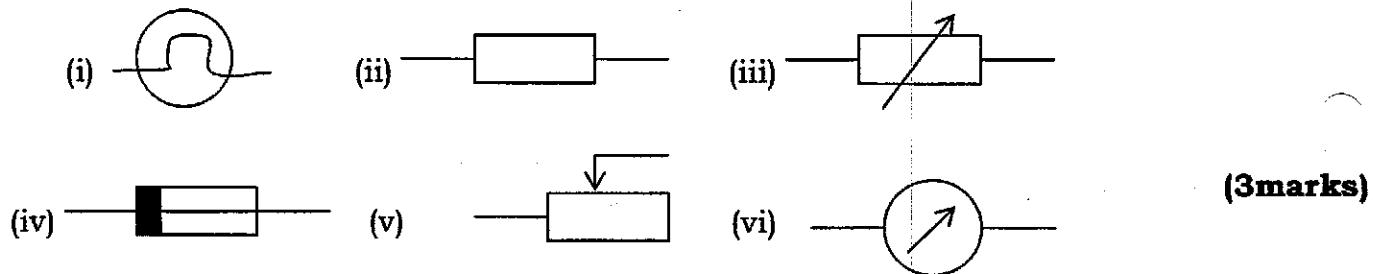
(1mark)

- (e) Give an example where energy from the sun is converted to electrical energy.

(1mark)

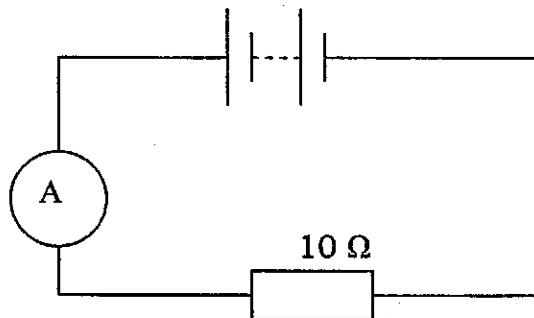
18. (a) (i) Draw a ray diagram to show the formation of an image by a diverging lens. (2marks)
 (ii) State the nature of the image. (2marks)
- (b) What is the function of an objective lens in the compound microscope? (2marks)
- (c) Which lens is used to correct short sightedness? (1mark)
- (d) Find the position of the image of an object placed 8cm from a diverging lens of focal length 10 cm. (3marks)

19. (a) Identify the common electrical symbols below.



- (b) State Ohm's Law. (2marks)

(c)



What is the potential difference across the $10\ \Omega$ resistor in the figure above if the current is 3A ? (2marks)

- (d) Why does an ammeter have a low resistance? (1mark)
- (e) What is meant by an electromotive force of a cell? (2marks)

20. (a) Differentiate between latent heat of fusion and latent heat of vaporization. (3marks)
- (b) What effect does increase in pressure have on melting point of a substance which expands on solidifying ? (2marks)

- (c) Explain why pieces of ice at 0°C added to a drink at room temperature are more effective in cooling the drink than an equal mass of water at 0°C . **(3marks)**
- (d) How much heat will change 20g of ice at 0°C to water at 0°C ? Specific latent heat of fusion of ice is 336 J/g. **(2marks)**

SECTION C (15 marks)

21. This question is **compulsory** and must be answered on the graph paper provided at the end of your answer booklet. The table below shows the motion of a moving body.

Time (s)	0	1	2	3	4	5	6	10	15
Velocity (m/s)	0	5	10	15	15	15	15	30	0

- a) Use the above data and plot a graph of velocity on Y-axis against time on X-axis. **(8marks)**
- b) From your graph, determine :
- (i) The acceleration for the first 3 seconds **(2marks)**
 - (ii) The time the acceleration is constant **(1mark)**
 - (iii) The deceleration **(2marks)**
 - (iv) The distance moved by the body during the first 3 seconds. **(2marks)**

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Physics III

141

14th Nov.2006 8.30 - 11.30a.m

RWANDA NATIONAL EXAMINATIONS COUNCIL



B.P 3817 KIGALI-TEL/FAX : 586871

ORDINARY LEVEL NATIONAL EXAMINATION 2006

SUBJECT : PHYSICS III

DURATION : 3 HOURS

INSTRUCTIONS :

This paper has THREE sections : A, B and C.

SECTION A : Answer ALL questions. **(55 marks)**

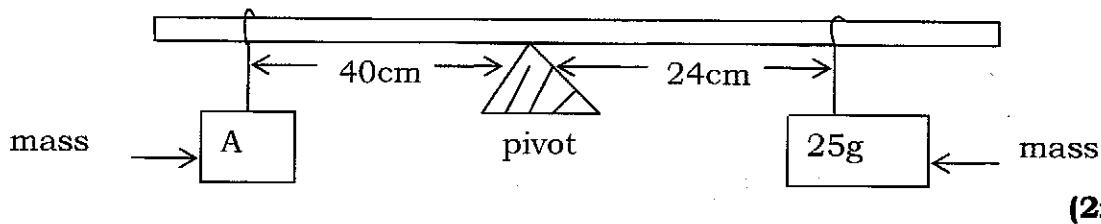
SECTION B : Answer any THREE questions. **(30 marks)**

SECTION C : Answer only ONE question. **(15 marks)**

- Calculators and mathematical instruments may be used.

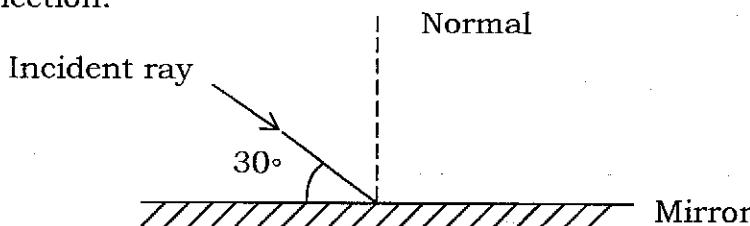
SECTION A:**/55 Marks**

1. (a) What is meant by the term density? **(2marks)**
- (b) The mass of a solid is 45g and its volume is 5cm³. Calculate the density of the solid. **(2marks)**
2. Which of the following quantities are vectors: weight, mass, density, velocity and volume? **(2marks)**
3. The uniform meter rule below is pivoted at its centre. If the meter rule balances, calculate mass A.

**(2marks)**

4. (a) Calculate the pressure on a surface when a force of 30N acts on an area of
(i) 0.2 m² **(1½marks)**
(ii) 0.1 m² **(1½marks)**
- (b) Explain why a nail is pointed at one end. **(2marks)**
5. (a) What are the three methods of heat transfer? **(3marks)**
- (b) By which method of heat transfer does the heat from the sun reach the earth? **(1mark)**

6. The diagram below shows an incident ray of light and a plane mirror. Copy the diagram in your answer book and complete it to show what happens to the incident ray. Label reflected ray, angle of incidence and angle of reflection.

**(4marks)**

What is the size of angle of incidence? **(1mark)**

7. Which of the following statements are correct? (write the letter which corresponds to the answer required).

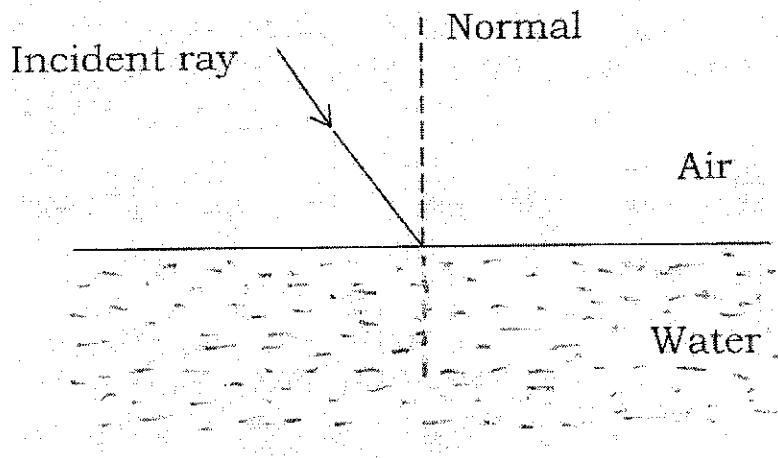
- (a) The molecules in a solid vibrate about a fixed position.
- (b) The molecules in a liquid are arranged in a regular pattern.
- (c) The molecules of a gas occupy all the space available.

(2marks)

8. (a) State one law of refraction of light.

(2marks)

- (b) Copy the diagram below and complete it to show the path of light through the water.



(2marks)

9. (a) What is meant by acceleration of a moving body?

(1mark)

- (b) A body moves with a steady increase of velocity from 28.8 km/h to 72 km/h in 6 seconds. Find the acceleration.

(3marks)

10. The diagrams below show two repelling bar magnets.



- (a) Identify magnetic pole A.

(1marks)

- (b) Copy the diagrams in your answer booklet and draw magnetic field lines of force around the magnets.

(2marks)

- (c) Label the neutral point, N.

(1mark)

11. (a) What are the two kinds of electric charges?

(2marks)

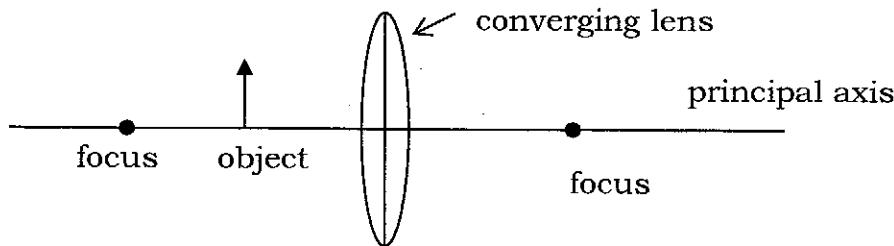
- (b) A current of 4A flows in an electric circuit. What charge passes each point in 5 seconds?

(2marks)

12. The weight of a stone in air is 11N. When the stone is wholly submerged in water, its weight is 7N.
- (a) What is the weight of displaced water? **(2marks)**
(b) Determine the mass of displaced water.
Take 1 kg of water to weigh 10N. **(2marks)**
13. (a) What is a fuse? **(2marks)**
(b) Why are fuses used in electrical appliances? **(2marks)**
14. An 8 KW electric cooker is used for 4 hours a day. What is the cost of using the cooker for 5 days if 1 KWh costs 140 frw and a tax of 15% is added to the cost? **(2marks)**
15. How much heat is needed to change 40g of ice at 0°C to steam at 100°C?
Specific latent heat of ice = 340J/g,
Specific heat capacity of water = 4.2J/g and
Specific latent heat of steam = 2300J/g. **(4marks)**
- SECTION B: /30 Marks**
16. (a) With the aid of a diagram show that pressure in water increases with depth. **(3marks)**
(b) Calculate the pressure water exerts at 8m below the surface of the water in a lake. Assume the density of water, $\rho = 1000 \text{ kg/m}^3$ and $g = 10 \text{ N/kg}$. **(2marks)**
(c) Water supply reservoirs are often made on high hills or mountains.
Why? **(2marks)**
(d) In a hydraulic press, a force of 10N is applied to a piston of area 0.4m^2 .
The area of the other piston is 3.0m^2 .
What is: (a) the pressure transmitted through the liquid? **(1½marks)**
(b) the force on the other piston? **(1½marks)**
17. (a) What is the difference between potential energy and kinetic energy? **(2marks)**

- (b) An orange fruit of mass 0.1kg falls from its tree 3m high to the ground.
- (i) State the energy changes which occur as the orange falls to the ground. **(2marks)**
- (ii) Calculate the potential energy possessed by the orange before it falls .
Take $g = 10 \text{ N/kg}$. **(2marks)**
- (iii) Calculate the kinetic energy of the orange as it hits the ground. **(2marks)**
- (iv) Does the orange stop immediately after it has hit the ground? **(1mark)**
- 18 (a) Draw an electric circuit diagram which has 2 torch batteries in series, a switch, connecting wires, a lamp and an ammeter. **(3marks)**
- (b) If the voltage for each torch battery is 1.5V and the resistance of the lamp is 0.6Ω , calculate the current. Ignore the internal resistance of batteries. **(3marks)**
- (c) Mention only two accidents that electricity may cause in a home. Explain how these accidents may be avoided. **(4marks)**
19. (a) State heat effects. **(3marks)**
- (b) Explain how a wet shirt dries up when it is left outside on a hot day. **(2marks)**
- (c) Why is mercury a better liquid to use in a laboratory thermometer than water? **(3marks)**
- (d) A tyre of a bicycle full of air may burst when left outside on a hot day. Why? **(2marks)**
20. (a) The sun is a luminous object. Why? **(1mark)**
- (b) Why is the moon non-luminous? **(1mark)**
- (c) Light is a form of energy. Explain how you can use energy from the sun light to burn a piece of paper. You may use a diagram to illustrate your answer. **(4marks)**

- (d)(i) Copy the diagram below and use rays to show how the image of the object is formed in a converging lens.



- (ii) State the nature of the image.

(4marks)

SECTION C: / 15 Marks

21. You are required to find the density of an irregular stone (a stone without a definite geometrical shape).

- (a) List the apparatus you may use.

(5marks)

- (b) Describe how you may carry out the experiment to determine:

- (i) the volume of the stone
(ii) the mass of the stone.

(5marks)

(2marks)

- (c) State any sources of errors and how you may avoid the errors.

(2marks)

- (d) Write the equation you may use to calculate the density of the stone.

(1mark)

22. An electric kettle is used to heat some water. The table below shows the variation of the temperature of the water with time.

Time (seconds)	0	10	20	50	80	100	120	140
Temperature (°C)	20	20	20	44	68	84	100	100

- (a) Draw a graph to reflect this information - Plot temperature on y - axis and use a scale of 1 cm to represent 10°C and time on x - axis. Use a scale of 1 cm to represent 20 seconds.

(12marks)

- (b) Why is the temperature of water constant for 20 seconds?

(1mark)

- (c) What time does it take for the water to boil?

(1mark)

- (d) What is happening to the energy supplied to the water after boiling?

(1mark)

Physics IV
141
23 Nov. 2005 8h30 – 11h30

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O. BOX 3817 KIGALI-TEL/FAX : 586871

NATIONAL EXAMINATION 2005

SUBJECT : PHYSICS IV

LEVEL : TRONC-COMMUN

DURATION : 3 HOURS

INSTRUCTIONS :

This paper has THREE Sections :

SECTION A : Answer **all** questions. (55 marks)

SECTION B : Answer any **three** questions. (30 marks)

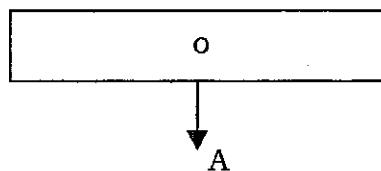
SECTION C : Answer **one** question only. (15 marks)

N.B : - Show all the necessary working.

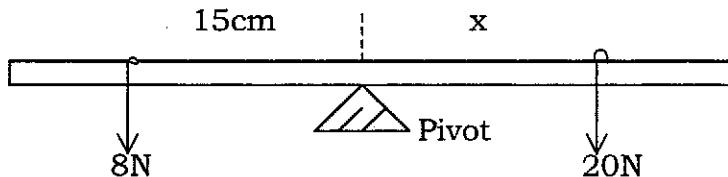
- Calculators and mathematical instruments may be used.

SECTION A : Answer ALL questions (55Marks)

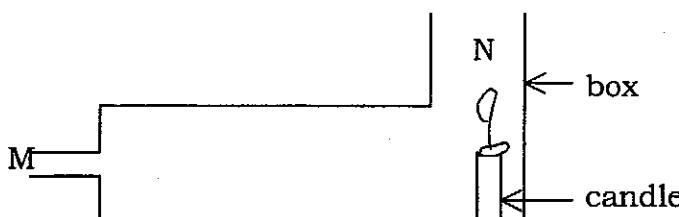
1. (a) Explain why a piece of iron sinks in water but an iron ship floats in water. **(2marks)**
- (b) Calculate the mass of cement of 0.4m^3 and a density of 3000kg/m^3 . **(1mark)**
2. (a) State the difference between mass and weight. **(2marks)**
- (b) The weight of a body on the moon is less than the weight of the body on the earth. Why ? **(1mark)**
3. (a) Why are gases squeezed more easily than liquids ? **(2marks)**
- (b) Give an example which illustrates that paraffin evaporates at room temperature. **(1mark)**
4. (a) The figure below is a uniform metre rule and O is its centre of gravity. Identify quantity A. **(1mark)**



- (b) The metre rule below is supported at its centre. Calculate the distance x if the metre rule is uniform and the weights are balancing. **(2marks)**



5. The formation of the food we eat depends on the sun. Explain. **(3marks)**
6. The diagram below shows a box with openings at M and N. A lighted candle is placed in the box as shown.



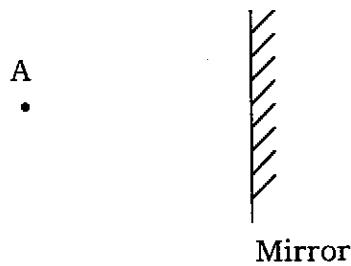
- (a) Copy the diagram and label arrows to indicate the direction of hot air and cool air. **(2marks)**

(b) Name the process of air movement being illustrated in the diagram. **(1mark)**

(c) On a hot day, it feels better when a person is near a lake. Why? **(1mark)**

7. (a) State the laws of reflection of light. **(2marks)**

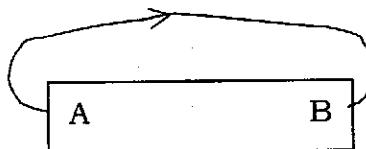
(b) Copy the diagram in your answer book. Using ray construction, show the position of the image of point A in the mirror. **(2marks)**



8. (a) Mention the main heat effects when objects are heated. **(3marks)**

(b) A piece of wood is burnt completely and becomes ash. Which is this heat effect? **(1mark)**

9. The diagram shows a bar magnet and one magnetic field line. **(2marks)**



(a) Copy the diagram and draw two more magnetic field lines. **(1mark)**

(b) Which of the poles A or B is (i) a North pole? (ii) a South pole? **(1mark)**

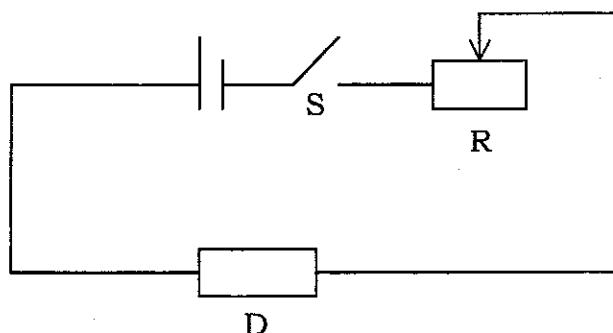
(2marks)

(1mark)

(1mark)

10. (a) Copy the diagram and complete the circuit to show how you would connect:

- a voltmeter to measure the potential difference across resistor D
- an ammeter to measure the current through D.



(2marks)

(b) Why are the components R and S used in the above electric circuit?

(2marks)

11. (a) What is meant by specific heat capacity of a substance?

(2marks)

(b) A mass of water is heated and its temperature rises from 45°C to 55°C . Calculate the mass of water if the heat energy supplied is 2100J. Specific heat capacity of water = $4200\text{J/kg}^{\circ}\text{C}$.

(2marks)

12. (a) Name the unit of pressure.

(1mark)

(b) What is the pressure on a surface when a force of 200N acts on an area of 0.5m^2 ?

(1mark)

(c) Explain why knife edges are sharp.

(2marks)

13. (a) State what is meant by friction.

(2marks)

(b) How does friction help us to walk on land?

(1mark)

(c) Friction can damage parts of engines in vehicles. How is the friction reduced?

(1mark)

14. John's weight is 600N and runs 10m in 12 seconds. Mary weighs 700N and runs the same distance as John in 14 seconds.

(a) Calculate the power developed by each person.

(2marks)

(b) Who of the two persons is more powerful?

Explain your answer.

(2marks)

15. (a) Explain in terms of electron movement how electric charges are produced by rubbing.

(2marks)

(b) An electrically charged body insulated from everything else is touched with a rod of material, one end of which is held in the hand.

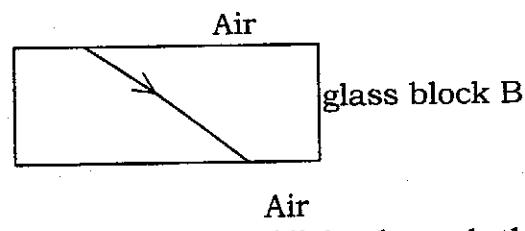
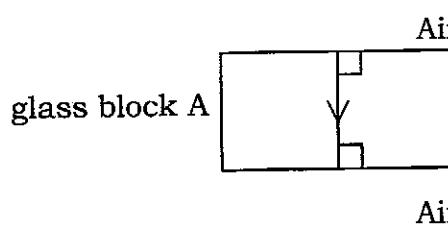
Identify the type of rod used if the body

(i) retains its charges. (1mark)

(ii) loses its charges rapidly. (1mark)

SECTION B: Answer any THREE questions (30 Marks)

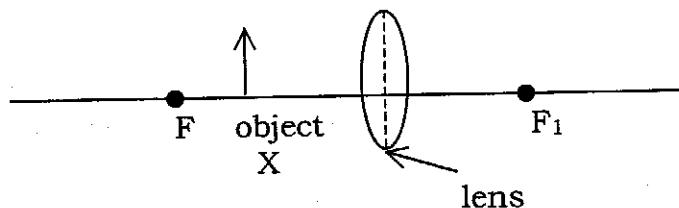
16. (a) The diagrams below show the paths of rays of light through the blocks of glass.



(i) Copy the diagram and show paths of rays of light through the air before and after passing through the blocks of glass. (2marks)

(ii) On glass block B, label equal angles A and B, and the second pair X and Y. (2marks)

(b) (i) Copy the diagram and use ray diagrams construction to show the formation of image of the object X in the converging lens. (4marks)

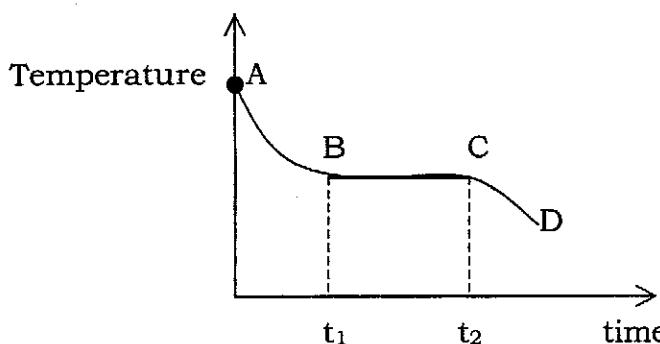


(ii) State the relation between the size of the image formed and size of object X. (1mark)

(c) Name an optical instrument where a converging lens is used. (1mark)

17. (a) What is meant by specific latent heat of fusion of a substance? (2marks)

(b) The graph below represents a cooling curve of a hot liquid.



Use the idea of particles to explain what is happening from

(i) A to B.

(ii) B to C.

(iii) C to D.

(c) What is the heat lost between B and C called?

(2marks)

(2marks)

(2marks)

(1mark)

(d) Given that the mass of the hot liquid is 0.2kg and the heat it loses from time t_1 to t_2 is 40000J, calculate the heat loss per kilogram.

(1mark)

18. (a) Which property of light do shadows rely on to occur?

(1mark)

(b) Draw a diagram to show how umbra and penumbra shadows are formed at the same time.

(3marks)

(c) State the condition for an eclipse to occur.

(1mark)

(d) A pinhole camera consists of a box with a small hole in a metal plate at one end and a screen of frosted glass at the other end. What is the use of

(i) the small hole?

(1mark)

(ii) the box?

(1mark)

(iii) the frosted glass?

(1mark)

(e) The height of the image of an object observed on the screen of a pinhole camera is 3 cm and the distance from the screen to the pinhole is 15 cm. Calculate the height of the object if the object is 30 m away from the pinhole camera.

(2marks)

19. (a) List in order, energy conversions taking place when a torch bulb is lit.

(2marks)

(b) What advantage and disadvantage does the torch battery have over the car battery?

(2marks)

(c) Circuits below show different ways of arranging batteries in a circuit.

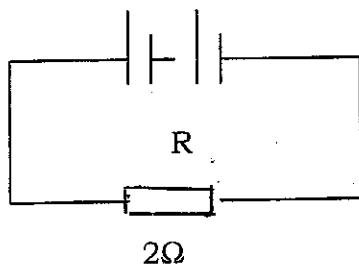


Fig A

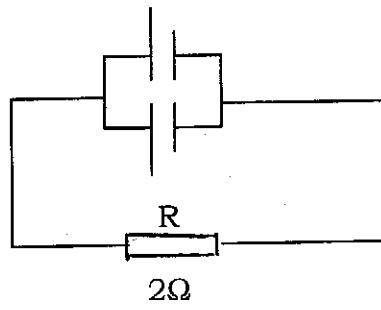
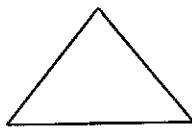


Fig B

- (i) Identify each type of battery arrangement. **(2marks)**
- (ii) If the batteries are identical and each has a potential difference of 1.5V, calculate the current through the resistance R in each circuit. **(2marks)**
- (iii) What advantage does the arrangement in Fig B have over Fig A? **(1mark)**

20. (a) Name states of equilibrium. **(3marks)**
 (b) State how a body can be made more stable. **(2marks)**
 (c) The diagram below is an equilateral triangle cardboard. Copy it and label with an O its centre of gravity. Explain how you determine the position of O.



(2marks)

- (d) Explain how passengers make the vehicles more likely to roll over. **(3marks)**

SECTION C: Answer only ONE question (15 Marks)

21. A student did an experiment to find out how the length of a spring increases when different weights were added. The table shows the results.

Weight (N)	1	2	3	4	5	6	7
Length (mm)	23	26	29	32	35	49	66

- (a) Draw a graph of length against weight using these results. **(12marks)**
- (b) What is the original length of the spring? **(1mark)**

(c) By how many millimeters did the 1.7N weight cause the spring to stretch? **(1mark)**

(d) What is the length of the spring when the spring reaches its elastic limit? **(1mark)**

22. The table below shows how the speed of a moving body changes with time.

Time(s)	5	10	15	20	25	30	40
Speed (m/s)	20	30	40	50	50	60	70

(a) Plot the graph of speed against time using these results. **(12marks)**

(b) Estimate the initial velocity of the moving body. **(1mark)**

(c) Put letter A on any part of the graph where the velocity is constant. **(1mark)**

(d) For how long is the speed constant? **(1mark)**

23. A student did an experiment to find out how the pressure of a gas varies with its volume at constant temperature. The table below shows the results obtained.

P (units)	3	4	6	12
V (units)	4	3	2	1
$\frac{1}{V}$				

(a) Copy table above and complete it. **(4marks)**

(b) What happens to the volume of the gas as the pressure increases? **(1mark)**

(c) Plot the graph of pressure against $\frac{1}{volume}$. **(8marks)**

(d) Estimate the volume of the gas when the pressure is 9 units. **(2marks)**

Physics I

010

09th Nov. 2004 08.30 – 11.30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O.BOX, 3817 KIGALI-TEL/FAX : 86871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2003 / 2004

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

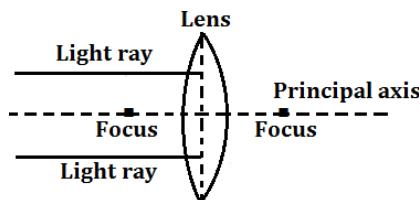
You may use a calculator and mathematical instruments.

Show all your working.

SECTION A: ANSWER ALL QUESTIONS**(55 MARKS)**

1. Name two instruments which can be used to measure, accurately, the diameter of a small metal sphere. **(2 marks)**

2. a) Copy the diagram below and complete it. **(2 marks)**



- b) A person sees only far objects clearly.
i. Which vision defect would cause this? **(1 mark)**
ii. Which type of lens would correct this defect? **(1 mark)**

3. A body has mass and weight. Which of the two quantities:

- a) Is a vector? **(1 mark)**
b) Is measured in Newtons? **(1 mark)**
c) Remains the same at any place? **(1 mark)**

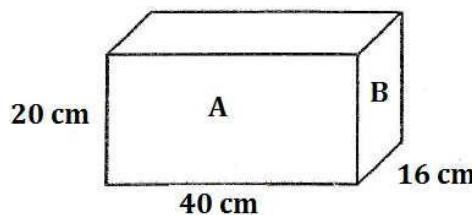
4. The mass of a body is 0.026 kg and its density is 1.3 kg/m^3 . Calculate the volume of the body. Express the answer in standard form. **(2 marks)**

5. A uniform meter rule is pivoted at 45 cm mark. A mass of 5 g placed at 5 cm mark balances the meter rule horizontally. Calculate the mass of the meter rule. **(2.5 marks)**

6. a) Define the term pressure. **(1 mark)**

- b) What effect does lower air pressure have on boiling point of water? **(1 mark)**

- c) The mass of the rectangular block below is 16 kg.
i. Calculate the pressure exerted on the ground by each of the surfaces A and B. Take $g = 10 \text{ N/kg}$. **(2 marks)**



- ii. What conclusion can you make from your answers about the area in contact with the surface and the pressure exerted? **(1 mark)**

7. a) State 3 methods of heat transfer. **(3 marks)**

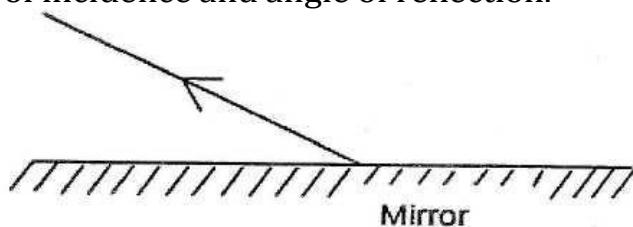
- b) A girl boils water in a saucepan on a stove. Identify the methods of heat transfer that takes place. **(1 mark)**

8. Copy the bar magnets below and show the magnetic field lines of force around them. Label the neutral point. **(2.5 marks)**



9. a) Identify the difference between distance and displacement of a moving body. **(2 marks)**
 b) A man walks 4 km away from his home and then returns to his home. Determine:
 i. The displacement and distance of this movement. **(1 mark)**
 ii. The average speed if the whole journey takes 2 hours. **(1 mark)**
10. a) State the unit of power **(1 mark)**
 b) In loading a lorry a boy lifts 25 kg bag of sugar through a height of 2 m. Calculate:
 i. The work done. Take $g = 10 \text{ N/kg}$ **(2 marks)**
 ii. The Power developed if the boy takes 2 seconds to load the lorry. **(2 marks)**
11. a) State the laws of electrostatic charges. **(2 marks)**
 b) A current of 2 A flows for 3 seconds. Calculate the charge passing a point. **(2 marks)**
12. a) What is the difference between speed and velocity? **(1 mark)**
 b) The initial speed of a car is 20 km/h. After 30 minutes the speed of the car is 50 km/h, calculate the acceleration. **(2 marks)**
13. a) An electric current flows through a high resistance conductor. What effect does the current have on the resistance? **(1 mark)**
 b)
-
- (4 marks)**
- From the electric circuit above, calculate the current recorded by ammeters A_1 , A_2 and A_3 .
- c) Calculate the cost of running three 100 W lamps and six 60 W lamps for 10 hours if electric energy costs 50 frs per kWh. **(2 marks)**
14. a) Which is the source of energy that enables plants to make food in their green leaves? **(1 mark)**
 b) A child picks up a stone and then releases it. List three energy changes which occur. **(3 marks)**

15. a) Copy and complete the diagram below showing clearly: incident ray, the normal, angle of incidence and angle of reflection. **(2 marks)**



- b) State the relation between the angle of incidence and angle of reflection. **(1 mark)**

SECTION B: Attempt any THREE questions in this section. (30 marks)

16. a) State the 3 states of matter and explain the differences between them. **(3 marks)**

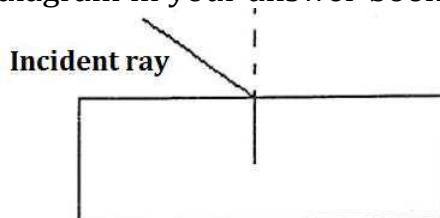
b) A mass of air can have different volumes without changing its mass. Why? **(1 mark)**

c) A bottle of milk remains cool when it stands in water in a clay pot in warm surroundings. Why? **(4 marks)**

d) Explain what is meant by diffusion of liquids. **(2 marks)**

17. i) State and explain the factors which affect resistance of a conductor wire at constant temperature. **(4.5 marks)**
- ii) What is meant by the resistivity of a conductor material? **(1.5 marks)**
- iii) A resistance of 20Ω is needed from a long resistance wire of radius 0.7 mm and resistivity $1.0 \times 10^{-6} \Omega\text{m}$. How long is the resistance wire needed? **(2 marks)**

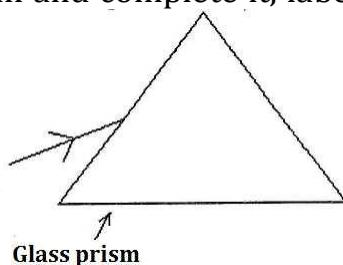
18. a) i) Copy the diagram in your answer book and complete it. **(2 marks)**



ii) On the diagram label the refracted ray and emergent ray. **(2marks)**

iii) What can you say about incident ray and emergent ray? **(1 mark)**

b) Copy the diagram and complete it, label the angle of deviation. **(1 mark)**



c) A light ray incident to a triangular glass prism is separated into different colours.

i) What is this process called? **(1 mark)**

ii) What causes the separation of colours? **(1 mark)**

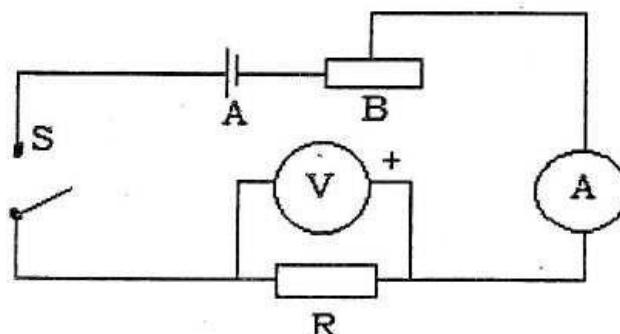
- iii) Which colour is bent most (1 mark)
 iv) Which colour is bent least? (1 mark)

19. a) i) With the aid of a diagram show how pressure in a liquid increases with depth of the liquid. (3 marks)
 ii) Name another quantity, besides depth of a liquid, on which variation of pressure in liquids depends. (1 mark)
 b) The density of lake water is 1000 kg/m^3 . The pressure at a point A below the surface of the lake water is 45000 Pa. Calculate the depth of the point A under the surface of the lake water. (2 marks)
 c) It is better to use a liquid in hydraulic machines than a gas. Why? (2 marks)
 d) Give two examples where transmission of pressure in liquids is applied. (2 marks)

20. a) Define the term specific heat capacity. (2 marks)
 b) Determine heat given out when an iron ball of mass 3 kg and specific heat capacity 440 J/kg.K cools from 200°C to 100°C . (2 marks)
 c) Water is used to cool car engines and in the radiators of central heating systems. Why is water a better liquid to use in cooling engines? (3 marks)
 d) A shiny object and a black object are left in the sun. Which of the two objects becomes hot? Explain your answer. (3 marks)

SECTION C: Answer only one question in this section. (15 MARKS)

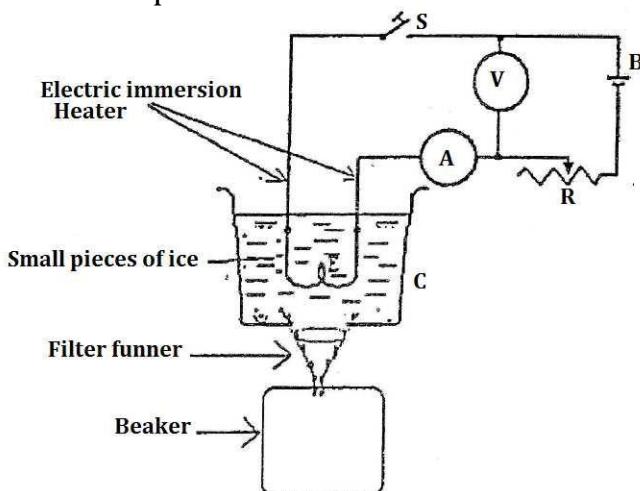
21. The electric circuit below may be used to determine the unknown resistance of a conductor.



- a) What is the use of part A? (1 mark)
 b) Name the part B and state its function. (2 marks)
 c) i) The ammeter has a low resistance. Why? (2 marks)
 ii) Name instrument labelled and state its function. Explain why it has a high resistance. (3 marks)
 d) Small currents should be used in this experiment. Why? (2 marks)
 e) Write an equation connecting the resistance, R, potential difference V and current I. (1 mark)
 f) Results below were obtained from this type of experiment. Copy the table in your answer book and complete it. Calculate the mean resistance. (4 marks)

Voltmeter reading (V)	Ammeter reading (A)	Resistance (Ω)
1	0.5	
2	1.1	
3	1.6	
4	2.0	
5	2.6	
6	3.0	

22. You are provided with a clock, electric immersion heater of known power, small pieces of ice, a beaker and funnel. See the apparatus below. A beam balance is provided to determine the mass of water.



- a) State what is meant by specific latent heat of fusion of a substance. **(2 marks)**
- b) Describe how you would use the apparatus above to determine the specific latent heat of fusion of ice. **(9 marks)**
- c) Why is the immersion heater better than a Bunsen burner flame in this experiment? **(2 marks)**
- d) Mention a possible cause of error in the experiment. **(2 marks)**
23. a) You are provided with a beam balance, a beaker, a measuring cylinder (250 cm^3), water, test tube and a thin thread. Describe how you may determine the density of the test tube. Show clearly how you arrive at the final results. All necessary calculations should be shown. Mention any precautions you take. (Ignore the mass of air in the test tube). **(11 marks)**

- b) A pupil carried out the experiment above and obtained the following results.

- Mass of test tube = 26 g
- Volume of water in tube = 40 cm^3
- First level of water in the measuring cylinder = 20 cm^3
- Level of water in the measuring cylinder + the test tube full of water = 70 cm^3 .

Calculate the density of the test tube and express the answer in kilograms per cubic meter. **(4 marks)**

Physics I

010

10th Nov. 2003 08.30 – 11.30 am

RWANDA NATIONAL EXAMINATIONS COUNCIL



P.O.BOX, 3817 KIGALI-TEL/FAX : 86871

ORDINARY LEVEL NATIONAL EXAMINATIONS 2002 / 2003

SUBJECT: PHYSICS I

DURATION: 3 HOURS

INSTRUCTIONS:

This paper consists of **three** sections **A, B and C**

Answer **ALL** questions in section A. **(55 marks)**

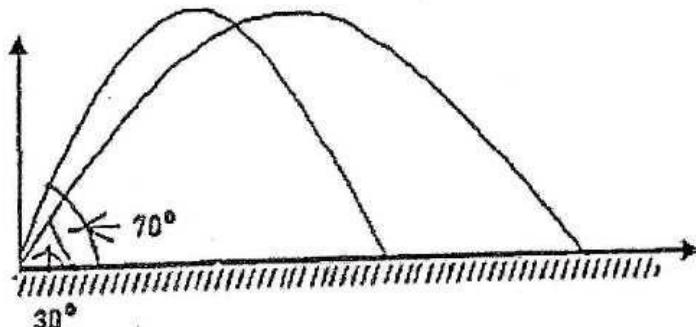
Answer **THREE** questions in section B. **(30 marks)**

Answer only **one** question in section C **(15 marks)**

You may use a calculators and mathematical instruments.

SECTION A: ANSWER ALL QUESTIONS**(55 MARKS)**

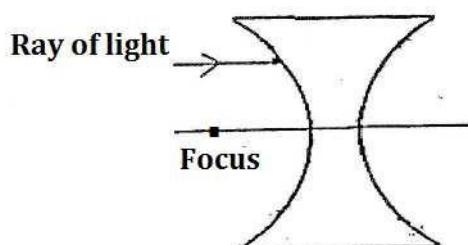
1. A stone is thrown into the air at an angle of 70° as shown in the figure below. The same stone is again thrown with the same force and speed at an angle of 30° .



- a) For which angle does the stone travel the farthest? **(1 mark)**
b) Why does the stone fall to the ground each time? **(1 mark)**
c) At which of the two angles should a high jumper leave the ground in order to jump the highest? **(1 mark)**
2. By mid-day, land can get much hotter than water in the sea.
- a) Copy the diagram below and show how the air will move between the land and the sea at that time. **(2 marks)**

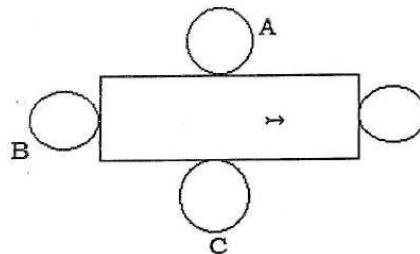


- b) What is the name given to the process in 2 (a) above by which the air moves? **(1 mark)**
c) A piece of iron of mass 200 g and specific heat capacity 460 J/kg.K cools down from 120°C to 70°C . Calculate the heat lost. **(2 marks)**
3. a) i) What kind of lens is shown below? **(1 mark)**

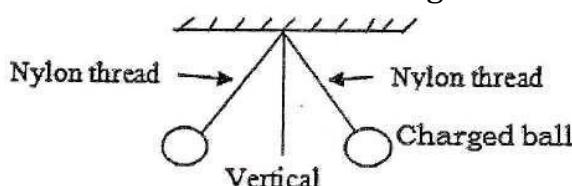


- ii) Copy the diagram in your answer book and complete the ray of light as it travels through the lens. **(1 mark)**
b) An object is placed 4 cm in front of the above lens. A vertical image is produced 1 cm from the lens.
i) What is the magnification produced by the lens? **(1 mark)**
ii) If the image is 1.5 cm tall, how tall is the object? **(2 marks)**
4. a) Draw a diagram to illustrate how one may magnetize iron nail by using a bar magnet. **(1.5 marks)**

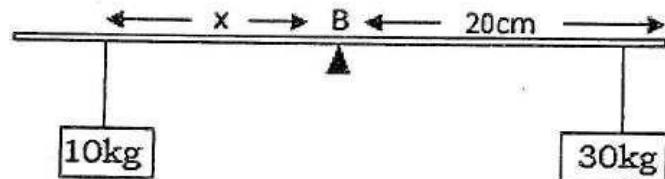
- b) Copy the diagram below and insert arrows in the magnetic compasses A, B and C around the bar magnet and hence label the poles of the magnet. (2 marks)



5. a) A boy raises a hammer and then hits the nail. State the energy changes which occurs. (2 marks)
- b) The potential energy of a 5 kg mass is 100 J. Calculate how high the mass is from the ground. Take $g = 10 \text{ m/s}^2$. (2 marks)
6. Two light charged balls are suspended on nylon threads and then released. Immediately the balls come to rest with the threads making equal angles with the vertical as shown in the diagram below.

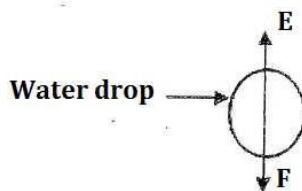


- a) What can you say about the charges on the ball? (1 mark)
- b) What would happen to the balls if somebody touches one of the balls? (1 mark)
- c) A steady current of 2 A flows passing a point, find the charges which pass the point in 3 seconds. (1.5 marks)
7. a) Name the simple machine that can be used to lift small masses in laboratory. (1 mark)
- b) State why the efficiency of the machine in 7 (a) is less than 100%. (1 mark)
- c) A machine lifts a mass of 150 g through a vertical height of 8 cm. Calculate the work done. (2 marks)
8. a) The density of sea water is greater than the density of pure water. Why? (1.5 marks)
- b) The volume of a substance is 280 cm^3 and its mass is 336 g. Calculate the density of the substance. (1 mark)
- c) State the differences between density and relative density of substance? (1.5 marks)
9. a) A tall person is more likely to fall down than a short person if the two persons are climbing the same hill. Why? (2 marks)
- b) Draw a cone seated on a plane surface in unstable equilibrium position. (1 mark)
- c) Calculate the distance x when the figure below balances. (2 marks)



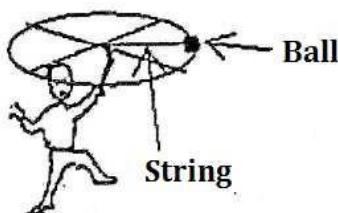
10. a) Name the unit that is the same as a watt. **(1 mark)**
 b) A person takes 1 minute 15 seconds to run a distance of 100 m. Calculate the person's power if his weight is 600 N. **(2 marks)**

11. The figure below shows forces E and F acting on a falling drop of water to the ground.



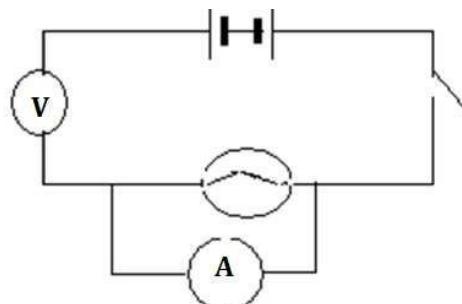
- a) Name force **(1.5 marks)**
 i) E **(1.5 marks)**
 ii) F **(1.5 marks)**
 b) State what causes force E **(1 mark)**
 c) What would happen to the drop of water if forces E and F are equal? **(1 mark)**
12. a) Methylated spirit is said to be a volatile liquid. What does this mean? **(1 mark)**
 b) When a drop of methylated spirit is put on the skin, the skin feels cold and the drop disappears. Explain this effect. **(2 marks)**
 c) In which domestic electrical appliance is a volatile liquid used? **(1 mark)**

13. A boy swings a ball attached to the end of a string in horizontal circle above his head as shown in the diagram below.



- a) Name the force in the string pulling inwards on the ball **(1 mark)**
 b) What happens to the force in the string when the speed increases? **(1 mark)**
 c) In which direction does the ball move when the string breaks? **(1 mark)**

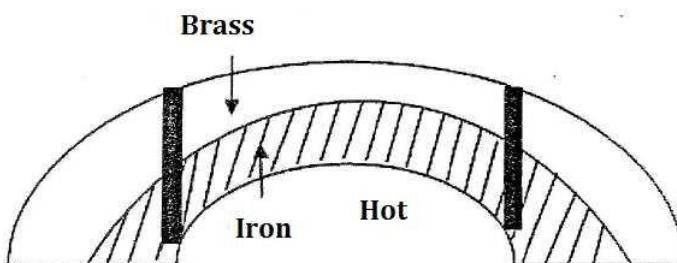
14.



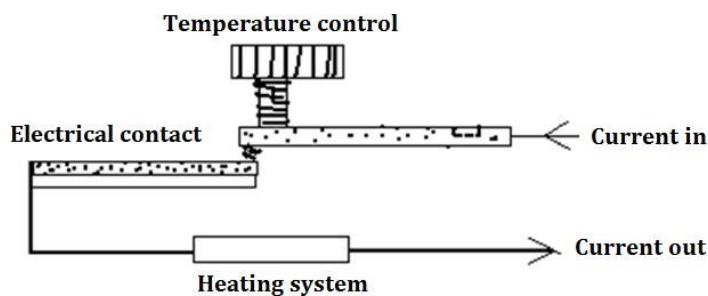
- a) From the electric circuit above there are three mistakes. What are the three mistakes? **(1.5 marks)**
- b) Draw the electric circuit above correctly so that the voltmeter reads the potential difference across the cells and the ammeter reads the current flowing in the circuit. The switch should be on. **(2 marks)**
- c) Electric lamps in houses are connected in parallel and not in series. Why? **(1.5 marks)**

SECTION B: Attempt any THREE questions in this section. (30 marks)

15. a) Below is a bimetallic strip made from brass and iron joined together. When heated, the metals expand but by different amounts as shown in the diagram.

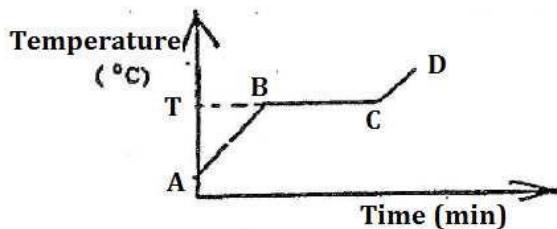


- i) Which of the two metals expands faster? **(1 mark)**
- ii) Draw the bimetallic strip when it has cooled down. **(1 mark)**
- b) A bimetallic strip is used to control the operating electric iron. See a simple diagram below.

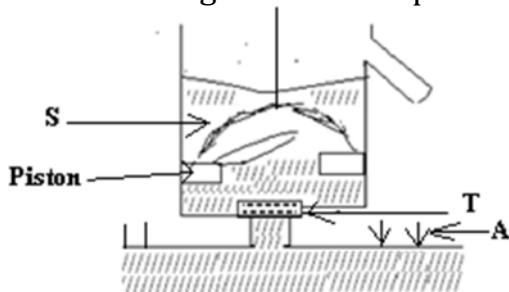


From diagram above

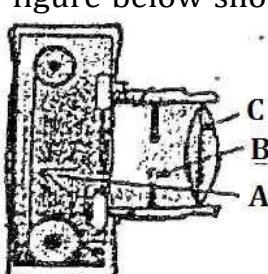
- i) What is the use of electric current? **(1 mark)**
- ii) How does the bimetallic strip work? **(3 marks)**
- c) A Solid substance was heated and the graph below shows how the temperature of the substance changed as the heat was given to it.



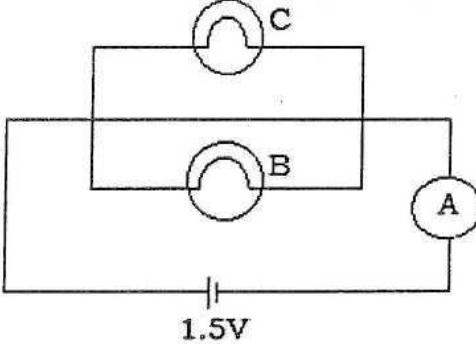
- i) What does the temperature A represent? **(1 mark)**
- ii) Why does the temperature from B to C not change while the substance is being heated? **(1 mark)**
- iii) What is the temperature T of substance called? **(1 mark)**
- iv) What is the state of substance from C to D? **(1 mark)**
16. a) Given a drinking glass, a piece of paper and some water, draw well labelled diagrams to show that the air of the atmosphere exerts pressure in all directions. Give a brief explanation. **(2 marks)**
- b) Below is a diagram of a simple lift pump. The piston is going down.



- i) Name parts A, T and S. **(1.5 marks)**
- ii) Explain what is happening to the water as the piston moves down. **(2 marks)**
- iii) Briefly explain what happens when the piston moves up. **(2.5 marks)**
- c) A mass of 20 kg rests on a square surface measuring 0.2 m by 0.2 m. Calculate the pressure exerted by the mass on the surface. Take $g = 10 \text{ m/s}^2$. **(2 marks)**
17. a) What is meant by an annular eclipse? **(1 mark)**
- b) With an aid of a well labelled diagram show umbra and penumbra shadows form. **(3 marks)**
- c) The figure below shows a simple camera.



- i) Name parts labelled A, B and C. **(1.5 marks)**
- ii) What is the use of part B? **(1.5 marks)**
- iii) Which part of the camera is similar in action to part A of the camera? **(1.5 marks)**

- d) i) An oblique ray of light travels from air and continues through the water. State the relationship between the ray of light in the air, the normal and the ray of light in water. **(1.5 marks)**
 ii) Draw diagram to show this relation in 17 (d) i) above. **(1.5 marks)**
18. a) What is meant by a uniform velocity? **(1 mark)**
 b) Sketch a graph of a body moving with a uniform velocity. Label distance on Y-axis and time on X-axis. **(2 marks)**
 c) Write the standard unit of acceleration. **(1 mark)**
 d) The initial velocity of a moving body is 10 m/s. In 5 s time, the velocity of the body reaches 30 m/s. The body maintains the velocity.
 i) Calculate the acceleration of this body. **(2 marks)**
 ii) Calculate the distance moved by the body during the 5 s. **(2 marks)**
 iii) What distance does the body travel in 45 minutes times? **(2 marks)**
19. a) State Ohm's law. **(2 marks)**
 b) Copy the simple circuit below and insert:
 i) A switch, S_1 , to control current flow through lamp C
 ii) A voltmeter to measure voltage across lamp B.
- 
- c) Calculate the electric current flow recorded by the ammeter, in the circuit if resistance of lamp C is 2 Ohms and that of lamp B is 3 Ohms. **(2 marks)**
 d) Draw a simple electric bulb and describe briefly how it gives off light. **(4 marks)**

SECTION C: Answer only one question in this section. (15 MARKS)

20. Describe an experiment to demonstrate that light travels in a straight line. Use any necessary diagram to make your answer clear.
21. You are provided with the following apparatus: eureka can, 2 beakers, water, balance, Newton balance and metal. Describe an experiment to verify Archimedes' Principle for a metal in water.
22. You are provided with dilute Sulphuric acid in a beaker, copper plate (electrode), Zinc plate (electrode), connecting wire and a bulb.
 a) With an aid of a well labelled diagram explain how an electric current is produced by a simple cell.
 b) How do you show that the electric current is produced by the simple cell?