Uganda Certificate of Education
PHYSICS MARKING GUIDE FOR SET 6
Topic: Fluids At Rest And In Motion

SECTION A

01. D ✓	02. D ✓	03. D ✓	04. C ✓	05. D ✓	06. B ✓	07. C ✓	08. A ✓
09. B ✓	10. B ✓	11. D ✓	12. C ✓	13. C ✓	14. C ✓	15. A ✓	16. A ✓
17. B ✓	18. C ✓						

Working for the mathematical calculations:

Question 5: (Source UNEB 2009/P1/Qn 7)

$$\text{Density of floating sphere} = \text{Fraction submerged} \times \text{Density of water}$$

$$\text{Density of sphere} = \frac{2}{3} \times 1 = 0.667 \text{ g cm}^{-3}$$

$$\text{Mass of sphere} = \text{Density of sphere} \times \text{Volume of sphere}$$

$$60 = \frac{2}{3} \times V$$

$$V = \frac{60 \times 3}{2} = 90 \text{ cm}^3$$

Question 7: (Source UNEB 2006/P1/Qn 11)

$$\text{Density of floating wood} = \text{Fraction submerged} \times \text{Density of water}$$

$$\text{Density of wood} = \frac{1}{2} \times 1000 = 500 \text{ kg m}^{-3}$$

$$\text{Mass of wood} = \text{Density of wood} \times \text{Volume of wood}$$

$$= (500 \times 40 \times 10^{-6}) \text{ kg}$$

Question 18: (Source UNEB 1987/P1/Qn 10)

$$\text{Fraction submerged} = \frac{\text{Density of floating wood}}{\text{Density of liquid}} = \frac{600}{800} = 0.75$$

$$\text{Density of floating wood} = \text{Fraction submerged} \times \text{Density of water}$$

$$\text{Density of wood} = \frac{1}{2} \times 1000 = 500 \text{ kg m}^{-3}$$

$$\text{Mass of wood} = \text{Density of wood} \times \text{Volume of wood}$$

$$= (500 \times 40 \times 10^{-6}) \text{ kg}$$

SECTION B

Question 19:

(a). Up thrust is the upward force experienced by anything immersed in a fluid. ✓ 01

(b). (i).

$$W = mg = 3.2 \times 10^3 \times 10 = 3.2 \times 10^4 \text{ N}$$ ✓ 01

(ii). upthrust = weight of liquid displaced $= V\rho g$

$$= 0.6 \times 1.56 \times 10^3 \times 10$$

$$= 9.36 \times 10^3 \text{ N}$$

Weight of block in liquid = weight of block in air − upthrust

$$= 3.2 \times 10^4 - 9.36 \times 10^3$$

$$= 2.264 \times 10^4 \text{ N}$$ 02

Question 20:

(a).

- Measurement of density and relative density of solids. ✓
- Measurement of density and relative density of liquids. ✓
- Floating bodies e.g. balloons, ships, submarines. ✓ 01 Any one

(b).

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

$$\frac{175}{175-153} = \frac{\rho_{\text{solid}}}{1000}, \quad \Rightarrow \rho_{\text{solid}} = \frac{175}{22} \times 1000 = 7954.545 \text{ kg m}^{-3}$$ ✓ 03

Question 21:

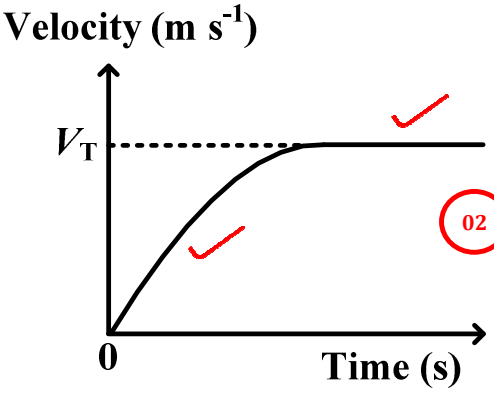
(a). (i). Terminal velocity is the maximum constant velocity attained by a body when falling in a viscous fluid. ✓

Or: This is the constant velocity attained by a body moving through a fluid when the net force acting on it is zero. ✓ 01 Any one

(ii).

- Mass/weight of the body. ✓
- Cross sectional area of the body. ✓
- Density of the fluid. ✓
- Temperature of the fluid. ✓ 01 Any one

(b).



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).

$$\text{Apparent weight} = \text{Weight in air} - \text{Upthrust}$$

$$= 52 - 12 = 40\ \text{N}$$ 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).

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

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

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

Question 24:

(a). The principle of flotation states that a floating body displaces its own weight of fluid in which it floats. 01

(b).

Density of floating object = Fraction submerged × Density of liquid

$$= \frac{1}{3} \times 1200$$

$$= 400 \text{ kg m}^{-3}$$

03

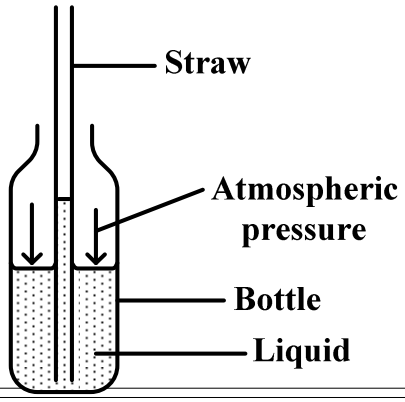
Question 25:

(a).

- **Mass/weight of the body.**
- **Cross sectional area of the body.**
- **Density of the fluid.**
- **Temperature of the fluid.**

02 *Any two*

(b).



When sucking, lungs expand and air is driven out from the inside of the straw to the lungs.

This reduces the pressure inside the straw.

The atmospheric pressure acting on surface of the liquid in the bottle is thus greater than the air pressure in straw and so it forces the liquid up to the mouth. 02

Question 26:

(a). Density is the mass per unit volume of a substance. ✓ 01

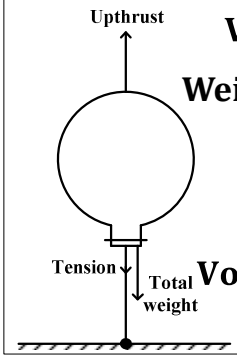
(b). When the balloon is released, it rises up in air because the weight of air displaced by the balloon (upthrust of the balloon in air) is greater than the total weight of balloon and hydrogen, hence it experiences a net (resultant) upward force and therefore rises. The balloon continues to rise up until the upthrust acting on it is equal to the weight of the balloon plus its content (hydrogen) and then it floats. 03

Question 27:

(a). [See Qn 5 a]

(b). **Weight of the balloon,**

$$W_{\text{balloon}} = M_{\text{balloon}} \times g = 5 \times 10^{-3} \times 10 = 5 \times 10^{-2}\ \text{N}$$



Volume of hydrogen = volume of balloon = $5 \times 10^{-3}\ \text{m}^3$

Weight of hydrogen in the balloon,

$$W_{\text{hydrogen}} = V_{\text{hydrogen}} \times \rho_{\text{hydrogen}} \times g$$

$$= 5 \times 10^{-3} \times 0.08 \times 10 = 4 \times 10^{-3}\ \text{N}$$

Volume of air displaced = volume of balloon = $5 \times 10^{-3}\ \text{m}^3$

$$\text{Upthrust in air} = V_{\text{displaced}} \times \rho_{\text{air}} \times g$$

$$= 5 \times 10^{-3} \times 1.15 \times 10 = 5.75 \times 10^{-2}\ \text{N}$$

When the balloon is stationary,

$$\text{Upthrust in air} = \text{Total weight} + \text{Tension}$$

$$5.75 \times 10^{-2} = 5 \times 10^{-2} + 4 \times 10^{-3} + T$$

$$T = 3.5 \times 10^{-3}\ \text{N}$$

03

Question 28:

(a).

$$\text{Density of floating solid} = \text{Fraction submerged} \times \text{Density of liquid}$$

$$= \frac{3}{5} \times 10^3$$

$$= 6 \times 10^2 \text{ kg m}^{-3}$$

$$\text{Mass of solid} = \text{Density of solid} \times \text{Volume of solid}$$

$$= 6 \times 10^2 \times 10^{-4}$$

$$= 6 \times 10^{-2} \text{ kg}$$

02

(b).

$$\text{Density of floating solid} = \text{Fraction submerged} \times \text{Density of liquid}$$

$$6 \times 10^2 = \frac{4}{5} \times \rho_{\text{liquid}}$$

$$\rho_{\text{liquid}} = 7.5 \times 10^2 \text{ kg m}^{-3}$$

02

Question 29:

(a). [See Qn 5 a]

(b). (i). $\text{Upthrust} = \text{weight of block in air} - \text{Weight of block in liquid}$

$$= 25 - 15$$

$$= 10 \text{ N}$$

01

(ii).

$$(R.D)_{\text{solid}} = \frac{\text{weight of solid in air}}{\text{upthrust of solid in water}} = \frac{\text{density of solid}}{\text{density of water}}$$

$$\frac{25}{10} = \frac{\rho_{\text{solid}}}{1000}$$

$$\rho_{\text{solid}} = \frac{25}{10} \times 1000 = 2500 \text{ kg m}^{-3}$$

02

Question 30:

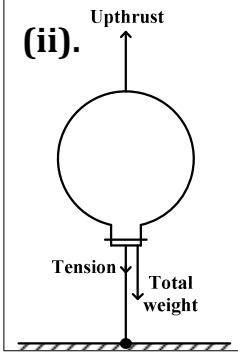
(i).

$$\text{Volume of air displaced} = \text{volume of balloon} = 50\ \text{m}^3$$

$$\text{Upthrust in air} = V_{\text{displaced}} \times \rho_{\text{air}} \times g = 50 \times 1.2 \times 10 = 600\ \text{N}$$

02

(ii).



$$\text{Upthrust in air} = \text{Weight} + \text{Tension}$$

$$600 = 40 \times 10 + T$$

$$T = 200\ \text{N}$$

02

Question 31:

(a).

- Weight of the body which acts downwards towards the earth.
- Viscous drag which acts upwards so as to oppose motion of the body.
- Upthrust which acts upwards.

03

(b).

The body moves with constant velocity and the net force acting on it is zero.

01

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)
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