MILITARY TECHNOLOGICAL COLLEGE
ACADEMIC YEAR
GENERAL STUDIES DEPARTMENT
SAMPLE EXAMINATION PAPER

Module Name & Code	PHYSICS & MTCG1017	
Date	Duration	Total Marks
	90 Minutes	50

STUDENT DETAILS

Student ID.		Seat No	

Instructions:

- Write the information required on the front page. Use blue / black ink or ball-point pen.
- Students should not keep any helping / study materials with you. Copying, cheating and any kind of malpractices in the examination are strictly prohibited.
- Use of only **non-programmable** calculators allowed.
- Answer the questions in the space provided. Extra sheets are neither allowed nor provided.
- All necessary solutions should be shown in Section B and Section C, otherwise marks for method will be lost.
- The figures shown, if any, are only illustration.
- **Do not open** this question paper until the invigilator has told you to do so.

MARK DISTRIBUTION			
Section	No. of Questions × Marks per Question = Total Marks Allocated	1st Marking	2nd Marking
A	20 × 1 = 20 Marks		
B	10 Marks		
C	20 Marks		
	Total = 50 Marks	/50	/50
Final Marks		/50	

1st Marker
Name and Signature

2nd Marker
Name and Signature

Section-A

Answer all the following 20 questions. Each question carries 1 mark.

(20× 1 = 20 Marks)

Circle the letter of the correct answer e.g: (a)

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1. How many base quantities are there?

a) 3
b) 7
c) 5

2. When atoms bond together they form ___

a) molecule
b) isotopes
c) isobars

3. The phase change from solid to liquid is called :

a) boiling
b) condensation
c) melting

4. If **A**, **B** are two vectors, which of the following relations represent commutative law?

a) n(**A**+**B**) = n**A**+n**B**
b) **A**+**B** = **B**+**A**
c) **A**+**B** = -**B**+**A**

5. In which of the following cases the work done by a force is maximum?

a) If the angle between the force and the displacement is zero
b) If the angle between the force and the displacement is 90°
c) If the angle between the force and the displacement is 180°

6. An aircraft accelerates from rest to 72 km/h in 10 sec, then its acceleration is:

a) 7.2 m/s^2
b) 5 m/s^2
c) 2 m/s^2

7. If the time period of an object is 20 μs, then its frequency will be:

a) 2000 Hz
b) 50 kHz
c) 500 kHz

8. A body with mass of 5 kg accelerated from rest to 10 m/s.What is the change in the momentum?

a) 50 kg m/s
b) 5 kg m/s
c) 0.5 kg m/s

9. The physical quantity which is equal to the **product** of **force** and **velocity** is:

a) work
b) energy
c) power

10. A steel sphere with mass of 600 g has a density of 2000 kg/m^3, then its volume is:

a) $3\times10^{-4}\ m^3$
b) $30\times10^{-4}\ m^3$
c) $300\times10^{-4}\ m^3$

11. If we dip a hydrometer in pure water it reads__.

a) 1
b) 9.8
c) 13.6

12. A piston holds a liquid in a tube of cross section area of 25 m^2 with a force of 200N, then the static pressure will be:

a) 5000 pascal
b) 8 pascal
c) 12.5 pascal

13. Which of the following statements is **true**?

a) the body will float in water if buoyancy is positive
b) the body will float in water if buoyancy is negative
c) the body will float in water if buoyancy is neutral

14. How much **internal energy** raises if we heat 0.2 kg of water from 10°C to 100°C? (specific heat of water is 4200 J/kg K)

a) 7560 J
b) 75600 J
c) 756 J

15. Which of the following relations is **true** for Boyle's law ?

a) PV = constant
b) PT = constant
c) VT = constant

16. The process of heat transfer in liquids from **hotter part to colder part** by the **actual movement** of the particle is known as:

a) radiation
b) conduction
c) convection

17. A convex lens of magnification 3, forms an image at a distance of 30 cm from the optical center, what may be the position of object from optic center?

a) 90 cm
b) 10 cm
c) 0.1 cm

18. If the angle of **incidence** of a light beam is 38°, what is the angle of **reflection**?

a) 38°
b) 52°
c) 128°

19. If the wavelength and frequency of sound wave is 0.5m and 700 Hz respectively, then velocity of sound wave is:

a) 350 m/s
b) 1400 m/s
c) 330 m/s

20. Intensity of sound level can be measured in__.

a) Hertz
b) Decibels
c) m/s

Section-B (10 Marks)

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21 a) Match the following (Column-I with Column-II) by using the letter of the correct answer in the box given below:

(4×1=4 marks)

(Column-I)	(Column-II)
1.The magnitude of the gravitational force on an object is:	a. inertia
2. Newton's first law explains:	b. potential energy
3. Energy possessed due to motion of a body is	c. weight
4.The up thrust force when a body submerged in water is called:	d. kinetic energy
	e. buoyancy

1-	2-	3-	4-

b) Write any two **differences** between **lens** and **mirror**. **(2 marks)**

S.No	Lens	Mirror
1.		
2.		

c) Read the questions and **<u>underline</u>** the **correct** answer given in the **brackets.** **(4×1=4 marks)**

i) Two atoms with the same atomic number but have different mass number are called__(isotopes / isobars)

ii) Work is maximum if angle between force and displacement is_(90° / 0°)

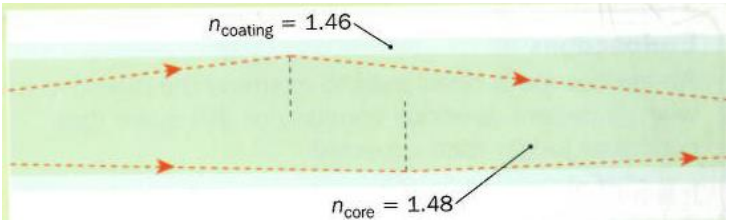
iii) Low viscosity liquids flow___(faster / slower)

iv) when wave particles move parallel to the direction of wave motion the wave is called: (longitudinal wave / transverse wave)

<u>Section-C (20 Marks)</u>

Answer the following questions and show all the necessary working steps.

22. The diagram shows an optical fiber with a core of refractive index 1.48 and a coating of refractive index 1.46. What is the critical angle of incidence for this optical fiber? **(3 marks)**



23) The frequency of a sound wave is 35 Hz and with a speed of 320 m/s.

Find,

a) the wave length of sound wave. **(1.5 marks)**

b) the time period of this wave. **(0.5 mark)**

24) A car moving along a straight highway with a speed of 144 km/h is brought to rest within a distance of 220 m.

Find ,

(i) the retardation(deceleration) of the car. **(2 marks)**

(ii) the time it will take to stop. **(2 marks)**

25) The pressure of a sample of gas kept at constant volume is 105 kPa at 0°C.What will be its pressure at 70°C ? **(3 marks)**

26) Taking atmospheric pressure as 101325 N/m^2, convert the following gauge pressures into absolute pressure. Give your answer in kPa. **(1.5 marks)**

a) 500 kN/m^2

b) 15 MN/ m^2

c) 7000 Pa

27) An object "A" of mass 6 kg travelling in a straight line with a speed of 5 m/s collides with other object "B" with a mass of 5 kg travelling in the same straight line but in the opposite direction with a speed of 4 m/s. After the collision the object "A" continues to move in the same direction with a speed of 2 m/s. What is the speed of object "B" after the collision? **(2.5 marks)**

FORMULAE SHEET

- $v = S / t$
- $a = (v - u) / t$
- $v = u + at$
- $v = gt$ (freely falling body)
- $S = \frac{1}{2} gt^2$ (freely falling body)
- $v^2 = u^2 + 2as$
- $s = ut + \frac{1}{2}at^2$
- $s = \frac{1}{2}(u + v) t$
- $\omega_f = \omega_i + \alpha t$
- $\Delta\theta = \omega_i t + \frac{1}{2}\alpha t^2$
- $\omega_f^2 = \omega_i^2 + 2\alpha\theta$
- $a_c = v^2 / r = r \omega^2$
- $F_c = mv^2 / r = m r \omega^2$
- $S = r\theta$
- $V = r\omega$
- Moment of force = F. d
- Stress = Force / Area
- Pressure = F / A

- $T = \frac{1}{f}$
- $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$ or $\frac{1}{f} = \frac{1}{p} + \frac{1}{q}$
- $dQ = dU + dW$
- $Q = c\, m\, \Delta T$
- $Q = mL_f$
- $L_2 - L_1 = L_1 (\theta_2 - \theta_1) \alpha$
- $PV = nRT$
- $Efficiency = \frac{Work\ output}{Energy\ input}$
- Absolute pressure = gauge pressure + atmospheric pressure
- Speed of light in air = 3×10^8 m/s
- $\text{Magnification} = \frac{\text{Image height}}{\text{Object height}}$
- $n = \frac{\text{speed of light (in air)}}{\text{speed of light (in medium)}} = \frac{C}{V}$
- $n_1 \sin i = n_2 \sin r$
- Speed of sound in air = 331 m/s
- $V = f\lambda$
- Speed of sound = $\sqrt{\gamma RT}$
- Decibel level (β) = $10 \log \frac{I}{I_0}$
- $\mu = 1/\sin C$
- $P_1 + \frac{\rho v_1^2}{2} + \rho g h_1 = P_2 + \frac{\rho v_2^2}{2} + \rho g h_2$
- $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$
- Strain = Change in dimension / original dimension = $\Delta l / l$
- $T = 2\pi \sqrt{(\frac{L}{g})}$
- $T = 1 / f$
- $F = mg$
- $P.E = mgh$
- $K.E = \frac{1}{2} mv^2$
- Young's modulus = stress/strain
- $v = (331 m/s)\sqrt{\frac{T(K)}{273K}}$
- Velocity of light = 3×10^8 m/s
- $m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$

Space for Rough Work