

Physics IV

141

23 Nov. 2005

8h30 – 11h30

RWANDA NATIONAL EXAMINATIONS COUNCIL



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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)**

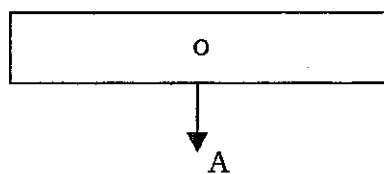
2. (a) State the difference between mass and weight. **(2marks)**

(b) The weight of a body on the moon is less than the weight of the body on the earth. Why ? **(1mark)**

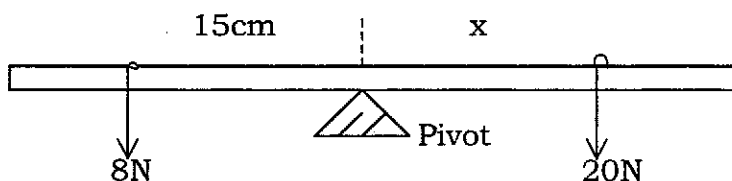
3. (a) Why are gases squeezed more easily than liquids ? **(2marks)**

(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)**

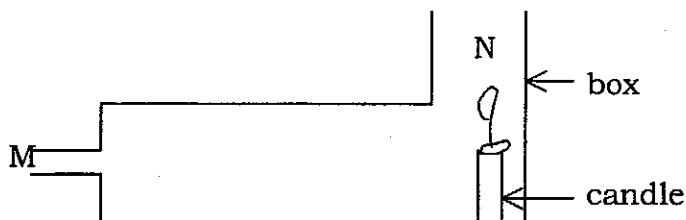


(b) The metre rule below is supported at its centre. Calculate the distance x if the metre rule is uniform and the weights are balancing. **(2marks)**



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.



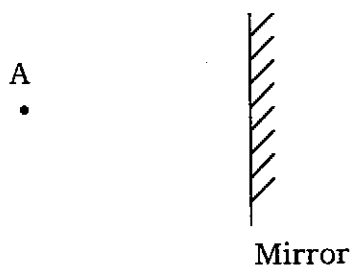
(a) Copy the diagram and label arrows to indicate the direction of hot air and cool air. **(2marks)**

(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)

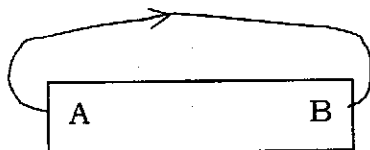
(b) Copy the diagram in your answer book. Using ray construction, show the position of the image of point A in the mirror.



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)

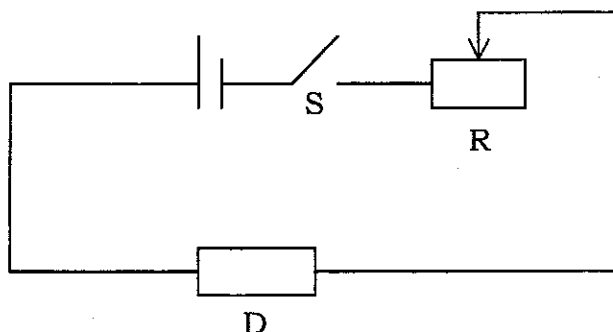
9. The diagram shows a bar magnet and one magnetic field line.



(a) Copy the diagram and draw two more magnetic field lines. (2marks)

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

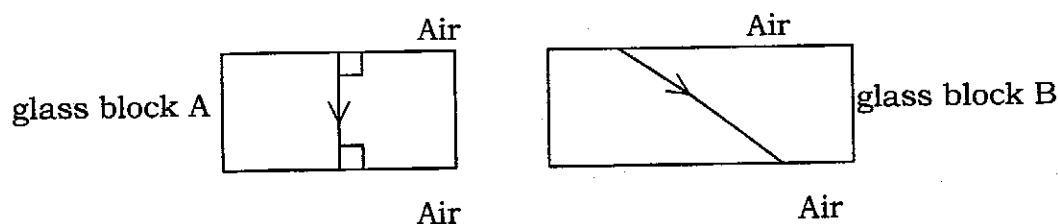
- (b) An electrically charged body insulated from everything else is touched with a rod of material, one end of which is held in the hand. Identify the type of rod used if the body

(i) retains its charges. (1mark)

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

SECTION B: Answer any THREE questions (30 Marks)

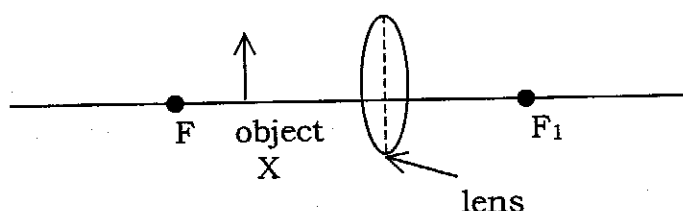
16. (a) The diagrams below show the paths of rays of light through the blocks of glass.



- (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.

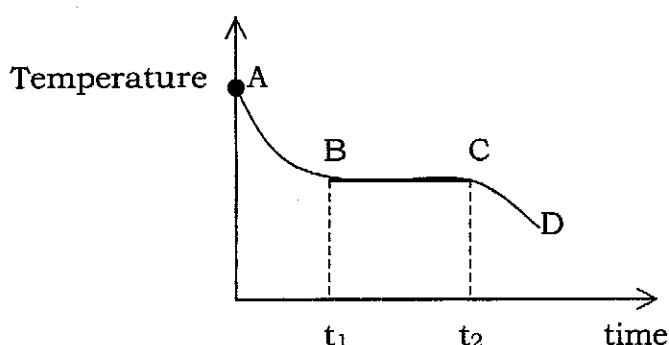


- (ii) State the relation between the size of the image formed and size of object X. (4marks)

- (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.

(2marks)

(ii) B to C.

(2marks)

(iii) C to D.

(2marks)

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

(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.

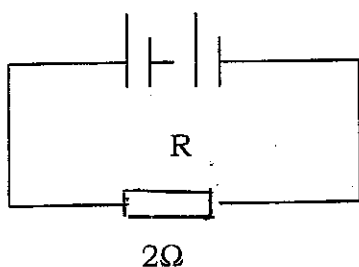


Fig A

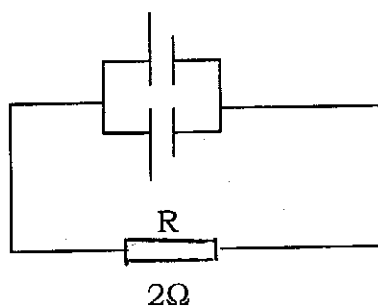
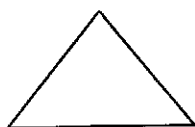


Fig B

- (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 unit? **(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 $\frac{1}{\text{volume}}$. **(8marks)**

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