Pressure

Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Pressure
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

Time Allowed: 62 minutes

Score: /52

Percentage: /100

1   **(a**   **(i)** $(P =) F \div A$ OR $3.5 \times 10^4 \div 0.25$ C1
                      $= 1.4 \times 10^5 \, \text{Pa ecf}$ **(i)**   A1

        (ii) $(1.4 \times 10^5 - 1.0 \times 10^5 =) \, 4(.0) \times 10^4 \, \text{Pa ecf}$ **(ii)**   B1

        (iii) $P = h \rho g$ in any form OR $(h =) P \div \rho g$ OR $4.0 \times 10^4 \div (1020 \times 10)$ C1
                     $= 3.9 \, \text{m OR } 4 \, \text{m}$ A1

    (b) any 2 from: max. B2
        •   weight of block
        •   upward force of water (on block) / upthrust (of water on block)
        •   weight of cable

    (c) (tension force) becomes smaller or zero   B1

                                                       [Total: 8]

2   **(a**   **(i)**   force / pressure greater on outside surface owtte   B1

        (ii) $p = F/A$ in any form **OR** $(F =) pA$ C1
                    $= (1.0 \times 10^5 - 6000) \times 0.12$ C1
                    11280 N to at least 2 sig. figs.   A1

    (b)   pressure of oil = pressure of water   B1

        (ii) **1.** $(p=) h\rho g$ C1
                 $(= 0.25 \times 1000 \times 10 =) \, 2500$ Pa   A1

             2. $h\rho g = 2500$ C1
                 $(\rho = 2500 / (0.32 \times 10) =) \, 781 \, \text{kg}/\text{m}^3$ to at least 2 sig. figs.   A1

                                                        [Total: 9]

3   **(a**   **(i)**   (pressure =) force/area OR force per unit area OR (P =) F/A with symbols
              explained   B1

          (ii)   molecules collide with/hit walls/surface (of box)   B1
                  molecule(s) exert force on wall   B1
                  pressure is total force / force of all molecules divided by (total) area of wall   B1

     (b)   **(i)**   (P =) $h\rho g$ OR in words OR $0.25 \times 13\,600 \times 10$ C1
                  $34\,000$ Pa OR N/m^2 A1
                  allow 1 mark for h = 250 used and 3.4×10^7 Pa obtained

          (ii)   ($P = 1.02 \times 10^5 - 34\,000$)
                  $68\,000$ Pa or N/m^2 B1
                  e.c.f. from **(b)(i)** only if **(b)(i)** is less than 1.02×10^5

                                                                       [Total 7]

4   **(a**   molecules   OR   atoms   OR   particles
           speed   OR   velocity   OR   kinetic energy
           molecules   OR   atoms   OR   particles
           (Surface) area   B2
           any four correct gains 2 marks, two or three correct gains 1 mark

     (b)   **(i)**   (when cap is screwed on) at top of mountain:
                  pressure of air in bottle = the low pressure of the air outside
                  OR   is less than pressure at bottom of mountain
                  OR   is low   B1

                  (at bottom of mountain) bottle collapses because pressure outside (bottle) is
                  greater than pressure inside   B1

          (ii)   Boyle's law applies   OR PV = constant   OR $P_1V_1 = P_2V_2$ C1
                  $9.2 \times 10^4 \times V = 4.8 \times 10^4 \times 250$ C1
                  $130\,\text{cm}^3$ A1

                                                                       [Total: 7]

5 **(a** **(i)** atoms/molecules/particles move **or** collide (ignore with each other)   B1
atoms/molecules/particles collide <u>with (inside) surface/wall</u>   M1
force (exerted) on wall etc. **or** force/unit area **or** force spread-out   A1

(ii) fewer atoms/molecules/particles **and** fewer collisions (with wall)   B1

(b) (P =) hρg **or** 25 × 1.0 × 10^3 × 10   C1
hρg + p$_{atm}$ **or** 25 × 1.0 × 10^3 × 10 + 10^5 **or** 2.5 × 10^5 C1
3.5 × 10^5 Pa *Unit penalty applies   A1   **[7]**

*Apply unit penalty once onl

6   (a)   **(**i   smaller because <u>area</u> smaller   B1

(ii)   smaller because depth/height smaller   B1

(b)   **(**i $h\rho g$ OR   12 × 1000 × 10   C1
1.2 × 10^5 Pa OR 1.1772 × 10^5 Pa OR 1.176 × 10^5 Pa accept N/m^2 A1

(ii)   candidate's **(i)** + 1.0 × 10^5 Pa correctly evaluated with unit (correct value
2.2 × 10^5)   B

(iii) $p_1V_1 = p_2V_2$ in any form   C1
1.1 cm^3
OR   0.5 × candidate's **(ii)**/10^5 correctly evaluated   A1

(iv)   value in **(iii)** too small OR volume larger o.w.t.e.   B1   [8]

7   **(a**   surfaces shown at realistic levels in dish and tube AND vertical height h between
       levels clearly shown   B1
       top label: vacuum / mercury vapour   B1
       bottom label: mercury   B1

     (b) $(P =)$ hdg OR   0.73 × 13600 × 10   C1
         99280 Pa at least 2 s.f.   B1

     (c)   one from:
         abnormal weather / atmospheric conditions   o.w.t.t.e.
         air in space above mercury in tube
         barometer is in a high altitude location   o.w.t.t.e.
         space above mercury is not a vacuum   B1   [6]
         ignore atmospheric pressure varies   ignore temperature