THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL
CERTIFICATE OF SECONDARY EDUCATION EXAMINATION,
NOVEMBER 1992

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. Attempt ALL questions in section A and any FIVE (5) questions from section B using 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 7 printed pages

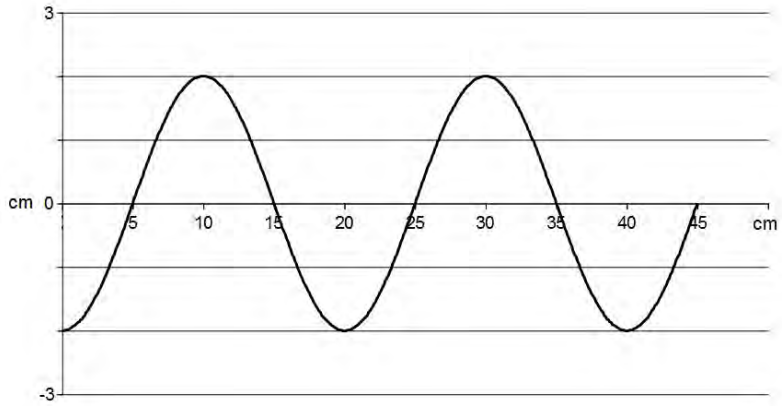
SECTION A (50 marks)
Attempt ALL the questions in this section.

1. (a) Define “Uniform acceleration” (1 mark)
   (b) Starting from rest and after 5 minutes, a train reached a velocity of 500 m/s. If the acceleration had been constant, how far did the train travel in the 5 minutes? (4 marks)

2. (a) A glass stopper weighs 37.5 g in air, 22.5g in water and 24.0g in lubricating oil. Find the
      (i) relative density of the lubricating oil
      (ii) relative density of the glass (3 marks)
   (b) State the principle you applied in your calculations in 2(a) above. (2 marks)

3. (a) Draw a ray diagram to show the direction of path of the reflected rays when a parallel beam of light falls close and parallel to the principal axis of a concave mirror. (2 marks)
   (b) A concave mirror has a curvature of radius 20cm. Find the position, magnification and nature of the image of a small pin placed on the axis at right angles to it at 15cm from the pole. (4 marks)

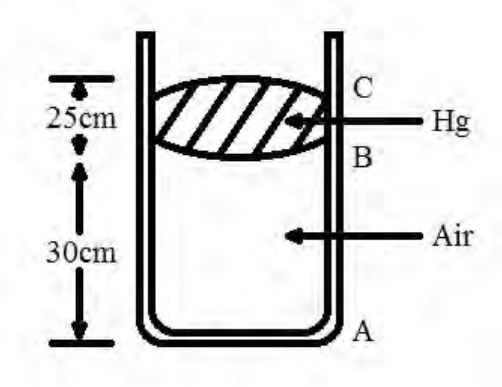
4. The figure below shows a snap shot of a wavelength in a string. The numbers on the diagram show scales in centimetres. The speed of travel of the wave is 8 m/s.



With reference to this wave motion what is the
   (a) wavelength?
   (b) amplitude?
   (c) frequency?

5. (a) With application of the same force on the same material, a sharp knife cuts more easily than a blunt knife. Explain why. (2 marks)
   (b) Find the liquid pressure at a point 50m below sea-water whose relative density is 1.024 (3 marks)

6.



The above diagram shows a vertical uniform tube containing a mercury thread CB and a volume of air AB.

(a) If the atmospheric pressure is 75mmHg, what is the pressure of the air trapped in the tube? (2 marks)

(b) If the tube is now turned through 90°, what will be the length of the air column AB? (2 marks)

7. (a) With the aid of a diagram, show why a pool of water appears shallower than it really is. (2 marks)

(b) A swimming pool is seen to have a depth of 9m when viewed from above. What is its actual depth?
(Refractive index of air-water is 4/3) (3 marks)

8. (a) Prove that when three resistors; R_1, R_2 and R_3 are arranged in series, the effective resistance, R_e is the sum of the separate resistors. (2 marks)

(b) Two 2Ω resistors connected in parallel are connected in series to a 3Ω resistor and then connected to a cell of emf 2v and internal resistance 1Ω.
Calculate the current in the circuit. (3 marks)

9. (a) Distinguish between a primary colour and a secondary colour. (2 marks)

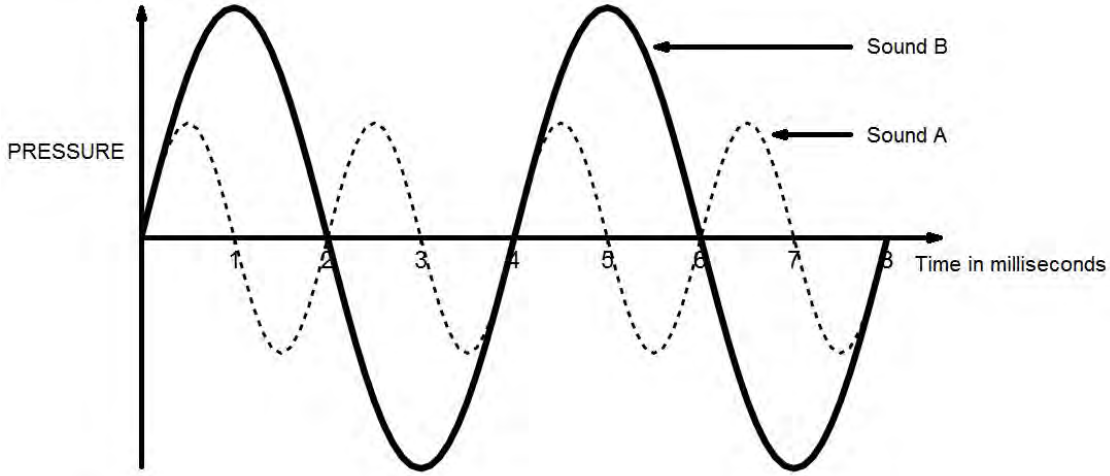
(b) Jessie is wearing a blue with red spots neck-tie. What is the appearance of the neck-tie in
(i) blue light?
(ii) red light?
(iii) yellow light? (3 marks)

10. (a) Differentiate between mass and weight. (2 marks)

(b) Explain clearly why a given object weighs more on the earth than on the moon. (3 marks)

SECTION B (50 marks)
Attempt any FIVE (5) questions from this section.

11.



The diagram above illustrates how pressure at a person's ear varies with time for two different sounds A and B from two different sources.

(a) Calculate the frequency of sound A. (4 marks)
(b) Comment on the difference in the sounds heard by referring to their pitch and their loudness. (6 marks)

12. (a) (i) Distinguish between heat and temperature. (2 marks)
(ii) What causes heat to flow from one point to another? (2 marks)
(b) Summarize the results of Leslies' Cube experiment. (6 marks)

13 (a) Mention the factors on which the strength of the induced electromotive force depend. (3 marks).

(b)

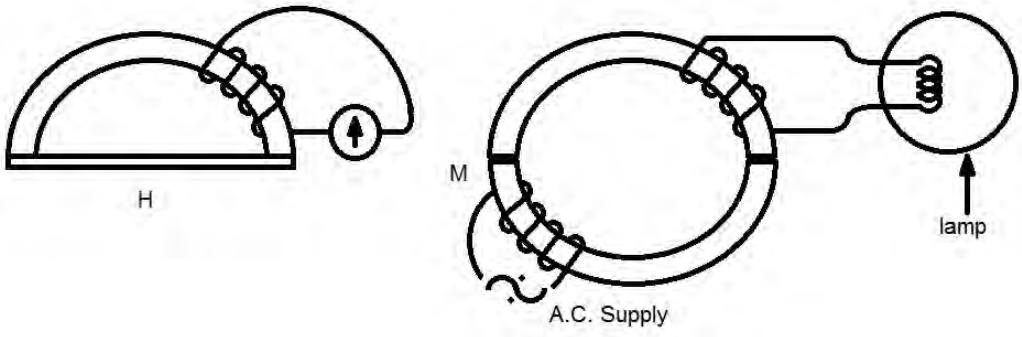


Figure H above shows a ∩-core of iron with a coil wound on it. The ends of the coil are joined to a galvanometer. What would you notice in the galvanometer if you put a bar magnet on the core and took it off? (2 marks)

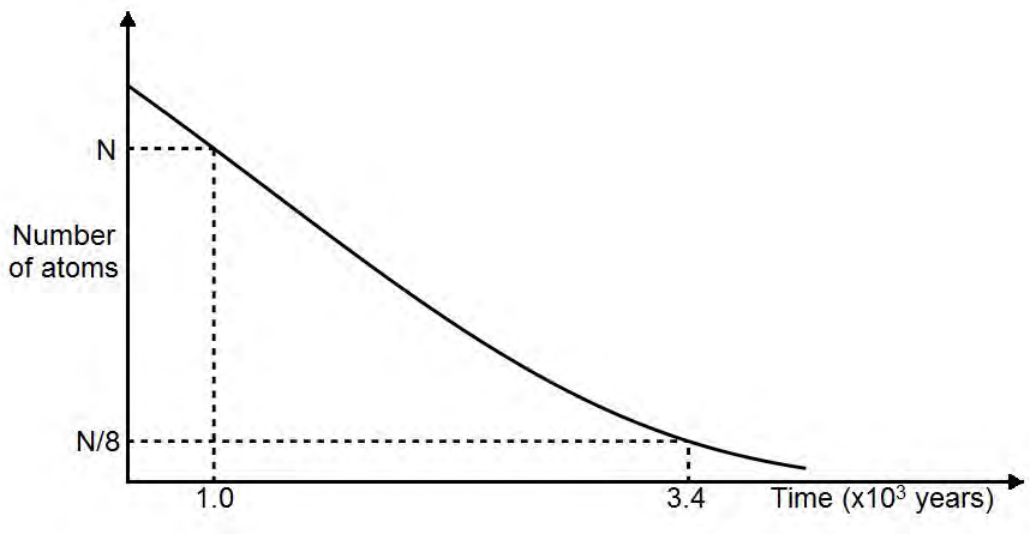
(c) Figure M shows the same ∩-core of iron with the four turn coil joined to a lamp instead of a galvanometer. A second ∩-core of iron is now attached to the first and also has a four-turn coil which is joined to a 2-volt ac. supply.

(i) What would you see in the lamp? (2 marks)

(ii) Briefly explain your observations in c(i) above. (3 marks)

14. (a) (i) The half-life of Radium 225 is 1600 years. What does this statement mean? (2 marks)

(ii)



The above graph shows a decay curve for a radioactive substance. Use it to determine the half-life of the substance. (5 marks)

(b) Find the values of a, b, c and d in the following radioactive decay equations.

(i) ${}^{213}_{84}Po \rightarrow {}^{209}_{82}Pb + {}^{a}_{b}A$

(ii) ${}^{209}_{82}Pb \rightarrow {}^{c}_{d}Bi + {}^{0}_{-1}e$ (2 marks)

(iii) What is A in equation 14(b)(i) above? (1 mark)

15. (a) (i) What is the essential condition under which an e.m.f. is induced in the conductor?

(ii) What determines the magnitude of the e.m.f. induced in a length of conductor moving in a magnetic field?

(iii) In what two ways may the rate of change of magnetic flux linking a conductor be increased?

(iv) Summarize answers for part (i) - (iii) above in one law and state the law. (5 marks)

(b) A transformer has 800 turns in the primary winding and 40 turns in the secondary winding. The alternating e.m.f. connected to the primary winding is 240v and the current flowing is 0.2A. Find the

(i) secondary e.m.f.

(ii) current flowing in the secondary winding if there are no power losses. (5 marks)

16. (a) Distinguish between “the specific heat capacity” and “heat capacity”. (2 marks)

(b) 500g of water at 100° are added to a thick copper calorimeter at 15°C. The mass of the calorimeter is 1000g.

(i) What is the final temperature of the water and the Calorimeter? (5 marks)

(ii) What are the heat capacities of the water and the calorimeter? (3 marks)

(Specific heat capacity of copper = 0.4J/gK
Specific heat capacity of water = 0.42J/gK)

17. (a) Define “work”, “Energy” and “Power””. (3 marks)

(b) A car of mass 3000kg is driven from rest with uniform acceleration and reaches a speed of 10m/s in 30 seconds. Find the

(i) useful force, in Newtons, exerted by the engine. (3 marks)

(ii) power, in kilowatts, developed at that speed (10m/s) (4 marks)

18. (a) With the aid of a diagram, define a “diode”. (4 marks)

(b) What do you understand by the terms:

(i) rectification?

(ii) demodulation? (4 marks)

(c) State the uses of a diode.