

THE UNITED REPUBLIC OF TANZANIA

PRESIDENT'S OFFICE

REGIONAL ADMINISTRATION AND LOCAL GOVERNMENT



**FORM FOUR JOINT MOCK EXAMS FOR DAR-ES-SALAAM, DODOMA,
IRINGA, MOROGORO, SINGIDA AND TANGA REGIONS**

031/1

PHYSICS- 1

(For both School and Private Candidates)

Time: 3:00 Hours

May, 2024

INSTRUCTIONS:

1. This paper consists of section A, B and C with a total of **eleven (11)** questions.
2. Answer **all** questions in section A and B and **two (2)** questions from section C.
3. Communication devices and any unauthorized materials are **not** allowed in the examination room.
4. Non programmable calculators and mathematical tables may be used.
5. Write your **examination number** on every page of your answer sheet(s).
6. Where necessary, the following constant may be used
 - (i) Acceleration due to gravity, $g = 10\text{m/s}^2$
 - (ii) Linear expansivity of aluminum = 2.6×10^{-5} per $^{\circ}\text{C}$
 - (iii) Pie (π) = 3.14

$$2.6 \times 10^{-5} = \underline{\underline{2.49}}$$

$$\overline{1} = 20 \div \underline{\underline{2.49}} \\ \overline{1} = 20 \div \frac{2.49}{100}$$

This paper consists of 4 printed pages

$1 - 20 \quad 4.6 \times 10^{-5}$

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SECTION A: (16 MARKS)

Answer all questions in this section

1. For each of the items (i)-(x) choose the correct answer from among the given alternatives and write its letter beside the item number in the answer booklet provided. (10 marks)
- (i) An airship is floating stationary high above the ground. What can you conclude?
- A. The air up thrust is equal to the airship weight.
 - B. The air temperature inside the ship is equal to the temperature outside.
 - C. The air density outside the airship is greater than the air density inside.
 - D. The air density outside the airship is less than the air density inside. ()
 - E. The air up thrust is greater than the airship weight.
- (ii) A wire X is half the diameter and half the length of a wire Y of similar material. What is the ratio of resistance of wire X to that of wire Y?
- A. 8:1
 - B. 4:1
 - C. 2:1
 - D. 1:1
 - E. 1:4
- (iii) A rectangular solid box has dimensions 2m by 1m by 0.5m and weighs 100N. Which one is the maximum pressure exerted by the box when placed on flat ground surface?
- A. 1000N/m^2
 - B. 200N/m^2
 - C. 100N/m^2
 - D. 50N/m^2
 - E. 2000N/m^2
- (iv) When a gas is compressed at a constant temperature, which statement is correct about the gas molecules?
- A. Move faster so that the pressure is increased
 - B. Move at the same speed so that the pressure is unchanged ()
 - C. Gain kinetic energy
 - D. Increase slightly in size
 - E. Make more impact per second on the walls of the container
- (v) The relative humidity of a place was measured at 25°C and found to be 54%. If the absolute humidity is 23g/m^3 , what is the actual vapour density at this temperature?
- A. 10.6g/m^3
 - B. 2g/m^3
 - C. 42.56g/m^3
 - D. 12.42g/m^3
 - E. 23.47g/m^3
- (vi) What will be the appearance of a blue dress with red spots when viewed in red light?
- A. Black with red spots
 - B. White red spot
 - C. Magenta with red spot
 - D. Completely red
 - E. Blue with red spot ()
- (vii) According to Newton's third law of motion, why action and reaction force never cancel each other?
- A. They are not equal in magnitude
 - B. They are in the same direction
 - C. They act on different objects
 - D. They act in opposite direction
 - E. Action is greater than reaction force ()
- (viii) How will you determine the acceleration of a moving object graphically?
- A. The area under its velocity time graph
 - B. The slope of the velocity time graph
 - C. The area under its distance time graph ()

- D. The slope of the distance time graph
 E. The slope at the peak of its distance time graph
- (ix) A man whose mass is 80kg walks up a flight of 25 steps each 20cm high in 10 seconds. What is the power developed by the man in kilowatts?
 A. 400kW B. 0.4kW C. 0.04kW ()
 D. 200kW E. 16kW
- (x) Why are magnets often fitted to the doors of refrigerators and some of the cupboard?
 A. To keep away heat B. To keep the inside environment warm
 B. To keep the door tightly closed ()
 C. To keep easier for the door to be opened.
 D. To create electromagnetism during cooling the drinks
2. Match the properties or function of the devices used in electric current in **LIST A**, with their corresponding names of the device in **LIST B** by writing the letter of the correct response beside the corresponding item number in the answer sheet(s) provided. (6 marks)

LIST A	LIST B
(i) Control the brightness of a lamp in the circuit	A. Connecting wires
(ii) Convert electrical energy to heat and light energy	B. Resistor
(iii) Impedes the flow of current in a circuit	C. Ammeter
(iv) Detect the presence of current	D. Rheostat
(v) Carry current from one point to another point in a circuit	E. Galvanometer
(vi) Used to measure current in a circuit	F. Voltmeter
	G. Bulb
	H. Heater
	I. Capacitor

SECTION B: (54 MARKS)

Answer all questions in this section

3. (a) Danger signs along the road as well as brake lamps of motor vehicle are painted red. Briefly explain the reason behind. (4 marks)
- (b) A certain microscope consists of two converging lenses of focal lengths 10cm and 4cm for objective lens and eye piece lens respectively, the two lenses are separated by a distance of 30cm. The instrument is focused so that the final image is at infinity. Calculate,
 (i) The position of the object (3 marks)
 (ii) Magnification of the objective lens (2 marks)
4. (a) Explain how a plastic pen rubbed against your hair can be attracted to small pieces of paper. (4 marks)
- (b) Three capacitors A, B and C have capacitances of $1\mu F$, $2\mu F$ and $4\mu F$ respectively are required to be connected in order to obtain minimum capacitance.
 (i) Draw the diagram showing the arrangement of the connection in 4(b). (2 marks)
 (ii) Determine the effective minimum capacitance of the arrangement. (3 marks)

5. (a) Explain in term of pressure, how straw is used to drink juice? (4 marks)
- (b) A car of mass 980kg is to be lifted by a screw jack of pitch 6.3mm. If the effort hand is 0.9m long and efficiency of the machine is 36%, what force must be applied to the machine? (5 marks)
6. (a) Explain how fish and other aquatic life are able to survive in a frozen lake. (4 marks)
- (b) A diameter of an aluminum sphere at 20°C is 2.5cm. If its diameter increases by 0.01cm when heated, what will be the final temperature? (5 marks)
7. (a) (i) Give two experiments which can distinguish between alpha particles and beta particles. (2 marks)
- (ii) Uranium $^{238}_{92}\text{U}$ emits an alpha particle to become another element as shown in the following equation $^{238}_{92}\text{U} \rightarrow {}_Z^AX + \text{alpha particle}$. Determine the values of A and Z (2 marks)
- (b) Radon has a half-life of 5472 minutes. How long will it take for 75% of radon to decay? (5 marks)
8. (a) Briefly explain four effects of global warming. (6 marks)
- (b) Briefly explain why infrared photography is used in long distance photography? (3 marks)

SECTION C: (30 MARKS)

Answer two (2) questions from this section

9. (a) With the aid of a diagram explain how the current from the microphone is converted into sound in the telephone receiver. (6 marks)
- (b) How an a.c generator can be converted to d.c generator? (3 marks)
- (c) A moving coil galvanometer which gives full scale deflection with 0.005A is converted to a voltmeter reading up to 5V using the external 975Ω resistance. Determine the resistance of the meter. (6 marks)
10. (a) Which transistor between NPN or PNP is most commonly used? Give reason. (4 marks)
- (b) Explain the mode of action of a p-n junction. (6 marks)
- (c) How will penetrating power of X-rays be affected when:
- (i) Their wavelength is reduced? (2.5 marks)
 - (ii) Voltage across X-ray tube is reduced? (2.5 marks)
11. (a) Why do we hear more clearly in a room with curtains than in a room with no curtains? (3 marks)
- (b) Calculate the wave length of a wave whose speed is 4m/s and frequency is 2.0kHz. (5 marks)
- (c) The speed of light is $2.25 \times 10^8 \text{ m/s}$ in water and $3 \times 10^8 \text{ m/s}$ in air. Determine:
- (i) The refractive index of water. (4 marks)
 - (ii) The angle of refraction in the water if the incident angle of light at the surface of water is 30° (3 marks)