

2019

**MATRICULATION EXAMINATION
DEPARTMENT OF MYANMAR EXAMINATION**

PHYSICS

Time Allowed: (3) Hours

WRITE YOUR ANSWERS IN THE ANSWER BOOKLET

The symbols in this paper have their usual significance

SECTION (A)

(Answer ALL questions)

1. Choose the correct answer from the following. (4 marks)

- (i) The construction of hydraulic brake is based on -----.
(A. Pascal's law, B. Hooke's law, C. Newton's law)
- (ii) Water ($n_w = 1.33$) in a pond appears to have only ----- of its true depth.
(A. four-thirds, B. three-quarters, C. two-thirds)
- (iii) The unit volt is the same as ----- .
(A. coulomb per second, B. newton per coulomb, C. joule per coulomb)
- (iv) The longest wave vibrating in one single segment is called -----
harmonic.
(A. first, B. second, C. third)

2. Match the following. (4 marks)

(i)	Power of a machine	A. kilowatt hour (kWh)
(ii)	Power of a lens	B. watt (W)
(iii)	Electrical energy	C. watt per metre squared (Wm^{-2})
(iv)	Intensity of a wave	D. diopetre (D)

3. A system of levers with a velocity ratio of 25 overcomes a resistance of 3300 N when an effort of 165 N is applied to it. Calculate the efficiency of the system. (4 marks)
4. What is meant by refraction? Draw a ray diagram to show that a stick is partly immersed in water, the part under water appears to be bent. (4 marks)
5. The area and thickness of a glass plate of a window are 0.25 m^2 and 4 mm respectively. The temperature of inside surface of glass plate is 25°C and its outside surface temperature is 26°C . Find the amount of heat that passes through the glass plate in one hour. The thermal conductivity of glass is $0.6276 \text{ Wm}^{-1}\text{K}^{-1}$. (4 marks)

[P.T.O]

6. A negative charge of $4.0 \mu\text{C}$ exerts a force of repulsion of 7.2 N on a second charge 25 cm away. What is the sign and magnitude of the second charge? (4 marks)

$$K = \frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ Nm}^2\text{C}^{-2}$$

7. What is meant by "Radon has a half-life of 3.8 days"? Draw a graph to illustrate the exponential nature of radioactive decay. (4 marks)
8. What is a solenoid? How can produce a permanent magnet by using solenoid? Answer by drawing circuit diagram. (4 marks)
9. Show how three NAND gates can be connected to behave as a OR gate. Construct a stage- by- stage truth table to confirm this action. (4 marks)

SECTION (B)

(Answer any **FOUR** questions)

10. (a) What does a hydrometer measure? Why lead shot must be filled in bulb of the glass tube of the hydrometer? Until when does the hydrometer sink in the liquid? (8 marks)
The weight of a metal block of unknown volume is 20 N . The apparent weight of the metal block is only 16 N when it is immersed in water. Find the density and volume of the metal block. ($g = 10 \text{ ms}^{-2}$)
- (b) (i) Define temperature gradient. What is its unit in SI? Explain why an air conditioner should be best positioned high, near the ceiling of a room. (8 marks)
- (ii) The highest and lowest frequency strings of a piano are tuned to fundamentals of $f_H = 4186 \text{ Hz}$ and $f_L = 32.8 \text{ Hz}$. Their lengths are 0.051 m and 1.98 m respectively. If the tension in these two strings is the same, compare the masses per unit length of the two strings.
11. (a) Show that $n_x \lambda_x = n_y \lambda_y$ for a ray of light passing through two media x and y . A ray of light in water has a wavelength of $4.42 \times 10^{-7} \text{ m}$. What is the wavelength and velocity of that ray while passing through ice? ($n_w = 1.33$; $n_{ice} = 1.31$) (8 marks)
- (b) A magnifying glass of focal length 9 cm is used to produce an image which is three times the size of an object. How far must the magnifying glass be placed from the object? Draw a ray diagram to illustrate your answer. (8 marks)

12. (a) State the definition of electric potential difference and write down its unit. (8 marks)
 Why can the earth be regarded as a body having zero electric potential?
 An electron is accelerated by a uniform electric field from rest to a velocity of 10^6 ms^{-1} . If the accelerating region is 0.2 m long, find the magnitude and direction of the electric field. Draw a diagram which agrees with your answer. (Mass of an electron = $9.1 \times 10^{-31} \text{ kg}$, charge of an electron = $-1.6 \times 10^{-19} \text{ C}$)
- (b) What is a resistor? Describe two types of resistors. What is meant by batteries in series opposing? (8 marks)
 Two batteries each having an e.m.f. of 6 V and an internal resistance of 2Ω are connected in parallel. Find the current when the batteries are connected to a 1Ω resistor. Draw a circuit diagram to show your answer.
13. (a) Why is a pointed rod very useful as a lightning conductor? Explain how a lightning conductor can prevent to a building from lightning discharge when a charged cloud passes over building. (8 marks)
 A body whose mass is 10^{-6} kg carries a charge $+10^{-6} \text{ C}$. If the body is suspended in equilibrium at a point above the ground by an electric field, find the magnitude and direction of the electric field. Draw a diagram to show your answer. ($g = 10 \text{ ms}^{-2}$)
- (b) State Joule's law of electricity and heat. If the potential difference across a resistor is doubled, what will be the electrical power? (8 marks)
 Find the number of calories produced per second by a 2Ω resistor connected to a battery having an e.m.f of 6 V and internal resistance of 1Ω . Draw a circuit diagram for conversion of electrical to heat energy in the resistor. ($J = 4.2 \text{ J cal}^{-1}$)
14. (a) Explain how an n-type semiconductor and a p-type semiconductor can be obtained. What are the majority carriers in these semiconductors? (8 marks)
 What are cathode rays? State the properties of cathode rays. How can it be known that cathode rays are electrically charged particles?
- (b) Explain Thomson's atomic model and Bohr's atomic model. (8 marks)
 Draw the diagrams to show alpha scattering according to Thomson's and Rutherford's atomic models.

15. (a) Which device can be used as a rectifier? Why? Describe the function of a full-wave rectifier. Draw a circuit diagram of the full-wave rectifier showing input and output wave forms. (8 marks)
- (b) What is a shunt? Why is it necessary for the shunt of an ammeter to have a very low resistance? How must a moving-coil galvanometer be modified to convert it into a voltmeter? (8 marks)
- The resistance of a moving-coil galvanometer is $20\ \Omega$ and the current required for a full-scale deflection is 0.02 A . Find the resistance to be used to convert it into (i) an ammeter reading up to 5 A and (ii) a voltmeter reading up to 150 V .

(OR)

15. (a) What is atmospheric pressure? Why are you able to withstand atmospheric pressure? At sea level, what is the approximately value of atmospheric pressure (i) in Pa (ii) in mm Hg (iii) in atm? Does atmospheric pressure change according to locality and time? (8 marks)
- The refractive index of a liquid is 1.32 and that of glass is 1.5 . If a ray of angle of incidence 35° enters from liquid to glass find the angle of refraction.
- (b) What is electric capacity of a conductor? (8 marks)
- When the charge on a capacitor is increased, does its capacitance increase? Explain. Is there any kind of material that, when inserted between the plates of a capacitor, reduces its capacitance?
- The equivalent capacitance is $10\ \mu\text{F}$ when 'n' identical capacitors are connected in parallel and $0.4\ \mu\text{F}$ when they are connected in series. Determine 'n' and the capacitance of each capacitor.
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