AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.5.5.1 PRESSURE IN A FLUID

SCORE	PERCENTAGE
/83	%

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Q1.

(a) $p = \frac{27}{0.009}$

1

p = 3000

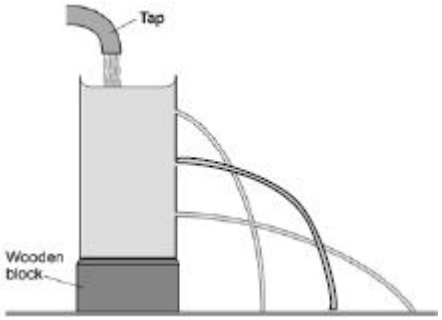
1

Pa

1

*an answer of 3000 scores **2** marks*

(b)



the water path hits the surface somewhere between the other two paths

1

(c) pressure increases with depth

allow when the pressure is higher, the water travels further

1

(d) pressure acts in all directions
or
pressure causes a force on (all) the surfaces

ignore liquids cannot be compressed

1

[6]

Q2.

(a) air molecules colliding with a surface create pressure

1

at increasing altitude distance between molecules increases

or

at increasing altitude fewer molecules (above a surface)

1

so number of collisions with a surface decreases

or

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or so always less weight of air than below (the surface)

1

(b) atmospheric pressure = 20 kPa from graph **and** conversion of 810 cm^2 to 0.081 m^2

allow ecf for an incorrect value clearly obtained from the graph

1

$5 \times 10^4 = \frac{F}{0.081}$

1

$F = 5 \times 10^4 \times 0.081$

1

4050

1

4100 (N)

1

*allow 4100 (N) with no working shown for **5** marks*
*allow 4050 with no working shown for **4** marks*

(c) force from air pressure acting from inside to outside bigger than force acting inwards

1

so keeps the window in position

1

[10]

Q3.

(a) The pressure at X is the same as at Y

1

(b) larger than

1

(c) (i) 3 (N/mm^2)

accept 3 000 000 Pa (correct unit must be given)
*allow **1** mark for correct substitution, ie* $\frac{24}{8}$
provided no subsequent step

2

(ii) pascal

1

(d) the brakes would not work

allow the vehicle (car/bike etc) would not stop
*accept they would freeze solid **or** seize up*

1

[6]

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Q4.

(a) rate of flow of water less

1

because pressure is less
or
because force acting is less
or
because height of water above tap is less

1

(b) (i) at short lengths water collected is the same

accept rate of flow for water collected

1

at longer lengths water collected decreases as the length of pipe increases

*if no other mark gained allow as the length increases the flow decreases for **1** mark*

1

(ii) **max 4 marks**
take more readings to calculate a mean (1)

take more readings is insufficient

to reduce effect of random errors (1)
or
take more readings between 5.0 m and 10.0 m (1)
see where the change occurs (1)
or
take more readings above 15.0 m (1)

accept take more readings at longer lengths

to see if trend continues (1)

*maximum of **2** marks for more readings and max **2** for reasons*

4

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

0 marks
No relevant content

Level 1 (1−2 marks)
There is a basic description of the measurement of time **or** volume **or** diameter of pipe

Level 2 (3−4 marks)
There is a description of the measurement of the time taken to collect a fixed volume **or** the volume collected in a fixed time
and a description of an additional control variable

Level 3 (5−6 marks)
There is a description of the measurement of the time taken to collect a fixed

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volume
or the volume collected in a fixed time
and a description of an additional control variable
and a description of appropriate equipment

examples of the points made in the response
equipment
- tape measure or rule
- stopwatch
- container for collecting water
- measuring cylinder.

measurements
- diameter of hosepipe
- length of hosepipe
- volume of water collected
- time taken for collecting water
- repeat for different diameters.

control factors
- height of water in water butt (achieved by using a tap)
- length of hosepipe and how it is achieved by measuring and cutting.

6

[14]

Q5.

(a) (i) the line of action of the weight (of the bus) lies / acts outside of the base (of the bus)

allow line of action through the centre of mass lies / acts outside the base

1

there is a resultant <u>moment</u> (acting on the bus)

1

(ii) in normal use the centre of mass may be in a different position

1

or
passengers on the bus may affect the position of the centre of mass

for safety, buses should always be tested beyond the normal operating conditions / parameters

for safety is insufficient

accept in case something unexpected happens

1

(b) (i) a liquid is (virtually) incompressible

accept a liquid cannot be squashed

a liquid is difficult to compress is insufficient

1

(ii) 84000

*award **2** marks for*

$$\frac{F}{0.28} = \frac{360}{0.0012}$$

or

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$$\frac{F}{0.28} = 300\ 000$$

or *award* ***1*** *mark for*

$$P = \frac{360}{0.0012}$$

or

300 000 (Pa)

seen anywhere

3

[8]

Q6.

(a) make the rod longer

1

push down on the rod with a greater force

1

(b) particles are close together

1

so no room for more movement

dependent on 1st marking point

1

(c) (i) downward force produces pressure in liquid

reference to compression of liquid negates this mark

1

this pressure is the same at all points in a liquid
or
this pressure is transmitted equally through the liquid

and P = F / A ***or*** *F = P × A*

1

area (at load) bigger *(so force bigger)*

1

(ii) the force acting on the car moves less distance than the effort force

1

[9]

Q7.

(a) hydraulic

1

(b) 9

allow ***1*** *mark for a correct substitution, ie* $\frac{1800}{200}$ *provided no subsequent step*

2

(c) an environmental

1

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[4]

Q8.

(a) hydraulic (system)

1

(b) 15.40×10^2
or
1540

*allow **1** mark for correct substitution, ie*

$8.75 \times 10^4 = \frac{F}{1.76 \times 10^{-2}}$

or

$87\ 500 = \frac{F}{0.0176}$

or

$F = 8.75 \times 10^4 \times 1.76 \times 10^{-2}$

or

$F = 87\ 500 \times 0.0176$

2

(c) any **one** environmental **advantage**:

stating a converse statement is insufficient, or a disadvantage of the usual oil, ie the usual oil is non-renewable

plant oil is renewable

using plant oil will conserve (limited) supplies **or** extend lifetime of the usual / crude oil.

plant oil releases less carbon dioxide (when it is being produced / processed)

plant oil will add less carbon dioxide to the atmosphere (when it is being produced / processed, than the usual oil)

plant oil removes carbon dioxide from **or** adds oxygen to the air when it is growing

stating that plant oil is carbon neutral is insufficient

1

(d) (the current flowing through the coil) creates a magnetic field (around the coil)

1

(this magnetic field) interacts with the permanent magnetic field
or
current carrying conductor is in a (permanent) magnetic field

it must be clear which magnetic field is which

1

this produces a (resultant) force (and coil / cone moves)

1

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when the direction of the current changes, the direction of the force changes to the opposite direction

*accept for **2** marks the magnetic field of the coil interacts with the permanent magnetic field*

1

[8]

Q9.

(a) 3000

*correct substitution of 24 / 0.008 gains **1** mark provided no subsequent steps are shown*

2

N / m^2 or Pa

1

(b) (i) K

accept ringed K in table

1

(ii) water exiting bottle one-third of vertical height of K

allow less than half vertical height of spout shown, judged by eye

1

water landing twice the distance of the spout shown in the diagram

accept at least one and a half times further out than spout shown, judged by eye

*do **not** accept water hitting the side of the sink*

ignore trajectory

1

(c) water will land on the (vertical) side of the sink

*accept sink **not** long / wide / big enough*

or

water will dribble down very close to the bottle

or

that part of the bottle is curved

*do **not** accept goes out of the sink*

1

[7]

Q10.

(a) (i) are incompressible

1

(ii) in all directions

1

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(b) 1.6

*allow **1** mark for correct substitution, ie* $\frac{80}{50}$ *provided no subsequent step shown*
*an answer 0.032 gains **0** marks*

2

(c) Pa

1

(d) increases

1

[6]

Q11.

(a) (i) liquids are (virtually)

incompressible

1

(b) 84

*allow **1** mark for correct substitution, ie*

$1.5 \times 10^{6} = \frac{F}{5.6 \times 10^{-5}}$

numbers may not be written in standard form, ie

1 500 000 = $F \frac{F}{0.000\ 056}$

*allow **1** mark for an answer 216*

2

(c) it (the force on the slave pistons) is greater / larger

accept force (at slave piston) = 216 (N)

1

the area (touching the liquid) of the slave piston is greater than the area of the master piston

accept it has a bigger area
just quoting numbers, eg the master piston is 5×10^{-5} *and the slave piston is* 14.4×10^{-5} *is insufficient*

1

[5]

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