MEAUREMENTS 1

1.

(a) (i) 20 (cm3))
(ii) 25 (cm3)±0.5) both B1 [1]
(b) 5 (cm3) e.c.f. B1 [1]
(c) 5/200 e.c.f. C1
0.025 (cm3) e.c.f. A1 [2]
[Total: 4]

2.

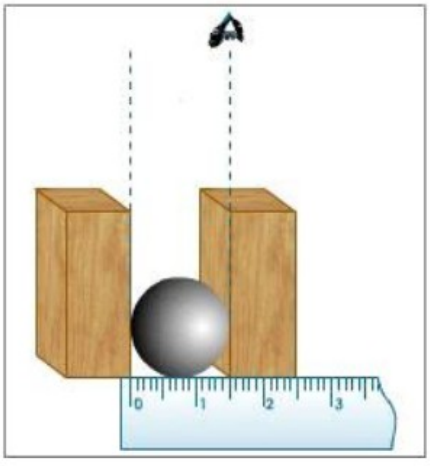
(a)	(i)	point plotted for (150, 1.5) to ± half a small square		1
	(ii)	line of best fit	*the anomalous point should be avoided* *the line need not be drawn through the origin*	1
(b)		point at (300, 3.8) circled	*accept this result circled in the table*	1
(c)	(i)	a number from 640 to 660	1	
	(ii)	a number from 0.4 to 0.6	*consequential marking applies to both **c i** and **c ii*** *accept answers consistent with the graph drawn*	1
(d)		any **one** from	*the answer must refer to the results or the pattern shown by the results*	1
	·	the pattern is revealed **or** observed more easily	*accept 'it allows you to see a pattern'*	
	·	it tells you the pattern without working it out	*accept 'you can tell the rule by looking at it'*	
	·	it gives readings between the recorded readings	*accept 'it is easier to make predictions'*	
	·	you can see if there are results that are wrong **or** do not fit the pattern	*accept 'it shows better **or** more quickly the more mass the more weight'* *accept 'the data is continuous'* *do **not** accept 'it is more accurate **or***	

precise'

[6]

3.

Place the sphere or the cylinder between two blocks in contact with a ruler as shown in figure below



[1m]

Read the distance between the two blocks on the ruler accurately. (The line of sight should be vertical.) [1m]

[Total 2m]

4.

(a) 200,000 (m^3) B1
(b) D = M/V in any form B1
his (a) x 1.3 C1
260,000 c.a.o. A1
kg B1
(c) decreases M1
air expands OR density decreases A1
(d) hot air rises B1

[Total: 8]

5.

(i) Volume of copper = 360/9 =40cm^3 [1m]

(ii) Volume of iron= 80/8 = 10cm^3 [1m]

(iii) Density of the alloy = (360 + 80)/(40 + 10) = 8.8gcm^{-3}

[Total 3m]

6.

(a) (i) 50, 75/76 [1]
(ii) 25 (ecf) [1]
cm3 (at least once and not contradicted) [1]
(iii) density 4.36 (ecf) [1]
(b) V2, V1 [1]
cm3(at least once and not contradicted) [1]

density g/cm3 [1]
5.68, 3.02 both to 2/3 sf [1]
(c) Same method, lots of grains [1]

[Total: 9m]

7.

Total volume = 2.0 m^3

Total mass = [0.5 x 800] +[1.5 x 1000] = 1900kg [1m]

D = m/v = 1900/2 [1m]

950 kg m^{-3} [1m]

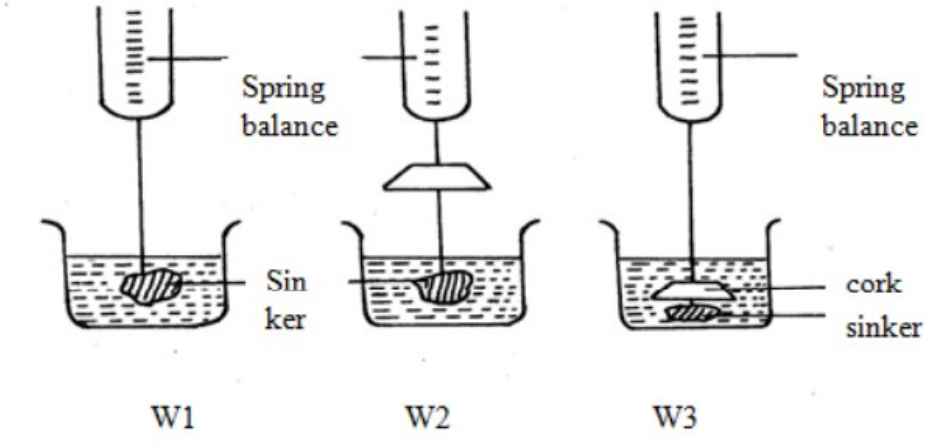
8.

a) - Weigh sinker in water = w_1 ü 1
- Weigh sinker in water + cork in air = w_2 ü 1
- Weigh the sinker and cork in water = w_3ü 1

Up thrust on cork = $w2 - w_3$ ü 1

Weight of cork in air = $w2 - w_1$

Relative density of cork = $\frac{w_2 - w_1}{w_2 - w_3}$ ü 1



b) Volume of liquid displaced = 80cm^3 = 8.0 x 10 m^3ü 1

Weight of liquid displaced = 8.0 10^{-5} x 1200 x10 =0.96 Nü 1

Up thrust = weight of the liquid displaced

Weight when fully = (3.80 -0.96)Nü 1
submerged
= 2.84 Nü 1

FORCE

1. (a) (i) • an arrow labelled R, to the right, drawn on the rope — 1 (L3)

accept a labelled arrow to the right, drawn parallel to the rope

(ii) • an arrow labelled G, vertically downwards — 1 (L4)

(b) any **one** from — 1 (L4)

- snow is smoother
- snow is more slippery

accept 'snow is slippery'
*accept 'concrete **or** the path is rough'*
*'snow is soft' **or** 'concrete is hard' are insufficient*

[3

2. (a) Mars — *accept '6 kg'* / *do **not** accept '24 N'* — 1 (L5)

(b) any **one** from — 1 (L5)

- 4 kg weighs more on Earth — *accept the converse* / *'different weights' is insufficient*
- the weight of the object is greater on Earth — *accept the converse* / *accept 'Earth is 40 N and Venus is 36 N'* / *accept 'Earth is 40 and Venus is 36'* / *accept 'more newtons on Earth' **or** 'less newtons on Venus'* / *accept 'there is a greater force on Earth'* / *do **not** accept 'it has more mass on the Earth'*

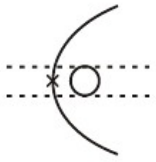
(c) *answers must be in the correct order*

- less (than) **or** smaller (than) **or** lower (than) — 1 (L6)
- the same (as) **or** equal (to) — 1 (L6)

(d) (i) • the greater the distance — *accept 'it increases'* / *the greater the time for one orbit* — 1 (L5)

(ii) • an answer from 1.6 to 6 inclusive — 1 (L6)

(e) 1 (L6)



award a mark for X marked on the orbit within the tolerances shown

[7]

3. (a) B 1 (L5)

(b) (i) A and C *accept 'lift and weight'* 1 (L5)

answers may be in either order
***both** letters are required for the mark*

(ii) D *and* B *accept A and C* 1 (L5)

answers may be in either order
***both** letters are required for the mark*

(c) (i) • Force D is greater than force B. ✓ 1 (L6)

if more than one box is ticked, award no mark

(ii) • Force A is greater than force C. ✓ 1 (L6)

if more than one box is ticked, award no mark

[5]

4. (a) any **one** from 1 (L4)

- the forces are balanced

ignore references to gravity if the answer is in terms of balanced forces

- the forces are equal **or** the same

'the sides are equal' is insufficient

- the forces are both 1000 N

accept 'the forces are both 1000'
accept 'the newtons are even'
*do **not** accept 'both teams weigh 1000 N'*

- they pull with the same force **or** equally hard

accept 'both teams have the same strength'

(b) an arrow drawn to the right 1 (L3)

accept an arrow drawn to the right anywhere on the drawing

(c) any **one** from 1 (L4)

- team A pulled harder than team B — *accept 'team A pulled harder' **or** 'team A pulled more' **or** 'they pulled harder'*
  accept the converse
- team A was stronger — *accept 'they used more strength'*
- team A was pulling with more than 1000
- team B was pulling with less than 1000
- there was more force to the left — *accept 'there are more newtons to the left'*

(d) 1200 N ✓ 1 (L4)

if more than one box is ticked, award no mark

(e) friction 1 (L4)

[5]

5. (a) (i) point plotted for (150, 1.5) to ± half a small square 1 (L5)

(ii) line of best fit 1 (L6)

the anomalous point should be avoided
the line need not be drawn through the origin

(b) point at (300, 3.8) circled — *accept this result circled in the table* 1 (L6)

(c) (i) a number from 640 to 660 1 (L6)

(ii) a number from 0.4 to 0.6 1 (L6)

*consequential marking applies to both **c i** and **c ii***
accept answers consistent with the graph drawn

(d) any **one** from — 1 (L6)

the answer must refer to the results or the pattern shown by the results

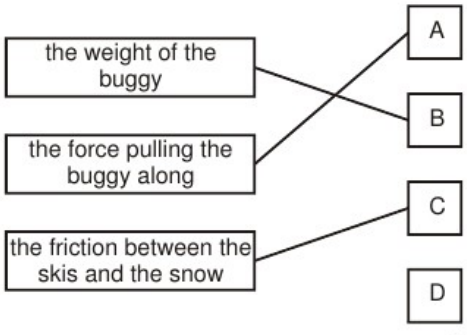
- the pattern is revealed **or** observed more easily — *accept 'it allows you to see a pattern'*
- it tells you the pattern without working it out — *accept 'you can tell the rule by looking at it'*
- it gives readings between the recorded readings — *accept 'it is easier to make predictions'*
- you can see if there are results that are wrong **or** do not fit the pattern — *accept 'it shows better **or** more quickly the more mass the more weight'*

accept 'the data is continuous'

*do **not** accept 'it is more accurate **or** precise'*

[6]

6. (a) — 3 (L3)



if more than one line is drawn from any one force award no mark for that force

(b) 800 — 1 (L4)

accept '80 x 10'

(c) any **one** from — 1 (L4)

- it weighed more
- the mass was greater — *accept 'it was heavier'*
- it weighed less at the end — *accept 'it only weighed 130 at the end'*

*accept 'there was more food **or** fuel **or** supplies'*

accept 'more pressure'

(d) any **one** from 1 (L4)

- they spread out the weight

accept 'they do not sink into the snow'
accept 'wheels sink'

- they have a bigger surface **or** area
- they can slide easily

accept 'they reduce the pressure'
accept 'less friction'
'they are bigger' is insufficient
'it can slide' is insufficient

(e) any **one** from 1 (L4)

- there is a bigger surface **or** area
- there is a bigger force
- it catches more air **or** wind

*do **not** accept 'there is more air resistance'*

[7]

7. (a) (i) C 1 (L3)

(ii) B 1 (L3)

(b) 20 1 (L3)

(c) any **one** from 1 (L4)

- friction
- air resistance **or** drag
- reaction

accept 'upthrust'
*do **not** accept 'gravity'*

[4]

8. (a) (i) 12.5 m/s *accept '$\frac{400}{32}$ m/s'* 1 (L7)

*accept 'metres per second' **or** 'ms^{-1}' for m/s*
the unit is required for the mark
*do **not** accept 'mps'*

(ii) they are equal **or** the same *accept 'they are balanced'* 1 (L7)

(b) the forward force is greater than the backward force — *accept the converse* — 1 (L7)
*accept 'the forward force is greater' **or** 'the backward force is smaller'*
*do **not** accept 'the forward force becomes greater **or** increases'*

any **one** from — 1 (L7)
- because air resistance **or** drag is smaller **or** reduced — *accept 'less friction'*
- because there is a smaller surface area

'she is more streamlined' is insufficient as it is given in the question

[4]

9. (a) (i) any **two** from — 2 (L6)
- gravity **or** weight
- friction
- reaction — *accept 'upthrust'*
- air resistance — *accept 'drag'*
*do **not** accept 'centrifugal force' **or** 'centripetal force' **or** 'g- force'*

(ii) any **one** from — 1 (L6)
- constant speed
- steady speed
- it stays the same — *accept 'it is the same' **or** 'it does not change'*

(b) friction is less — 1 (L5)
*'it is smoother' **or** 'it is slippery' are insufficient*

(c) it increases — *accept 'he goes more quickly'* — 1 (L6)
because there is less air resistance **or** friction — 1 (L6)
*accept 'he is streamlined **or** aerodynamic'*

[6]

10. (a) **Both the correct ball and the correct reason are required for the mark.**

the bowling ball because it has the greatest mass **or** it is the heaviest — 1 (L5)

*do **not** accept 'because it is bigger'*

'the bowling ball because it is bigger' insufficient

(b) any **one** from — 1 (L5)

- they are the same diameter — *accept 'they are the same size'*
- they produce the same air resistance **or** friction

(c) (i) they would both reach the ground at the same time — 1 (L5)

(ii) air resistance — *accept 'friction'* — 1 (L5)

(iii) **either**

- the feather and the hammer landed at the same time — 1 (L6)
  there is no atmosphere **or** air resistance **or** air on the moon — 1 (L6)

or

- they would take longer to fall on the moon — 1 (L6)
  because there is lower gravity than on the Earth — 1 (L6)

*do **not** accept 'there is no gravity on the moon'*

[6]

11. (a) they are equal — *accept 'they are balanced'* — 1 (L5)

(b) (i) weight is greater than friction — *accept 'they are not equal **or** balanced'* — 1 (L5)

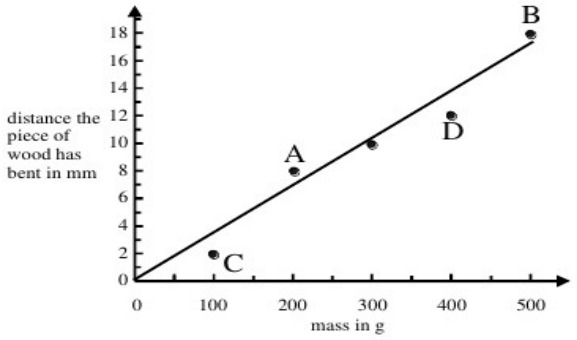
(ii) it increases — 1 (L6)
it decreases — 1 (L6)

(iii) it increases **or** it gets faster — 1 (L6)

[5]

12. (a) gravity **or** weight — 1

(b) (i)



1

*accept any straight line which goes through **or** below both points A and B*
***and** through **or** above both points C and D*
*the line does **not** have to extend to an axis*

(ii) 11.5 *accept any answer from 10.0 to 13.0* 1

[3]

13. (a) (i) any **one** from 1

- when the weight increases, the number of masses increases
  *accept 'they increase together' **or** 'they decrease together'*
- the number of masses goes down if the weight goes down
- the number of masses increases with weight

(ii) 12 1

(b) (i) she would need fewer masses *accept 'it would slide more easily'* 1
*do **not** accept 'less friction'*

(ii) put oil or water on the glass *accept a named lubricant for oil* 1
accept 'lubricate the surfaces'
accept 'polish the block of wood'
*accept 'put the block of wood on rollers **or** ball bearings'*
***or** on any objects used as rollers*
*do **not** accept 'tilt the glass'*

[4]

14. (a) (i) they hit the front of the car *accept 'the car has to push the air molecules out of the way'* 1 (L6)
accept 'air hits the front of the car'

(ii) any **one** from 1 (L6)

- molecules **or** particles hit the car faster **or** harder

  accept 'the car hits the air particles faster'

- more molecules **or** particles hit the car

  *accept 'the car has to push more air each second' **or** 'the pressure gets greater at the front of the car' **or** 'the pressure difference increases'*

(b) (i) larger than the air resistance — *accept 'larger' **or** 'bigger'* — 1 (L6)

(ii) the same as the air resistance — *accept 'the same' **or** 'equal'* — 1 (L6)

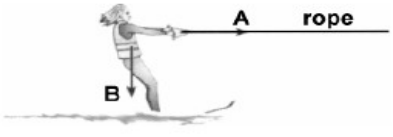
(c) any **one** from — 1 (L6)

- it has to balance the air resistance
- air resistance is larger — accept 'more molecules hit the car' **or** *'molecules hit the car faster' **or** 'the car has to push more air each second'*

(d) friction — 1 (L5)

[6]

15. (a) (i) — 1 (L3)

(ii) 

1 (L3)

the first mark is for an arrow pointing to the right,
*with **or** without the label **A***
the arrow may be separate from, but parallel to, the rope

*accept an arrow placed on the second drawing provided it is labelled **A***

*the second mark is for an arrow pointing vertically downwards, with **or** without the label **B***

(b) any **two** from

- air resistance **or** wind resistance — *accept 'wind'* — 2 (L4)
- friction **or** water resistance
- upthrust — *accept 'buoyancy'*
- lift — *accept 'drag' as an alternative to wind*

resistance ***or*** *water resistance, but not both*

accept 'weight of the skis'

do ***not*** *accept 'weight'* ***or*** *'gravity'* ***or*** *water pressure'* ***or*** *'resistance'*

(c) 1 (L3)

*the mark is for an arrow pointing to the left, with **or** without the label C the arrow may be separate from, but parallel to, the rope*

accept an arrow placed on the first drawing provided it is labelled C

(d) any **one** from

- it increases it — accept 'makes it accelerate' — 1 (L3)
- it speeds it up
- it makes it go faster

accept 'faster'
*do **not** accept 'it changes it'*

[6]

16. (a) the weight of the bricks ✓ — *if more than two boxes are ticked, deduct one mark for each incorrectly ticked box* — 1 (L3)

the push of the man's hands on the handles ✓ — 1 (L3)

minimum mark zero

(b) friction — 1 (L4)

(c) any **one** from — 1 (L3)

- speeds it up
- makes it bigger
- it accelerates — *accept 'makes it go faster' **or** 'faster'*

*do **not** accept 'it falls quickly'*

[4]

17. (a) The tension equals the weight. ✓ — *if more than one box is ticked, award no mark* — 1 (L6)

(b) tension is greater than weight

accept 'tension is bigger' ***or*** *'weight is less'* 1 (L6)

or *'the upward force is bigger'* ***or*** *'the downward force is smaller'*

(c) tension equals weight

accept 'they are the same' 1 (L6)

(d) tension is less than weight

1 (L6)

*accept 'tension is less '****or*** *'weight is more'*
or *'the upward force is less'* ***or*** *'the downward force is bigger'*

[4]

18. (a) B

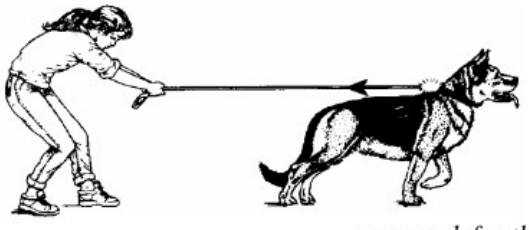
1 (L3)

(b) D

1 (L3)

(c) (i)

1 (L3)



one mark for the arrow pointing to the left
the arrow may be anywhere on the diagram

accept 'D' on the diagram

accept arrows pointing diagonally downwards and to the left

do ***not*** *accept arrows pointing vertically downwards*

(ii) **answers should refer to a force pulling or the effect of pulling**
any **one** from 1 (L3)

- because Megan is pulling it
- because there is a force on it
- because the force is unbalanced
- force D is still acting

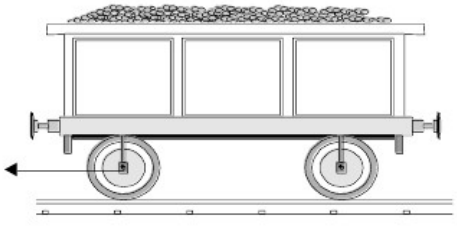
accept 'because it was stretched' **or** *'because the dog isn't pulling it any more'*

accept answers referring to gravity, weight or falling ***only*** *if the arrow in (c) (i) points diagonally or vertically downwards*

do ***not*** *accept 'it is not attached to the dog any more'*

[4]

19. (a) (i) 1 (L5)



the mark is for an arrow pointing to the left as shown
the arrow may be anywhere on the diagram

accept an arrow pointing to the left, drawn in the space beneath the question

(ii) equal to *accept 'equal'* 1 (L5)

(b) (i) backwards *accept 'in the opposite direction to the movement'* 1 (L5)
or 'in the opposite direction' ***or*** *'to the left'*
accept an arrow drawn pointing to the left either on the diagram, if labelled clearly, or in the space beneath the question

(ii) between 0 and 5000 N ✓ *if more than one box is ticked, award no mark* 1 (L5)

(c) 5000 N ✓ *if more than one box is ticked award no mark* 1 (L5)

[5]

PRESSURE

1. (a) (i)
- 100 — *accept '200 ÷ 2.0'* — 1 (L7)
- N/cm^2 — 1 (L7)

*accept '10^6 N/m^2' **or** '10^6 Pa' for two marks*

(ii) 800 — *accept '100 × 8'* — 1 (L7)

*accept the numerical answer to **a i** × 8*
the unit is not required for the mark

(b) (i) any **one** from — 1 (L6)
- air **or** gas can be compressed — *accept 'gases are easier to compress'*
*'air **or** gas provides less resistance' is insufficient*
- water **or** liquids cannot be compressed
- gaps between particles of air **or** gas can be reduced — *accept 'atoms can be compressed together'*

(ii) any **one** from — 1 (L7)
- less force would be transmitted to the brakes — *accept 'the brakes have less effect'*
'the brakes are spongy' is insufficient
- less pressure at B — *accept 'less pressure could be produced'*
*accept 'less **or** no resistance to the brakes'*
- piston B would not move

accept 'the air bubbles could be compressed'

[5]

2. (a) (i) ice skate — *accept 'skate'* — 1 (L3)

(ii) Tom's weight on the footwear ✓ — 1 (L3)

if more than one box is ticked, award no mark

(b) any **one** from — 1 (L3)
- they do not sink in
- they have a big surface — *accept 'they are wide' **or** 'they are big'*
accept 'they spread out your weight'
*do **not** accept 'you won't get your feet stuck in the snow'*
accept 'they reduce the pressure'
*do **not** accept 'they spread out your pressure'*

	(c)	friction		1 (L4)	**[4]**
3.	(a)	25	*accept '175 ÷ 7'*	1 (L7)	
	(b)	any **one** from			
		• greater than 27 N/cm^2	*the unit is required for the mark* *do **not** accept '27 N/cm^2'*	1 (L7)	
		• greater than the pressure in the tyre	*accept any answer greater than 27 N/cm^2*		
	(c)	2850		1 (L7)	**[3]**

4.	(a)	(i)	450		1	
			Ncm	*accept 'cmN'* *accept '4.5 N m' for **both** marks*	1	
		(ii)	300	*the unit is not required for the mark* *consequential marking applies* *accept the numerical answer to (a) (i) ÷ 1.5 cm*	1	
	(b)	(i)	400 000	*accept '40 N/m^2' **or** '40 Pa' for **both** marks*	1	
			N/cm^2		1	
		(ii)	because the area of contact will increase		1	**[6]**

5.	(a)	(i)	40 N/cm^2	*the unit is required for the mark* *accept '400 000 Pa'*	1	
		(ii)	200 N	*the unit of force is required for the mark consequential marking applies* *accept numerical answer to (a)(i) ×5 cm^2*	1	

(b) (i) 200 N *the unit is required for the mark* 1

(ii) 1600 N *the unit of force is required for the mark consequential marking applies* 1
accept numerical answer to (b) (i) × 8

[4]

6. (a) 150 1

(b) there is nothing to balance the force of the string 1
*accept 'it is pushed by the string' accept 'there is a forward force acting on it' accept 'potential energy is converted to kinetic energy' **or** 'energy from the bow is transferred to the arrow'*

(c) any **one** from 1

- because they are not in opposite directions
*accept 'because they are in different directions' **or** 'because they are at an angle to each other' **or** 'because they are not both horizontal'*
*do **not** accept 'because they are at an angle'*
- because they do not act along the same line
accept 'gravity pulls down and friction pushes across'

(d) any **one** from 1

- because the force is concentrated in a much smaller area
accept 'because the area in contact is smaller'
***or** 'because there is a smaller area'*
- because pressure is force divided by area

[4]

7. (a) (i) they get closer **or** it gets less 1

(ii) nothing **or** same distance 1

(iii) it increases 1

(iv) it decreases 1

(b) water flows into the cap *accept 'water flows **or** is pushed* 1
***or** got into the cap'*
***or** 'the air in the cap takes up less space'*
accept 'the air in the cap is under pressure'

any **one** from 1

- increasing the density
- less upthrust
- pen cap now less buoyant *accept 'increasing the weight'*
  *do **not** accept 'the pen cap gets heavier'*

[6]

PARTICULATE NATURE OF MATTER

1. D

2. D

3. B

4. C

5.
(a) speck of light B1
that moves haphazardly/randomly/jerkily/etc. B1 [2]
(b) randomness of collisions would be 'averaged out' B1
so less (haphazard) movement B1 [2]
(do not allow 'more massive so less movement')

6.
ans

(a) Safety precaution
liquid might overflow
& igniteor vapour might ignite
ANY TWO VALID COMMENTS ..... 1 + 1 **2**

(b) (i) cooling 1
solidifying 1
exothermic 1
(ii) 37 ^{0}C 1
(iii) single melting temperature 1
(iv) room temperature 1 **6**

Total 8

7. (a) (i) A description to include:

1. particles moving;
2. in all directions/randomly / or implied by description (each other / walls); 2

[Arrows on diagram acceptable]

(ii) An explanation to include:

1. particles hit/collide with container walls;
2. producing a force; 2

(iii) pressure would increase/get bigger/larger; 1

(b) statements 2, 3 and 4 ticked ; ; ;
[If more than 3 ticked then deduct 1 mark for each error] 3

(c) An explanation to include two from:

1. temperature of air in tyre increases / hot / hotter;
2. particles hit more often/hit harder;
3. particles moving faster / more energy; 2

plus one communication mark for presenting relevant information in a form that suits its purpose 1

[11]

THERMAL EXPANSION

1. C

2. A
3. C

4.

(a) Differential expansion clear[1m]
Brass expands more than iron OR so brass on outside of curve or
Equivalent [1m]

(b) (i) Clear that strip is heated by current [1m]
So circuit breaks [1m]
Cools remaking the circuit [1m]
(ii) Any circuit requiring a flashing light, such as a car indicator 1 [4]

[Total 6m]

5.

Either a large bulb / large amount of mercury (1)
Increase the volume change for a given temperature change (owtte) (1) [2]
Or a thin capillary / tube (1)
So greater movement of mercury for a given temperature change (1)

6.

(a) (i) 120□ ◦C or-10□ ◦C to 10□ ◦C B1 [1]
(ii) longer thermometer or wider bore or less mercury or smaller bulb not change liquid B1 [1]
(b) (i) measures small(er) change in temperature or small(er) range for same distance or large(r) expansion for (same) temperature rise B1 [1]
(ii) larger bulb or more liquid or narrower bore/tube or use liquid that expands more B1 [1]
(c) constriction/narrowing (accept 1st and 3rd marks on diagram)
mercury/thread breaks at constriction (on cooling) or thermometer is a "maximum" thermometer
range different
more sensitive/divisions further apart
triangular cross-section/acts as lens
thin(ner) bulb (quick response to temperature change) ANY 3 lines B3 [3]

7.

(a) (i) most: gas
least: solid both required B1
(ii) because change of pressure (also) causes volume change (in a gas) B1
NOT 'gas can be compressed'
(b) (i) two from:
expands uniformly (over required range)

remains liquid over required range
expands more than glass / has high expansivity / expansion
has (reasonably) low specific heat capacity.
has low freezing point / lower freezing point than mercury max B2
(ii) make (capillary) tube narrower (and longer) / thinner / smaller diameter B1
make bulb larger (and tube longer) B1
allow 'bore' for tube ignore 'smaller' ignore narrow thermometer

(c) allows fast(er) flow of heat to / from alcohol
OR allows fast response (to temperature change)
OR because glass is a poor conductor / good insulator (so needs to be thin for fast response)
OR heat transfer more efficient / faster
OR glass takes up less heat B1 [7]
ignore reference to sensitivity ignore 'easier'

8.

(a) (i) mercury or alcohol 1
(ii) 35 ± 1 1
(iii) Make Hg move further/increase sensitivity 1 (3)
(b) (i) cools 1
liquid contracts 1
(ii) correct position at 0 1 (3)

[Total 6m]

HEAT TRANSFER

1. C

2. A
3. C
4. A
5.

black or black cools quickly
better emitter (of heat) A1 OR better radiator/black
radiates white doesn't
radiation/infra-red A1 of heat/infra-red
Accept in terms of white teapot (NOT better emitter and absorber/conductor)

[Total 3]

6.

(a) (i) chemical)
internal OR heat OR thermal) any 2
but also accept)
nuclear OR kinetic OR potential for one of the
marks
2F
B1,
B1
(ii) radiation F B1
(b) (i) K.E. OR kinetic OR motion C B1
(ii) conduction F B1
(iii) 1 gravitational OR P.E. OR potential OR
position
F B1
2 chemical/fuel/food C B1
7

7.

(a) cool air more dense OR cool air falls
OR warm air rises so it can be cooled B1
(b) energy/heat removed from store must be released outside store B1
heat developed by refrigeration unit B1
(c) reduce/prevent heat coming in from outside NOT cold getting out B1
reduce/prevent conduction NOT convection/radiation B1
(d) idea that heat gained from outside = heat removed by refrigeration unit B2
allow B1 for idea of thermostatic control [7]

8.

(a) (i) evaporation at all temperatures - boiling at specific temperature 1

evaporation at surface - boiling in body of liquid 1
boiling the molecules have more energy than evaporation/higher energy molecules escape 1
(b) liquid molecules much closer together or vv 1
intermolecular forces therefore much greater in liquids or vv 1 2
(c) warms the room 1

1

(d) (i) P = VI seen or implied 1
I = 0.5 (A) 1
(ii) R = V/I seen or implied 1
440 (Ω) 1
Both units correct 1

5

[Total 11m]

9.

(a) time or observe when wax melts/falls or states first to melt/fall B1
first to do so or less wax left (after given time) (transfers heat best) B1

RECTILINEAR PROPAGATION OF LIGHT

1. Recliner property /light travels in a straight line; (1mk)

2. (a) (i) B 1

(ii) any **one** from 1

- light travels in straight lines
- light will not pass through the cardboard

accept 'the cardboard blocks the light'
***or** 'the cardboard is opaque'*

- they are in the shadow of the cardboard

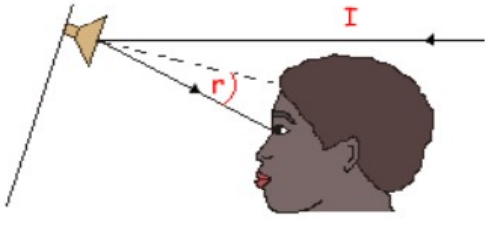
*do **not** accept 'they are in the shadow'*

(b) green 1

(c) Q 1

[4]

3. Ans



(i) See diagram ✓✓

(2 marks)

(ii) The normal ✓

(1 mark)

4. ANS

(a)	**Lines**	(i)	Middle dot labelled Z	1
		(ii)	From Y continuing on left of mirror as if coming from their Z	2
			Straight line from their Z to Y only scores (1)	
(b)	**Incidence**	(i)	Show correct *i* and correct normal	1
	Reflection	(ii)	Show their correct *r*	1
(c)	**Image**	Virtual		1

(Total 6 marks)

5. (a) • 65 1 (L5)

it is different from the angle of incidence **or** all the others are the same

*accept 'number 4' **or** 'the fourth'*

*accept 'it is not 60°' **or** 'it should be 60°'*

accept 'the angle of reflection and the angle of incidence should be the same'

accept 'it is 5° out'

accept 'they are not the same'

***both** the answer and the correct explanation are required for the mark*

award a mark for '60°' if the explanation is correct

'they go up in tens' is insufficient

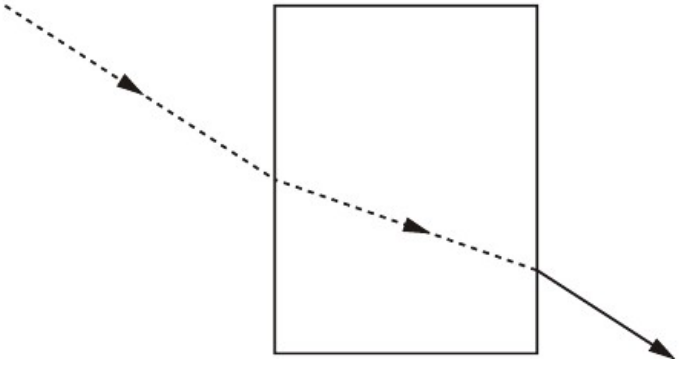
'it does not fit the pattern' is insufficient

(b) (i) • a number from 30 to 32 1 (L5)

(ii) • greater than 1 (L5)

accept 'greater' or 'bigger'

(c) 1 (L6)



accept a continuous straight line that bends away from the normal

accept a line without an arrow

The ray need not be parallel to the incident ray

[4]

6. (a) ray drawn from tooth to mirror to eye

1

angle I = angle R

judged by eye

1

at least one arrow in correct direction

*do **not** credit conflicting arrows*

1

*if no ruler used maximum mark is **2***

(b) virtual

1

upright

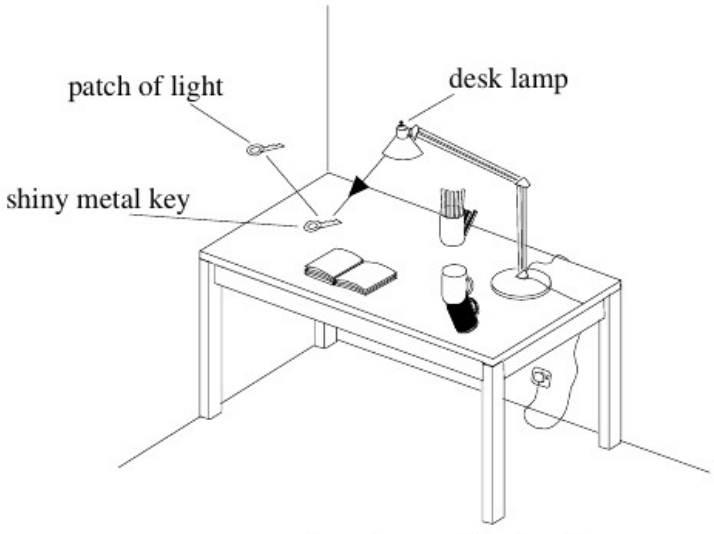
1

[5]

7. (a) (i) the first mark is for a continuous straight line from the rim of the lamp 1
to the key
the line must reach the key

the second mark is for the arrow on the line 1
the arrow must point away from the lamp

(ii) the mark is for a straight line from the key to the patch of light 1
the line must both touch the key and reach the patch of light



*do **not** accept broken lines*

accept the reflected ray drawn from any part of the key irrespective of the first ray

the reflected ray need not have an arrow

(b) any **one** from 1

- light cannot bend around the mug *accept 'light travels in straight lines'*
- light cannot go through the mug *accept 'the mug absorbs **or** scatters the light' **or** 'the mug is opaque' **or** 'the mug is in the way of the light'*

*do **not** accept 'light reflects off the mug'*

[4]

ELECTROSTATICS 1

1. (a) (i) electron/negatively charged particle; 1

(ii) An explanation to include:

1. causing explosion/fire/ignition;
2. sparking; 2

[Ignore references to electrical shock/current]

(iii) pipe could be earthed/charge conducted away safely;
[Accept 'rubber' conductivity strip] 1

(b) An explanation to include:

1. granules have like charges;
2. like charges repel; 2

[6]

2. (a) friction;
electrostatic;
electrons;
attract; 4

(b) (i) correct direction of movement shown (towards metal plates); 1

(ii) An explanation to include:

- repelled from positive grid;
- attracted to negative plates; 2

[Allow like charges repel/unlike charges attract for 1 mark]

(iii) to make dust particles fall off/
in order to collect dust particles/to clean the plates; 1

[8]

3. (a) An explanation to include two from:

1. movement of fuel through pipes;
2. friction with surface of pipe causing charges to be produced;
3. electrons transferred between the fuel and the pipe; 2

(b) spark could ignite the fuel/cause explosion; 1

(c) An explanation to include:

1. copper wire acts as an earth;
2. which neutralises any charged object placed in contact with it; 2

[5]

4. (a) copper;
silver; 2

(b) (i) two forces pushing outwards;
horizontal; 2
[Reject curved lines for force]

(ii) An explanation to include:
1. positive;
2. like (charges) repel; 2
[Ignore poles]

(iii) An explanation to include:
1. aluminium is a conductor / OWTTE;
2. charge / current would flow to earth / OWTTE; 2

(c) (i) Any two correct suggestions, for example, Vander graaf / lightning conductor / Plasma ball / photocopiers / spray painter / precipitator (smoke cleaning) / insecticide sprays / particle accelerators / inkjet printers; 2

(ii) Any two correct suggestions, for example, shocks / dust / electronic circuit damage / hair standing on end / explosions (fuel) / could turn pace maker off / tumble dryer / lighting; 2

[12]

5. (a) (i) A description to include two of:
1. attracted / picked up by rod;
2. stick to rod;
3. paper (becomes charged) and is repelled from rod; 2

(ii) plastic charged, copper and steel not
[All three correct for 2 marks, 2 correct for 1 mark] 2

(b) An explanation to include two from:
1. lightning strikes poles (not the person) / poles attract the lightning;
2. charge / electrons / current travels along the poles;
3. to earth / (spike in) ground;
4. poles are good conductors (of electricity);
[Ignore conduct / absorb lightning] 2

[6]

6. (a) An explanation to include:
electrons / negative charge / negative particles;
transferred / moved from the ruler (to the cloth); 2
[reject for both marks positives move]

(b) An explanation to include three of:
(movement of petrol / lorry / tyres) can build up / transfer a charge / static electricity builds up;
tyres are (good electrical) insulators ;
they do not allow / stop charge / (static) electricity escaping / transferring to earth;
spark;
could cause an explosion / fire; 3
electricity / charge escapes / transferred from / through strip / lorry is earthed / charge goes to earth;

[5]

7. (a) A suggestion to include:
electrons;
pass through tyres to earth; 2
[Allow aircraft is earthed for 1 mark]

(b) $Q = I \times t \; / \; I = \frac{Q}{t}$

$= \frac{2.0 \times 10^{-4} C;}{0.5s}$

$= 4 \times 10^{-4}$ A; 4

[5]

8. (a) arrow drawn to the left; 1

(b) the sizes are equal; 1

(c) the strips have the same type of charge;
similar charges repel 2

(d) (i) electrons ; 1

(ii) positive, there are more positive charges than negative 1

[6]

9. (a) (i) arrow drawn from right to left close to horizontal;
(if at angle the path extended must intersect duster) 1

(ii) they (the balloon and duster) have opposite/different charges;
opposite/positive & negative (charges) attract;
Reject magnetic poles for 2(both marks)
Reject positive electrons for the 1st mark
Reject poles for either mark 2

(b) (i) the spark/lightning that passed to the ground; 1

(ii) the cloud;
Ignore thunder/lightning/kite/string 1

(iii) by movement/flow/conduction of charge/ions/electrons;
Ignore key 1

[6]

10. (a) by movement of electrons/negative charge;
from earth/switch to the man;
Reject positive electrons (for both marks) 2

(b) movement/conduction of ions/charged particles;
in the string by movement of positive & negative ions/charges;
in the key by movement of (free) electrons; 3

[5]

CELLS AND SIMPLE CIRCUITS

1.

A: Manganese IV Oxide mixed with carbon;
B: Ammonium chloride solution; (2mks)

2.

Dry cells uses paste electrolyte while wet cells uses solution of an electrolyte; (1mk)

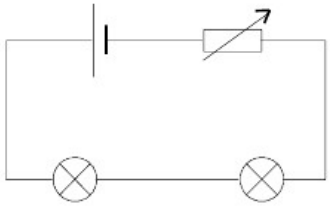
3.

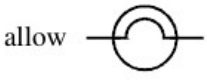
A secondary **battery** is capable of being recharged; its electrode reactions can proceed in either direction. [1m]

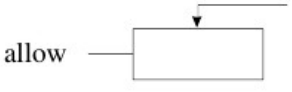
A **primary cell**, cannot be recharged with any efficiency, so the amount of energy it can deliver is limited to that obtainable

from the reactants that were placed in it at the time of manufacture.[1m]

4. **(a)**







[if connected]

(i)

series circuit; (-1 for obvious gaps, more than 1mm)
only acceptable addition in parallel is a voltmeter. ignore extras
correct symbols;; (-1 for incorrect symbol or omission)
up to max 2. [only penalise lamp once, ignore extras] 3

(ii) thermal; 1

(b) (i) fan rotates / works / blows / (heater off) cold air given out / / cold air blown out;

(ii) no current in the circuit / nothing / no effect;

(iii) fan rotates / works / blows and the heater is on/ hot air given out / both work / hot air is blown out; 3

[7]

5.

(a) (i) circuit is broken/not complete/gap in circuit/connection broken/no current in circuit; 1
[Ignore because they are in series]

(ii) dimmer/light dims/brightness decreases/eq; 1
[Accept light goes down]
[Ignore goes off]

(iii) (circuit has) more resistance/less current/voltage across each lamp/voltage/energy/power shared amongst (more) lamps;
[Reject charge] 1

(b) (i) current can pass in resistor/resistor by-passes the filament/eq; 1
[Accept it does not cause a break in the circuit/ it is a parallel circuit]

(ii) An explanation to include:

1. other lights would be dim/go out;
2. because high (circuit) resistance/low current; 2
[Accept resistor takes a bigger share of voltage/power/energy]

[6]

6.

(a) 2A [1m]

(b) 2A[1m]

7.

conventional circuit diagram with two lamps in parallel B1
switch in correct position alongside power supply B1
correct symbols for lamps and switch used B1

8.

(a) 1 (L3)

P	off
Q	on
R	on

accept 1 for 'on' and '0' for 'off'

***all three** answers are required for the mark*

(b) any **one** from 1 (L4)

- battery — *accept 'batteries'*
- cell — *accept 'cells'*

(c) 2 (L4)

on	
off	✓

on	

on	✓

if all three answers are correct, award two marks
if two answers are correct, award one mark if more than one box is ticked for any circuit, award no credit for that circuit

[4]