



GRADE: XI Date: 02/12/24	TERM 2 EXAMINATION 2024-25 PHYSICS (042)	Marks: 70 Time: 3h
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**Instructions:**

- (1) There are 33 questions in all. All questions are compulsory. This question paper has five sections: Section A, Section B, Section C, Section D and Section E.
- (2) All the sections are compulsory.  
**Section A** contains sixteen questions, twelve MCQ and four Assertion Reasoning based of 1 mark each, **Section B** contains five questions of two marks each, **Section C** contains seven questions of three marks each, **Section D** Contains three long answer questions of five marks each and **Section E** contains two case study-based questions of four marks each
- (3) Use of calculators is not allowed.
- (4) You may use the following values of physical constants where ever necessary

Q. NO.	SECTION A	MARKS
1	Bernoulli's principle is based on principle of conservation of (a) mass (b) momentum (c) energy (d) linear momentum	1
2	A particle is falling through a viscous liquid reaches its terminal velocity. The acceleration then is (a) $g$ (b) $0$ (c) $>g$ (d) $<g$	1
3	According to Stefan's law the total energy emitted per second per unit area of the surface $E$ is proportional to (a) $T$ (b) $T^2$ (c) $T^3$ (d) $T^4$	1
4	An ideal fluid flows through a pipe of circular cross section made of two sections with diameters 2.5 cm and 3.75 cm. The ratio of velocities in the pipe is (a) 9:4 (b) 3:2 (c) $\sqrt{3}:\sqrt{2}$ (d) $\sqrt{2}:\sqrt{3}$	1



12	<p>Two bodies are projected with the same velocities such that they have the same horizontal range. At what angle they might have been projected?</p> <p>a     20<sup>0</sup> and 60<sup>0</sup>                                     b     25<sup>0</sup> and 65<sup>0</sup>  c     30<sup>0</sup> and 55<sup>0</sup>                                     d     40<sup>0</sup> and 60<sup>0</sup></p>	1
13	<p>For QS 13 to 16, Two statements are given-one labelled Assertion (A) and the otherlabelled Reason (R). Select the correct answer to these questionsfrom the codes (a), (b), (c) and (d) as given below.</p> <p>a) Both A and R are true and R is the correct explanation of A  b) Both A and R are true and R is NOT the correct explanation of A  c) A is true but R is false  d) A is false and R is also false</p> <p><b>Assertion:</b> Mass is a measure of inertia of the body in linear motion.  <b>Reason:</b> Greater the mass, greater is the force required to change its state of rest or of uniform motion</p>	1
14	<p><b>Assertion:</b> If two objects of different masses have same momentum, the lighter body possess greater velocity.  <b>Reason:</b> For all bodies momentum always remains same</p>	1
15	<p><b>Assertion:</b> Work done by or against gravitational force in moving a body from one point to another is independent of the actual path followed between the two points.  <b>Reason:</b> Gravitational forces are conservative forces.</p>	1
16	<p><b>Assertion:</b> adhesive force &gt; cohesive, angle of contact is acute _  <b>Reason:</b> Angle of contact is acute; liquid do not wet the glass</p>	1
<b>SECTION B</b>		
17	<p>Find the orbital velocity of an artificial satellite of the earth given <math>g = 10 \text{ /s}^2</math>, <math>R = 6400\text{km}</math></p> <p style="text-align: center;">OR</p> <p>A vertical Offshore structure is built to withstand a Maximum stress of <math>10^9</math> Pascal is the structure is suitable upon top of an oil well in Bombay High, take the depth of sea to roughly 3 kilometer and ignore ocean currents</p>	2

18	Draw pressure vs Volume graphs for isobaric and isochoric process	2
19	Give one point of difference between streamline flow and turbulent flow, based on Reynolds number how can we identify it.	2
20	Cooking is easier in pressure cooker but difficult on hills, why? OR The stream of water flowing at high speed from a garden hose pipe tends to spread like a fountain when held vertically up, but tends to narrow down when held vertically down, explain how?	2
21	Check the dimensional consistency of the following equation $\frac{1}{2}mv^2 = mgh$ . Where m is mass, v is velocity, g is the acceleration due to gravity and h is the height.	2
<b>SECTION C</b>		

22	Find out the load to be suspended at the end of a wire of length 8 meter to stretch it through 1 cm, diameter of the wire is 0.4 mm and Young's modulus of wire is $90 \times 10^9$ Pascal	3
23	State stock formula and derive the expression for maximum constant velocity acquired by the body (Terminal velocity) by falling freely through a viscous medium	3
24	Why $C_p$ is greater than $C_v$ , show that $C_p - C_v = R$	3
25	State pascals law and with the help of pascals law explain the working hydraulic lift and obtain a relation connecting mass of the object to be lifted and force applied	3
26	Distinguish between elastic and inelastic collision. Show that in one dimensional elastic collision of two objects, the velocity of separation of the two particles after collision is equal to the relative velocity of approach before collision	3

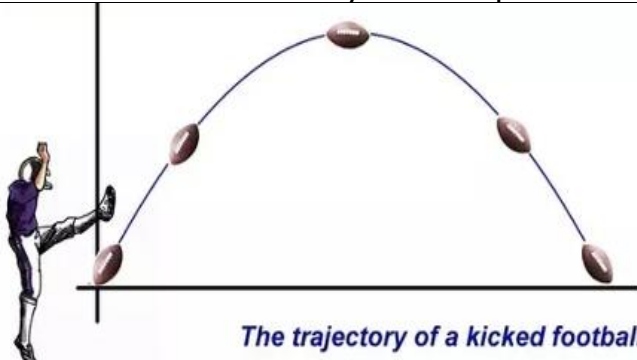
27	The reading of a pressure meter attached with a closed pipe is $4 \times 10^5 \text{ Nm}^{-2}$ . On opening the valve of the pipe, the reading of the meter is reduced to $3.2 \times 10^5 \text{ Nm}^{-2}$ . Calculate the velocity of water flowing in the pipe.	3
28	A liquid is flowing through a horizontal pipe line of varying area of cross section. At a certain cross section, the diameter of the pipe is $5 \times 10^{-2} \text{ m}$ and velocity of flow of the liquid is $25 \times 10^{-2} \text{ m/s}$ . Calculate the velocity of flow at another cross-section, where the diameter is $1 \times 10^{-2} \text{ m}$	

### SECTION D

29	Obtain the expression for acceleration due to gravity at the surface of the earth, Explain and show that what happened to $g$ of an object moving away or towards the center of the earth	5
30	What do you understand by streamline flow and turbulent flow? State Bernoulli's theorem and prove that, the total energy per unit volume is constant in a stream line flow of a liquid through a pipe of varying area of cross section.	5
31	Liquid drops are spherical in shape why? Obtain the mathematical expression for excess pressure inside liquid drop and bubble.	5

### SECTION E

#### Case study-based questions

32	 <p style="text-align: center;"><i>The trajectory of a kicked football</i></p> <p>Figure shows the trajectory of a kicked football. The initial velocity of the football is <math>v_0</math> and it makes an angle <math>\theta_0</math> with the horizontal.</p> <p>i) Name the type of motion of the football and its trajectory  ii) What is the acceleration of the football during its motion?  iii) Write the expression for the total time taken by the football to complete the motion</p>	4
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	<p>iv) At what angle should it be kicked with the horizontal so that it covers maximum distance in horizontal direction?</p> <p style="text-align: center;">OR</p> <p>If the ball is kicked with an initial speed of 10 m/s at an angle <math>60^\circ</math> with the horizontal, what will be the maximum height attained by the ball during its motion?</p>	
33	<p>The property due to which the free surface of liquid tends to have minimum surface area and behaves like a stretched membrane is called surface tension. It is a force per unit length acting in the plane of interface between the liquid and the bounding surface <i>i.e.</i>, <math>S = F/L</math>, where <math>F</math> = force acting on either side of imaginary line on surface and <math>L</math> = length of imaginary line. Surface tension decreases with rise in temperature. Highly soluble impurities increase surface tension and sparingly soluble impurities decreases surface tension.</p> <p>1 Which of the following statements is not true about surface tension?</p> <p>(a) A small liquid drop takes spherical shape due to surface tension.</p> <p>(b) Surface tension is a vector quantity.</p> <p>(c) Surface tension of liquid is a molecular phenomenon.</p> <p>(d) Surface tension of liquid depends on length but not on the area.</p> <p>2 Which of the following statement is not true about angle of contact?</p> <p>(a) The value of angle of contact for pure water and glass is zero.</p> <p>(b) Angle of contact increases with increase in temperature of liquid.</p>	4

(c) If the angle of contact of a liquid and a solid surface is less than  $90^\circ$ , then the liquid spreads on the surface of solid.

(d) Angle of contact depend upon the inclination of the solid surface to the liquid surface.

3 Which of the following statements is correct?

(a) Viscosity is a vector quantity.

(b) Surface tension is a vector quantity.

(c) Reynolds number is a dimensionless quantity.

(d) Angle of contact is a vector quantity.

4 A liquid does not wet the solid surface if the angle of contact is

(a)  $0^\circ$

(b) equal to  $45^\circ$

(c) equal to  $90^\circ$

(d) greater than  $90^\circ$

