JUNE 2005
SECTION A

ANSWER ONLY TWO QUESTIONS FROM THIS SECTION

(a) (i) State Newton's first law
(ii) Define inertia

(1 mark)

(b) On a certain Christmas day, it was reported during the 3p.m newscast that two identical cars travelling in opposite directions at speeds 60km/h and 80km/h respectively made a head on collision in Buea. On that same day, two similar cars travelling with the same speed as above and in the same direction collided in Tiko.

(i) What is meant by head on collision?

(1 mark)

(ii) In which of the collisions were the cars seriously damaged, (assuming that the front and back of the cars have equal strength) Explain your answer.

(c) In a motor race, a car, on reaching a level road, accelerates at 3 m/s^2 from a speed of 20m/s for a period of 5s to attain a maximum uniform velocity. The car then moves at this uniform velocity over a distance of 700m before the driver starts applying the brakes on seeing a broken bridge 40m ahead. This action brings the car to rest in 2 s.

(i) Calculate the time it took the car to travel the distance of 700 at this uniform velocity

(2 marks)

(ii) Draw a graph of velocity (y-axis) against time (x-axis) for the entire motion

(4 marks)

(iii) Show by calculation from the graph whether or not the car entered the broken bridge

(3 marks)

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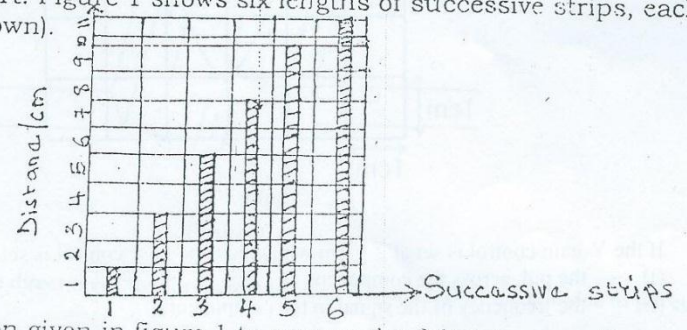
a) In an experiment, a trolley ran down an inclined plane, pulling a length if ticker tape through a timer. The frequency of the timer was 50Hz. The ticker tape was cut into strips, each having ten dots (corresponding to a time interval of 2.0s each) and then displayed on a chart. Figure 1 shows six lengths of successive strips, each having ten dots (not shown).



Use the information given in figure 1 to answer the following questions

(i) Calculate the initial and final velocities of the trolley

(3 marks)

(ii) How long did it take the trolley to change its velocity from the initial to the final velocity as calculated in (i) above?

(1 mark)

(iii) Calculate the acceleration of the trolley

(1 mark)

(iv) Redraw the chart to show what would have been obtained had the trolley run down the runway at uniform velocity.

(2 marks)

(b) A student puts water into a thin-walled aluminum can until it was half full. She then heats up the water to boil for a few minutes, after which she stops the heating and closes the can with an airtight stopper. As the can cools it is noticed that it collapses (becomes twisted). Explain why the can collapses

(3 marks)

(c) The pressure exerted by a chair on the floor is 50000 Pa. The contact area of each of the four legs of the chair is $5 \times 10^{-4} m^2$.

(i) Calculate the weight of the chair

(3 marks)

(ii) A person of weight 700 N sits on the chair with his legs off the ground. Calculate the pressure now exerted on the ground

(2 marks)

(iii) The average density of the chair is $1200 kg/m^3$. If the chair is thrown into a pond, will it float or sink? Explain your answer. (Density of water $= 1000 kg/m^3$)

(2 marks)

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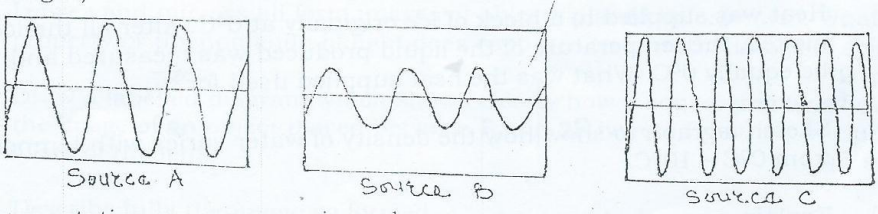
3 (a) Figure 2 shows the Cathode Ray Oseilloscope (CRO) traces that were obtained when the electrical signals due to sound from different sources, were in turn connected to the Y-input of given CRO (whose time base and sensitivity remained unchanged)



Compare stating your reasons in each case:

(i) The loudness of Source B with that of Source A

(2 marks)

(ii) The pitch of Source C with that of Source A

(2 marks)

(b) Electromagnetic waves are described as non-mechanical waves

(i) Explain the meaning to the underlined word A disturbance which cannot travel in a vaccum.

(1 mark)

(ii) Name one mechanical wave - Sound, ripple in a tank, String waves

(1 mark)

(iii) Name two electromagnetic waves (other than visible light) and state one source of each

(4 marks)

ultra-violet — from Sun

Radio waves — from radio

- They carry energy from one place to another
- They carry no charge

(iv) State the characteristic common to all electromagnetic waves

(1 mark)

(c) Boats always carry an instrument called an echo sounder that notes the time of an echo for use in calculating the depth of the sea. The echo sounder on one such boat sends down a pulse and receives it's echo 0.3S later. If the velocity of sound in water is 1445 m/s, calculate the depth of the sea

(3 marks)

(d) At certain engine speed the windows and fixtures of a bus may rattle violently

(i) What is this phenomenon called? Resonance

(1 mark)

(ii) Explain the cause of the rattle

(2 marks)

SECTION B

ANSWER ONLY TWO QUESTIONS FROM THIS SECTION

(a) Describe an experiment you would carry out to measure the specific heat capacity of a solid by a method which involves direct electrical heating. State clearly the precautions you would take to ensure accurate results.

(6 marks)

Use the kinetic theory to explain.

(i) The effect of evaporation on the temperature of a liquid

(2 marks)

(ii) The rise in the pressure of a gas as its temperature is raised

(3 marks)

(c) (i) Heat was supplied to a block of ice originally at 0°C. After all the ice had melted, the temperature of the liquid produced was measured and found to be equally 0°C. What was the heat supplied used for?

(ii) Sketch a graph to show how the density of water varies with temperature from 0°C – 10°C.

(2 marks)

(iii) Explain a practical situation where this density variations is a nuisance

(2 marks)

(a) (i) State the principle of conservation of energy

(1 mark)

(ii) Chemical, electrical and light energy are three different energy forms. Differentiate between these forms by:

- Stating where or how it can be obtained
- Stating whether it is possible or not to store energy in that form, giving your reasons for each

(6 marks)

(b) The table below shows some sources of energy. Copy and complete the table as in the example shown

Energy	How it is obtained	Advantages of the	Atleast one

source		source	disadvantages of the source
Wind energy	K.E. of wind used to drive wind turbines and generate electricity	(i) Excellent for isolated communities (ii) Good for developing countries	(i) Causes visual and noise pollution (ii) Windy site essential (iii) Efficiency of energy capture/transfer is very low
Hydro-electric energy			
Solar energy			

(6 marks)

(c) The movement of very small particles in a gas or liquid can be observed by illuminating the particles in a medium from one side and viewing the effect through a microscope.

(i) What is the name given to this movement?

(1 mark)

(ii) Why is good illumination necessary? (1 mark)

(iii) Give the names of two suitable particles for this experiment and for each particle name the medium in which it must be suspended.

(2 marks)

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6. (a) (i) Lenses and mirrors all form images of objects placed before them. What property or phenomenon of light does each use to form the image of objects?

(2 marks)

(b) (i) Draw a labelled diagram which shows clearly how a converging lens forms the image of an object placed between F and 2F (where F is the principle focus of the lens).

(3 marks)

(ii) Describe fully the image so formed.

(2 marks)

(iii) State a practical situation or device where this arrangement may be used

(1 mark)

(iv) What difference would occur in the nature of the image f the converging lens in (i) above is replaced by a diverging lens?

(2 marks)

(c) (i) Draw a diagram to show how a glass prism with angles 45^0, 90^0 and 45^0, may be used to deviate a ray of light through lens?

(2 marks)

(ii) Name one practical device or situation where this is used

(1 mark)

(d) (i) Briefly explain the terms: refractive index, and critical angle (2 marks)

(ii) State the conditions that must be fulfilled for total internal reflection to occur (2 marks)

SECTION C

ANSWER ONLY TWO QUESTIONS ROM THIS SECTION

7. (a) A neutral can be negatively or positively charged by one of three methods namely: By rubbing (friction); by contact and by induction.

(i) What does "charging an object mean"? (2 marks)

In order to charge a metal can a student mounted the can on an insulation stand. She then requested for a positively charge rod from her physics teacher

(ii) Which of the above method(s) is she most likely to use to charge the can negatively? (1 mark)

(iii) Why did she mount the can on an insulating stand? (1 mark)

(iv) Using well labelled diagrams, describe carefully the procedure you expect her to adopt in order to charge her metal can. (4 marks)

(v) How could she verify that the can had acquired a negative charge? (2 marks)

(b) (i) What is a fuse? (1 mark)

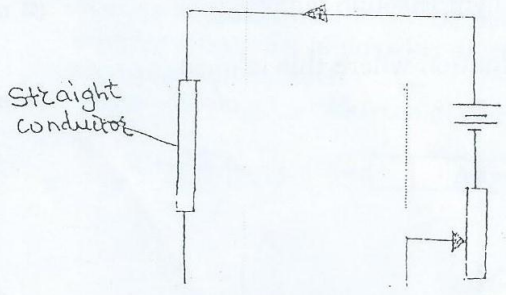
(ii) Explain how it works (1 mark)

(c) SONEL charges for electrical energy consumed by the kilowatt-hour (kWh).

(i) Define the kWh (1 mark)

(ii) An electric heater is rated 1000W. Find the cost of using this heater for 6 hours each week for 4 weeks, if a tax of 5% of a total consumption is levied per month. One unit of electricity costs 60frs. (4 marks)

8. (a) Figure 3 shows a circuit with a piece of straight conductor through which current flows.



(i) Draw a diagram to show the magnetic field pattern that is created around the conductor. Indicate on your diagram the direction of the current and state clearly how the field direction was obtained.

(3 marks

(ii) What is the effect on the field of increasing the resistance in the circuit? Explain

(2 marks

(iii) State and explain how the field lines in (ii) are different from those in (i)

(2 marks

(b) The circuit diagram shown in Figure 4 has a battery with negligible internal resistance. Assuming that the voltmeter and the ammeter have their normal properties.

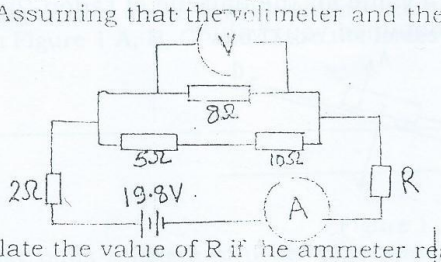


Fig. 4

(i) Calculate the value of R if the ammeter reads 1.5 A

(3 marks

(ii) Calculate the reading of the voltmeter

(3 marks

(iii) Explain why ammeter and voltmeters are always connected in series and parallel respectively

(4 marks

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9 (a) (i) What is radioactivity?

(1 mark)

(ii) Radioactivity leads to the emission of three different radiations, alpha, beta and gamma radiations. The table below concerns the properties of these radiations. Copy and complete the table.

Property	Alpha radiation	Beta radiation	Gamma radiation
Charge			
Stopped by (or absorbed by)			

(6 marks

(iii) State and explain two uses of radioactivity.

(2 marks

(b) Radon $^{220}_{86}Rn$ decays to polonium (Po) by alpha emission and has a half-life of one minute.

(i) Explain the underlined word

(1 mark)

(ii) Write a balanced nuclear equation to represent the decay

(2 marks

An experiment was set up to measure the half-life of $^{220}_{86}Rn$. The results obtained are shown in the table below:

Count/s	19308	15462	11989	8656	6852	5200	3143	1734	1134	496
Time elapsed/s	0	20	40	60	80	100	140	180	220	300

(iii) Draw a graph of counts per second (y-axis) against time elapsed (x-axis). Use your graph to obtain a value for the half-life of radon-220. Show clearly on your graph how you obtained your value.

(5 marks)