Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Thermal Physics

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Name of the Student:____

Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) (i) (use of $\Delta Q = mc\Delta\theta$ gives) energy lost by water
= 0.20 × 4200 × 20 **(1)**
= 1.7×10^4 J **(1)** (1.68×10^4 J)

(ii) rate of loss of energy = $\frac{1.68 \times 10^4}{10 \times 60}$ = 28 (W) **(1)**

(allow C.E. for value of energy lost in (i))

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(b) (i) (use of $\Delta Q = ml$ gives) ($28 \times t$) = $0.20 \times 3.3 \times 10^5$ **(1)**
$t = 2.4 \times 10^3$ s **(1)** (2.36×10^3 s)
(allow C.E. for value of rate of loss of energy in (a)(ii)

(ii) e.g. constant rate of heat loss **(1)**
ice remains at 0°C **(1)**

max 3

[6]

Q2.

(a) (i) $pV = nRT$ **(1)**

$V = \frac{15 \times 8.31 \times 290}{500 \times 10^3}$ **(1)** (gives $V = 7.2 \times 10^{-2}$ m^3)

(ii) (use of $E_k = \frac{3}{2}kT$ gives) $E_k = \frac{3}{2} \times 1.38 \times 10^{-23} \times 290$ **(1)**

= 6.0×10^{-21} (J) **(1)**

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(b) (use of $pV = nRT$ gives) $n = \frac{420 \times 10^3 \times 7.2 \times 10^{-2}}{8.31 \times 290}$ **(1)**
[or use $p \propto n$]

n = 13 moles **(1)** (12.5 moles)

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(c) pressure is due to molecular bombardment [or moving molecules] **(1)**
when gas is removed there are fewer molecules in the cylinder
[or density decreases] **(1)**

(rate of) bombardment decreases **(1)**
molecules exert forces on wall **(1)**

$\overline{c^2}$ is constant **(1)**

[or $pV = \frac{1}{3} Nm (c^2)$ **(1)**

V and *m* constant **(1)**

(c^2) constant since *T* constant **(1)**

$p \propto N$ **(1)**]

[or $p = \frac{1}{3}$ p(c^2) **(1)**

explanation of ρ decreasing **(1)**

(c^2) constant since *T* constant **(1)**

p (c^2) ρ **(1)**]

max 4

[10]

Q3.

(a) (use of $mc\Delta\theta$ = *Pt* gives)

0.725 × *c* × (100 – 20) **(1)** = 2000 × 120 **(1)**

c = 41 00 **(1)** J kg^{-1} **(1)** (4140 J kg^{-1})

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QWC 2

(b) (i) (use of *mL* = *Pt* gives) 94 × 10^{-3} *L* = 2000 × 105 **(1)**
L = 2.2 × 10^{6} J kg^{-1} **(1)**

(ii) no evaporation (before water heated to boiling point)
no heat lost (to the surroundings)
heater 100% efficient any two **(1)** **(1)**

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[8]