THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

NOVEMBER 1995

031/1

PHYSICS PAPER 1

(For Both School and Private Candidates)

TIME: 3 Hours.

---

1. This paper consists of Sections A, B and C.
2. Answer ALL questions in Section A, any SIX (6) questions from Section B and any FOUR (4) questions from Section C in the answer book provided.
3. Read the instructions given under each section very carefully.
4. The marks intended for Section A and for each question in Sections B and C are indicated in brackets.
5. Where calculations are involved, you are expected to show clearly all the steps of your work in a systematic manner.
6. Remember to write your Index Number on every page of your answer book provided.

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

$\pi = \frac{22}{7}$

This paper consists of 7 printed pages.

SECTIONS A (30 Marks)

Answer all questions in this section.

For each question, choose and write the letter of the most correct or best answer in the answer book provided.

1. (i) The SI units of linear momentum is

A. Ns

B. Kgms

C. Kg/ms

D. Js.

(ii) Potential and Kinetic energies are similar in that

A. both produce heat

B. both are measured in watts

C. one is a substitute of the other

D. both are forms of mechanical energy.

(iii) If a uniform rod, 1.0m long of mass 100g is supported horizontally on two knife edges placed 10.0 cm from its ends, the reaction at the supports, when a 150g mass is placed at the mid-point of the rod will be

A. 250g

B. 125g

C. 1.25N

D. 125 dynes.

(iv) The difference between a scalar and vector quantity is that

A. a scalar has magnitude only

B. a vector has direction only

C. a scalar has magnitude and direction while a vector has magnitude only

D. A a scalar has magnitude only while a vector has both magnitude and direction.

(v) The gallax in which the solar system is occupied is called

A. the milky way

B. the Universe

C. constellation

D. X-santauri.

(vi) The area under a speed against time graph represents

A. displacement

B. velocity

C. distance

D. acceleration.

(vii) The heat capacity of a substance is defined as the

A. heat required to raise the temperature of a unit mass of it

B. heat required to raise the temperature of a substance by 1K

C. heat required to raise the temperature of a unit mass of a substance by 100°C or 373K.

D. quantity of heat required to raise the temperature of a substance.

(viii) The density of most liquids decrease with increasing temperatures because their volumes

A. increase while their masses decrease

B. increase more than their masses

C. increase while their masses remain constant.

D. decrease while their masses remain constant.

(ix) Which statement correctly explains the truth about the image formed in a plane mirror? It is laterally inverted,

A. enlarged, real and positioned as far behind the mirror as the object is in front.

B. reduced in size, virtual and positioned as far behind the mirror as the object is in front.

C. the same size as the object, real and positioned as far behind the mirror as the object is in front.

D. the same size as the object, virtual and positioned as far

(x) If the refractive index of water is $\frac{4}{3}$, then the critical angle of water-air interface is

A. 48° 35'

B. 45°

C. 42°

D. 36° 51'.

(xi) When ultra violet light falls on a metal surface, electrons are emitted from the metal surface. This effect is called

A. thermionic emission

B. spontaneous emission

C. photo electric emission

D. electron emission.

(xii) An instrument which consists of a solenoid wound around a soft iron core whose magnetism disappears when the current is switched off is called

A. an electromagnet

B. an electric bell

C. a magnetic relay

D. a solenoid.

(xlvi) Two main differences between light and sound waves are that light waves
A. are transverse and exhibit interference while sound waves do not;
B. are transverse and exhibit refraction while sound waves do not;
C. undergo interference and refraction while sound waves do not;
D. are transverse and electromagnetic while sound waves are not.

(xlvii) Cathode rays are
A. electrons
B. negative charges
C. β-particles
D. fast moving electrons.

(xlviii) An instrument which can detect electric charges is called
A. ammeter
B. electroscope
C. voltmeter
D. electrometer.

(xlix) The two main conditions which are necessary for interference of waves to take place are
A. two close sources and a distant screen
B. two close sources which are coherent
C. two coherent sources and a distant screen
D. two close sources which are not coherent.

(l) The weight of an object is
A. the same as its mass when at the poles
B. measured in grammes or kilogrammes
C. greater at the poles than it is at the equator
D. greater at the equator than it is at the poles.

(li) When water is warmed between -5°C and 5°C, it expands, contracts and then expands again. This behaviour of water is called
A. tripple point of water
B. phase change of water
C. contraction of water
D. anomalous expansion of water.

(lii) The use of a soft iron cylinder round the neck of a cathode ray tube in television receivers is to provide
A. magnetic shielding
B. conduction of electricity
C. a stronger magnetic field
D. mechanical protection.

(ii) If the e.m.f. and internal resistance of a battery are 1.5V and 0.5Ω respectively, the current that this battery will supply to a resistor of 10.5Ω will be

A. 13 A
B. 10 A
C. 1.5 A
D. 0.1 A.

SECTION B (30 Marks)

Answer any TWO (2) questions from this section.

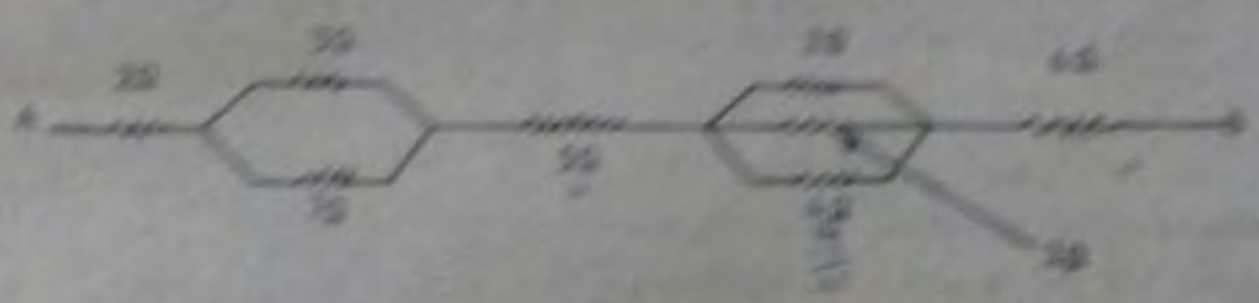
ALL WORKING for each question you attempt must be shown clearly.

You are advised to spend not more than 1 hour on this section.

3. A spring balance reads 120 when a metal block is suspended from it in air and reads 100 when totally immersed in water.

Find the volume of the metal block.

3. Find the total resistance between points A and B in the following diagram.



4. A converging lens has a focal length of 25.0cm and an object is placed 30 cm from the lens. Calculate the image position and its magnification.

5. A mass of 80 kg falls from a height of 100 metres. Assuming there are no losses, what is the kmt developed at the ground?

6. (a) Illustrate how you would use a right 45° prism to change the direction of the ray by

(i) 90°

(ii) 180°.

(b) What type of reflection is demonstrated in the above examples.

7. (a) Explain why radio waves are similar to light waves but not to sound waves.

(b) A radio station transmits a signal of wavelength 1500 metres. Calculate the frequency of this signal.

8. A sonometer wire of length 40 cm between two bridges produces a note of 512 Hz when plucked at the mid-point. Calculate the length of the wire that would produce a note of 256 Hz with the same tension.

9. (a) What is a diode?

(b) Draw the circuit symbol of a diode

(c) Draw the circuit diagram of a simple half wave rectifier using a single diode and an output load resistor R.

SECTION C (40 Marks)

Answer any FOUR (4) questions from this section.

ALL WORKING for each question you attempt must be shown clearly.

You are advised to spend not more than 1 hour and 20 minutes on this section.

10. (a) Define the terms: watts and kilowatt hour as used in electricity

(b) A washing machine for use in a 240V mains has a $\frac{1}{4}$ h.p. motor and a heating element rated at 2 kW connected in series.

(i) What current does it take when in use?

(ii) What is the cost of using it for 40 minutes every day for a period of 12 weeks if the cost of electricity is 5/= per unit (kWh)?

[1 h.p = 0.75 kW].

11. (a) Draw and label a simple a.c. dynamo.

(b) Explain why an e.m.f. is induced in the coil as it rotates.

(c) Show one of the positions of the coil when the dynamo produces maximum e.m.f.

(d) At what position of the coil is the induced e.m.f. zero?

12. (a) Briefly explain the meaning of each of the following

(i) Deviation

(ii) Dispersion

(iii) Pure spectrum.

(b) Draw a ray diagram to illustrate how a pure spectrum of white light can be projected on a screen using two lenses and a prism.

(c) How does the colour of a body vary with the colour of the light in which it is viewed?

13. (a) What is a hygrometer?

(b) A plastic tray weighing 48g and containing 200g of water at 20°C is put in a refrigerator which abstracts heat at a uniform rate of 2100 J/min. Calculate the

(i) time taken for the tray and water to reach 0°C

(ii) total time taken to freeze all the water to ice at 0°C.

[Specific heat capacity of the plastic = 1050 J/kg K

Specific latent heat of fusion of water = 335000 J/kg].

14. (a) Define each of the following:

(i) Mechanical advantage

(ii) Velocity ratio.

(b) A load of 500N is raised through 5 metres by a machine when its effort E moves simultaneously through a distance of 25 metres along its direction. If the machine has an efficiency of 80%, calculate the

(i) total work done by the machine

(ii) value of E.

15. (a) What are

(i) α- particles

(ii) β - particles

(iii) γ - rays?

(b) A radon nucleus $^{222}_{86}Rn$ emits an α- particle followed by a β -particle. What are the atomic number and mass number of the nucleus formed after the emission?

(c) A radio active source has a half life of 16 days. How long will it take for the count rate to fall from 160 per minute to 20 minute?