

SCHOOL: **Your school name****SENIOR TWO PHYSICS · UNIT 4 HOMEWORK****Pressure in Solids and Liquids · FREE SAMPLE****MARKING SCHEME (TEACHER'S COPY)****Academic year:** 20..... – 20.....**Date:** ...../...../20.....**Duration:** Take-home**Total marks:** 19**INSTRUCTIONS**

1. Answer ALL questions.
2. Show your working for calculations and give units.
3. This free sample is a short extract. A full homework sheet has 25 marks.

**PART 1: QUICK QUESTIONS***Write the letter, True or False, or the missing word (1 mark each).*

1. The pressure at a depth  $h$  in a liquid of density  $\rho$  is given by: (1 mark)
- A.  $P = h/\rho g$
  - B.  $P = \rho g/h$
  - C.  $P = h\rho g$
  - D.  $P = \rho/gh$

**Answer:** C.  $P = h\rho g$ **Explanation:** Liquid pressure  $P = h\rho g$  (depth  $\times$  density  $\times$  g).

2. On Lake Muhazi the atmospheric pressure is 88 kPa (water 1000 kg/m<sup>3</sup>,  $g = 10$  N/kg). At what depth is the total pressure twice the atmospheric pressure? (1 mark)
- A. 17.6 m
  - B. 88 m
  - C. 8.8 m
  - D. 0.88 m

**Answer:** C. 8.8 m**Explanation:** Total =  $2 \times 88$  kPa means the water adds 88 000 Pa:  $h = P \div (\rho g) = 88\,000 \div 10\,000 = 8.8$  m.

3. A camel's wide feet exert a smaller force on the sand than the narrow hooves of a donkey of the same weight. (True / False) (1 mark)

**Answer:** False**Explanation:** Both animals push down with a force equal to their (equal) weights. The camel's feet exert a smaller PRESSURE because the area is larger.

4. In a hydraulic press, the larger output force acts on the piston with the larger \_\_\_\_\_. (1 mark)

**Answer:** area

**Explanation:**  $F_2 = F_1 \times A_2/A_1$ , so the piston with the bigger area gives the bigger force.

5. A cow of weight 2000 N stands on soft ground and exerts a pressure of 50 000 Pa. The total area of its hooves touching the ground is \_\_\_\_\_ m<sup>2</sup>. (1 mark)

**Answer:** 0.04

**Explanation:**  $A = F \div P = 2000 \div 50\,000 = 0.04\text{ m}^2$ .

## PART 2: SHORT ANSWERS

Answer in full sentences.

6. A 60 kg learner ( $g = 10\text{ N/kg}$ ) first stands on one foot of sole area 150 cm<sup>2</sup>, then lies flat on a mat with a contact area of 0.5 m<sup>2</sup>. How many times smaller is the pressure when she lies down? (2 marks)

**Answer:** About 33 times smaller

**Model answer:** Standing:  $P = 600 \div 0.015 = 40\,000\text{ Pa}$ . Lying:  $P = 600 \div 0.5 = 1200\text{ Pa}$ .  $40\,000 \div 1200 \approx 33$ .

**Marking:** 1 mark for the correct answer · 1 mark for a correct reason or working.

7. A box of weight 600 N rests on a face of area 1.5 m<sup>2</sup>. What pressure does it exert on the floor? (2 marks)

**Answer:** 400 Pa

**Model answer:**  $P = 600 \div 1.5 = 400\text{ Pa}$ .

**Marking:** 1 mark for the correct answer · 1 mark for a correct reason or working.

8. State whether this statement is true or false, and give a reason: "Tilting the tube of a mercury barometer changes the vertical height of the mercury column above the dish." (2 marks)

**Answer:** False

**Model answer:** The vertical height is fixed by the atmospheric pressure; tilting only makes the mercury fill more of the tube's length.

**Marking:** 1 mark for True/False · 1 mark for a correct reason or correction.

## PART 3: STRUCTURED PROBLEM

Show your working and give units.

9. **Pressure in Solids and Liquids** (8 marks)

- (a) A student measures the pressure due to a liquid at three depths: 1200 Pa at 0.1 m, 2400 Pa at 0.2 m and 3600 Pa at 0.3 m ( $g = 10\text{ m/s}^2$ ). What do the results show? (4 marks)

**Answer:** Pressure is proportional to depth; density = 1200 kg/m<sup>3</sup>

**Model answer:** Doubling or tripling the depth doubles or triples the pressure;  $\rho = P \div (hg) = 1200 \div (0.1 \times 10) = 1200 \text{ kg/m}^3$ .

**Marking:** Formula or method: 3 marks · correct answer with unit: 1 mark.

- (b) In a hydraulic lift,  $F_1/A_1 = F_2/A_2$ . A 50 N force on a 2 cm<sup>2</sup> piston lifts a load on a 200 cm<sup>2</sup> piston. What is the load? (4 marks)

**Answer:** 5000 N

**Model answer:**  $F_2 = F_1 \times A_2/A_1 = 50 \times 200/2 = 5000 \text{ N}$ .

**Marking:** Formula or method: 3 marks · correct answer with unit: 1 mark.

**END**