THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION NOVEMBER 1993

031/1

PHYSICS PAPER 1

(For both school and Private Candidates)

TIME: 3 Hours

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1. This paper consists of sections A and B.
2. Answer ALL questions in section A and any FIVE questions from section B in the answer book provided.
3. Where calculations are involved, you are expected to show clearly all the steps in your work in a systematic manner.
4. The intended marks for questions or parts of questions are given in brackets.
5. Where necessary, make use of the following:

   Acceleration due to gravity, $g = 10ms^{-2}$

   $\pi = 22/7$

This paper consists of 5 printed pages.

SECTION A (50 marks)
Answer ALL questions in this section.

1. (a) Define momentum and state the Principle of conservation of momentum. (2 marks)

(b) A projectile of mass 400g moving at 600m/s hits a movable target of mass 20kg which is at rest. The projectile and the target move on together after the impact. Find

(i) the momentum of the projectile

(ii) the combined velocity just after the impact. (3 marks)

2. (a) Sketch a graph to show the variation of density with temperature for a given mass of water heated from -5°C to +5°C. (3 marks)

(b) What is the biological significance of this variation? (2 marks)

3. (a) Explain why a bubble of air increases in volume as it rises from the bottom of a pond to the surface. (2 marks)

(b) If the volume of the bubble as it reaches the surface is double that at the bottom of the pond, estimate the depth of the pond.
(Assume that the water temperature is uniform, the pressure at the water surface is 10^5 N/m^2 and the density of water is 1000kg/m^3) (3 marks)

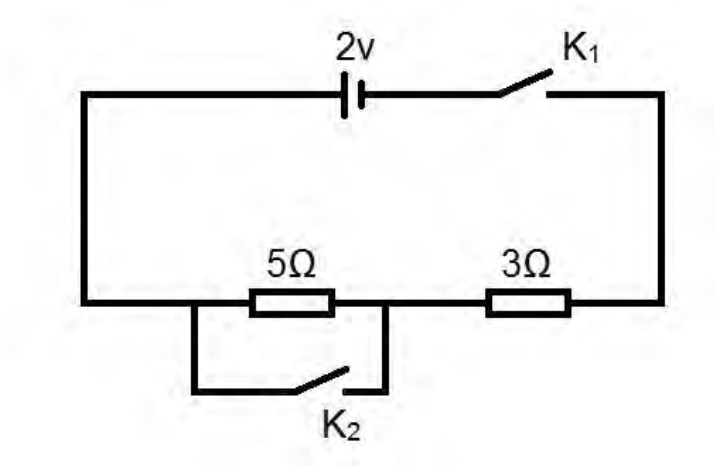
4. (a) If and $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ and $m = \frac{v}{u}$, show that $m = \frac{v}{f} - 1$
Where f = focal length of the lens
u = object distance from the lens
v = image distance from the lens
m = magnification. (2 marks)

(b) A converging lens of focal length 15cm produces a real image four times larger than the object. How far, from the lens, is the object?

5. (a) Distinguish between a star and a planet. (2 marks)

(b) If the radius traced by the path of the planet is 8400 km, calculate the speed of the planet in km/day. (Assume the planet makes 1 revolution in 400 days, and π = 22/7). (3 marks)

6.



Use the above diagram to calculate the current when

(a) switch K_1 is closed while K_2 is open. (2 marks)

(b) Both switches K_1 and K_2 are closed. (2 marks)

(c) switch K_1 is open while K_2 is closed. (1 mark)

7. (a) Define:

(i) Altimeter

(ii) Barograph (2 marks)

(b) With the aid of a diagram, explain briefly how a bicycle pump works. (3 marks)

8. (a) Briefly explain why a bat can fly in the dark without hitting objects? (2 marks)

(b) A hunter shoots a rifle and 6 seconds later he hears a sound echoed from a cliff. How far away is the cliff? (Velocity of sound = 3×10^8m/s). (3 marks)

9. If a mercury barometer reads 760mmHg at the foot of a mountain 440 m high, what is the barometer reading at the top of the mountain? (Assume the average value for the density of air to be 1.2kg/m^3 and for mercury to 13200kg/m^3). (5 marks)

10. (a) What do you understand by the term Photoelectron? (2 marks)

(b) With the aid of a clearly labelled diagram, describe a simple demonstration of the photoelectric effect. (3 marks)

SECTION B (50 marks)

Answer any FIVE questions from this section.

11. (a) Define

(i) humidity (ii) dew point (iii) hygrometer

SORRY - WE ARE MISSING THIS PAGE

15. (a) State Ohm's law (1 mark)

(b) Two cells each having an e.m.f. of 2.5v and internal resistance of 2Ω are connected in

(i) series

(ii) parallel

Find the current, in each case, when the cells are connected to a 5Ω resistor. (4 marks)

(c) If a cell supplies a current of 0.6A through a 2Ω coil and a current of 0.2A through a 7Ω coil, calculate the e.m.f. and internal resistance of the cell. (5 marks)

17. (a) Explain why burns are produced by steam at 100°C are more severe than those produced by hot water at 100°C. (2 marks)

(b) State four ways in which evaporation differs from boiling. (2 marks)

(c) In an experiment to determine the latent heat of vaporization of water, steam was bubbled into a copper calorimeter weighing 50g and containing 100g of water at 4.7°C. The final mass of the calorimeter and contents was 154g. Calculate the latent heat of vaporization in Joules/g.
(Specific heat of copper = 0.4J/gK and specific heat of water = 4.19J/gK). (6 marks)

18. (a) A radioactive nucleus is denoted by the symbol Y_{92}^{288}. Write down the composition of the nucleus at the end of the each of the following stages of disintegration.

(i) The emission of an alpha particle.

(ii) The further emission of a beta particle

(iii) The emission of some gamma rays. (6 marks)

(b) The count rate recorded by a Geiger-Muller tube and counter close to an alpha-particle source is 400 per minute after allowing for the background count. if the half-life of the source is 4 days,

(i) What will be the count rate 12 days later?

(ii) Why should the rate be determined over periods of several minutes rather than over a seconds? (4 marks)