

Name: _____ Index No: _____

2705/102 2709/102

2707/102 2710/102

MATHEMATICS I AND

PHYSICAL SCIENCE

Oct/Nov 2015

Time: 3 hours



Candidate's Signature: _____

Date: _____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN BUILDING TECHNOLOGY

DIPLOMA IN CIVIL ENGINEERING

DIPLOMA IN ARCHITECTURE

(MODULE I)

MATHEMATICS I AND PHYSICAL SCIENCE

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of examination in the spaces provided above.

You should have Mathematical tables/Scientific calculator and drawing instruments for this examination.

This paper consists of EIGHT questions in TWO sections: A and B.

Answer FIVE questions, choosing TWO questions from section A, TWO questions from section B and

ONE question from either section in the spaces provided in this question paper.

All questions carry equal marks.

Maximum marks for each part of a question are as shown.

Do NOT remove any pages from this question paper.

Candidates should answer the questions in English.

For Examiner's Use Only

Section	Questions	Maximum Score	Candidate's Score
A	1	20	
	2	20	
	3	20	
	4	20	
B	5	20	
	6	20	
	7	20	
	8	20	
Total Score			

This paper consists of 20 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

SECTION A: MATHEMATICS

Answer at least TWO questions from this section.

1. (a) (i) Transpose the formula

$$V = \frac{4}{3}\pi r^3$$

to make r the subject.

(3 marks)

- (ii) Solve the simultaneous equations

$$8x - 3y = -39$$

$$7x + 6y = 9$$

(3 marks)

- (iii) Simplify

$$\frac{3x^2y^2 + 2xy^2}{6xy}$$

(3 marks)

- (b) Solve the equation

$$3^x = 5(3^x) - 6$$

(6 marks)

- (c) Find the sum of all the numbers between 6 and 204 which are exactly divisible by 8.

(5 marks)

2. (a) Draw a triangle ABC such that AB = 10 cm, AC = 4 cm, $\angle BAC = 90^\circ$. Construct a triangle ABP such that $\angle BAP = 30^\circ$ and $\angle APB = 90^\circ$. Measure AP and PB. Calculate area of $\triangle ABC$.

(10 marks)

- (b) Solve the equation

$$2\sec^2\theta = 3(2 - \tan\theta)$$

$$\text{for } 0^\circ \leq \theta \leq 360^\circ$$

(8 marks)

- (c) A pyramid with a square base has an altitude of 15 cm. If the side of the square base is 6 cm, find its volume.

(2 marks)

- (a) Draw a triangle ABC with $AB = 10$ cm, $AC = 4$ cm and $\angle BAC = 90^\circ$. Construct a triangle ABP such that $\angle BAP = 60^\circ$ and $\angle APB = 90^\circ$. Measure PA and PB.

Calculate the area of $\triangle ABC$. (10 marks)

- (b) P and Q are two points on latitude $62^\circ N$. They lie on longitude $40^\circ W$ and $140^\circ E$ respectively. Determine the distance P to Q.

- (i) along a parallel of latitude.
- (ii) along a great circle.

Take the radius of the earth to be 6400 km.

(10 marks)

- (a) The probability of the occurrence of three events x , y and z are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{3}{8}$ respectively. Determine the probability of

- (i) all events occurring;
- (ii) event x and y but not z occurring;
- (iii) only event y occurring;
- (iv) none of the events occurs.

(8 marks)

- (b) Table 1 gives the distribution of monthly income of 100 workers in a certain construction firm.

Table 1

Monthly income (Ksh. '00)	No. of workers
0-75	8
75-150	10
150-225	20
225-300	22
300-375	18
375-450	12
450-525	10

Determine the:

- (i) mean;
- (ii) median;
- (iii) standard deviation.

(12 marks)

SECTION B: PHYSICAL SCIENCE

Answer at least TWO questions from this section.

5. (a) Name the following covalent compounds:
- (i) P_2O_5 ;
 - (ii) Cl_2O_7 ;
 - (iii) Cl_2 .
- (3 marks)
- (b) Explain two uses of graphite in relation to its physical properties. (6 marks)
- (c) Describe using a chemical equation, how chlorine can be used to convert iron (II) ions (Fe^{2+}) into iron (III) ions (Fe^{3+}). (8 marks)
- (d) Give three examples of common reducing agents. (3 marks)
6. (a) Give the names of six different types of naturally occurring polymers. (6 marks)
- (b) Name two natural and two synthetic fibres. (4 marks)
- (c) Describe three applications of isotopes. (6 marks)
- (d) A trumpet is placed at a distance of 3.2 m from a wall. Assuming that the sound waves produced by the trumpet are spherical, determine the intensity of the sound waves produced by the trumpet, when the power of the trumpet is 0.20 W. (4 marks)
7. (a) A convex mirror of focal length 18 cm produces an image on its axis 12 cm away from the mirror. If the image is 6 cm high, by scale drawing, determine the:
- (i) object distance from the mirror;
 - (ii) size of the object.
- (9 marks)
- (b) A light steel bar 8 m long is supported at both ends by sharp-edged supports. The bar is subjected to vertical downwards forces of 32N and 24N at 2 m and 4 m from the left-hand support respectively. Calculate the reactions at the sharp-edge supports. (11 marks)

8. (a) Describe three characteristics of an acid. (6 marks)
- (b) Briefly state the difference between the following:
- (i) deliquescent and efflorescent salts;
 - (ii) hydrated salts and anhydrous salts.
- (8 marks)
- (c) Describe three properties of covalent compounds. (6 marks)