

2018

**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. Fill in the blanks. (4 marks)
 - (i) Electrical force is a quantity.
 - (ii) A hydraulic system transfers force from place to place, using
 - (iii) The velocity of light in a medium depends upon the density of that medium.
 - (iv) rays are the most penetrating of the three rays.
2. Are the following statements **True** (or) **False**? (4 marks)
 - (i) Archimedes' principle is true not only for liquids but also for gases.
 - (ii) Work must be done to separate two bodies having opposite charges.
 - (iii) The angle of incidence is equal to the angle of emergence when the angle of deviation is maximum.
 - (iv) In the p-type semiconductor, electrons are the majority carriers of electric current.
3. Define 'watt'. Is it possible that a machine has the efficiency of 100%? (4 marks)

A man of 50 kg mass climbs up by pulling a rope 10 m long at a constant velocity for 10 s. Find the power output of the man. ($g = 10 \text{ ms}^{-2}$)
4. Prove that an angle of incidence (i) is equal to an angle of emergence (i') for a ray passing through a glass slab with parallel sides. (Answer with an appropriate illustration). Does it hold true only for the media of glass and air? (4 marks)
5. An electrical device with the resistance of 48Ω is connected to a 240 V mains line. Find the electrical power and the current flowing through it. Also find the electrical power produced by it when the voltage of the mains line drops to 180 V. (4 marks)
6. What is a p-n junction diode? How can the p-n junction be obtained? Draw the structure and symbol of a p-n junction diode. (4 marks)

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7. If the electric potentials at two points are the same, how much work is done? (4 marks)
What is the practical unit of electric potential? Draw the electric lines of force and equipotential surfaces around the charge $+Q$.
8. If the rate of energy radiation from a black body with an area of 100 cm^2 is 42 W , find the temperature of that black body. (4 marks)
($\sigma = 5.685 \times 10^{-8} \text{ Wm}^{-2}\text{K}^{-4}$, emissivity = 1)
9. What are the atomic number and mass number of an atom? Draw the structures of helium and lithium atoms. (4 marks)

(OR)

Why do the cathode rays consist of the fast moving electrons? What are the properties of alpha ray? (4 marks)

SECTION (B)

(Answer any **FOUR** questions)

10. (a) Although the atmospheric pressure on a person is very high, why are we able to withstand it? Will the mercury column be higher or lower than 76 cm when the whole up of the barometer is taken to a high mountain top? Explain your observation. (8 marks)
A hydraulic (water power) press consists of 1 cm and 5 cm diameter pistons. What force must be applied on the small piston so that the large piston will be able to raise 10 N load?
- (b) (i) Express the heat current equation. What is the rate of heat flow if the temperature difference ($T_2 - T_1$) is unchanged and length (l) is halved? (8 marks)
(ii) If the mass of a string of 1 m length is $0.2 \times 10^{-3} \text{ kg}$ and its tension is 32 N , find the frequency of the second harmonic of the string.
11. (a) Define an electric field. Why don't the electric lines of force intersect one another? (8 marks)
An electron of charge $1.6 \times 10^{-19} \text{ C}$ is situated in a uniform electric field of intensity $1.14 \times 10^5 \text{ NC}^{-1}$. Find the force on the electron and the acceleration of the electron. How long does the electron take to travel a distance of 40 mm from rest? (mass of electron = $9.1 \times 10^{-31} \text{ kg}$)
- (b) What is an electrical force? Draw the directions of force between two like charges. When the length of a wire is doubled and its diameter is halved, what will be the resistance of the wire? (Give your answer with appropriate calculations) (8 marks)

12. (a) Express a refractive index of a medium in terms of velocity ratio. When light passes from one medium to another, will its frequency and wavelength change? In the formation of the spectrum of white light by a prism, which colour is the largest refractive index and which colour is the smallest refractive index? (8 marks)
- The angle of a glass prism is 60° and the refractive index of glass is 1.66. Find the angle of minimum deviation.
- (b) An image, which is five times the size of an object, is to be produced by a convex lens of power $+2D$ on the same side as the object. How far should the object be placed from the lens? Also draw the ray diagram for your answer. (8 marks)
13. (a) Describe the batteries in series aiding and draw its circuit diagram which is connected to a resistor R . Write down the circuit equation for it. (8 marks)
- When two $6V$ batteries having the same internal resistance and connected in series are connected to a 5Ω resistor, the current in the circuit is $2A$. When these batteries are in parallel, a current of $1.5A$ flows through when connected to another resistor. Find the resistance of the resistor.
- (b) What electrical device is a capacitor? When an insulating material is inserted between the conductors of a capacitor in a vacuum, does its capacitance increase or decrease? Explain. (8 marks)
- A $45\mu F$ capacitor is needed, but only $10\mu F$ capacitors are available. How should a minimum number of $10\mu F$ capacitors be connected so that the combination has a capacitor of $45\mu F$? Also mention the minimum number of capacitors. (Give your answer with diagrams.)
14. (a) Why is it important to use radioactive tracers with short half-lives? Give two uses of radioactive tracers. (8 marks)
- What are cathode rays? State the properties of cathode rays.
- (b) Draw the fire alarm system, using logic gates and give its truth table. Which gates are called universal gates and why? (8 marks)
- What is a rectifier? How can diodes be used as rectifiers?

15. (a) What are radioisotopes? Give two medical uses of radioisotopes. (8 marks)

An electric circuit installed in an office contains a 10 A fuse and the voltage is 230 V . Ten 100 W electric lamps and two 150 W refrigerators are being used there. Find the maximum number of 40 W electric lamps which can be safely used in addition.

- (b) What is a bar magnet? What is the difference between the magnetic lines of force around a bar magnet and those around a current-carrying wire? (8 marks)

Draw a diagram of the magnetic lines of force around a bar magnet and draw a diagram of magnetization by electric current.

(OR)

15. (a) What is a manometer? At what depth will the pressure exerted on a man be twice that of the pressure on the surface of water? (8 marks)

($\rho_{\text{water}} = 1000\text{ kg m}^{-3}$, $g = 10\text{ ms}^{-2}$, $1\text{ atm} = 1.01 \times 10^5\text{ Pa}$)

If the angle of incidence of a ray of light passing from the air to a transparent medium x is 30° and the angle of refraction is $19^\circ 28'$, find the refractive index and the critical angle of medium x .

- (b) What is an electrical energy? How many watts are there in 1 hp ? (8 marks)

Find the rate of production of heat in the battery in the circuit diagram shown below. ($J = 4.2\text{ J cal}^{-1}$)

