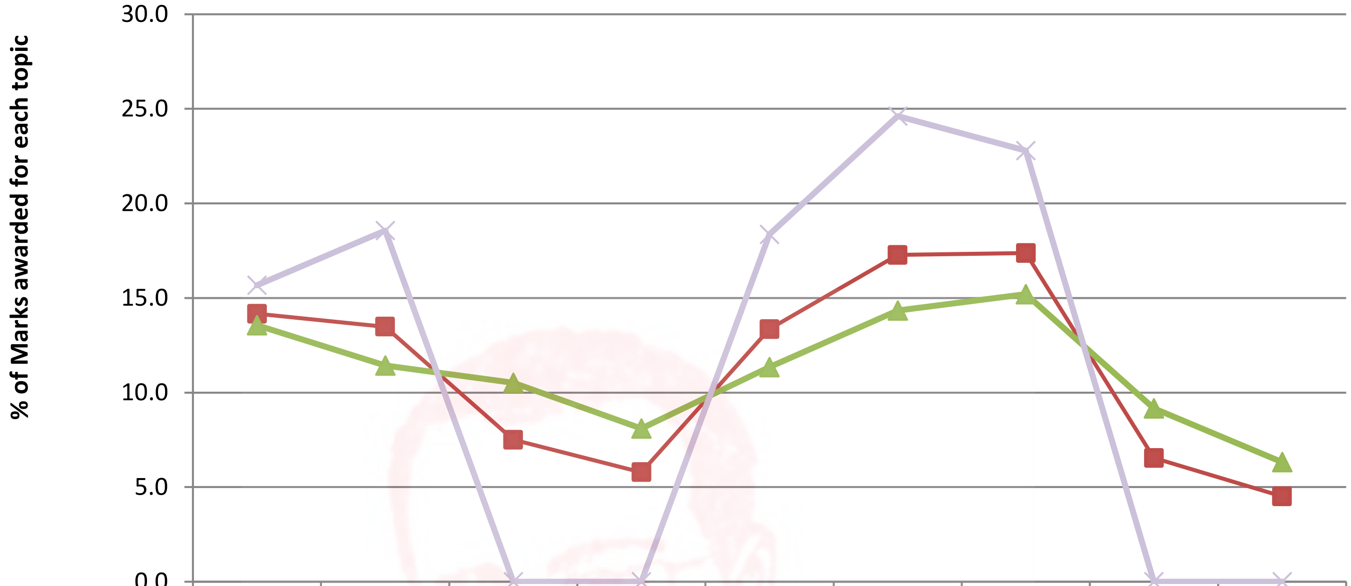
Name

iG Phx 4 EQ 14w to 02w P3 4Teachers 168marks

For these stats only papers 3 (which after 2016 became paper 4) and paper 6 were used to examine the topics.

iG Phx CIE 0625 PAPERS 3 and 6

Percentage of all WEIGHTED marks awarded for P3 & 6 each topic from s2002 to w2014 (red squares) and % of Paper 3 marks (green triangles) and paper 6 (purple crosses)

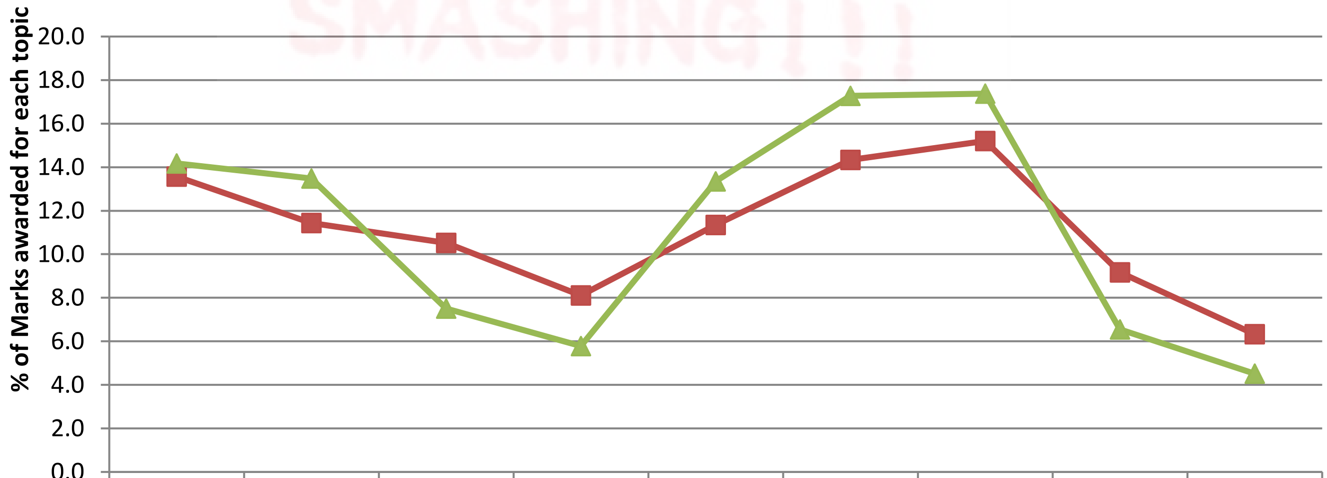


	1	2	3	4	5	6	7	8	9
PhxBoth P3&6	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5
PhxP3	13.6	11.4	10.5	8.1	11.3	14.3	15.2	9.2	6.3
PhxP6	15.7	18.6	0.0	0.0	18.4	24.6	22.8	0.0	0.0

Papers 3 and 6 Topic Number

PAPER 3

Percentage of all marks awarded for each topic from s2002 to w2014 in Paper 3 (red squares) and marks per topic for papers 3 and 6 (green triangles)



	1	2	3	4	5	6	7	8	9
ALL P3 %	13.6	11.4	10.5	8.1	11.3	14.3	15.2	9.2	6.3
P3 & 6	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5

Paper 3 Topic Number

Papers covered in this sample

	1st Paper	Last Paper	Marks/ paper	Theor. All Papers	Actual All Marks	Difference	Difference %	Weight per paper	Weight per mark
Paper 3	2002w	2014w	80	2000	2072	72	3.6	50	0.63
Paper 6	2002s	2015w	40	1120	1040	-80	-7.1	20	0.50

There are a few missing:

Got all Paper 31s (except 2014w Paper 31), and got 2014w 33

So papers in time zones 2 and 3 are not covered.

All topics ranked by frequency of marks in exams (P3 and 6 only)

Topic	PhxBoth P3&6	PhxP3	PhxP6
7	17.4	15.2	22.8
6	17.3	14.3	24.6
1	14.2	13.6	15.7
2	13.5	11.4	18.6
5	13.4	11.3	18.4
3	7.5	10.5	0.0
8	6.5	9.2	0.0
4	5.8	8.1	0.0
9	4.5	6.3	0.0

Other statistics that might be of interest:

	Topics:	1	2	3	4	5	6	7	8	9
P3/4 marks	2072	281	237	218	168	235	297	315	190	131
P3/4 %		13.6	11.4	10.5	8.1	11.3	14.3	15.2	9.2	6.3
P6	1040	163	193	0	0	191	256	237	0	0
P6 %		15.7	18.6	0.0	0.0	18.4	24.6	22.8	0.0	0.0
Total Marks (WIEGHTED)	1815	257	245	136	105	242	314	315	119	82
% of Marks (Weighted)	1815	14.2	13.5	7.5	5.8	13.4	17.3	17.4	6.5	4.5
# of Questions		63	64	35	16	63	74	70	26	20
Average marks per Q		**4.1**	**3.8**	**3.9**	**6.6**	**3.8**	**4.2**	**4.5**	**4.6**	**4.1**

Final note:

My iG and IB chemistry papers were broken down more carefully than these were, so there may be a mark or two in the wrong topic especially in topics 3 to 5, but if you learnt or taught these topics in sequence than you shouldn't have a problem with seeing material from an earlier topic.

Defining the Topics: Why not use the units given in the syllabus?

Artificial topics have been created for the physics syllabus by me so that each topic is roughly the same size. Topics go in syllabus order. I have decided to use the number of marks allocated in previous exams to each syllabus point to determine how many go into each topic.

1. General physics

Topic 1

1.1 Length and time
1.2 Motion
1.3 Mass and weight
1.4 Density

Topic 2

1.5 Forces
1.6 Momentum (Extended candidates only)

Topic 3

1.7 Energy, work and power
1.8 Pressure

2. Thermal physics

Topic 4

2.1 Simple kinetic molecular model of matter

Topic 5

2.2 Thermal properties and temperature
2.3 Thermal processes

3. Properties of waves, including light and sound

Topic 6

3.1 General wave properties
3.2 Light
3.3 Electromagnetic spectrum
3.4 Sound

4. Electricity and magnetism

Topic 7

4.1 Simple phenomena of magnetism
4.2 Electrical quantities
4.3 Electric circuits
4.4 Digital electronics (Extended candidates only)
4.5 Dangers of electricity

Topic 8

4.6 Electromagnetic effects

5. Atomic physics

Topic 9

5.1 The nuclear atom
5.2 Radioactivity

4 (a) Fig. 4.1 shows a syringe containing 100 cm^3 of air at atmospheric pressure. Atmospheric pressure is 1.0×10^5 Pa.

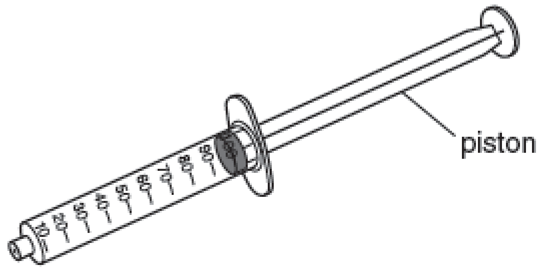


Fig. 4.1

The open end of the syringe is sealed and the piston is pushed inwards until the air occupies a volume of 40 cm^3. The temperature of the air remains constant.

Calculate the new pressure of the air in the syringe.

air pressure = ... [2]

(b) A syringe is used to transfer smokey air from above a flame to a small glass container.

Extremely small solid smoke particles are suspended in the air in the container.

The container is brightly illuminated from the side and viewed through a microscope.

(i) The movement of the suspended smoke particles is called Brownian motion. Describe this Brownian motion.

....

....

....[2]

(ii) Explain what causes the motion of the smoke particles.

....

....

....[2]

(c) In the space below, sketch a diagram to represent the molecular structure of a solid. Show the molecules as small circles of equal sizes.

[2]

[Total: 8]

6 Fig. 6.1 shows a quantity of gas in a cylinder fitted with a piston P.

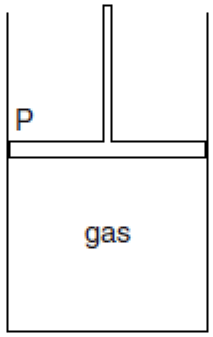


Fig. 6.1

(a) Describe the motion of the molecules of the gas.

....

....

....

....

.... [3]

(b) The piston is now slowly pushed down to decrease the volume of the gas. The temperature of the gas does not change.

(i) State and explain, in terms of molecules, what happens to the pressure of the gas.

....

....

.... [2]

(ii) Before pushing the piston down, the pressure of the gas was 1.0×10^5 Pa. Pushing the piston down reduces the volume of the gas from 500 cm^3 to 240 cm^3.

Calculate the final pressure of the gas.

pressure = ... [2]

[Total: 7]

6 **(a)** Complete the following statements by writing appropriate words in the spaces.

The pressure of a gas in a sealed container is caused by the collisions of

.... with the container wall.

An increase in the temperature of the gas increases the pressure because the

.... of the .... increases.

The force on the wall due to the gas is the pressure multiplied by the ....

of the wall. [2]

(b) A mountaineer takes a plastic bottle containing some water to the top of a mountain. He removes the cap from the bottle, drinks all the water and then replaces the cap, as shown in Fig. 6.1.

On returning to the base of the mountain, he finds that the bottle has collapsed to a much smaller volume, as shown in Fig. 6.2.

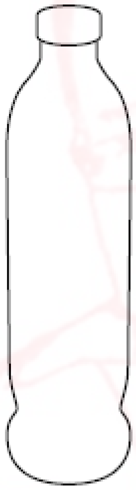


Fig. 6.1

Fig. 6.2

(i) Explain why the bottle collapsed.

....

....

....

.... [2]

(ii) At the top of the mountain the atmospheric pressure was 4.8×10^4 Pa and the volume of the bottle was $250\,cm^3$.

Calculate the volume of the bottle at the base of the mountain where the pressure of the air inside the bottle is 9.2×10^4 Pa. Assume no change of temperature.

volume = ... [3]

[Total: 7]

6 **(a)** **(i)** Define *pressure*.

.... [1]

(ii) A closed box contains a gas.

Explain, in terms of molecules, how the gas exerts a pressure on the walls of the box.

....

....

....

....

.... [3]

(b) Fig. 6.1 shows a flask connected to a pump and also to a manometer containing mercury.

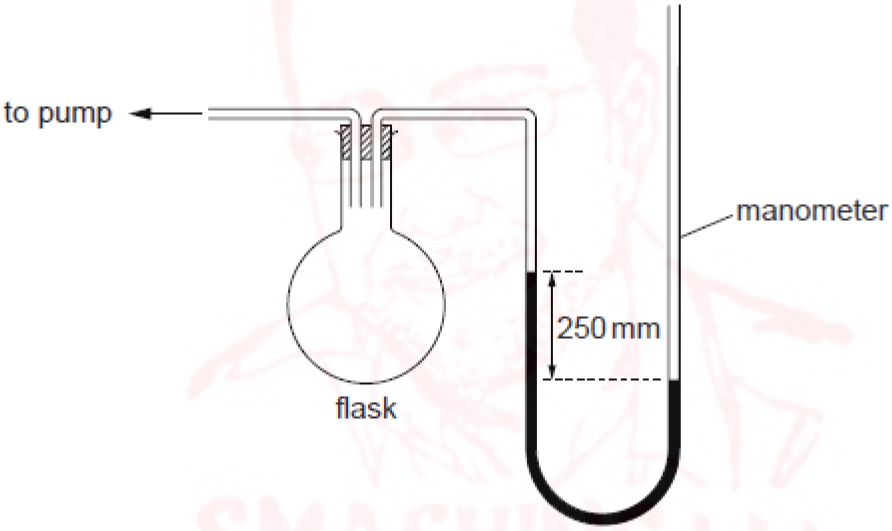


Fig. 6.1

The right-hand tube of the manometer is open to the atmosphere.

The pump has been operated so that the mercury levels differ, as shown, by 250 mm. The density of mercury is 13 600 kg / m^3.

(i) Calculate the pressure, in Pa, due to the 250 mm column of mercury.

pressure = ... [2]

(ii) The pressure of the atmosphere is 1.02×10^5 Pa.

Calculate the pressure of the air in the flask.

pressure = ... [1]

[Total: 7]

Q# 5/ iG Phx/2013/s/Paper 31/ www.SmashingScience.org

5 **(a)** On a hot day, sweat forms on the surface of a person's body and the sweat evaporates.

Explain, in terms of the behaviour of molecules,

(i) the process of evaporation,

....

....

....

(ii) how this process helps the body to cool down.

....

....

....

....

....

....

[3]

Q# 6/ iG Phx/2012/w/Paper 31/ www.SmashingScience.org

7 **(a)** Explain why a liquid cools when evaporation takes place from its surface.

....

....

.... [2]

5 **(a)** Explain

(i) how gas molecules exert a force on a solid surface,

....

....

.... [1]

(ii) the increase in pressure of a gas when its volume is decreased at constant temperature.

....

....

....

.... [3]

(b) A cylinder of volume $5.0 \times 10^3\,cm^3$ contains air at a pressure of 8.0×10^5 Pa.

A leak develops so that air gradually escapes from the cylinder until the air in the cylinder is at atmospheric pressure. The pressure of the atmosphere is 1.0×10^5 Pa.

Calculate the volume of the escaped air, now at atmospheric pressure. Assume that the temperature stays constant.

volume = ...cm^3 [4]

[Total: 8]

Q# 8/ iG Phx/2011/s/Paper 31/ NOT with 3a or 3b(i)

3 During a period of hot weather, the atmospheric pressure on the pond in Fig. 3.1 remains constant. Water evaporates from the pond, so that the depth *h* decreases.

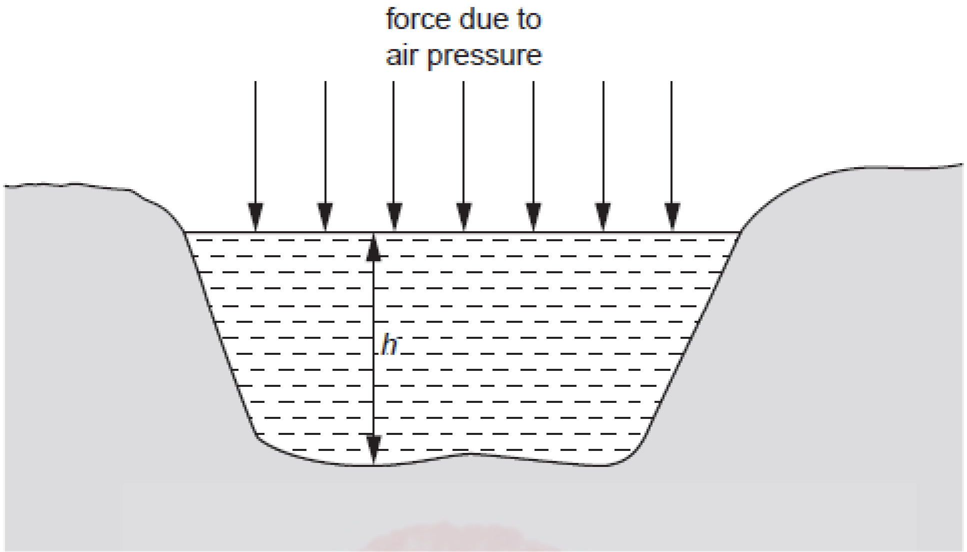


Fig. 3.1

(b) The pressure on the bottom of the pond caused only by the water is 1.2Pa.

(ii) Atmospheric pressure on that day is 1.0×10^5 Pa.

Calculate the total pressure at the bottom of the pond.

total pressure = ...[1]

(iii) A bubble of gas is released from the mud at the bottom of the pond. Its initial volume is $0.5\,cm^3$.

Ignoring any temperature differences in the water, calculate the volume of the bubble as it reaches the surface.

volume = ...[2]

(iv) In fact, the temperature of the water is greater at the top than at the bottom of the pond.

Comment on the bubble volume you have calculated in **(b)(iii)**.

....

....

....[1]

6 A vertical cylinder has a smooth well-fitting piston in it. Weights can be added to or removed from a tray on the top of the piston.

(a) Weights are added to the tray, as shown in Fig. 6.1.

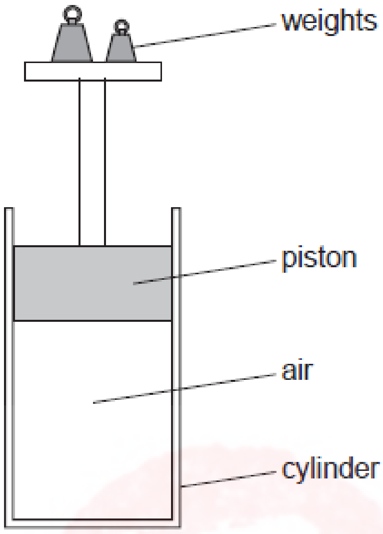


Fig. 6.1

(i) State what happens to the pressure of the air in the cylinder as a result of adding these weights.

.... [1]

(ii) The initial pressure of the trapped air is 1.05×10^5 Pa. When the weights are added, the volume of the air decreases from 860 cm^3 to 645 cm^3.

The temperature of the air does not change.

Calculate the final pressure of the trapped air.

pressure = ... [3]

(iii) The area of the piston is 5.0×10^{-3} m^2.

Calculate the weight that is added to the piston.

weight added = ... [4]

(b) The weights are kept as shown in Fig. 6.1. The temperature of the air in the cylinder is increased.

(i) State what happens to the volume of the air in the cylinder as a result of this temperature rise.

.... [1]

(ii) State how, if at all, the pressure of the air changes as the temperature changes.

.... [1]

(iii) State what must be done to prevent the volume change in **(b)(i)**.

.... [1]

(iv) The volume change in **(b)(i)** is prevented. State what happens to the pressure of the air in the cylinder.

.... [1]

[Total: 12]

7 **(a)** Some water is poured onto a plastic table-top, forming a puddle. The same volume of water is poured into a plastic dish, which is placed alongside the puddle. This is illustrated in Fig. 7.1.

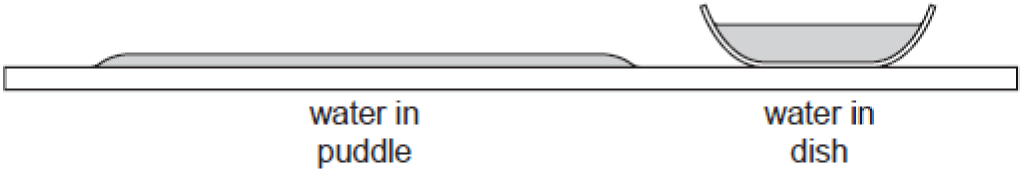


Fig. 7.1

Both lots of water begin to evaporate.

(i) In terms of the behaviour of molecules, describe what happens during the process of evaporation.

....

....

....

.... [2]

(ii) Explain why the puddle dries out more rapidly than the water in the dish.

....

....

....

.... [2]

(iii) State two changes that would make both lots of water evaporate more rapidly.

1. ....

2. .... [2]

(b) In a place where refrigeration is not possible, a person attempts to keep a bottle of milk cool by using the procedure illustrated in Fig. 7.2.

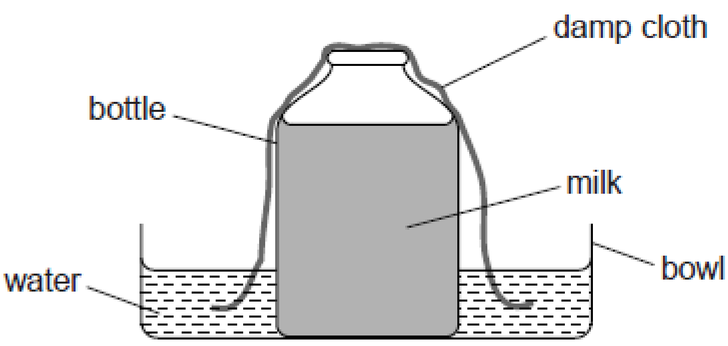


Fig. 7.2

Explain in terms of molecules why this procedure would be successful.

....

....

.... [3]

[Total: 9]

4 The whole of a sealed, empty, dusty room is kept at a constant temperature of 15 °C. Light shines into the room through a small outside window.

An observer points a TV camera with a magnifying lens into the room through a second small window, set in an inside wall at right angles to the outside wall.

Dust particles in the room show up on the TV monitor screen as tiny specks of light.

(a) In the space below draw a diagram to show the motion of one of the specks of light over a short period of time.

[1]

(b) After a period of one hour the specks are still observed, showing that the dust particles have not fallen to the floor.

Explain why the dust particles have not fallen to the floor. You may draw a labelled diagram to help your explanation.

....

....

....

.... [2]

(c) On another day, the temperature of the room is only 5 °C. All other conditions are the same and the specks of light are again observed.

Suggest any differences that you would expect in the movement of the specks when the temperature is 5 °C, compared to before.

....

....

.... [1]

[Total: 4]

5 Fig. 5.1 shows a way of indicating the positions and direction of movement of some molecules in a gas at one instant.

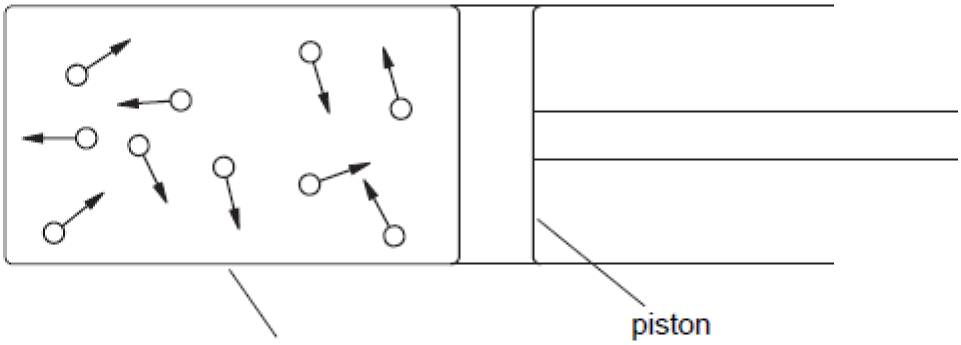


Fig. 5.1

(a) **(i)** Describe the movement of the molecules.

.... [1]

(ii) Explain how the molecules exert a pressure on the container walls.

....

.... [1]

(b) When the gas in the cylinder is heated, it pushes the piston further out of the cylinder.

State what happens to

(i) the average spacing of the molecules,

.... [1]

(ii) the average speed of the molecules.

.... [1]

(c) The gas shown in Fig. 5.1 is changed into a liquid and then into a solid by cooling.

Compare the gaseous and solid states in terms of

(i) the movement of the molecules,

....

.... [1]

(ii) the average separation of the molecules.

....

.... [1]

5 **(a)** Fig. 5.1 shows the paths of a few air molecules and a single dust particle. The actual air molecules are too small to show on the diagram.

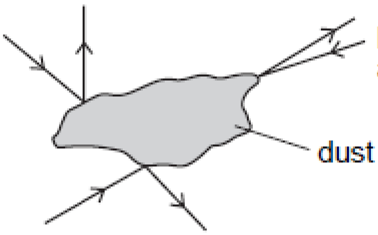


Fig. 5.1

Explain why the dust particle undergoes small random movements.

....

....

....

.... [4]

(b) Fig. 5.2 shows the paths of a few molecules leaving the surface of a liquid. The liquid is below its boiling point.

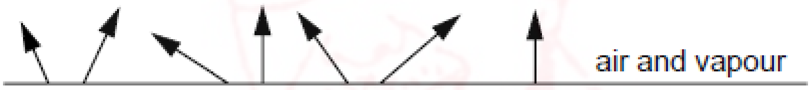


Fig. 5.2

(i) State which liquid molecules are most likely to leave the surface.

....

.... [1]

(ii) Explain your answer to **(i)**.

....

....

.... [2]

5 **(a)** Fig. 5.1 shows a sealed box.

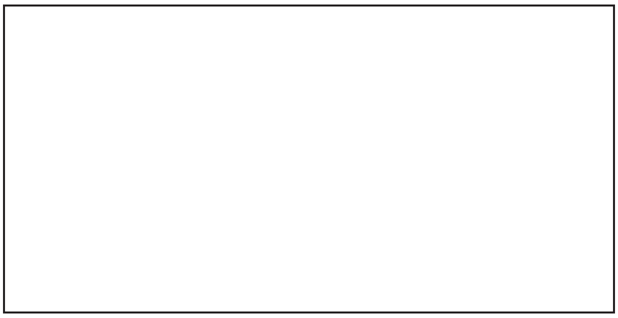


Fig. 5.1

(i) The box contains a large number of air molecules. On Fig. 5.1, draw a possible path of **one** of the air molecules, as it moves inside the box.

(ii) Explain

1 how air molecules in the box create a pressure on the inside walls,

....

....

....

2 why this pressure rises as the temperature of the air in the box increases.

....

....

....

[5]

(b) Air in a cylinder is compressed slowly, so that the temperature does not rise. The pressure changes from 2.0×10^5 Pa to 5.0×10^5 Pa. The original volume was $0.35\,m^3$. Calculate the new volume.

volume = ……………………..[3]

Q# 15/_iG Phx/2003/s/3Q1

(b) Another box of weight 1500 N is raised vertically by 3.0 m.

(i) Calculate the work done on the box.

work done = ...

(ii) The crane takes 2.5 s to raise this box 3.0 m. Calculate the power output of the crane.

power = ...

[4]

Q# 16/_iG Phx/2003/s/Paper 3 www.SmashingScience.org

4 Fig. 4.1 shows a sealed glass syringe that contains air and many very tiny suspended dust particles.

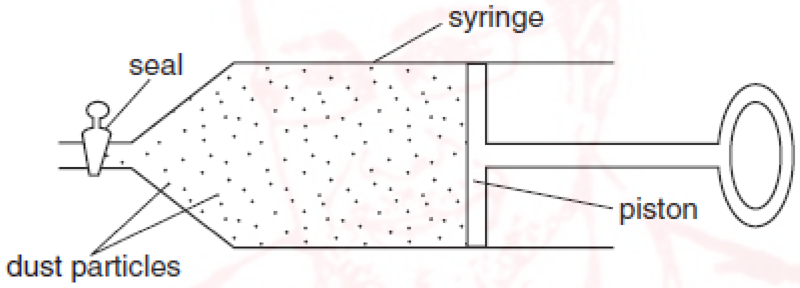


Fig. 4.1

(a) Explain why the dust particles are suspended in the air and do not settle to the bottom.

....

....

....

....[3]

(b) The air in the syringe is at a pressure of 2.0×10^5 Pa. The piston is slowly moved into the syringe, keeping the temperature constant, until the volume of the air is reduced from 80 cm^3 to 25 cm^3. Calculate the final pressure of the air.

pressure = ...[3]

Q# 1/ iG Phx/2014/w/Paper 33/ www.SmashingScience.org

4	**(a)**		*pV* = constant **OR** $p_1V_1 = p_2V_2$ **OR** p_1V_1/V_2 or $1.0 \times 10^5 \times 100 \div 40$	C1
			2.5×10^5 Pa	A1
	(b)	**(i)**	(the particles move) <u>randomly</u>	B1
			(the particles move) slowly **OR** through small distances **OR** disappear **OR** zigzag **OR** directions change **OR** erratic **OR** straight lines between collisions	B1
		(ii)	air <u>molecules</u>/<u>particles</u> collide with smoke particles (at high speed)	B1
			fast(er) air molecules **OR** move randomly **OR** many collisions	B1
	(c)		diagram showing:	
			<u>molecules</u> touching each other	B1
			<u>molecules</u> positioned in an ordered structure	B1
				[Total: 8]

Q# 2/ iG Phx/2014/s/Paper 31/ www.SmashingScience.org

6	**(a)**		(molecules) move in random directions / randomly / with constant random motion / zig-zag motion / in all directions	B1
			(molecules) have random speeds OR a range of speeds OR move (very) fast / at (very) high speed	B1
			any 1 from: (molecules) collide with each other (molecules) move in straight lines between collisions (molecules) change direction in collisions (molecules) collide with walls (of cylinder)	B1
	(b)	**(i)**	pressure increases	M1
			more <u>frequent</u> collisions between molecules and <u>walls</u> OR molecules collide with <u>walls</u> more often / at greater rate	A1
		(ii)	*pV* = constant OR $p_1V_1 = p_2V_2$ in any form OR $1.0 \times 10^5 \times 500 = p_2 \times 240$	C1
			2.1×10^5 Pa to 2 or more sig. figs	A1
				[Total: 7]

Q# 3/ iG Phx/2013/w/Paper 31/ www.SmashingScience.org

6 (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 cm^3 — A1

[Total: 7]

Q# 4/ iG Phx/2013/s/Paper 31/ www.SmashingScience.org

6 (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]

Q# 5/ iG Phx/2013/s/Paper 31/ www.SmashingScience.org

5 (a) (i) and (ii) marked together to maximum of 3 marks
(i) molecules escape/leave the liquid/form gas or vapour — B1

(ii) evaporation OR heat/(thermal) energy needed for evaporation leaves sweat cooler — B1
fast(er) molecules/high(er) energy molecules escape
OR slow(er) molecules left behind — B1
heat flows from body to warm the sweat (so body cools) — B1

(b) (i) (Q =) $mc\Delta\theta$ OR mcT OR $60 \times 4000 \times 0.50$ — C1
1.2×10^5 J / 120 kJ — A1

(ii) $Q = mL$ in any form OR (m =) Q/L OR either with numbers — C1
($m = 1.2 \times 10^5 / 2.4 \times 10^6$ =) 0.05 kg e.c.f from **(b)(i)** — A1

[Total 7]

Q# 6/ iG Phx/2012/w/Paper 31/ www.SmashingScience.org

7 (a) Faster / more energetic molecules escape / evaporate (from surface) B1
Molecules left (in liquid) have lower average speed / energy so temperature is lower B1
OR
(Latent) heat needed to evaporate / leave the surface (B1)
comes from remaining liquid (B1)

Q# 7/ iG Phx/2012/w/Paper 31/ www.SmashingScience.org

5 (a) (i) (Force exerted when) molecules hit wall / surface / solid (and rebound) B1
Allow (force) due to momentum change in collision

(ii) Molecules/atoms/particles collide with / push against walls B1
more (often) B1
(so) bigger force / push B1

NOT collide faster

(b) $P_1V_1 = P_2V_2$ OR PV = constant C1
$8.0 \times 10^5 \times 5000 = 1 \times 10^5 \times V_2$ C1
$V_2 = 40\ 000\ cm^3$ C1
Volume escaped = 40 000 – 5000 = 35 000 cm^3 A1 **[8]**

Q# 8/ iG Phx/2011/s/Paper 31/Q3(b)

(ii) candidate's (i) + 1.0×10^5 Pa correctly evaluated with unit (correct value 2.2×10^5) B1

(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.t.e. B1 [8]

Q# 9/ iG Phx/2009/w/Paper 31/ www.SmashingScience.org

6 (a) (i) increases B1

(ii) pV = const in any form C1
$1.05\ (\times 10^5) \times 860\ (\times 10^{-6}) = p \times 645\ (\times 10^{-6})$ C1
1.4×10^5 Pa A1

(iii) F = pA in any form   accept weight for F   C1
EITHER   increase in pressure = 0.35×10^5 (Pa)   C1
$0.35 \times 10^5 \times 5.0 \times 10^{-3}$ C1
175 N (minimum 2 s.f.) c.a.o.   A1
OR $1.05 \times 10^5 \times 5.0 \times 10^{-3}$ or 525 N or $1.4 \times 10^5 \times 5.0 \times 10^{-3}$ or 700 N   (C1)
700 – 525 N e.c.f. from **(a) (ii)**   (C1)
175 N (minimum 2 s.f.) c.a.o.   (A1)

(b) **(i)** increases   B1

(ii) no change   B1

(iii) extra weight (on tray/piston)   B1

(iv) increases   B1

[12]

Q# 10/ iG Phx/2009/s/Paper 31/ www.SmashingScience.org

7 **(a)** Total penalty for use of 'particles' rather than 'molecules' is 1 mark.

(i) idea of some molecules gaining more KE   B1
mols overcome attractive forces OR mols break free of surface   B1

(ii) greater area   B1
more mols escape (in given time)   B1

(iii) increase temperature / supply more heat / make hotter)
blow air across surface, or equiv.) any 2   B1 + B1
reduce humidity)
decrease pressure)

(b) water evaporates from cloth / water OR faster / more energetic
molecules evaporate)
less energetic mols left behind)
energy to evaporate taken from milk) any 3   B1 × 3
evaporation produces cooling)
idea of cloth always being damp by soaking up water)   [9]

Q# 11/ iG Phx/2008/w/Paper 31/ www.SmashingScience.org

4 **(a)** typical random path drawn, at least 3 abrupt changes of direction   B1

(b) air molecules hit dust particles in all directions/move it in all directions   B1
just as likely to be up as down   B1
(allow marks scored on diagram)

(c) random movements smaller OR slower movement
OR less energy OR movement decreases   B1   [4]

Q# 12/_iG Phx/2005/w/Paper 31/ www.SmashingScience.org

5	(a) (i)	random	B1	
	(ii)	hit and rebound	B1	[2]
	(b) (i)	increase or further apart	B1	
	(ii)	increase or move faster	B1	[2]
	(c) (i)	random, fast in gas to vibration in solid	B1	
	(ii)	long way apart in gas to very close or touching	B1	[2] Total [6]

Q# 13/_iG Phx/2005/s/Paper 3 www.SmashingScience.org

5	(a)	air molecules hit particles or vice versa air molecules have speed/moment/energy hits uneven or from all directions hits (by small molecules) can move a large particle or moves particles small distances	B1 B1 B1 B1	4
	(b) (i) (ii)	most energetic/fastest molecules need energy to overcome forces/break bonds/separate mols. so work must be done/energy used as work	B1 B1 B1	3 [7]

Q# 14/_iG Phx/2004/w/Paper 3/ www.SmashingScience.org

5 (a) (i)	any suitable random motion molecules hit walls	1 1	
(ii)	1. rebound/bounce back or many hits per unit area or per unit time or collisions create force 2. (av) k.e./speed of molecules increases more hits(/sec) or harder hits	 1 1 1	5
(b)	$p_1v_1 = p_2v_2$ quoted or any recognisable substitution $2 \times 10^5 \times 0.35 = 5 \times 10^5 \times v$ volume = 0.14 (m^3)	1 1 1	3 (8)

Q# 15/_iG Phx/2003/s/3Q1

(b)	(i)	work = force x distance or 1500 x 3.0 work = 4500 J	C1 A1	
	(ii)	power = work/time or 4500/2.5 power = 1800 W	C1 A1	4 [9]

4	**(a)**	air molecules hit dust particles	**M1**	
		hits continuously/unevenly/hits cause movement in all directions	**A1**	
		air molecules fast moving/high energy	**B1**	3
	(b)	any attempt to use p x v = constant or correct	**C1**	
		proportion	**C1**	
		fraction 2 x 80/25 seen	**A1**	3
		p = 6.4 x 10 (Pa)		
				[6]