PART 1 - PHYSICS

Topic : Mechanical properties of fluids, Electrostatic potential and capacitance

SECTION–1 : (Maximum Marks : 4)

- This section contains **ONE** question.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks	: +4	ONLY if (all) the correct option(s) is(are) chosen;
Partial Marks	: +3	If all the four options are correct but ONLY three options are chosen;
Partial Marks	: +2	If three or more options are correct but ONLY two options are chosen, both of which are correct;
Partial Marks	: +1	If two or more options are correct but ONLY one option is chosen and it is a correct option;
Zero Marks	: 0	If none of the options is chosen (i.e. the question is unanswered);
Negative Marks	: −2	In all other cases.

- For example, in a question, if **(A), (B) and (D)** are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get −2 marks.

1. A table tennis ball has radius $(3/2) \times 10^{-2}$ m and mass $(22/7) \times 10^{-3}$ kg. It is slowly pushed down into a swimming pool to a depth of d = 0.7 m below the water surface and then released from rest. It emerges from the water surface at speed v, without getting wet, and rises up to a height H. Which of the following option(s) is(are) correct?
[Given: $\pi = 22/7$, $g = 10$ m s^{-2}, density of water $= 1 \times 10^3$ kg m^{-3}, viscosity of water $= 1 \times 10^{-3}$ Pa-s.]

[JEE Advanced 2024 Paper 2]

(A) The work done in pushing the ball to the depth d is 0.077 J.

(B) If we neglect the viscous force in water, then the speed v = 7 m/s.

(C) If we neglect the viscous force in water, then the height H = 1.4 m.

(D) The ratio of the magnitudes of the net force excluding the viscous force to the maximum viscous force in water is 500/9.

Scan or tap for the full solution

Space for Rough Work

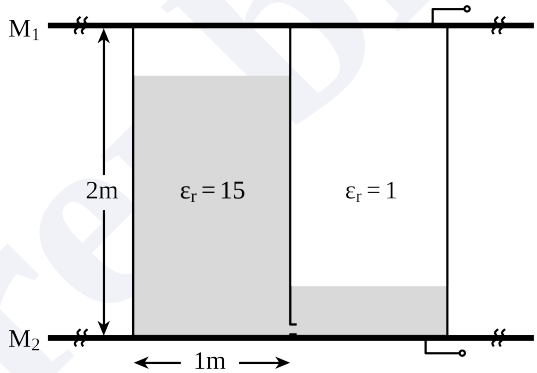
SECTION–2 : (Maximum Marks : 16)

- This section contains **ONE** paragraph.
- Based on each paragraph, there are **FOUR** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, −0.33, −.30, 30.27, −127.30) in the place designated to enter the answer.
- Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If ONLY the correct answer is entered;
Zero Marks : 0 In all other cases.

Paragraph for Questions 2 and 3

A container of height 2 m, length 2 m and breadth 1 m is made of insulating vertical walls and two large area horizontal metal plates (M_1 and M_2) which extend far beyond the vertical walls in all directions. The container is partitioned into two equal chambers with a thin insulating vertical wall. The partition wall contains a small hole of cross-sectional area $\sqrt{10}$ cm^2 near its bottom edge. Initially the hole is closed and the left chamber of the container is completely filled with a liquid of dielectric constant $\varepsilon_r = 15$ and the right chamber is empty ($\varepsilon_r = 1$). At time t = 0, the hole is opened and the liquid flows from the left chamber to the right chamber. In both the chambers, the space above the liquid has $\varepsilon_r = 1$ and is maintained at atmospheric pressure. The schematic of the container at a time t > 0 is shown in the figure. [Given: acceleration due to gravity is 10 m s^{-2}.]



2. The height (in m) of the liquid in left chamber at t = 500 s is: [JEE Advanced 2026 Paper 2]

Scan or tap for the full solution

3. The difference in the capacitance (in F) between the metal plates at t = 0 and that at t = 500 s is $(8 - n)\varepsilon_0$, where ε_0 is the permittivity of free space. The value of n is: [JEE Advanced 2026 Paper 2]

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Space for Rough Work

4. Two large, identical water tanks, 1 and 2, kept on the top of a building of height H, are filled with water up to height h in each tank. Both the tanks contain an identical hole of small radius on their sides, close to their bottom. A pipe of the same internal radius as that of the hole is connected to tank 2, and the pipe ends at the ground level. When the water flows from the tanks 1 and 2 through the holes, the times taken to empty the tanks are t_1 and t_2, respectively. If $H = \left(\frac{16}{9}\right)h$, then the ratio t_1/t_2 is _____.

[JEE Advanced 2024 Paper 1]

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5. A spherical soap bubble inside an air chamber at pressure $P_0 = 10^5$ Pa has a certain radius so that the excess pressure inside the bubble is $\Delta P = 144$ Pa. Now, the chamber pressure is reduced to $8P_0/27$ so that the bubble radius and its excess pressure change. In this process, all the temperatures remain unchanged. Assume air to be an ideal gas and the excess pressure ΔP in both the cases to be much smaller than the chamber pressure. The new excess pressure ΔP in Pa is _____.

[JEE Advanced 2024 Paper 2]

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JEE ADVANCED MECHANICAL PROPERTIES OF FLUIDS — PYQS

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1

Ques.	1																
Ans.	A, B, D																

SECTION–2

Ques.	2	3	4	5								
Ans.	1.25	1.90 to 2.10	3	96								

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