Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1.

(a) upthrust acts (upwards on the brick)

1

normal contact force acts upwards (on the brick)

1

weight is equal to upthrust plus normal contact force

allow resultant force is equal to zero only if all three forces are given

1

(b) $A = 0.25 \times 0.10 = 0.025\ m^2$

1

$$P = \frac{637}{0.025}$$

allow correct substitution of incorrectly calculated value of A

1

$P = 25\ 480$ (Pa)

allow correct calculation using an incorrectly calculated value of A
to gain further marks, P = F/A or an incorrect rearrangement of P = F/A must have been used with the given data

1

$25\ 480 = \underline{2.5} \times \rho \times 9.8$

allow correct substitution of incorrectly calculated value of P

1

$$\rho = \frac{25\ 480}{9.8 \times 2.5}$$

allow correct rearrangement using an incorrectly calculated value of P
allow use of h = 2.6 (m)

1

$\rho = 1040\ kg/m^3$

allow correct calculation using an incorrectly calculated value of P
allow use of h = 2.6 (m)

1

Alternative method

$A = 0.25 \times 0.10 = 0.025\ (m^2)$

1

volume of water column
(V) = 0.025 × 2.5

allow use of an incorrectly calculated value of A

1

V = 0.0625 (m^3)

allow use of an incorrectly calculated value of A

1

$$m \left(= \frac{637}{9.8}\right) = 65 \text{ (kg)}$$

1

$$\rho = \frac{65}{0.0625}$$

allow use of an incorrectly calculated value of V

1

ρ = 1040 (kg/m^3)

1

(c) $$F = 618 \times \frac{49.9}{2.5}$$

allow calculation of density = 1008.979 (kg/m^3)

1

F = 12 335.28

1

F = 12 300 (N)

allow correct rounding of an incorrectly calculated value of F

1

*allow max of **2** marks if 50 m is used*

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Q2.

(a) friction

1

(b) (area of rectangle =) 108 (m)

1

(area of triangle =) 54 (m)

1

(total area / distance =) 162 (m)

allow a correctly calculated total area / distance from an incorrectly calculated area of rectangle and / or triangle

1

(c) (the force on the pedal) causes a moment about the pedal axle

1

which causes a force on the chain (which causes a moment about the rear axle)

allow gear B for chain

1

(d) $2.4^2 (- 0^2) = 2 \times a \times 18$

1

$$a = \frac{2.4 \times 2.4}{36}$$

1

$a = 0.16 (m/s^2)$

1

alternative method

$t = 18 / 1.2$
$t = 15 (s)$ (1)

$a = 2.4 / 15$ (1)

this mark may be awarded if the time is incorrectly calculated

$a = 0.16 (m/s^2)$ (1)

allow a correctly calculated acceleration from an incorrectly calculated time 1

(e) horizontal (200N) **and** vertical (75N) forces drawn to the same scale

1

resultant force drawn in the correct direction

shown by an arrow head from bottom right to top left

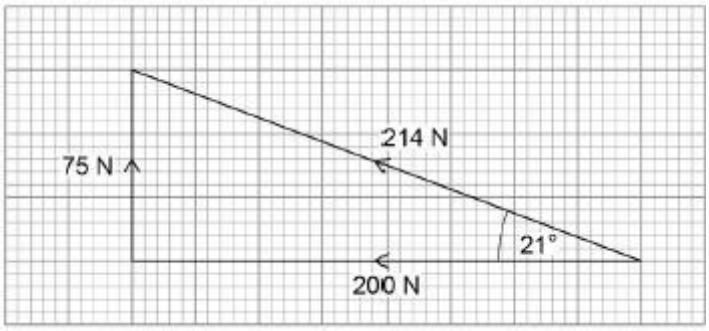
1

resultant force with a value in the range 212 to 218 (N)

allow a calculated value of 213.6 ***or*** *214 (N)*

1

direction in the range 20–22 (degrees from the horizontal)



allow 68–70 (degrees from the vertical)
allow a bearing in the range 290–292
to gain full marks a vector diagram must have been drawn

1

[13]