

THE UNITED REPUBLIC OF TANZANIA  
KAGONDO SECONDARY SCHOOL

JUNE 2011

**PHYSICS FORM 3**  
(For School Candidates Only)

**Time: 2.5 hours**

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1. This paper consists of sections A, B, C.
2. Answer all questions in sections A and B and two (2) questions from section C.
3. Calculators and cellular phones are not allowed in the examination room.
4. Write your Examination Number on every page of your answer booklet(s).
5. Needed constants are provided with the respective questions.

**Good luck!**

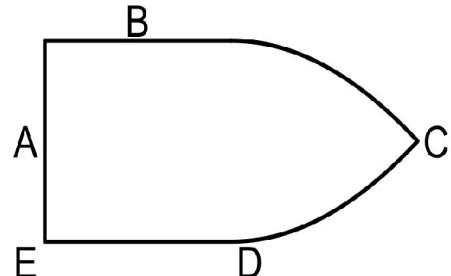
This exam consist of five (5) pages.

## SECTION A (22 marks)

Answer **all** questions in this section

1. For each of the items (i) - (v) choose the correct answer among the given alternatives and write its letter beside the item number. (2 marks each)

- (i) Which of the following is **not true** about Static Electricity
- A A body is charged by adding or removing protons from it
  - B A body can be charged by friction
  - C A body can be charged by induction
  - D A body is charged by adding or removing electrons from it
  - E A body can be charged by direct contact
- (ii) The following is **true** about lightning
- A Lightning is caused by too many electrons in a cloud.
  - B Lightning is fire coming from the sky.
  - C Lightning is an electric discharge that can take place between clouds or between a cloud and the earth.
  - D Lightning is a visual illusion.
  - E Lightning can be dangerous because it is cold as ice.
- (iii) Which of the following is **not true** about lightning and lightning rods
- A Lightnings can cause burning and destruction along their path.
  - B A lightning rod leads the lightning safely into the earth.
  - C Lightning rods can neutralize dangerous clouds so that lightning never strikes.
  - D Lightning rods make lightning strike far away from them.
  - E A lightning rod is best made from a good conductor such as copper.
- (iv) In the diagram of a charged, conducting object (to the right), which part of the surface has the largest concentration of charge?
- A A
  - B B
  - C C
  - D D
  - E E



- (v) Which of the following is **not true** about refraction
- A Refraction involves a change in the speed of light.
  - B When a light ray passes from a less dense into a denser medium, the angle of incidence is greater than the angle of refraction.
  - C Visual distortion in refraction happens because our eye assumes that light always travels in a straight line.
  - D Sometimes, a light ray from a denser into a less dense medium is reflected instead of refracted.
  - E The ratio of velocities (speed) in the different mediums is equal to the ratio of incidence and refraction angle:  $\frac{v_i}{v_r} = \frac{i}{r}$

2. Match the items in list A with the responses in list B by writing the letter of the correct response beside the item number. (1 mark each)

LIST A	LIST B
i. Charge of an electron	A. $V = R / I$
ii. 1A (Ampere)	B. $+1.602 \times 10^{-19} C$ (Coulomb)
iii. Resistors in parallel	C. measures the electric current
iv. Ohm's law	D. Magnified image
v. Electron current	E. from – (negative) to + (positive) terminal
vi. Voltmeter	F. $1C/s$ (Coulomb/second)
vii. Charge of a proton	G. measures electric potential difference
viii. Resistors in series	H. $V = I \times R$
ix. Conventional current	I. $1C$ (Coulomb)
x. Convex mirror	J. $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$
xi. Heat generated by 1A (Ampere) flowing through a resistor of $1\Omega$ (Ohm) for 1s (second)	K. Diminished image
xii. Ammeter	L. 1 Mole
	M. $R = R_1 + R_2 + R_3 + \dots$
	N. $1J$ (Joule)
	O. $-1.602 \times 10^{-19} C$ (Coulomb)
	P. $1N$ (Newton)
	Q. measures the electric resistance
	R. from + (positive) to – (negative) terminal
	S. $1W$ (Watt)

## SECTION B (48 marks)

Answer **all** questions in this section

3. Answer the following questions regarding electric currents: (12 marks)

- (i) If in a resistor of  $10\Omega$  there is an electric current of  $20A$ , what is the potential difference applied across the resistor?
- (ii) How would the electric current change if the potential difference is doubled from its original value?
- (iii) What would the resulting equivalent resistance be if the resistor ( $10\Omega$ ) is joined in **serial** with another identical resistor (also  $10\Omega$ )? What would be the electric current through the resistors if the potential difference across the combined resistors is  $200V$ ?
- (iv) What would the resulting equivalent resistance be if the resistor ( $10\Omega$ ) is joined in **parallel** with another identical resistor (also  $10\Omega$ )? What would be the electric current through the resistors if the potential difference across the combined resistors is  $200V$ ?

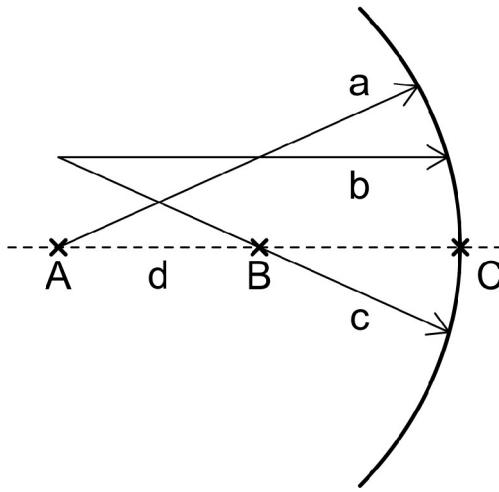
4. Answer the following questions concerning images created in **convex** mirrors: (8 marks)

- (i) Does the image appear to be in front of or behind the mirror? Does that mean the

image is “real” or “virtual”?

- (ii) What is the apparent distance of the image from the mirror compared to the distance of the reflected object from the mirror? What about the sizes of the image and the object?
- (iii) Is the orientation of the image the same as the original object or is it inverted?
5. In the following diagram of a curved mirror, answer these questions: (18 marks)

- (i) What type of curved mirror is this (light is reflected on the left side)?
- (ii) Name the points A, B and C, given that  $\overline{AC}$  is the radius of the mirror and  $\overline{AB} = 0.5 * \overline{AC}$ .
- (iii) Name the imaginary line d.
- (iv) Describe the reflected rays resulting from the incident light rays a, b and c in relation to the points A, B and C and the line d (given that b is parallel to d).
- (v) What are the following properties of an object that is behind A (further from the mirror): Is the image virtual or real? Is it inverted or upright? Magnified or diminished? Closer to the mirror or further away than the object?



6. Answer the following questions about refraction: (10 marks)

- (i) The ratio of the angle of incidence and the angle of refraction  $\frac{\sin i}{\sin r}$  is called what?
- (ii) Does this ratio change when different angles of incidence are used? Does it change when different combinations of mediums are chosen?
- (iii) What is the relation between this ratio and the ratio of speeds (velocities) in the mediums involved  $\frac{v_i}{v_r}$  ?
- (iv) If the ratio is  ${}_a\mu_w = 1.333$  for refraction from air into water, what is the ratio  ${}_w\mu_a$  for refraction from water into air?

## **SECTION C (30 marks)**

**Answer any two (2) questions from this section (15 marks each)**

7. An object of length 4cm is erected 6cm in front of a concave mirror of radius of curvature 10cm. By using a scale drawing, determine the position, size and nature of the image formed.
8. A light ray is sent from air (refractive index 1.00) to a crown glass block (refractive index 1.52).
  - (i) Calculate the angles of refraction corresponding to angles of incidence of (a)  $10^\circ$  (b)  $30^\circ$  (c)  $50^\circ$
  - (ii) If the velocity (speed) of light in air is  $3.0 \times 10^8$ m/s, what is the velocity of light in the crown glass?
  - (iii) What is the relative refractive index  $_{w\mu_g}$  for light being sent from water into the same crown glass, if the refractive index of water is 1.333?
  - (iv) Explain the phenomenon of total internal reflection.
9. Answer the following questions about electric power
  - (i) Define electric power (P) in terms of electric energy and time.
  - (ii) What is the formula for calculating electric power (P) from electric current (I) and electric potential difference (V)?
  - (iii) If a light bulb labelled 240V, 60W is connected to the appropriate electric potential difference of 240V, what will be the electric current I in the bulb?
  - (iv) Define the kilowatt-hour (kWh) and give its relation to the joule (J).
  - (v) If this same light bulb is operated for 2 hours per day for 30 days, what will be the energy consumed in kWh and J?

**THE END**

Enjoy your holidays and all the best for your future!