

Uganda Certificate of Education

PHYSICS MARKING GUIDE FOR SET 5

Topic: Pressure & Atmospheric Pressure

SECTION A

01. A ✓	02. D ✓	03. B ✓	04. D ✓	05. B ✓	06. A ✓	07. D ✓	08. D ✓
09. A ✓	10. D ✓	11. B ✓	12. C ✓	13. C ✓	14. A ✓	15. B ✓	16. D ✓
17. A ✓	18. A ✓	19. B ✓	20. C ✓	21. D ✓	22. A ✓	23. B ✓	24. B ✓
25. B ✓	26. D ✓	27. D ✓	28. A ✓	29. D ✓	30. B ✓	31. A ✓	32. A ✓
33. D ✓	34. D ✓	35. D ✓	36. D ✓	37. B ✓	38. D ✓	39. D ✓	40. C ✓
41. B ✓	42. D ✓	43. C ✓	44. C ✓	45. A ✓			

Working for the mathematical calculations:

Question 9:

$$\frac{\rho_1}{\rho_2} = \frac{h_2}{h_1}$$

$$\frac{1000}{800} = \frac{15}{h_1}$$

$$1000 \times h_1 = 800 \times 15$$

$$h_1 = \frac{800 \times 15}{1000} = 12 \text{ cm}$$

Question 10:

$$P_{\text{water}} = h\rho g = 0.5 \times 1000 \times 10 = 5000 \text{ N m}^{-2}$$

$$P_{\text{bottom}} = P_{\text{water}} + P_{\text{mercury}} = (h\rho g)_{\text{water}} + (h\rho g)_{\text{mercury}}$$

$$= (2 \times 1.0 \times 10^3 \times 10) + (3 \times 1.36 \times 10^4 \times 10)$$

$$= 2 \times 10^4 + 4.08 \times 10^5$$

$$= 4.28 \times 10^5 \text{ Pa}$$

Question 16:

$$\text{Base area} = \pi r^2 = \pi \left(\frac{50}{100} \right)^2 = 0.25\pi \text{ m}^2$$

$$\text{Weight of cone} = mg = 4 \times 10 = 40 \text{ N}$$

$$\text{Pressure} = \frac{\text{Weight of cone}}{\text{Base area}} = \left(\frac{4 \times 10}{0.25\pi} \right) \text{ N m}^{-2}$$

Question 20:

$$\text{Pressure} = \frac{\text{Weight of box}}{\text{Base area}} = \frac{mg}{l \times w} = \left(\frac{40 \times 10}{0.020 \times 0.015} \right) \text{ N m}^{-2}$$

Question 22:

$$\text{Greatest pressure} = \frac{\text{Weight of metal}}{\text{Smallest area}} = \frac{3}{0.02 \times 0.03} = 5 \times 10^3 \text{ N m}^{-2}$$

Question 23:

$$\text{Minimum pressure} = \frac{\text{Weight of cuboid}}{\text{Maximum area}} = \frac{48 \times 10}{4 \times 3} = 40 \text{ N m}^{-2}$$

Question 25:

$$h = 730 \text{ mm Hg} = \frac{730}{1000} \text{ m Hg}$$

$$P = h\rho g = \frac{730}{1000} \times 13600 \times 10 = \frac{730 \times 13600 \times 10}{1000} \text{ N m}^{-2}$$

Question 26:

$$\text{Force} = \text{Pressure} \times \text{Area} = h\rho g A = 5 \times 1100 \times 10 \times 0.005 = 275 \text{ N}$$

Question 27:

$$\text{Increase in pressure} = (h\rho g)_{\text{water}} = 20 \times 1.0 \times 10^3 \times 10 = 2 \times 10^5 \text{ N m}^{-2}$$

Question 29:

$$\text{Mercury column, } h = 68 - 38 = 30 \text{ cm Hg}$$

$$P = H + h = 76 + 30 = 106 \text{ cm Hg}$$

Question 32:

$$\text{Maximum pressure} = \frac{\text{Weight of block}}{\text{Minimum area}}$$

$$200 = \frac{Mg}{0.02 \times 0.01}$$

$$200 \times 0.02 \times 0.01 = M \times 10$$

$$M = 0.004 \text{ kg}$$

$$M = 0.004 \times 1000 = 4 \text{ g}$$

Question 33:

$$\text{Increase in pressure} = (h\rho g)_{\text{sea water}} = 30 \times 1.2 \times 10^3 \times 10$$

$$= 3.6 \times 10^5 \text{ N m}^{-2}$$

Question 35:

$$\text{Pressure} = \frac{\text{Weight of man}}{\text{Area of contact}} = \frac{2.4 \times 10}{6 \times 10^{-4}} = 4 \times 10^4 \text{ N m}^{-2}$$

Question 37:

$$\text{Least pressure} = \frac{\text{Weight of block}}{\text{Greatest area}} = \frac{48 \times 10}{4 \times 3} = 40 \text{ N m}^{-2}$$

Question 38:

$$P = H + h = 76 + 66 = 142 \text{ cm Hg}$$

Question 40:

$$\text{Atmospheric pressure} = H\rho g = \frac{760}{1000} \times 1.36 \times 10^4 \times 10$$

$$= 1.03 \times 10^5 \text{ N m}^{-2}$$

Question 41:

$$\text{Force} = \text{Pressure} \times \text{Area} = h\rho gA = 0.24 \times 1.03 \times 10^3 \times 10 \times 10^{-3}$$

$$= 2.472 \times 10^3 \text{ N}$$

Question 42:

$$P \propto \frac{1}{V}$$

$$P_1 V_1 = P_2 V_2$$

$$(1 + 0.76) \times 30 = 0.76 \times V_2$$

$$52.8 = 0.76 V_2$$

$$V_2 = 69.5 \text{ mm}^3$$

Question 43:

$$\text{Pressure} = \frac{\text{Weight of car}}{\text{Area of contact}} = \frac{740 \times 10}{4 \times 50 \times 10^{-4}} = 3.7 \times 10^5 \text{ N m}^{-2}$$

SECTION B

Question 46:

(a). When the handle is being pulled outwards, the pressure inside the barrel drops, causing valve 1 to close and valve 2 to open. As a result, atmospheric pressure forces air into the barrel. (02)

(b). (i). It states that pressure in an enclosed fluid is equally transmitted throughout the fluid in all directions. (01)

Or: It states that when fluid is completely enclosed in a vessel and pressure is applied to it at any part of its surface, pressure is transmitted equally throughout the fluid. (01) Any one

(ii). This is because air is compressible and this implies that not all the pressure will be transmitted. (01)

Question 47:

(a). Pascal's principle states that pressure in an enclosed fluid is equally transmitted through out the fluid in all directions. (01)

Or: It states that when fluid is completely enclosed in a vessel and pressure is applied to it at any part of its surface, pressure is transmitted equally throughout the fluid. (01) Any one

(b). (i).

$$\begin{aligned} \text{Minimum Pressure} &= \frac{\text{Force}}{\text{Maximum Area}} \\ &= \frac{10 \times 10}{0.2 \times 0.4} = 1250 \text{ N m}^{-2} \end{aligned} \quad (02)$$

(ii).

$$\text{Maximum Pressure} = \frac{\text{Force}}{\text{Minimum Area}} = \frac{10 \times 10}{0.1 \times 0.2} = 5000 \text{ N m}^{-2} \quad (01)$$

Question 48:

(a).

Pressure in solids depends on the:

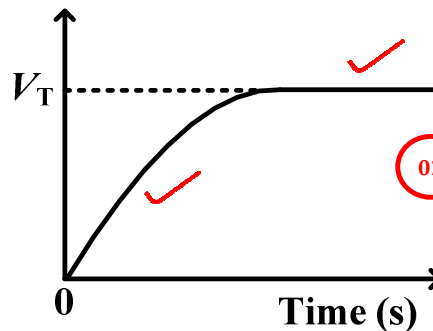
- Magnitude of force/weight/thrust applied. (02)
- Cross sectional area in contact.

(b).

$$P = h\rho g = \frac{20}{100} \times 13600 \times 10 = 27200 \text{ N m}^{-2} \quad (02)$$

(b).

Velocity (m s^{-1})



02

Note: Award no mark if there is a sharp bend

Where V_T is the terminal velocity of the ball bearing.

Question 22:

(a). Mass of the body is the quantity of matter present in the body. ✓ (01)

(b). (i).

Apparent weight = Weight in air – Upthrust

$$= 52 - 12 = 40 \text{ N} \quad \checkmark \quad (02)$$

(ii). At a much higher altitude, the weight of the body reduces.

This is because acceleration due to gravity decreases with increase in altitude. ✓ (01)

Question 23:

(a). Archimedes' principle states that when a body is fully or partially immersed in a fluid, it experiences an upthrust equal to the weight of the fluid displaced. ✓ (01)

(b).

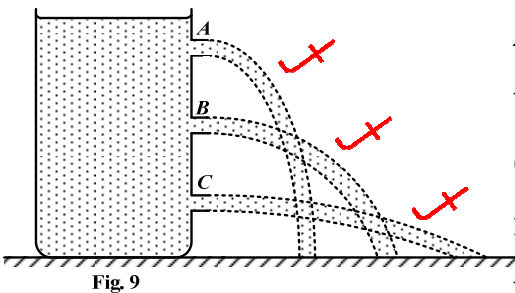
$$(R.D)_{\text{solid}} = \frac{\text{mass of solid in air}}{\text{mass of an equal volume of water}} = \frac{\text{density of solid}}{\text{density of water}}$$

$$\frac{25}{25 - 19} = \frac{\rho_{\text{solid}}}{1000} \quad \checkmark$$

$$\rho_{\text{solid}} = \frac{25}{6} \times 1000 = 4166.667 \text{ kg m}^{-3} \quad \checkmark \quad (03)$$

Question 49:

(a).



(b).

After some time, the pressure of the water out of the holes decreases due to the reduction in the height of water level above the holes.

This is so because pressure in liquids increases with depth.

04

Question 50:

(a).

- Depth below the surface of the liquid. ✓
- Density of the liquid. ✓
- Pressure exerted on the surface of the liquid. ✓

01

Any two

(b).

$$P = (H + h)\rho g = \left(\frac{76}{100} + \frac{10}{100}\right) \times 13.6 \times 10^3 \times 10 = 116,960 \text{ Pa}$$

03

Question 51:

(a).

$$P_{\text{gas}} = P_{\text{atm}} + h\rho g = 1.0 \times 10^5 + \frac{25}{100} \times 1.36 \times 10^4 \times 10 \\ = 134,000 \text{ N m}^{-2}$$

03

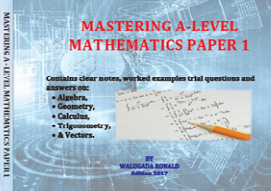
(b). The mercury level in the opened end rises while that in the originally open limb reduces simultaneously until both levels are the same. ✓

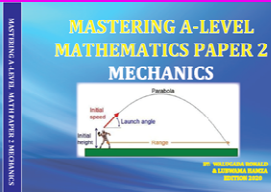
01

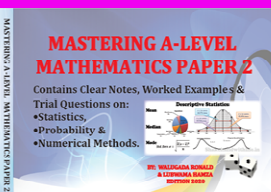
(c). No. This is because the length of the water column would be very big (too long) compared to that of the mercury column required to measure the same value of atmospheric pressure. ✓

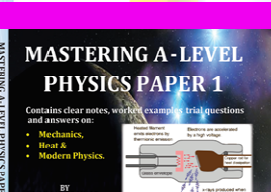
02

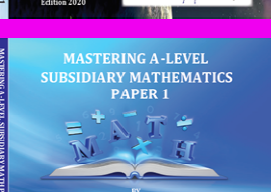
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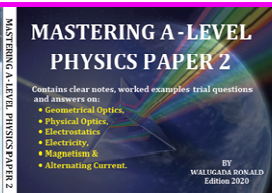
Recommended Books Include:

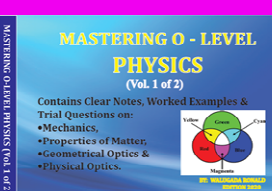
- Mastering A-level
- Physics Paper 1
- Physics Paper 2
- Subsidiary Math Paper 1
- Mathematics Paper 1
- Mathematics Paper 2
- (Statistics, Probability & Numerical Methods)
- Mathematics Paper 2 (Mechanics)
- Mastering O-level Physics (Vol. 1 of 2)
- Mastering O-level Physics (Vol. 2 of 2)

Topical Questions with Answers for

- U.C.E Mathematics Paper 1 & 2
- U.A.C.E Mathematics Paper 1 & 2
- U.A.C.E Physics Paper 1 & 2

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