TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN MEDICAL LABORATORY SCIENCE (DMLS 12S)
DIPLOMA IN PHAMACEAUTICAL TECHNOLOGY (DPT 14S)

AMA 2101: MATHEMATICS FOR SCIENCE

END OF SEMESTER EXAMINATION
SERIES: DECEMEBER 2014
TIME ALLOWED: 2 HOURS

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Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown

This paper consists of **FOUR** printed pages

Question One (Compulsory)

a) (i) $\frac{7}{6} of \left(3\frac{1}{2} - 2\frac{1}{4}\right) + 5\frac{1}{8} \div \frac{3}{16} - \frac{1}{2}$ **(3 marks)**

(ii) $\left(\frac{2}{3} \times 1\frac{1}{4}\right) \div \left(\frac{2}{3} + \frac{1}{4}\right) + 1\frac{3}{5}$ **(3 marks)**

b) (I) Two kilograms of a compound contains 30% of element of 45% of element B and 25% of element C. Determine the masses of the three element present. **(3 marks)**

(II) When mixing a quantity of paints, dyer of four different colour are used in the ratio of 7:3;19:5. If the mass of the first dye used is 3½g, determine the total mass of the dyes used. **(2 marks)**

c) (i) Evaluate using the laws of indices:

$$\frac{4^{1.5} \times 8^{\frac{1}{3}}}{2^2 \times 32^{-\frac{2}{5}}}$$

(i) **(2 marks)**

$$\frac{2^3 \times 3^5 \times \left(7^2\right)^2}{7^4 \times 2^4 \times 3^3}$$

(ii) **(2 marks)**

d) Evaluate expressing your answer in standard form:

$$\frac{\left(2.4 \times 10^3\right)\left(3 \times 10^{-2}\right)}{\left(4.8 \times 10^4\right)}$$

(i) **(2 marks)**

$$\frac{\left(6 \times 10^{-3}\right) + \left(4.5 \times 10^{-2}\right)}{3 \times 10^{-2}}$$

(ii) **(2 marks)**

e) Use a calculator to evaluate the following correct to 5 significant figures.

$$\frac{4\left(e^{-1.7295} - 1\right)}{e^{3.6817}}$$

(i) **(2 marks)**

$$\frac{e^{2.1127} - e^{-2.1127}}{2}$$

(ii) **(2 marks)**

$$\frac{-6}{5} e^{-1.5}$$

(iii) **(2 marks)**

f) Solve the following equations:

(i) $\log_8 x = -4/3$ **(2 marks)**

(ii) $\log 0.01 = x$ **(2 marks)**

(iii) $\log_4 8 = x$ **(1 mark)**

Question Two

a) Solve the following indical equations for x, each correct to 4 significant figures.

(i) $2^{x-1} = 3^{2x-1}$ **(3 marks)**

(ii) $4^{2x-1} = 5^{x+2}$ **(3 marks)**

(iii) $x^{-0.25} = 0.792$ **(2 marks)**

b) (I) Find the differential coefficient of $y = 4x^2 + 5x - 3$ and determine the gradient of the curve at x=-3 **(3 marks)**

(II) Using the general rule, differentiate the following with respect to x.

(i) $y = 5x^7$

(ii) $y = 3\sqrt{x}$

(iii) $y = 4/x^2$ **(3 marks)**

c) Determine:

(i) $\int 5x^2 dx$ **(2 marks)**

(ii) $\int (2t^2 + 4t)t dt$ **(2 marks)**

(iii) $3x^4 dx$ **(2 marks)**

Question Three

a) Solve the equations:

(i) $\frac{x}{4} - \frac{x+6}{5} = \frac{x+3}{2}$ **(2 marks)**

(ii) $\frac{x+3}{4} = \frac{x-3}{5} + 2$ **(2 marks)**

b) Solve the following simultaneous equations:

$$5c = 1 - 3d$$
$$2d + c + 4 = 0$$

(i) By Substitution method **(3 marks)**

$$7x - 2y = 26$$
$$6x + 5y = 29$$

(ii) By elimination method **(3 marks)**

c) Solve the following quadratic equations:

$$15x^2 + 2x - 8 = 0$$

(i) By factorization **(3 marks)**

$$2x^2 + 9x + 8 = 0$$

(ii) By completing square **(3 marks)**

d) Solve the following equations:

$$5(x-2) - 3(2x+5) + 15 = 0$$

(i) **(2 marks)**

$$10 + 3(y-7) = 16 - (y+2)$$

(ii) **(2 marks)**

Question Four

a) A rectangular garden measures 40m by 15m. A 1m flower border is made round the two shorter sides and one long side. A circular swimming pool of diameter 8m is constructed in the middle of the garden. Find the area remaining.

b) Calculate the areas of the following sectors of the circles having:

(i) Radius 6cm with angle subtended at centre 50^o

(ii) Diameter 80mm with angle subtended at centre 107^o

(iii) Radius 8cm with angle subtended at centre 115^o **(6 marks)**

c) Find the volume and total surface area of a closed cylinder of length 15cm and diameter 8cm **(4 marks)**

d) Calculate the volume and total surface area of a sphere of diameter 5.0cm. **(5 marks)**

Question Five

a) Plot the following graphs on the same axes between the range:

$x = -3$ to x = +3 and determine the gradient and y axis intercept of each:

(i) $y = 3x$

(ii) $y = 3x + y$

(iii) $y = -4x + 4$

(iv) $y = -4x - 5$ **(12 marks)**

b) Solve the simultaneous equations graphically:

$3x + 4y = 5$

$2x - 5y + 12 = 0$

(8 marks)