Marking Guide of Physics Examination for Senior Two by 100Marks 2025-2026 Second term

SECTION A: ANSWER ALL QUESTIONS (55 MARKS)

1)B. Systematic error (2marks each)

2) B. Speed

3) B. Opposite to motion

4)C. kg/m^3

5) B. Force / Area

6)B. Depth

7) B. Gas pressure

8) A. Hydraulic press

9) A. Weight of displaced fluid

10)A. Force causes displacement

11) B. Watt

12) C. KE + PE

13) C. Remains constant

14)A. Lubrication

15)B. Barometer

16)A. The SI unit of work is Joule (J). (1mark each)

B. Pressure in liquids is given by $P = \rho g h$.

C. Energy of motion is called kinetic energy.

D. Total mechanical energy equals kinetic energy plus potential energy.

E. The rate of doing work is power.

17) 17. True or False
(1marks each)

A. Friction is always harmful. — False
B. Pressure increases with depth in liquids. — True
C. Energy can be destroyed in an isolated system. — False
D. A hydraulic jack works using Pascal's principle. — True
E. Density equals mass divided by volume. — True

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18. Complete the Statements
(1marks each)

A. The SI unit of work is Joule (J).

B. Pressure in liquids is given by P = ρgh.

C. Energy of motion is called kinetic energy.

D. Total mechanical energy equals kinetic energy plus potential energy.

E. The rate of doing work is called power.

19. Matching (1 mark each)

a) The formula for pressure in a fluid → iii) Pressure P = ρgh

b) The formula for pressure in solid → i) Pressure (P) = Force (F) / Area (A)

c) Density → ii) The ratio of a substance's mass to its volume

d) Aneroid barometer → v) It measures atmospheric pressure by balancing the pressure of a mercury column against atmospheric pressure

e) Relative density → iv) The ratio of the density of an object with respect to the density of water

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20. Rectilinear Motion

Given:
Initial velocity (u) = 10 m/s
Final velocity (v) = 15 m/s
Distance (s) = 125 m

(a) Acceleration **(1mark for correct answer)**

Using:
$v^2 = u^2 + 2as$

$15^2 = 10^2 + 2a(125)$
$225 = 100 + 250a$
$125 = 250a$
$a = 0.5\ m/s^2$

✅ **Correct answer: iii) 0.5 m/s²**

(b) Time taken **(1mark for correct answer)**

Using:
$v = u + at$

$15 = 10 + (0.5)t$
$5 = 0.5t$
$t = 10\ s$

✅ **Correct answer: iv) 10 s**

22. Complete the Table **(1mark each)**

Numbers	Significant Figures
5001.000	7
0.0050830	5
450000	2

SECTION B: ATTEMPT ANY THREE QUESTIONS **/30marks**

I) Pascal's Principle (2 marks)

Pascal's principle states that:
When pressure is applied to a confined liquid, the pressure is transmitted equally and undiminished in all directions throughout the liquid.

II) Hydraulic Weight Bridge

From the diagram:

- Small piston area = **16 cm²**
- Large piston area = **1600 cm²**
- Mass on small piston = **8 kg**
- Take g=**10 N/kg**

Force on small piston:

$$F_B = mg = 8 \times 10 = 80N$$

Convert area to m²:

$$16\ \text{cm}^2 = 16 \times 10^{-4} = 0.0016\ \text{m}^2$$

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a) What is the pressure at B? (1 mark)

$$P_B = \frac{F}{A} = \frac{80}{0.0016}$$

$$P_B = 50\,000\ \text{N/m}^2$$

Pressure at B = 50,000 Pa

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b) What is the pressure at A? (1 mark)

According to Pascal's law:

$$P_A = P_B$$

Pressure at A = 50,000 Pa

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c) What is the weight of the vegetable on the large piston A? (2 ma

Convert large area:

$$1600\ \text{cm}^2 = 1600 \times 10^{-4} = 0.16\ \text{m}^2$$

$$F_A = P \times A$$

$$F_A = 50\,000 \times 0.16$$

$$F_A = 8\,000N$$

Weight of the vegetable = 8,000 N

(Equivalent mass = 800 kg)

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d) Fill in the blanks (4 marks)

Pressure tells us how concentrated a **force** is.

It is measured in **Pascals** or **N/m²**, and is calculated using the equation:

$$p = \frac{F}{A}$$

A force of 12 N acting over an area of 2 m² causes a pressure of:

$$p = \frac{12}{2} = 6\ \mathrm{N/m^2}$$

If the area were less, the pressure would be **greater**.

The dimensions of velocity are:

$$[LT^{-1}]$$

The dimensions of pressure are:

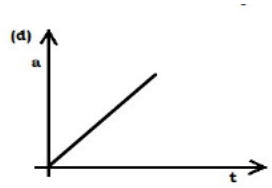
$$[ML^{-1}T^{-2}]$$

24. **(a) What is meant by uniform velocity? (1 mark)**

Uniform velocity is when a body moves with **constant velocity**, covering **equal distances in equal intervals of time in a given direction** (both speed and direction remain constant).

(b) Sketch and explanation (2 marks)

Since the motion is at **uniform velocity**, the distance–time graph is:



(c)

Given:

- Initial velocity, $u = 10\,m/s$
- Final velocity, $v = 30\,m/s$
- Time to reach 30 m/s = $5s$
- Then velocity is maintained for $45\,minutes$

Convert 45 minutes to seconds:

$$45 \times 60 = 2700\,s$$

(i) Calculate the acceleration (3 marks)

Formula:

$$a = \frac{v - u}{t}$$

$$a = \frac{30 - 10}{5}$$

$$a = \frac{20}{5}$$

$$a = 4\,m/s^2$$

Acceleration = 4 m/s²

(ii) Calculate the distance travelled (4 marks)

The motion has **two parts**:

Part 1: During acceleration (first 5 seconds)

Use:

$$s = ut + \frac{1}{2}at^2$$

$$s_1 = (10 \times 5) + \frac{1}{2}(4)(5^2)$$

$$s_1 = 50 + \frac{1}{2}(4)(25)$$

$$s_1 = 50 + 50$$

$$s_1 = 100\,m$$

Part 2: Constant velocity for 2700 s

$$s_2 = vt$$

$$s_2 = 30 \times 2700$$

$$s_2 = 81\,000\,m$$

Total distance travelled:

$$s_{total} = s_1 + s_2$$

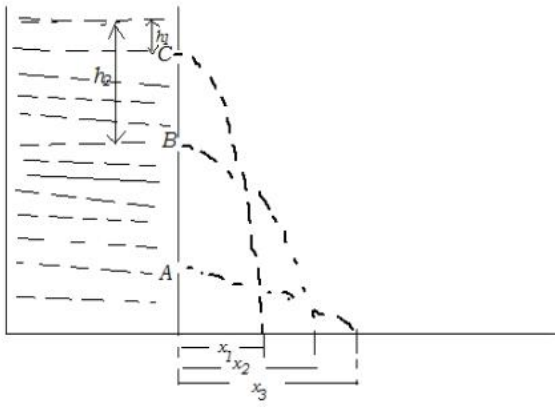
$$s_{total} = 100 + 81\,000$$

$$s_{total} = 81\,100\,m$$

Final Answers:

- Acceleration = **4 m/s²**
- Total distance travelled = **81,100 m** (or **81.1 km**)

Q25: Let us now make three small holes on the sides of a cylinder on which water can pass through**.(1mark**)



Water from hole A travels a long distance X_3 and indicates high pressure.

Water from hole C travels a short distance X_1 and indicates low pressure. Therefore pressure is proportional to the height.

b)

$$P = \rho gh = 1000\ x10X\ 8 = 80000Pa$$

(**2marks)**

c) The pressure increase with depth. At the bottom of a hill, there is great pressure, so water can flow with great speed from the summit **(3marks)**

d)· Convert dimensions to metres: 40 cm = 0.40 m, 12 cm = 0.12 m, 6 cm = 0.06 m.

· Volume = length × width × height = 0.40 × 0.12 × 0.06 = 0.048 × 0.06 = 0.00288 m^3**./0.5mark**

· Mass = density × volume = 2700 kg/m^3 × 0.00288 m^3 = 7.776 kg. **/0.5mark**

· Weight (force) = mass × g = 7.776 kg × 9.81 m/s^2 ≈ 76.28 N. **/0.5mark**

· Face areas (possible contact areas):

- 40 cm × 12 cm → 0.40 × 0.12 = 0.048 m^2,

- 40 cm × 6 cm → 0.40 × 0.06 = 0.024 m²,
- 12 cm × 6 cm → 0.12 × 0.06 = 0.0072 m².

· Pressure = force / area. **/0.5mark**

- Minimum pressure occurs when the contact area is largest (0.048 m²): Pa≈1.59 kPa**./1mark**
- Maximum pressure occurs when the contact area is smallest (0.0072 m²): Pa≈10.59 kPa. **/1mark**

26) (2marks for each)

b) Range

The **range** is:

$$\text{Range} = X_{\max} - X_{\min} = 88 - 72 = 16\,\text{cm}$$

Range = 16 cm ✅

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c) Uncertainty measurement

A common estimate of **uncertainty** for repeated measurements is **half the range**:

$$\text{Uncertainty} = \frac{\text{Range}}{2} = \frac{16}{2} = 8\,\text{cm}$$

Uncertainty = ±8 cm ✅

d) Uncertainty in the mean

The **uncertainty in the mean** is the uncertainty divided by the square root of the number of measurements n:

$$\text{Uncertainty in mean} = \frac{\text{Uncertainty}}{\sqrt{n}} = \frac{8}{\sqrt{5}}$$

$$\sqrt{5} \approx 2.236 \implies \frac{8}{2.236} \approx 3.58\,\text{cm}$$

Uncertainty in mean ≈ ±3.6 cm ✅

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e) Measured (reported) value

The **measured value with its uncertainty** is:

$$\text{Reported value} = \text{Mean} \pm \text{Uncertainty in mean} = 80.8 \pm 3.6\,\text{cm}$$

Reported value = 80.8 ± 3.6 cm ✅

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a) Mean value

The **mean** is calculated as:

$$\text{Mean} = \frac{\sum X_i}{n}$$

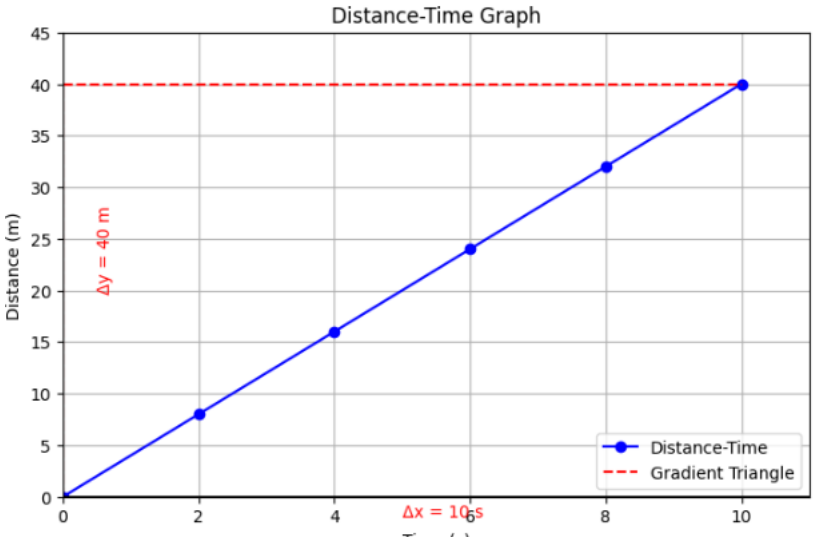
$$\text{Mean} = \frac{72 + 77 + 82 + 85 + 88}{5} = \frac{404}{5} = 80.8\,\text{cm}$$

Mean = 80.8 cm ✅

SECTION C: this question is compulsory /15marks

27) **. Distance-Time Graph and Calculations**

a) Distance–time graph:



c) Calculate Gradient (3 marks)

1. Use the formula:

$$\text{Gradient} = \frac{\Delta y}{\Delta x} = \frac{\text{Distance change}}{\text{Time change}}$$

2. Using points (0,0) and (10,40):

$$\Delta y = 40 - 0 = 40\,\text{m}$$

$$\Delta x = 10 - 0 = 10\,\text{s}$$

3. Gradient:

$$\text{Gradient} = \frac{40}{10} = 4\,\text{m/s}$$

d) The gradient represents the speed of the moving body.

Marks Distribution:

- **Correct title →1mark**
- **Correct axes labeled → 2 marks**
- **Correct scale → 2 marks**
- **Correct points plotted → 3 marks**
- **Line of best fit drawn → 1 marks**

END