

2016

**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) The product of force and velocity is
 - (ii) In closed organ pipes, a is formed at the closed organ pipe.
 - (iii) The electric field is everywhere inside a charged conducting object of any shape.
 - (iv) In n-type semiconductors, are majority carriers.

2. Are the following statements True (or) False? (4 marks)
 - (i) Elastic limits of different bodies are the same.
 - (ii) One hertz is equivalent to one oscillation per second.
 - (iii) Electromagnetic and gravitational forces are short-range forces.
 - (iv) A rectifier converts an alternating current into a direct current.

3. Define mechanical advantage. A 80 kg man is running up the stairs which is 3m high in 2 s. What is the power exerted by the man? ($g = 10 \text{ ms}^{-2}$) (4 marks)

4. Name two universal gates. Why are they called universal gates? (4 marks)
Suppose there was 2g of radon at $t = 0$ and its half-life is 3.8 days. How much would be left after (i) 7.6 days (ii) 15.2 days?

5. Compare the rates of energy radiation of a black body at temperatures 427°C and 77°C . (4 marks)
If the absolute temperature of a black is doubled, how is the total emissive power affected?

6. What is a lens? Can a real image be formed by a concave lens or convex lens? (4 marks)
If so draw ray diagram(s) to illustrate your answer.

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7. What is an electric line of force? Why don't the electric lines of force intersect one another? Draw lines of force between two metal plates which have charges of equal magnitude but opposite sign. (4 marks)
8. What resistances can be obtained by using three $10\ \Omega$ resistors in all possible ways? (4 marks)
9. What is a semiconductor? Give examples. What are the charge carriers in metals and semiconductors? Can semiconductor diode be used as a rectifier? (4 marks)

(OR)

Mention the essential components of a nuclear reactor. (4 marks)

What happens to the proportion of carbon-14 in the body of a plant or an animal while alive?

SECTION (B)

(Answer any **FOUR** questions)

10. (a) What is atmospheric pressure? Why are you able to withstand atmospheric pressure? At the sea level, what is the approximate value of atmospheric pressure in Pa? What factors does the pressure in a liquid depend on? The weight of metal block of unknown volume is 15 N. The apparent weight of the metal block is 12 N when immersed in water. Find the density ρ and volume of metal. ($\rho_{\text{water}} = 1000\ \text{kg m}^{-3}$, $g = 10\ \text{m s}^{-2}$) (8 marks)
- (b) (i) Write down the energy packet formula. State kinetic theory of gases in words and in symbols. (8 marks)
- (ii) A tuning fork is struck and placed over the open end of a resonance tube with adjustable air column. If resonances occur when the air column is 18.3 cm and 51.6 cm long, find the velocity of sound from these values. Frequency of tuning fork is 512 Hz.
11. (a) What is a light pipe? Give any two uses of concept of total internal reflection. What are primary and secondary light colours? (8 marks)
- The wavelength of a ray of light in air is $4 \times 10^{-7}\ \text{m}$. With what velocity will that ray pass through diamond whose refractive index is 2.42? Find the wavelength of that ray in diamond.
- (velocity of light in air = $3 \times 10^8\ \text{ms}^{-1}$)

- (b) Write down the lens-makers' equation. Explain the symbols used. What are the similarities between the virtual images formed by concave and convex lenses? An object is placed 32 cm from a screen. Where must a lens of focal length 6 cm be placed between the screen and the object to produce an image on the screen? (8 marks)
12. (a) What is electrical energy? What are its units? Why is electrical energy transformed into heat energy when a current flows through a resistor? If a 1200 W electric iron is used for 100 min, by how many units does the meter reading increase? Calculate the payment if one unit of electricity costs 30 kyats. (8 marks)
- (b) What is a shunt? Why should the shunt of an ammeter have a low resistance? The resistance of a moving-coil galvanometer is 30Ω and the current required for a full-scale deflection is 0.02 A. Find the resistance to be used to convert it into an ammeter reading up to 3 A and a voltmeter reading up to 200 V. (8 marks)
13. (a) Define capacitance of a capacitor. What is the equivalent unit of farad? What must be done to increase the capacitance of the capacitor? In which connection of the capacitors has each capacitor the same charge? The plates of a parallel-plate capacitor are 40 cm^2 area and 4 mm apart. What is its capacitance? When the capacitor is connected to a 24 V battery, what is the energy of the capacitor? ($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2 \text{ N}^{-1} \text{ m}^{-2}$) (8 marks)
- (b) Define electromotive force of a source connected to an external circuit. How must a voltmeter be connected to a battery to measure the electromotive force of the battery? A battery has an e.m.f of 6V and internal resistance of 1Ω . How many batteries are necessary to pass a current of 1A through 20Ω resistor in an electric circuit? (8 marks)
14. (a) What are three layers of semiconductors in a transistor? Explain how a transistor can be used as a current amplifier. Why are electrons considered as fundamental particles? Why are protons and neutrons not so fundamental? Are quarks considered as fundamental particles? (8 marks)
- (b) What do you understand by nuclear fission and chain reaction? Draw helium and lithium atoms based on Bohr's model. Draw the energy level diagram for an atom showing possible transitions. (8 marks)

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15. (a) Draw a circuit diagram of forward p-n junction diode and its I-V graph. (8 marks)
 Sketch the characteristic curve of a diode.
 Define electric field. What is meant by uniform electric field? What is the difference between the electric lines of force which represent a non-uniform electric field and those which represent a uniform electric field?
- (b) Define electric potential in words and in symbols. Write down the practical unit of electric potential. What is the electric potential of a conductor if it is connected to the earth? (8 marks)
 A 6V battery is connected to two parallel metal plates. If an electron is placed on the negatively charged plate, what is the velocity of the electron when it strikes the positive charged plate?
 (mass of electron = 9.1×10^{-31} kg, charge of electron = 1.6×10^{-19} C)

(OR)

15. (a) What is absolute refractive index? Define refractive index of a medium in terms of velocity ratio. Explain the symbols which you used. Why did Galileo not succeed in measuring the velocity of light? (8 marks)
 An object 3 cm tall is 60 cm from a convex lens of focal length 20 cm.
 (i) Find the size of image and the image distance. (ii) If the object is moved 15 cm closer to the lens, how far does the image moved?
- (b) What is meant by one volt? What is the value of electric potential at infinity due to a point charge? (8 marks)
 What is the electric capacity of a conductor? When the distance between two parallel plates having the charges of equal magnitude and opposite sign is reduced, what will happen to the potential difference?
 When a battery is connected to a 2Ω resistor it drives a current of 0.5 A through a resistor. When it is connected to a 5Ω resistor it drives a current of 0.25 A through the resistor. Find the e.m.f and the internal resistance of the battery.
