THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Applied & Health Sciences

DEPARTMENT OF PURE & APPLIED SCIENCES
CERTIFICATE IN SCIENCE LABORATORY TECHNOLOGY (CSLT)

APS 2202: PHYSICS TECHNIQUES

END OF SEMESTER EXAMINATION
SERIES: AUGUST/SEPTEMBER 2011
TIME: 3 HOURS

Instructions to Candidates:
This paper contains **TWO** sections **A** and **B**
Answer **ALL** questions in A and any **TWO** questions in section **B**
All questions in section **A** carry 4 marks each, while each question in section **B** carries 20 marks
This paper consists of **FOUR** printed pages

SECTION A (60 MARKS)

Answer ALL questions in this section

1. a) Define electrical resistance and give its units of measurement   (2 marks)

    b) What factors does resistance of a conductor depend on?   (2 marks)

2. State the laws of reflection   (4 marks)

3. Describe a procedure for mapping the magnetic field lines of a bar magnet
        (4 marks)

4. A convex mirror of focal length 25cm produces an image on its axis 8cm away from   the mirror. Determine:

    a) The position of object   (3 marks)
    b) Magnification   (1 mark)

5. A virtual image of 4cm is formed using a convex lens of focal length 20cm. If the size of the object is 1cm, determine the position of the object.   (4 marks)

6. With aid of diagrams, describe the 'double touch' method of magnetizing an iron bar.

        (4 marks)

7. Calculate the internal resistance ® of a cell and electromotive force (E) that passes a current of 1.2A through a 1.0 ohm resistor a current of 0.4A through a 4ohm resistor.
        (4 marks)

8. a) Describe the term 'magnetic saturation'   (4 marks)

    b) Differentiate between dipoles and domains as used in magnetism,   (2 marks)

9. A steel wire has a cross-sectional area 25cm^3 and the resistivity of steel is 1.0 x 10^{-7} Ω m. Calculate the resistance of the wire per metre neglecting the effect of joints.
        (4 marks)

10. a) Define capacitance and give its SI units.   (1 mark)

    b) Calculate the combined capacitance of two capacitors in parallel, each of capacitance 4 μ F in series with a single 0.5 μ F capacitor.   (3 marks)

11. Give TWO defects of the eye and state how each of the defects can be corrected.

        (4 marks)

12. An object is placed 20cm in front of a concave mirror of focal length 12cm. Find the nature and position of the image formed.   (4 marks)

13. Describe the electrical method of demagnetization (4 marks)

14. a) Give a reason why convex mirrors are frequently used as driving mirrors. (2 marks)

b) What is the difference between the principal focus (F) of a concave mirror and that of the convex mirror? (2 marks)

$$M = \frac{v}{f} - 1$$

15. For a lens, show that magnification, (4 marks)

SECTION B (40 MAKRS)

Answer any **TWO** questions from this section

16. a) Describe with aid of diagrams how an electroscope can be charged positively by induction. (6marks)

b) Explain what happens when an uncharged body is brought close to the cap of a charged electroscope. (4 marks)

c) (i) Explain why convergence of the leaf on the gold leaf electroscope is not a Conclusive test for the nature of charge on a body (3 marks)

(ii) State the uses of an electroscope (2 marks)

d) State THREE properties of magnetic field lines (3 marks)

e) Define magnetic flux density and state its S.I. units (2 marks)

17. a) Draw diagrams showing the pattern and the direction of the magnetic field around:-
   i) A bar magnet
   ii) Two bar magnets with unlike poles near each other
   iii) Two bar magnets with N-poles near each other. (9 marks)

b) What is an electromagnet? (1 mark)

c) Describe the working of an electric bell. (5 marks)

d) With aid of diagrams, explain the domain theory of magnetism (5 marks)

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

b) Derive an expression for the resistance of two resistors connected in:

i) Series (4 marks)
ii) Parallel (4 marks)

c) Define electromotive force and give its units of measurement (2 marks)

d) A meter has a resistance of 20 Ω and gives full-scale deflection when a current of 50m A passes through it. Calculate the value of the resistance, stating in each case how it is connected so that the meter may measure:

    i)   Current up to 2A   (5 marks)
    ii)   Potential difference up to 100V.   (4 marks)

19. a) A convex lens has focal length 12.0cm. It forms an image of a pin which is 4 times magnified and is upright. Calculate the object distance and the image distance from the lens.
                                                  (5 marks)

   b) Calculate the change in potential difference between the plates of 470 μ F Capacitor when
     it losses 9.4 x 10^{-6} coulombs of charge   (5 marks)

   c) A moving coil meter of resistance 5 Ω measures a maximum current of 50Ma. How can it be adopted to measure a maximum current of 5A?   (5 marks)

   d) Two capacitors of 0.1 μ F and 0.2 μF are connected in series to a supply of 100V. Calculate the potential difference across each capacitor.   (5 marks)