Name	Register Number	Class	Calculator Model

智行菩願

MANJUSRI SECONDARY SCHOOL
文 殊 中 學

MID YEAR EXAMINATION 2017

Subject:	Lower Secondary Science
Paper:	Physics and Chemistry
Level:	Secondary 1 Express
Date:	08 May 2017
Duration:	2 hours
Setter:	Mr Sulaiman and Mr Qamarul

Additional Materials: Optical Answer Sheet (OTAS)

READ THESE INSTRUCTIONS FIRST

Write your Name, Register Number and Class on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A: Multiple Choice Question [40 marks]
Write in soft pencil.
There are **forty** questions in this section.
For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet provided.

Section B: Short Answer Questions [40 marks]
Answer **all** the questions. Write your answers in the spaces provided on the question paper.

Section C: Free Response / Structured Questions [20 marks]
Answer **all** the questions. Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **100**.

A copy of the Periodic Table is printed on page **28**.

For Examiner's Use		
Section	**Phy**	**Chem**
A	**/ 20**	**/20**
B	**/ 20**	**/20**
C	**/ 10**	**/10**
Sub-total	**/ 50**	**/50**
Total		**/100**

Section A: Multiple Choice Questions [40 marks]

Answer **all** questions

A1 The scientific method usually involves the following skills.

I. making meaning of information and evidence
II. communicating
III. engaging with an event
IV. collecting and presenting evidence

What is the correct sequence in which the four skills are applied in the scientific method?

A I, IV, III, II

B III, IV, I, II

C I, II, III, IV

D IV, III, II, I

A2 Objectivity is an attitude of scientific enquiry.

What do you understand by this term?

A influenced by what is widely believed by others

B not influenced by what is widely believed by others

C follow the facts and be influenced by what is widely believed by others

D follow the facts and not be influenced by what is widely believed by others

A3 Which property of a substance indicates whether it is a liquid or solid at room temperature?

A flexibility

B solubility

C melting Point

D heat conductivity

Refer to the table below to answer questions A4 and A5.

mass of falling object (kg)	height from which object was released (m)	time taken for object to reach ground (s)

A4 Marie carried out an experiment involving falling objects. The table above shows the variables of the experiment.
Which of the statements below could be the hypothesis / hypotheses Marie tested through the experiment?

I. The greater the mass of an object, the longer the time it takes to fall to the ground.
II. The larger the volume of an object, the longer the time it takes to fall to the ground.
III. The greater the mass of a falling object, the greater the distance it falls before it reaches the ground.

A I only
B I and II
C II and III
D none of the above

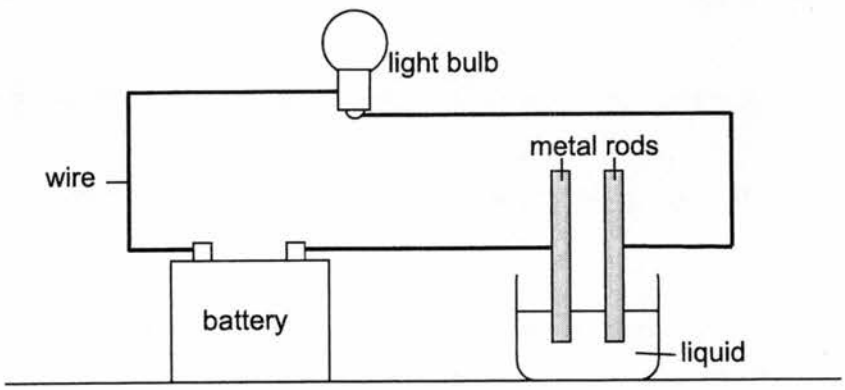
A5 To improve the experiment, Marie's teacher told her that she should ask herself some questions before carrying out the experiment.
Which of the following questions should Marie?

A How does the shape of the falling object affect the time taken?
B Should the release height be measured in centimetres instead of metres?
C Should the mass of the object be measured again after it reaches the ground?
D Should the mass of the object be measured using a beam balance or spring balance?

A6 As a supplement to some diets, iron is consumed in tablet form. The mass of iron in these tablets is often measured in .....

A grams
B calories
C mililitres
D miligrams

A7 The diagram below shows an experiment to test a certain property of liquids.



Which property is being tested?

A density

B solubility

C magnetism

D electrical conductivity

A8 Gold, silver, platinum and copper are metals that are commonly used in manufacturing processes. The table below shows the melting points and densities of these metals.

Liquid	Melting point (°C)	Density (g/cm^3)
Gold	1063	19.31
Silver	961	14.50
Platinum	1773	21.42
Copper	1083	8.96

Which of the following statements describes the relationship between the melting point and density of a material?

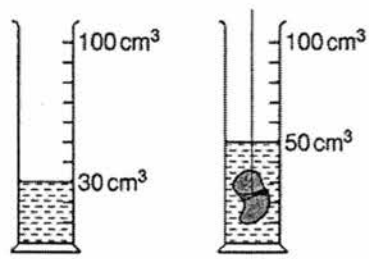
A The densest material has the lowest melting point.

B The melting point of a material is 100 times its density.

C The melting point of a material is independent of density.

D The melting point of a material decreases as density decreases.

A9 A stone of mass 60 g is lowered into a measuring cylinder. The water level rises as shown in the diagram below.



What is the density of the stone?

A 0.6 g/cm³

B 1.2 g/cm³

C 2.0 g/cm³

D 3.0 g/cm³

A10 Which of the following is not an effect of a force?

A It changes the size of an object.

B It changes the mass of an object.

C It changes the speed of a moving object.

D It changes the direction of a moving object.

A11 What is the resultant force acting on the box shown below?

A 2 N to the left

B 2 N to the right

C 8 N to the left

D 8 N to the right

A12 Which of the following is a contact force?

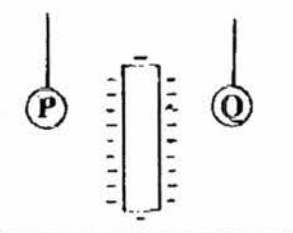
A magnetic force

B frictional force

C electrostatic force

D gravitational force

A13 Two metal balls, **P** and **Q**, each hangs from a nylon thread as shown below. A negatively charged rod is then placed between them. **P** is repelled by the rod while **Q** is attracted to it.



What are the charges of **P** and **Q**?

	P	Q
A	Positive	Positive
B	Positive	Negative
C	Negative	Positive
D	Negative	Negative

A14 Which material is magnetic?

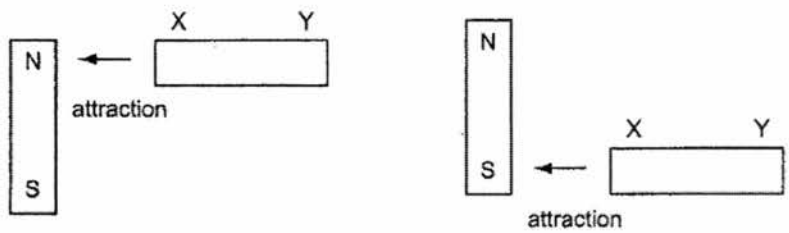
A wood

B brass

C steel

D aluminum

A15 A metal rod XY is placed near a magnet. End X is attracted when it is placed near to the north pole of the magnet, and also when it is placed near to the south pole.



How does end Y behave when it is placed, in turn, near to the two poles of the magnet?

	Y near north pole	Y near south pole
A	attraction	attraction
B	attraction	repulsion
C	repulsion	attraction
D	repulsion	repulsion

A16 Which of the following is the most likely to exert the greatest amount of pressure on the ground?

A a loaded lorry with four identical wheels

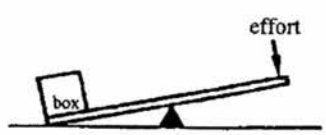
B a loaded lorry with six identical wheels

C an empty lorry with four identical wheels

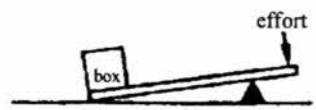
D an empty lorry with six identical wheels

A17 Four methods of lifting a heavy box using a lever are shown below.
Which method would lift the box most easily?

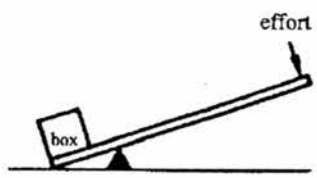
A



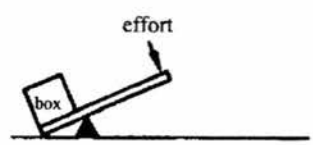
B



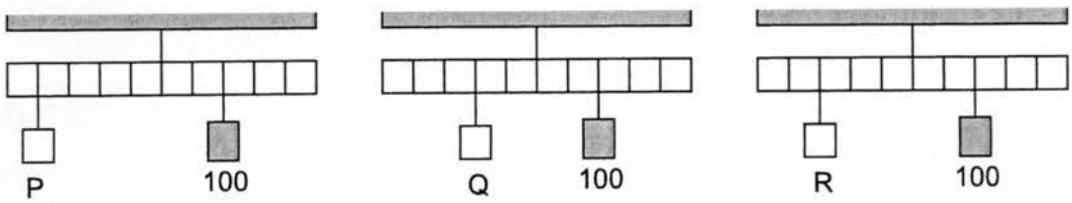
C



D



A18 Which of the following shows the weight of objects in **increasing** order?



A P, R, Q

B R, P, Q

C Q, R, P

D R, Q, P

A19 Which of the following does not use chemical potential energy?

A car

B blender

C torchlight

D handphone

A20 The arrow in each picture show the direction of force exerted by a person.
Which picture shows work being done?

A

standing holding a bag

B

lifting up a box

C

holding a ladder

D

sitting on a chair

A21 During an experiment in a school laboratory, Klein accidentally spilled a chemical with the following hazard symbol on his arm.

What should Klein do first?

A call the ambulance

B raise his hand to inform the teacher

C wipe his arm with a clean piece of cloth

D wash his arm thoroughly under running water

A22 Which of the following apparatus should Ryan use to measure exactly 31.4 cm^3 of a liquid?

A beaker

B burette

C pipette

D test-tube

A23 The steps to lighting up a Bunsen burner are shown below.

I Turn on the gas tap

II Open the air-hole

III Light it up with a lighter

IV Close the air-hole

Which is the correct order of steps for lighting up a Bunsen burner to obtain a non-luminous flame?

A **I, II, III, IV**

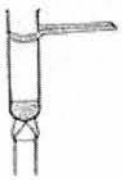
B **II, I, III, IV**

C **IV, I, III, II**

D **IV, III, II, I**

A24 Which one of the following diagrams shows the correct way of heating a liquid in a test-tube?

A



C

B

D

A25 After outdoor cooking in Scouts camp, Jing Han realised that the bottom of his cooking pot was covered with soot. Which of the following statements correctly describes his observation?

A The flame was too hot.

B The food in the pot was burnt.

C The camp fire was a luminous flame.

D The camp fire was a non-luminous flame.

A26 Gina accidentally poured salt into a bowl of rice grains. To prevent wastage, she decided to use some of the separation techniques she has learnt. She listed down the necessary steps below.

I Pour the mixture down a filter funnel fitted with filter paper

II Add water to the mixture and stir

III Heat the mixture until all the water has evaporated

Which is the correct order of the steps she must carry out?

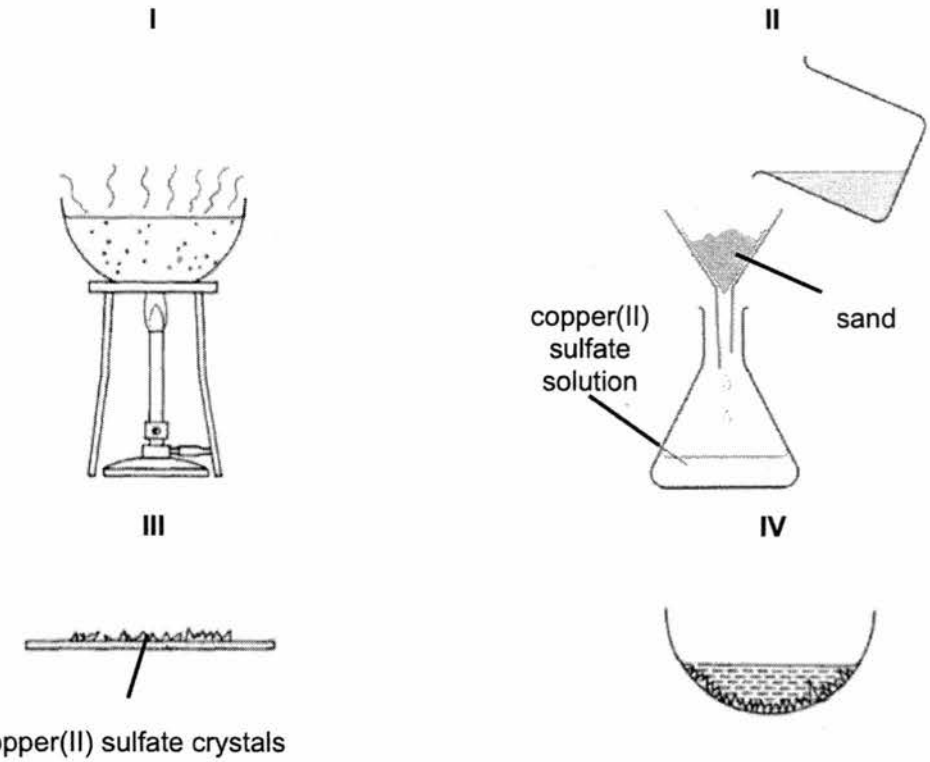
A I, II, III

B I, III, II

C II, I, III

D II, III, I

A27 Pure copper(II) sulfate crystals can be obtained from an impure mixture of copper(II) sulfate and sand. The following diagrams represent the stages of the preparation.



In which order should these stages be?

	first stage ⟶			last stage
A	**I**	**IV**	**II**	**III**
B	**II**	**I**	**IV**	**III**
C	**II**	**I**	**III**	**IV**
D	**IV**	**I**	**II**	**III**

A28 Which statement must be true in order for two substances to be separated by chromatography?

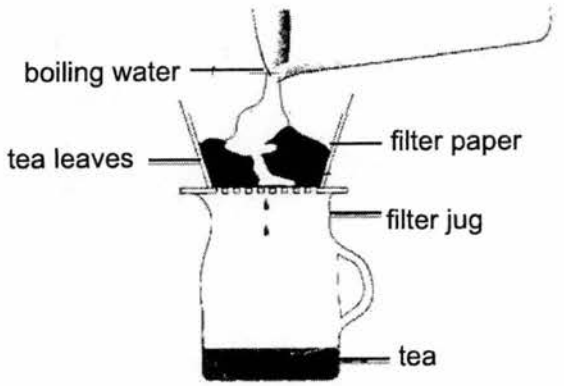
A They have different colours.

B They have different densities.

C They have different boiling points.

D They are soluble in the same solvent.

A29 The diagram shows a separation technique used to obtain tea.



Which of the following statements is correct?

A The tea leaves dissolve in water to make tea.

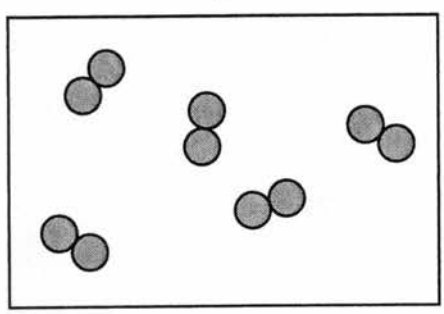
B The boiling water cannot pass through the filter paper.

C The tea is the filtrate and the tea leaves are the residue.

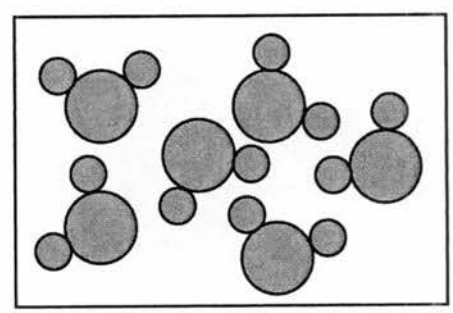
D The tea leaves are the filtrate and the tea is the residue.

A30 Which of the following diagrams represent an element?

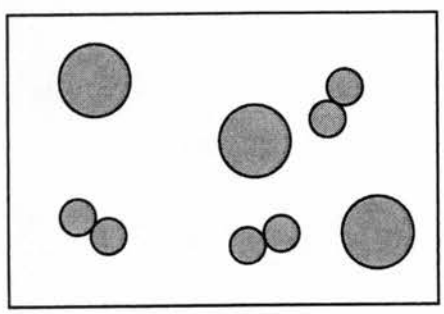
A



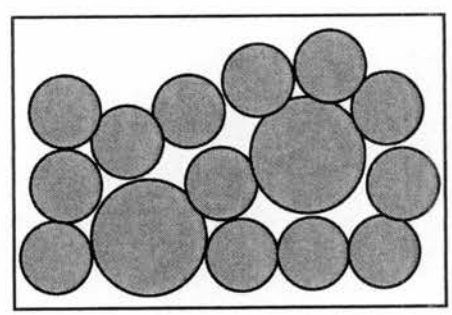
B



C



D



A31 In the 18th century, a chemist named Henry Cavendish carried out an experiment which showed that hydrogen burns with the oxygen in the air to form water. Which statement(s) can be inferred from this observation alone?

I Air is an element

II Water is an element

III Water is a compound

IV Water is formed from the reaction between hydrogen and oxygen

A **I** only

B **II** and **III**

C **II** and **IV**

D **III** and **IV**

A32 Which of the following shows an element, a compound and a mixture??

	element	**compound**	**mixture**
A	carbon monoxide	magnesium oxide	sugar solution
B	mercury	Milo	sodium chloride
C	nitrogen	carbon dioxide	air
D	steel	mud	tin

A33 In 2004, a group of Japanese scientists discovered a new element with proton number 113. The new element was given the name nihonium, is a metal, and was found to have 3 electrons in its outermost electron shell. Which statement regarding nihonium is **true**?

A Its chemical symbol is Ni.

B It belongs to Group I of the Periodic Table.

C It belongs to Period 4 of the Periodic Table.

D It is predicted to be between the elements copernicum and flerovium in the Periodic Table.

A34 Which statement is **true** for all metals?

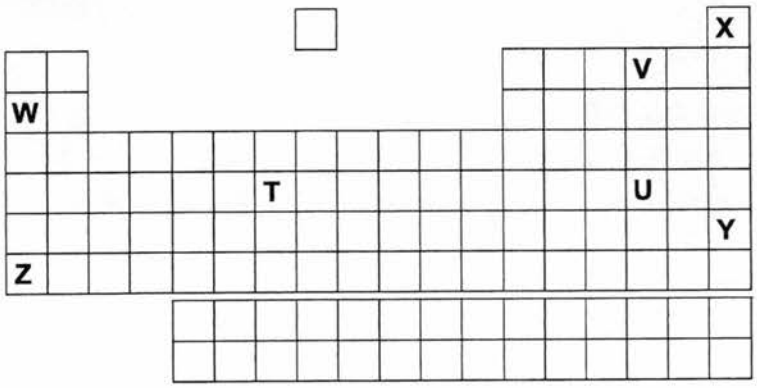
A They have a silvery appearance.

B They can be attracted by magnets.

C They can conduct electricity in the solid state.

D They are solids at room temperature and pressure.

Questions **A35**, **A36** and **A37** refer to the diagram below which represents the Periodic Table. The letters **T**, **U**, **V**, **W**, **X**, **Y** and **Z** represent elements.



A35 Which pair of elements are highly unreactive?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A36 Which pair of elements react violently in water?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A37 Which pair of elements have the same number of electron shells?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A38 Which of the following is a chemical reaction between elements only?

A magnesium + oxygen → magnesium oxide

B methane + oxygen → carbon dioxide + water

C oxygen + nitrogen monoxide → nitrogen dioxide

D potassium + water → potassium hydroxide + hydrogen

A39 Which of the following substances is a compound?

A C_{60}

B HF

C O_2

D S_8

A40 Which of the following statements is **true**?

A A compound has the properties of the elements it is made up of.

B A compound can be formed by chemical processes such as combustion.

C A compound can be broken down into simpler substances by physical methods.

D A compound made up of two or more different elements with different composition by mass.

END OF SECTION A

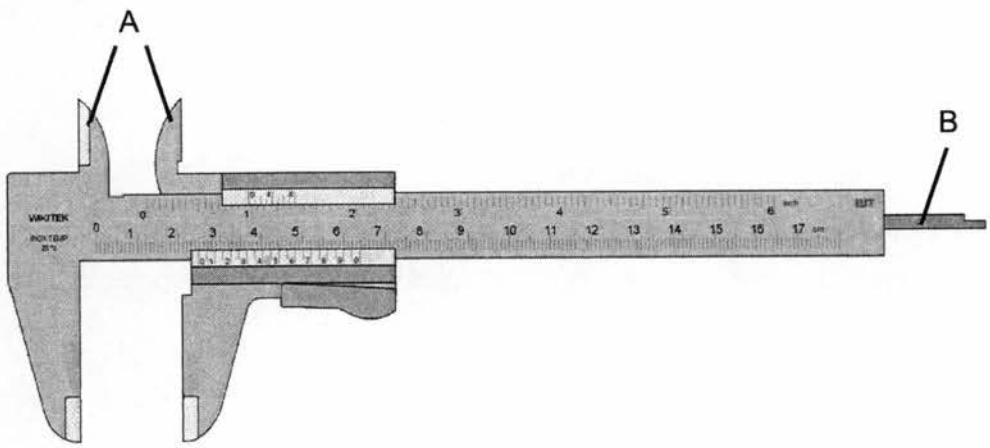
For Examiner's Use

Section B: Short Answer Questions [40 marks]

Answer **all** questions.

Write your answers in the spaces provided

B1 The diagram below shows a vernier caliper.



(a) Name parts A and B of the vernier caliper and state their function.

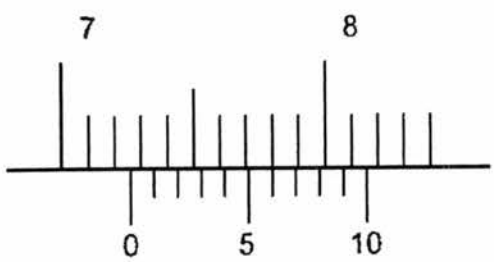
Name of part A: ..... [1]

Function of part A: ..... [1]

Name of part B: ..... [1]

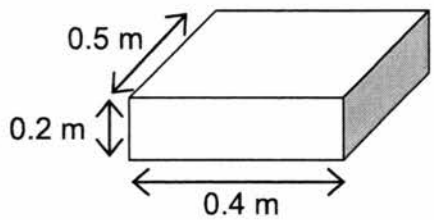
Function of part B: ..... [1]

(b) State the reading of the vernier caliper below.



Reading: ..... cm [1]

B2 The diagram below shows an object of dimension 0.5 m x 0.4 m x 0.2 m lying on the ground. Its weight is 100 N.



(a) Calculate the pressure exerted by the object on the ground.

pressure= ..... Pa [3]

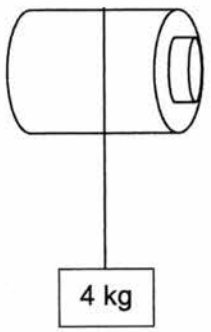
(b) If the object is made to stand on the shaded area, the pressure exerted on the ground will be greater. Explain why this is so.

.....

..... [1]

For Examiner's Use

B3 An electric motor is used to lift a box of mass 4 kg as shown in the diagram below. The box moves vertically up through a distance of 2 m in 5 s.



(a) State the energy conversion in raising the box.

..... [1]

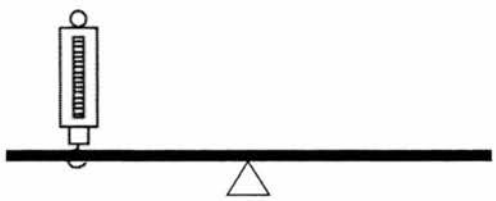
(b) Calculate the average speed of the box

average speed = ... m/s [1]

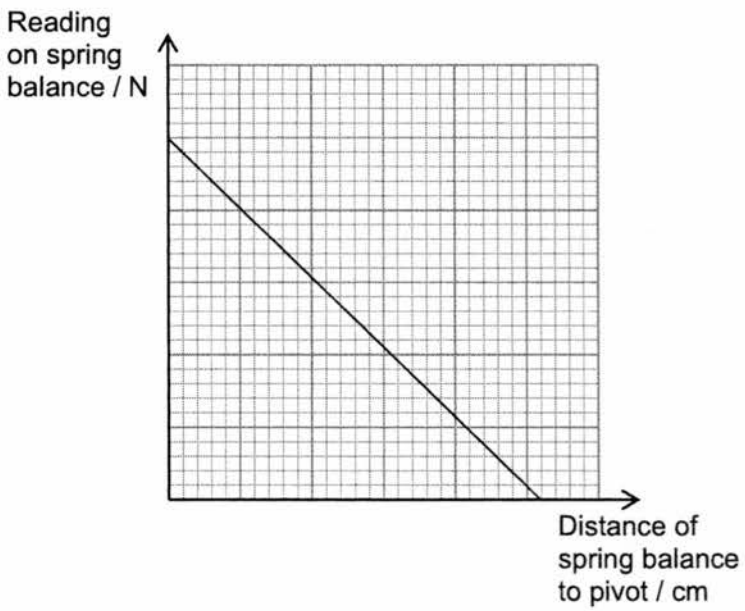
(c) Calculate the work done in raising the box. (Take g to be 10 N/kg)

work done = ... [3]

B4 A student carried out an experiment by balancing a light beam horizontally on a pivot using a spring balance as shown in the diagram below. The pivot is placed in the middle of the beam.



(a) The student concluded his findings through the graph shown below and it proved that his hypothesis for the experiment was accurate.



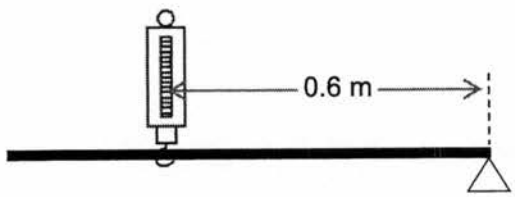
State the student's hypothesis for the experiment.

.....

..... [1]

For Examiner's Use

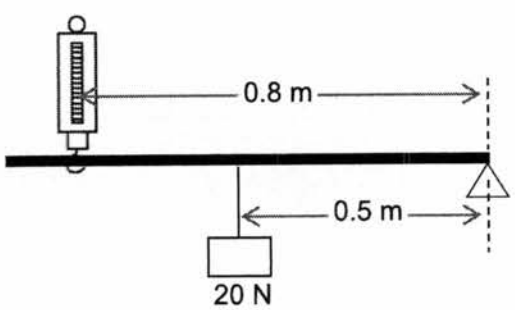
(b) The arrangement was adjusted such that the spring balance was 0.6 m away from the pivot, and it showed a reading of 7.5 N.



Calculate the moment produced by the spring balance about the pivot.

M\moment = ... Nm [2]

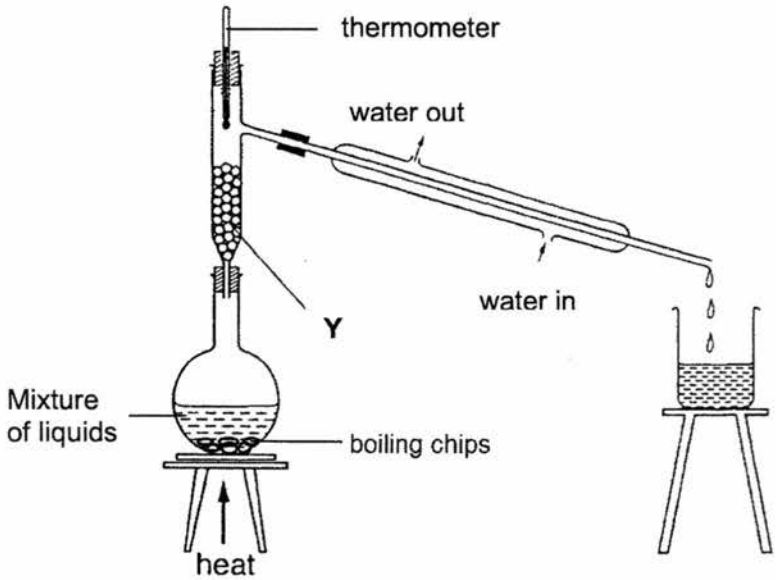
(c) The student then positioned the spring balance 0.8 m away from the pivot and added a box in the middle of the beam as shown in the diagram below.



If the weight of the box is 20 N, calculate the new reading on the spring balance.

reading on spring balance = ...

B5 Giselle used the experimental set up shown below to separate a mixture of three liquids, **P**, **Q** and **R**.



(a) State the name of apparatus **Y**.

.....

[1]

(b) The boiling points of liquids **P**, **Q**, and **R** are 156 °C, 118 °C, and 79 °C respectively. State which distillate will be the **last** to be collected? Explain your answer.

.....

.....

[2]

(c) What is the function of the boiling chips?

.....

[1]

(d) Can Giselle use the same experimental set-up to separate a mixture of oil and water? Explain your answer.

.....

.....

[2]

For Examiner's Use

B6 The table below shows the properties of five elements, **A**, **B**, **C**, **D**, and **E**. These letters do **not** represent their chemical symbols.

Element	Melting point (°C)	Boiling point (°C)	Density (g/cm^3)	Electrical conductivity	Reaction with water
A	− 39	630	13.5	good	No reaction
B	98	883	0.97	good	Reacts violently
C	− 189	− 186	0.0018	poor	No reaction
D	1085	2652	8.96	good	No reaction
E	− 101	− 34	0.0032	poor	Forms an acid

(a) Which of the above five elements is most likely a Group I element.
Support your answer with the information given in the table shown above.

.....

.....

.....

..... [3]

(b) Rubidium is also a Group I element and it lies further down the group as compared to the element in part **(a)**. How would you expect the melting point, density, and reactivity in water of rubidium to differ compared to the element in **(a)**?

.....

.....

.....

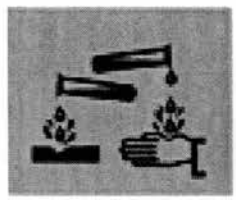
..... [3]

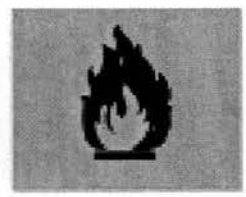
(d) State the identity of Element **A**.

..... [1]

For Examiner's Use

B7 Ethanoic acid is a colourless liquid with a pungent smell and has a chemical formula of $C_2H_4O_2$. A bottle of ethanoic acid has the two labels shown below.





(a) State what the two labels represent.

..... [1]

(b) Based on the labels, state **two** precautions that should be taken when using this chemical.

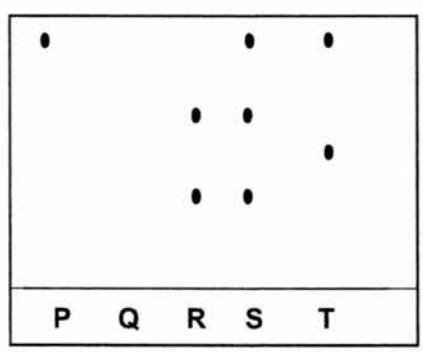
.....

..... [2]

(c) State the number of atoms of each element present in a molecule of ethanoic acid.

..... [1]

B7 A paper chromatography was performed on substances **P**, **Q**, **R**, **S** and **T** as shown.



(a) Which substance is pure? Explain your answer.

.....

..... [2]

(b) Suggest an explanation for the results of substance **Q**.

.....

.....

For Examiner's Use

Section C: Free Response / Structured Questions [20 marks]

Answer **all** questions.

C1 A cuboid of length 5.0 cm, breadth 3.0 cm and height 2.5 cm has a density of 70 g/cm^3. Taking gravitational field strength on Earth and the Moon to be 10 N/kg and 1.6 N/kg respectively,

(a) Calculate the cuboid's,

(i) mass on Earth,

mass = ... g [3]

(ii) weight on the Moon.

weight = ... N [3]

(b) Suggest an instrument used to measure the cuboid's

(i) Mass, ... [1]

(ii) Weigh.: ..... [1]

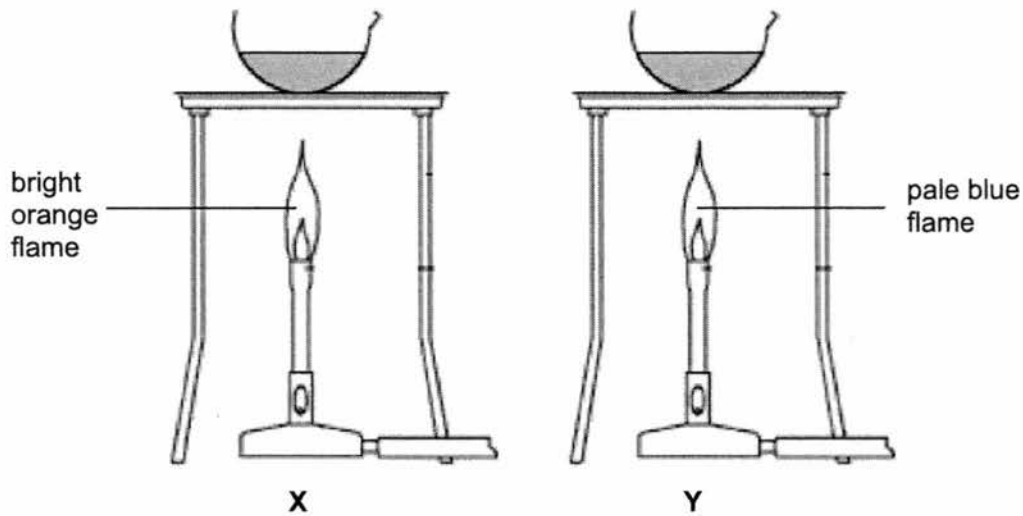
(c) The density water is 1 g/cm^3. Will the cuboid sink or float in water? Explain.

.....

.....

[2]

C2 **(a)** In an experiment, Ethan was given a sample of a colourless liquid. He separated it into two equal portions and heated them over two different types of flame as shown below.



(i) In which set-up, **X** or **Y**, would you expect the liquid to evaporate completely first? Explain your answer.

.....

..... [2]

(ii) After all the liquid has evaporated completely, a residue of a white solid was left behind in both **X** and **Y**. State, with a reason, whether the colourless solution was an element, a mixture, or a compound.

.....

..... [2]

For Examiner's Use

(b) Iron(III) chloride, $FeCl_3$, is a reddish brown solid and is made up of the elements iron and chlorine. Steel is made up of the elements iron and carbon.

(i) Explain why heat was given out when iron(III) chloride was formed but this does not happen when iron fillings and chlorine gas are mixed.

.....

.....

.....

..... [2]

(ii) Explain why some iron filings remained when the mixture of iron filings and chlorine gas was heated to form iron(III) chloride.

.....

.....

.....

..... [2]

(iii) Explain why steel can be attracted by magnets but not iron(III) chloride.

.....

.....

.....

..... [2]

END OF PAPE

DATA SHEET
The Periodic Table of the Elements

Group												
I	II											III
							1 H hydrogen 1					
3 Li lithium 7	4 Be beryllium 9											5 B boron 11
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	

Key

proton (atomic) number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosiu 163
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californiu –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

Name	Register Number	Class	Calculator Model
MARKING SCHEME			

BP~285

智行慈願

MANJUSRI SECONDARY SCHOOL
文 殊 中 學

MID-YEAR EXAMINATION 2017

Subject:	Lower Secondary Science
Paper:	Physics and Chemistry
Level:	Secondary 1 Express
Date:	08 May 2017
Duration:	2 hours
Setter:	Mr Sulaiman and Mr Qamarul

Additional Materials: Optical Answer Sheet (OTAS)

READ THESE INSTRUCTIONS FIRST

Write your Name, Register Number and Class on all the work you hand in.
Write in dark blue or black pen in the spaces provided on the Question Paper.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Section A: Multiple Choice Question [40 marks]
Write in soft pencil.
There are **forty** questions in this section.
For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet provided.

Section B: Structured Questions [40 marks]
Answer **all** the questions. Write your answers in the spaces provided on the question paper.

Section C: Structured Questions [20 marks]
Answer **all** the questions. Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **100**.

A copy of the Periodic Table is printed on page 24.

For Examiner's Use		
Section	**Phy**	**Chem**
A	/ 20	/20
B	/ 20	/20
C	/ 10	/10
Sub-total	/ 50	/50
Total		

Section A: Multiple Choice Questions [40 marks]

Answer **all** questions

Write your answers in the spaces provided

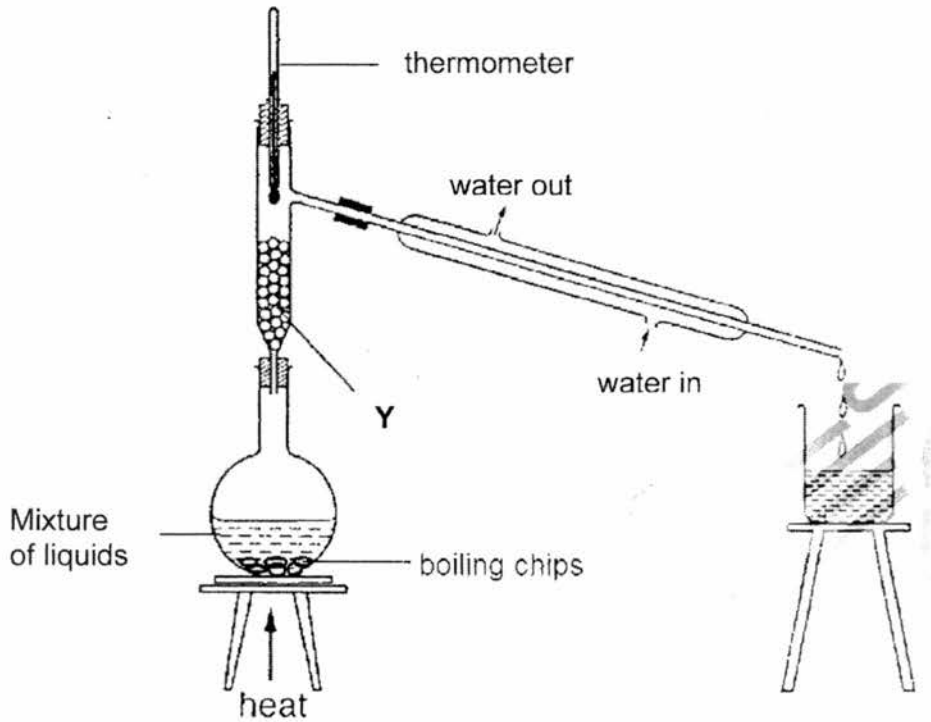
A21	A22	A23	A24	A25	A26	A27	A28	A29	A30
D	B	C	A	C	C	B	D	C	A
A31	**A32**	**A33**	**A34**	**A35**	**A36**	**A37**	**A38**	**A39**	**A40**
D	C	D	C	D	C	A	A	B	B

Section B: Short Answer Questions [40 marks]

Answer **all** questions.

Write your answers in the spaces provided

B5 Giselle used the experimental set up shown below to separate a mixture of three liquids, **P**, **Q** and **R**.



(a) State the name of apparatus **Y**.

Fractionating column (wrong spelling not accepted) [1]

(b) If liquid **P** boils at 156 °C, liquid **Q** boils at 118 °C and liquid **R** boils at 79 °C, which liquid will be the **last** to be collected? Explain your answer.

Liquid P [1m]. It has the highest boiling point / its boiling point is higher than the other two liquids [1m] [2]

("high boiling point" or "high temperature" not accepted.

(c) What is the function of the boiling chips?

To ensure smooth boiling [1]

(d) Can Giselle use the same experimental set-up to separate a mixture of oil and water? Explain your answer.

No [1m]. Oil and water are immiscible/insoluble in each other and cannot be separated by fractional distillation [1m]. [2]

B5 The table below shows the properties of five elements, **A**, **B**, **C**, **D**, and **E**. These letters do **not** represent their chemical symbols.

Element	Melting point (°C)	Boiling point (°C)	Density (g/cm^3)	Electrical conductivity	Reaction with water
A	− 39	630	13.5	good	No reaction
B	98	883	0.97	good	Reacts violently
C	− 189	− 186	0.0018	poor	No reaction
D	1085	2652	8.96	good	No reaction
E	− 101	− 34	0.0032	poor	Forms an acid

(a) Which of the above five elements is most likely a Group I element.
Support your answer with the information given in the table shown above.

B is a Group I metal [1m] since it has a low melting and boiling point, low density [1m] , conducts electricity and reacts violently with water [1m]. [3]

(2 correct data = 1m)

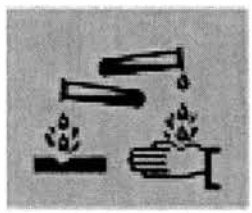
(c) Rubidium is also a Group I element and it lies further down the group as compared to the element in part **(a)**. How would you expect the melting point and reactivity in water of rubidium to differ compared to the element in **(a)**?

The melting point is lower than the element in (a) [1m].
It reacts more violently with water compared to the element in (a) [1m].
Its density is higher than the element in (a) [1m] [3]

(d) State the identity of Element **A**.

Mercury (the only example of a metal that is liquid at room temperature) [1]

B6 Ethanoic acid is a colourless liquid with a pungent smell and has a chemical formula of $C_2H_4O_2$. A bottle of ethanoic acid has the two labels shown below.



(a) State what the two labels represent.

corrosive and flammable [1]

(b) Based on the labels, state two precautions that should be taken when using this chemical.

Wear protective gloves/lab coat [1m].

Keep away from a flame OR use a water bath when heating it. [1m] [2]

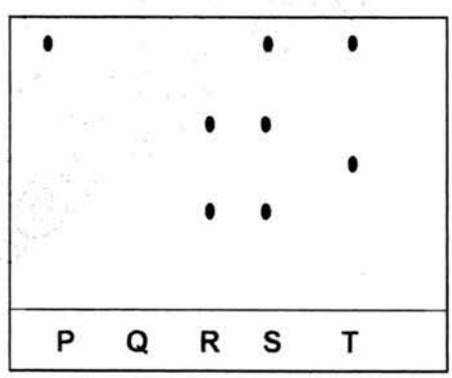
MUST BE SPECIFIC TO THE LABELS SHOWN

(c) State the number of atoms of **each** element present in a molecule of ethanoic acid.

2 carbon atoms, 4 hydrogen atoms, and 2 oxygen atoms. [1]

[NOT ASKING FOR TOTAL, MANY CARELESS MISTAKES]

B7 A paper chromatography was performed on substances **P**, **Q**, **R**, **S** and **T** as shown.



(a) Which substance is pure? Explain your answer.

P [1m]. There is only one spot in the chromatogram for P, hence there is only one substance present in P [1m]. [2]

(b) Suggest an explanation for the results of substance **Q**.

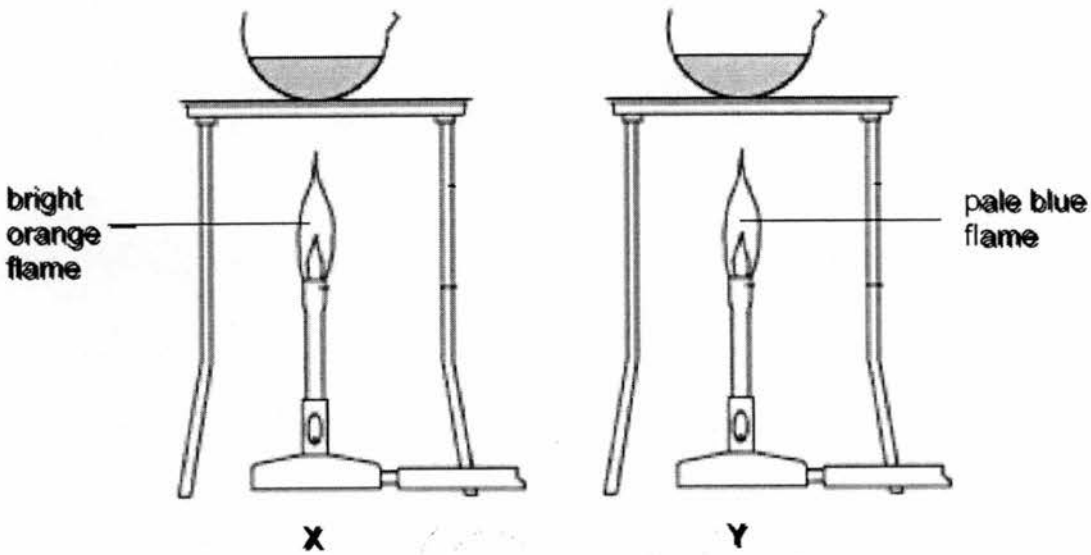
Substance Q is not soluble in the solvent used.

Section C: Free Response / Structured Questions [20 marks]

Answer **all** questions.

Write your answers in the spaces provided

C2 **(a)** In an experiment, Ethan was given a sample of a colourless liquid. He separated it into two equal portions and heated them over two different types of flame as shown below.



(i) In which set-up, **X** or **Y**, would you expect the liquid to evaporate completely first? Explain your answer.

Y [1]. A non-luminous flame was used, which produces more heat than the luminous flame in X [1]. [2]

(ii) After all the liquid has evaporated completely, a residue of a white solid was left behind in both **X** and **Y**. State, with a reason, whether the colourless solution was an element, a mixture, or a compound.

It is a mixture [1] since it is made up of two different substances that can be separated by a physical method [1]. [2]

Examiner's Use

(b) Iron(III) chloride, $FeCl_3$, is a reddish brown solid and is made up of the elements iron and chlorine. Steel is made up of the elements iron and carbon.

(i) Explain why heat was given out when iron(III) chloride was formed but this does not happen when iron fillings and chlorine gas are mixed.

When the compound iron(III) chloride is formed, a chemical reaction occurs and heat is given out[1]. When iron is mixed with chlorine gas, no chemical change takes place hence there is no energy change [1].

..... [2]

(ii) Explain why some iron filings remained when the mixture of iron filings and chlorine gas was heated to form iron(III) chloride.

The elements in the compound iron(III) chloride combine in a fixed proportion[1]. If the proportion of iron filings in the mixture is greater than what is required in forming the compound, there would be extra iron filings that remain unchanged [1].]

(iii) Explain why steel can be attracted by magnets but not iron(III) chloride.

A mixture has similar properties as the substances that it is made up of. Therefore, steel can be attracted by magnets like iron [1]. However, a compound have different properties compared to its constituent elements, hence iron(III) chloride cannot be attracted by a magnet like iron. [1]

..... [2]

END OF PAPER

Name	Register Number	Class	Calculator Model

智行茲願

MANJUSRI SECONDARY SCHOOL
文 殊 中 學

MID YEAR EXAMINATION 2017

Subject:	Lower Secondary Science
Paper:	Physics and Chemistry
Level:	Secondary 1 Express
Date:	08 May 2017
Duration:	2 hours
Setter:	Mr Sulaiman and Mr Qamarul

Additional Materials: Optical Answer Sheet (OTAS)

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Section A: Multiple Choice Question [40 marks]
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Section B: Short Answer Questions [40 marks]
Answer **all** the questions. Write your answers in the spaces provided on the question paper.

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The total number of marks for this paper is **100**.

A copy of the Periodic Table is printed on page **28**.

For Examiner's Use		
Section	**Phy**	**Chem**
A	**/ 20**	**/20**
B	**/ 20**	**/20**
C	**/ 10**	**/10**
Sub-total	**/ 50**	**/50**
Total		**/100**

Section A

Answer **all** questions

A1 The scientific method usually involves the following skills.

I making meaning of information and evidence
II communicating
III engaging with an event
IV collecting and presenting evidence

What is the correct sequence in which the four skills are applied in the scientific method?

A I, IV, III, II

B III, IV, I, II

C I, II, III, IV

D IV, III, II, I

A2 Objectivity is an attitude of scientific enquiry.

What do you understand by this term?

A influenced by what is widely believed by others

B not influenced by what is widely believed by others

C follow the facts and be influenced by what is widely believed by others

D follow the facts and not be influenced by what is widely believed by others

A3 Which property of a substance indicates whether it is a liquid or solid at room temperature?

A flexibility

B solubility

C melting point

D heat conductivity

For questions A4 and A5, refer to the table below.

mass of falling object (kg)	height from which object was released (m)	time taken for object to reach ground (s)

A4 Marie carried out an experiment involving falling objects. The table above shows the variables of the experiment.

Which of the statements below could be the hypothesis / hypotheses Marie tested through the experiment?

I The greater the mass of an object, the longer the time it takes to fall to the ground.

II The larger the volume of an object, the longer the time it takes to fall to the ground.

III The greater the mass of a falling object, the greater the distance it falls before it reaches the ground.

A I only

B I and II

C II and III

D none of the above

A5 To improve the experiment, Marie's teacher told her that she should ask herself some questions before carrying out the experiment.

Which of the following questions should Marie ask?

A How does the shape of the falling object affect the time taken?

B Should the release height be measured in centimetres instead of metres?

C Should the mass of the object be measured again after it reaches the ground?

D Should the mass of the object be measured using a beam balance or spring balance?

A6 As a supplement to some diets, iron is consumed in tablet form. The mass of iron in these tablets is often measured in ..... .

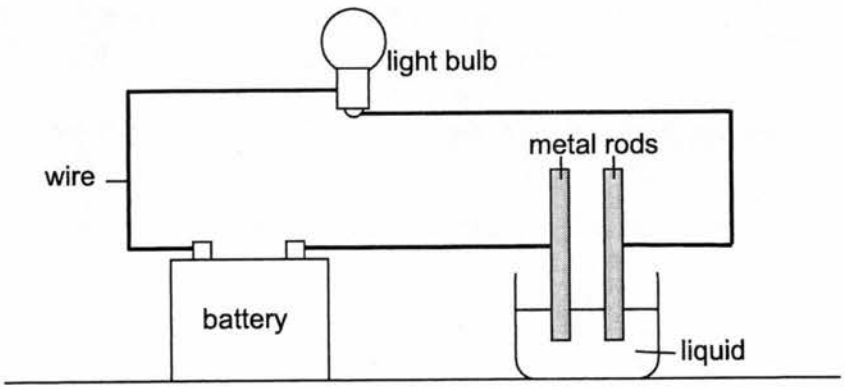
A grams

B calories

C mililitres

D miligrams

A7 The diagram below shows an experiment to test a certain property of liquids.



Which property is being tested?

A density

B solubility

C magnetism

D electrical conductivity

A8 Gold, silver, platinum and copper are metals that are commonly used in manufacturing processes. The table below shows the melting points and densities of these metals.

Liquid	Melting point (°C)	Density (g/cm^3)
Gold	1063	19.31
Silver	961	14.50
Platinum	1773	21.42
Copper	1083	8.96

Which of the following statements describes the relationship between the melting point and density of a material?

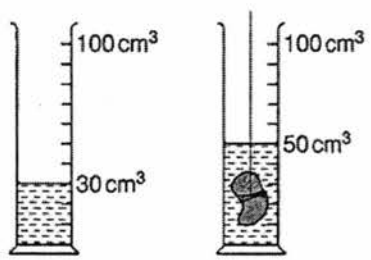
A The densest material has the lowest melting point.

B The melting point of a material is one hundred times its density.

C The melting point of a material is independent of density.

D The melting point of a material decreases as density decreases.

A9 A stone of mass 60 g is lowered into a measuring cylinder. The water level rises as shown in the diagram below.



What is the density of the stone?

A 0.6 g/cm³

B 1.2 g/cm³

C 2.0 g/cm³

D 3.0 g/cm³

A10 Which of the following is not an effect of a force?

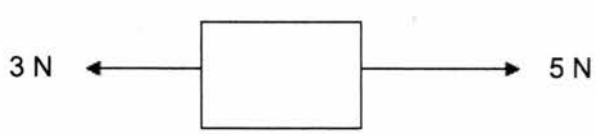
A It changes the size of an object.

B It changes the mass of an object.

C It changes the speed of a moving object.

D It changes the direction of a moving object.

A11 What is the resultant force acting on the box shown below?



A 2 N to the left

B 2 N to the right

C 8 N to the left

D 8 N to the right

A12 Which of the following is a contact force?

A magnetic force

B frictional force

C electrostatic force

D gravitational force

A13 The electrostatic force between two charged particles ..... .

A attracts if they are like charges.

B repels each other if they are like charges.

C is zero if they both have negative charges.

D repels each other if they are unlike charges.

A14 Which material has magnetic properties?

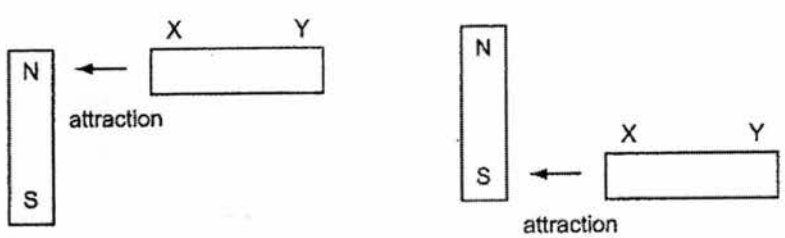
A wood

B brass

C steel

D aluminum

A15 A metal rod XY is placed near a magnet. End X is attracted when it is placed near to the north pole of the magnet, and also when it is placed near to the south pole.



How does end Y behave when it is placed, in turn, near to the two poles of the magnet?

	Y near north pole	Y near south pole
A	attraction	attraction
B	attraction	repulsion
C	repulsion	attraction
D	repulsion	repulsion

A16 Which of the following is the most likely to exert the greatest amount of pressure on the ground?

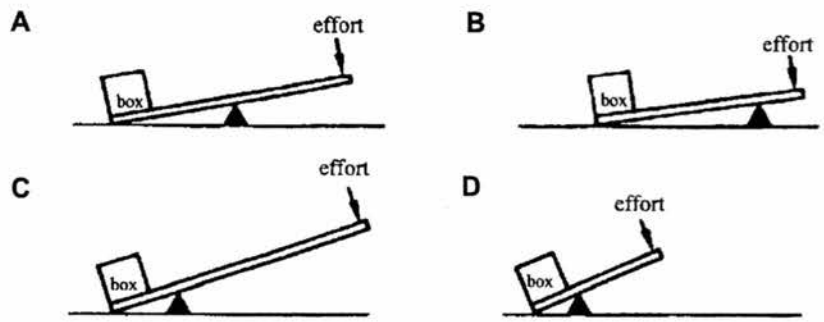
A a loaded lorry with four identical wheels

B a loaded lorry with six identical wheels

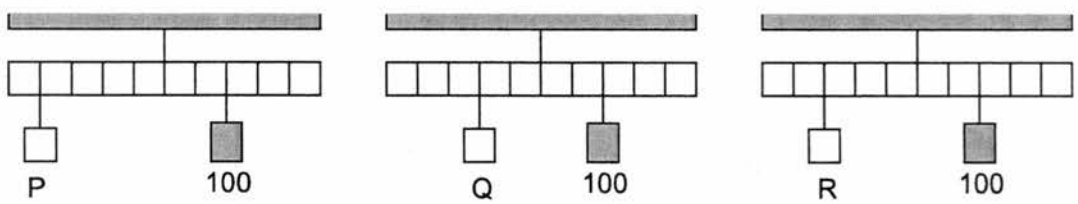
C an empty lorry with four identical wheels

D an empty lorry with six identical wheels

A17 Four methods of lifting a heavy box using a lever are shown below.
Which method would lift the box most easily?



A18 Which of the following shows the weight of objects in increasing order?



A P, R, Q

B R, P, Q

C Q, R, P

D R, Q, P

A19 Which of the following does not use chemical potential energy?

A car

B blender

C torchlight

D handphone

A20 The arrow in each picture show the direction of force exerted by a person.
Which picture shows work being done?

A

standing holding a bag

B

lifting up a box

C

holding a ladder

D

sitting on a chair

A21 During an experiment in a school laboratory, Klein accidentally spilled a chemical with the following hazard symbol on his arm.

What should Klein do first?

A call the ambulance

B raise his hand to inform the teacher

C wipe his arm with a clean piece of cloth

D wash his arm thoroughly under running water

A22 Which of the following apparatus should Ryan use to measure exactly 31.4 cm^3 of a liquid?

A beaker

B burette

C pipette

D test-tube

A23 The steps to lighting up a Bunsen burner are shown below.

I Turn on the gas tap

II Open the air-hole

III Light it up with a lighter

IV Close the air-hole

Which is the correct order of steps for lighting up a Bunsen burner to obtain a non-luminous flame?

A I, II, III, IV

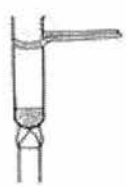
B II, I, III, IV

C IV, I, III, II

D IV, III, II, I

A24 Which one of the following diagrams shows the correct way of heating a liquid in a test-tube?

A



C

B

D

A25 After outdoor cooking in Scouts camp, Jing Han realised that the bottom of his cooking pot was covered with soot. Which of the following statements correctly describes his observation?

A The flame was too hot.

B The food in the pot was burnt.

C The camp fire was a luminous flame.

D The camp fire was a non-luminous flame.

A26 Gina accidentally poured salt into a bowl of rice grains. To prevent wastage, she decided to use some of the separation techniques she has learnt. She listed down the necessary steps below.

I Pour the mixture down a filter funnel fitted with filter paper

II Add water to the mixture and stir

III Heat the mixture until all the water has evaporated

Which is the correct order of the steps she must carry out?

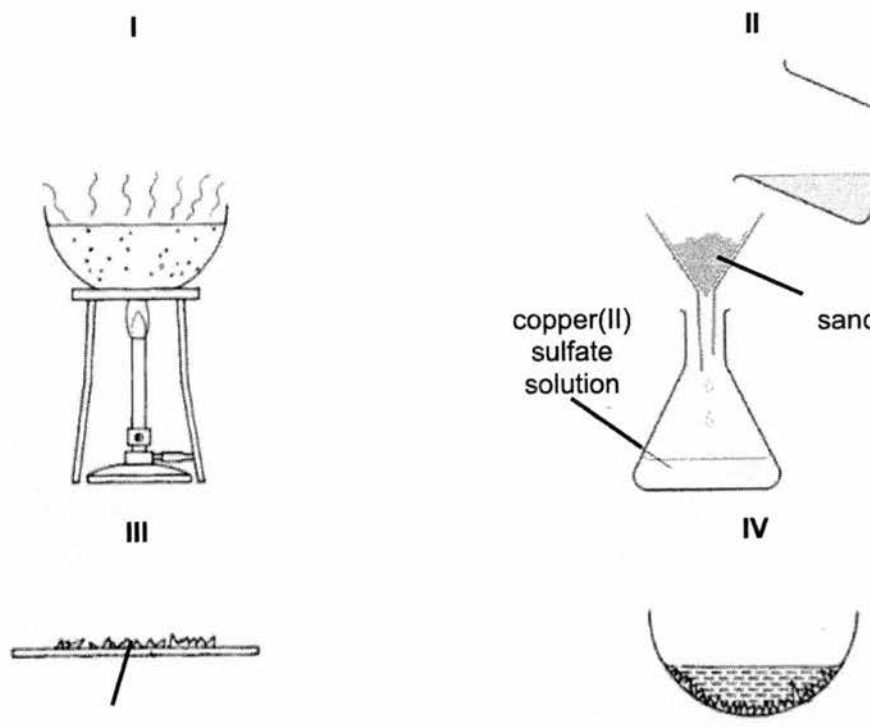
A I, II, III

B I, III, II

C II, I, III

D II, III, I

A27 Pure copper(II) sulfate crystals can be obtained from an impure mixture of copper(II) sulfate and sand. The following diagrams represent the stages of the preparation.



In which order should these stages be?

	first stage ⟶			last stage
A	I	IV	II	III
B	II	I	IV	III
C	II	I	III	IV
D	IV	I	II	III

A28 Which statement must be **true** in order for two substances to be separated by chromatography?

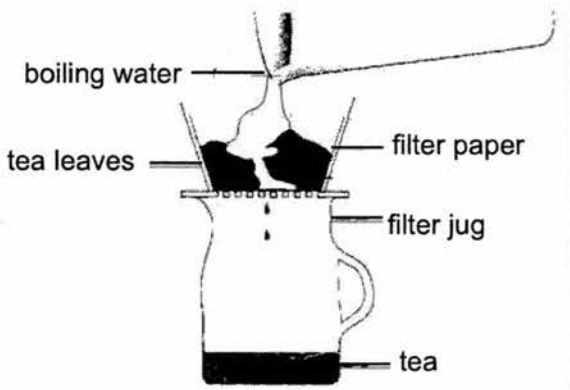
A They have different colours.

B They have different densities.

C They have different boiling points.

D They are soluble in the same solvent.

A29 The diagram shows a separation technique used to obtain tea.



Which of the following statements is **correct**?

A The tea leaves dissolve in water to make tea.

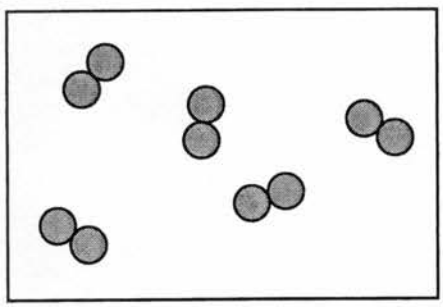
B The boiling water cannot pass through the filter paper.

C The tea is the filtrate and the tea leaves are the residue.

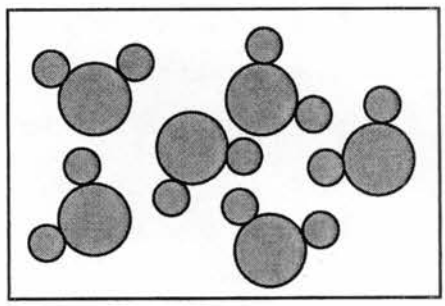
D The tea leaves are the filtrate and the tea is the residue.

A30 Which of the following diagrams represent an element?

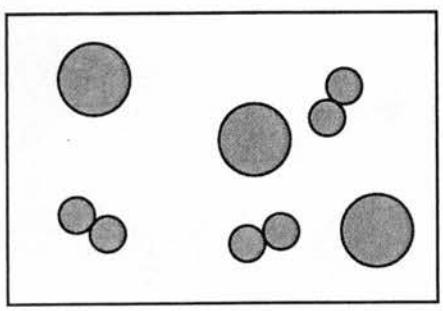
A



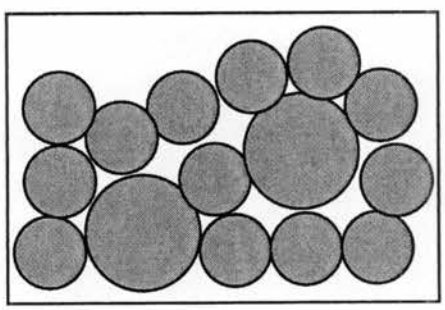
B



C



D



A31 In the 18th century, a chemist named Henry Cavendish carried out an experiment which showed that hydrogen burns with the oxygen in the air to form water. Which statement(s) can be inferred from this observation alone?

I Air is an element

II Water is an element

III Water is a compound

IV Water is formed from the reaction between hydrogen and oxygen

A I only

B II and III

C II and IV

D III and IV

A32 Which of the following shows an element, a compound and a mixture??

	element	compound	mixture
A	carbon monoxide	magnesium oxide	sugar solution
B	mercury	clay	sodium chloride
C	nitrogen	carbon dioxide	air
D	steel	mud	tin

A33 In 2004, a group of Japanese scientists discovered a new element with proton number 113. The new element was given the name nihonium, is a metal, and was found to have 3 electrons in its outermost electron shell. Which statement regarding nihonium is **true**?

A Its chemical symbol is Ni.

B It belongs to Group I of the Periodic Table.

C It belongs to Period 4 of the Periodic Table.

D It is predicted to be between the elements copernicum and flerovium in the Periodic Table.

A34 Which statement is **true** for all metals?

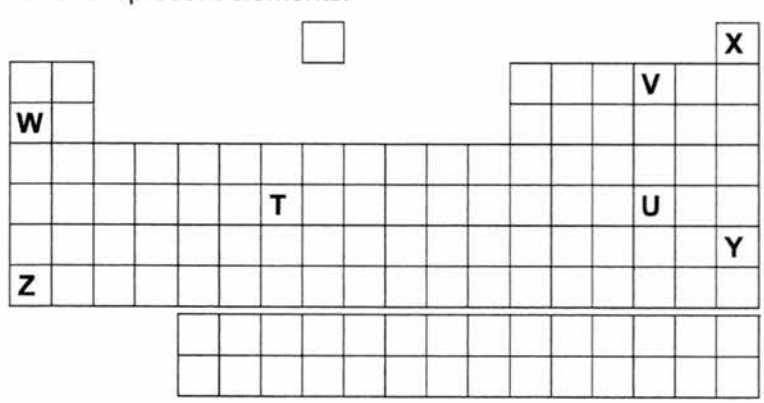
A They have a silvery appearance.

B They can be attracted by magnets.

C They can conduct electricity in the solid state.

D They are solids at room temperature and pressure.

For questions **A35**, **A36** and **A37** refer to the diagram below which represents the Periodic Table. The letters **T**, **U**, **V**, **W**, **X**, **Y** and **Z** represent elements.



A35 Which pair of elements are highly unreactive?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A36 Which pair of elements react violently in water?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A37 Which pair of elements have the same number of electron shells?

A **T** and **U**

B **V** and **Y**

C **W** and **Z**

D **X** and **Y**

A38 Which of the following is a chemical reaction between elements only?

A magnesium + oxygen → magnesium oxide

B methane + oxygen → carbon dioxide + water

C oxygen + nitrogen monoxide → nitrogen dioxide

D potassium + water → potassium hydroxide + hydrogen

A39 Which of the following substances is a compound?

A C_{60}

B HF

C O_2

D S_8

A40 Which of the following statements is **true**?

A A compound has the properties of the elements it is made up of.

B A compound can be formed by chemical processes such as combustion.

C A compound can be broken down into simpler substances by physical methods.

D A compound made up of two or more different elements with different composition by mass.

END OF SECTIO

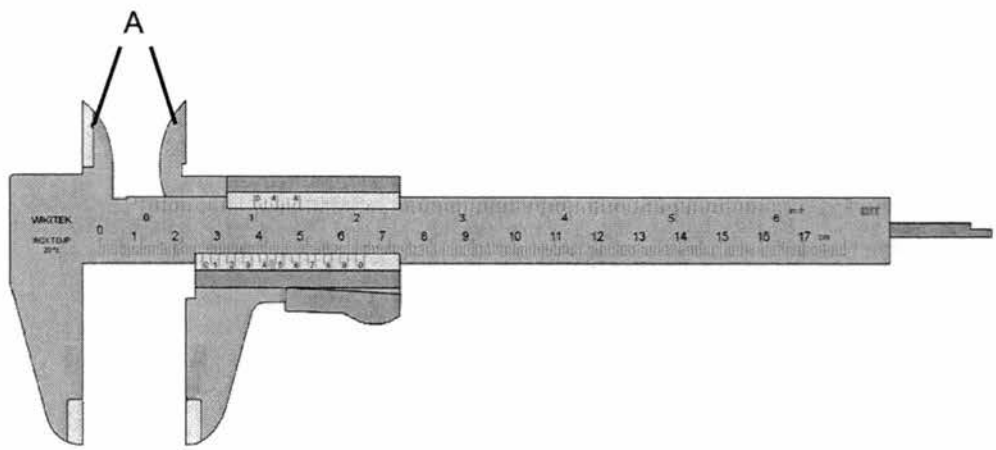
For Examiner's Use

Section B: Short Answer Questions [40 marks]

Answer **all** questions.

Write your answers in the spaces provided

B1 The diagram below shows a vernier caliper.

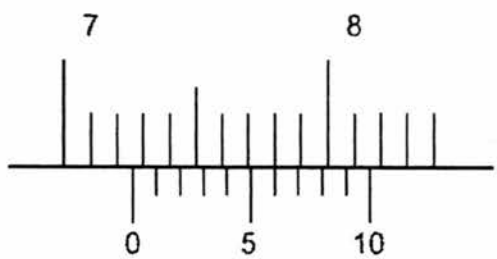


(a) Name part A of the vernier caliper and state its function.

Name of part A: ..... [1]

Function of part A: ..... [1]

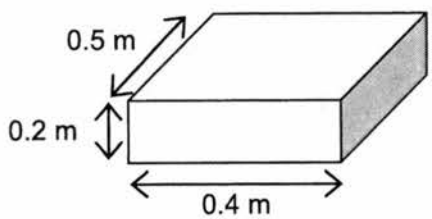
(b) State the reading of the vernier caliper below.



reading = ... cm [1]

For Examiner's Use

B2 The diagram below shows an object of dimension 0.5 m x 0.4 m x 0.2 m lying on the ground. Its weight is 10 kg. Taking gravitational field strength to be 10 N/kg,



(a) Calculate the pressure exerted by the object on the ground.

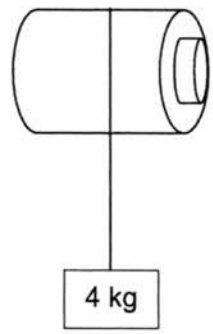
pressure = ... Pa [3]

(b) The object is made to stand on the shaded area. State and explain how this affects the pressure of the box exerting on the ground.

.....

..... [2]

B3 An electric motor is used to lift a box of mass 4 kg as shown in the diagram below. The box moves vertically up through a distance of 2 m in 5 s.



(a) State the energy conversion in raising the box.

..... [1]

(b) Calculate the average speed of the box.

average speed = ... m/s [1]

(c) Calculate the work done in raising the box. (Take g to be 10 N/kg)

work done = ... J [2]

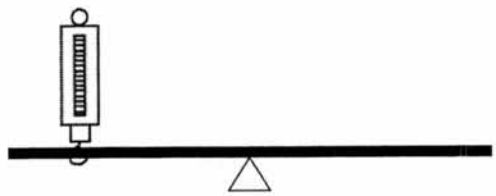
(d) Determine the change in gravitational potential energy after it was raised 2m.

gravitational potential energy = ... J [1]

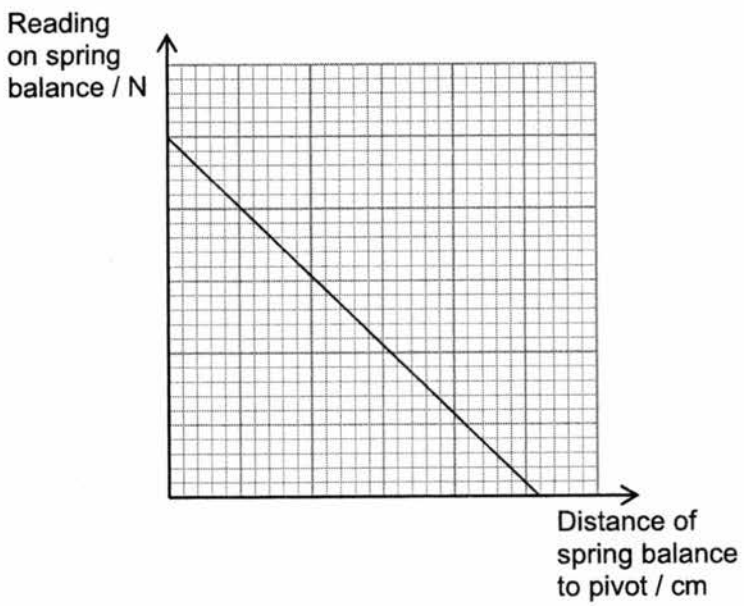
(e) Determine the kinetic enegy when it is stationary at the highest point.

For Examiner's Use

B4 A student carried out an experiment by balancing a light beam horizontally on a pivot using a spring balance as shown in the diagram below. The pivot was placed in the middle of the beam.



(a) The student concluded his findings through the graph shown below and it proved that his hypothesis for the experiment was accurate.

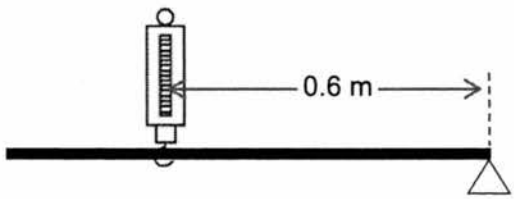


State the student's hypothesis for the experiment.

.....

..... [1]

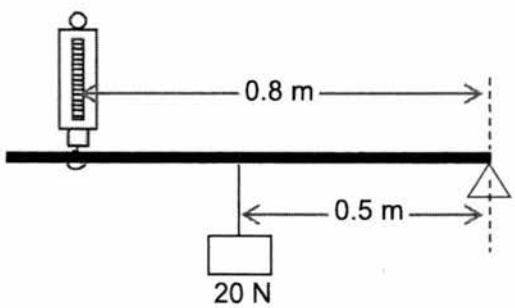
(b) The arrangement was adjusted such that the spring balance was 0.6 m away from the pivot and it showed a reading of 7.5 N.



Calculate the moment produced by the spring balance about the pivot.

moment = ... Nm [2]

(c) The student then positioned the spring balance 0.8 m away from the pivot and added a box in the middle of the beam as shown in the diagram below.

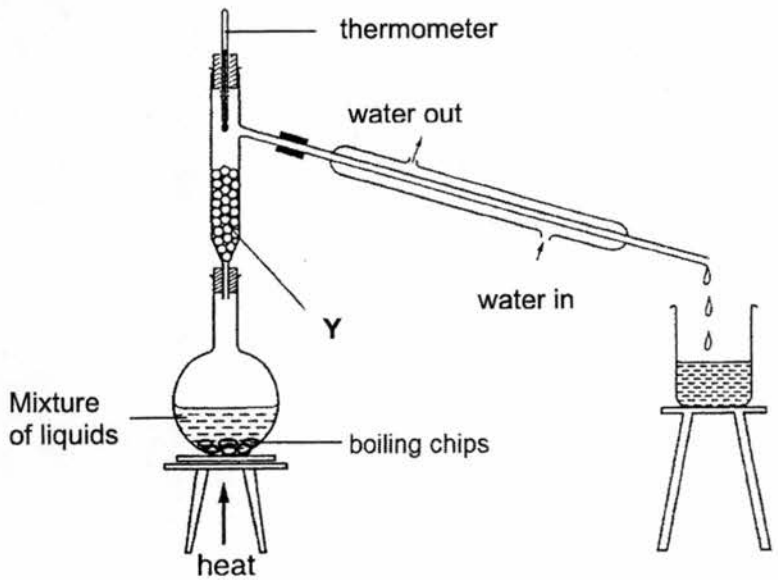


If the weight of the box is 20 N, calculate the new reading on the spring balance.

reading on spring

For Examiner's Use

B5 Giselle used the experimental set up shown below to separate a mixture of three liquids, **P**, **Q** and **R**.



(a) State the name of apparatus **Y**.

.....

[1]

(b) The boiling points of liquids **P**, **Q**, and **R** are 156 °C, 118 °C, and 79 °C respectively. State which distillate will be the **last** to be collected? Explain your answer.

.....

.....

[2]

(c) What is the function of the boiling chips?

.....

[1]

(d) Can Giselle use the same experimental set-up to separate a mixture of oil and water? Explain your answer.

.....

.....

[2]

B6 The table below shows the properties of five elements, **A**, **B**, **C**, **D**, and **E**. These letters do **not** represent their chemical symbols.

Element	Melting point (°C)	Boiling point (°C)	Density (g/cm^3)	Electrical conductivity	Reaction with water
A	− 39	630	13.5	good	No reaction
B	98	883	0.97	good	Reacts violently
C	− 189	− 186	0.0018	poor	No reaction
D	1085	2652	8.96	good	No reaction
E	− 101	− 34	0.0032	poor	Forms an acid

(a) Which of the above five elements is most likely a Group I element.
Support your answer with the information given in the table shown above.

.....

.....

.....

..... [3]

(b) Rubidium is also a Group I element and it lies further down the group as compared to the element in part **(a)**. How would you expect the melting point, density, and reactivity in water of rubidium to differ compared to the element in **(a)**?

.....

.....

.....

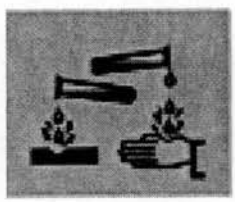
..... [3]

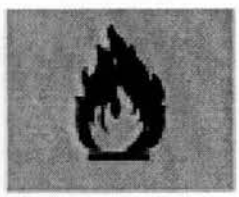
(c) State the identity of Element **A**.

..... [1]

For Examiner's Use

B7 Ethanoic acid is a colourless liquid with a pungent smell and has a chemical formula of $C_2H_4O_2$. A bottle of ethanoic acid has the two labels shown below.





(a) State what the two labels represent.

..... [1]

(b) Based on the labels, state **two** precautions that should be taken when using this chemical.

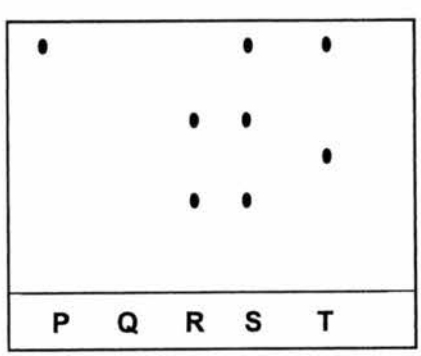
.....

..... [2]

(c) State the number of atoms of each element present in a molecule of ethanoic acid.

..... [1]

B8 A paper chromatography was performed on substances **P**, **Q**, **R**, **S** and **T** as shown.



(a) Which substance is pure? Explain your answer.

.....

..... [2]

(b) Suggest an explanation for the results of substance **Q**.

.....

.....

For Examiner's Use

Section C: Free Response / Structured Questions [20 marks]

Answer **all** questions.

C1 A large irregular-shaped object of volume 37.5 cm^3 has a density of 70 g/cm^3. Taking gravitational field strength on Earth and on the Moon to be 10 N/kg and 1.6 N/kg respectively,

(a) Calculate the cuboid's,

(i) mass on Earth,

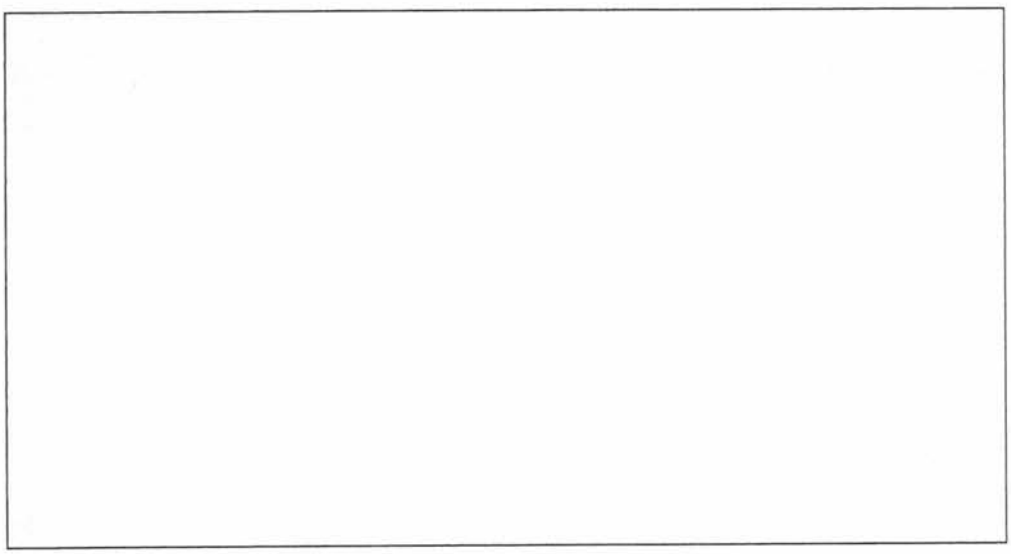
mass = ... g [2]

(ii) weight on the Moon.

weight = ... N [2]

For Examiner's Use

(b) Describe, with the help of label and diagrams, the steps of an experiment to prove that the density of the large irregular-shaped object is 70 g/cm^3. [6]



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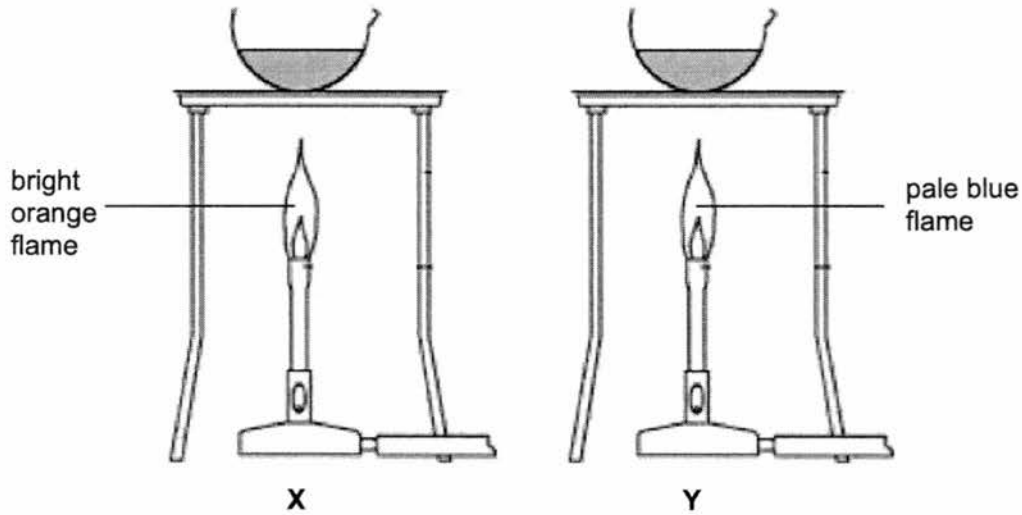
C2 **(a)** In an experiment, Ethan was given a sample of a colourless liquid. He separated it into two equal portions and heated them over two different types of flame as shown below.



(i) In which set-up, **X** or **Y**, would you expect the liquid to evaporate completely first? Explain your answer.

.....

..... [2]

(ii) After all the liquid has evaporated completely, a residue of a white solid was left behind in both **X** and **Y**. State, with a reason, whether the colourless solution was an element, a mixture, or a compound.

.....

..... [2]

For Examiner's Use

(b) Iron(III) chloride, $FeCl_3$, is a reddish brown solid and is made up of the elements iron and chlorine. Steel is made up of the elements iron and carbon.

(i) Explain why heat was given out when iron(III) chloride was formed but this does not happen when iron fillings and chlorine gas are mixed.

.....

.....

.....

..... [2]

(ii) Explain why some iron filings remained when the mixture of iron filings and chlorine gas was heated to form iron(III) chloride.

.....

.....

.....

..... [2]

(iii) Explain why steel can be attracted by magnets but not iron(III) chloride.

.....

.....

.....

..... [2]

END OF PAPE

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9		Key: proton (atomic) number; atomic symbol; name; relative atomic mass									5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57 – 71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89 – 103 actinoids	104 Rf Rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).

MANJUSRI SECONDARY SCHOOL

MID YEAR EXAMINATION 2017

Section A: Multiple Choice Question Answer

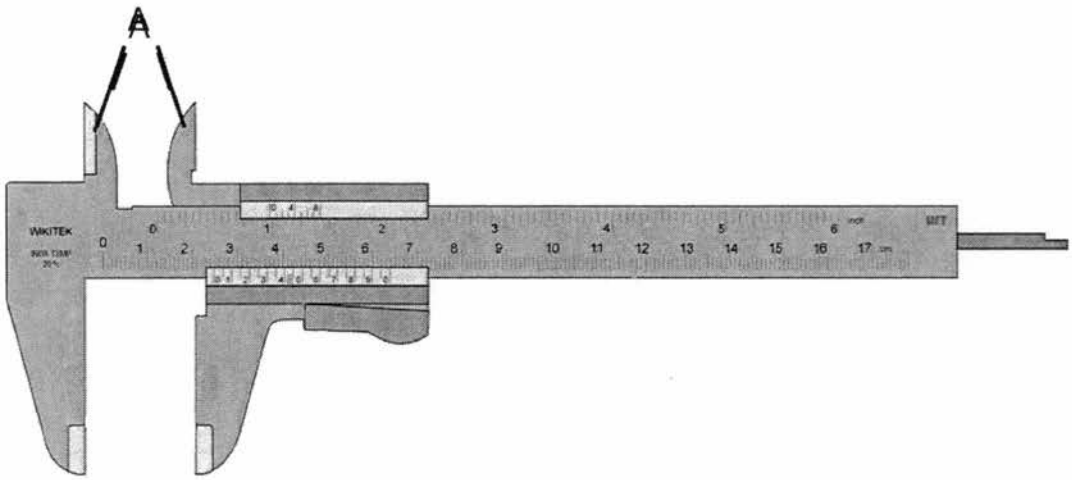
A1	B	A6	D	A11	B	A16	A
A2	D	A7	D	A12	B	A17	C
A3	C	A8	C	A13	B	A18	A
A4	A	A9	D	A14	C	A19	B
A5	A	A10	B	A15	A	A20	B

Section B: Short Answer Questions [40 marks]

Answer **all** questions.

Write your answers in the spaces provided

B1 The diagram below shows a vernier caliper.

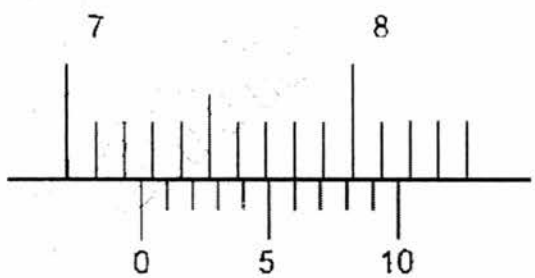


(a) Name parts A and B of the vernier caliper and state their function.

Name of part A: **Inside jaws** [1]

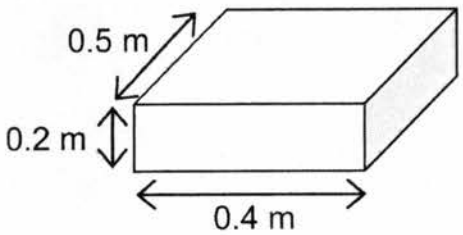
Function of part A: **To measure inner diameters** [1]

(b) State the reading of the vernier caliper below.



Reading: **7.26** cm [1]

B2 The diagram below shows an object of dimension 0.5 m x 0.4 m x 0.2 m lying on the ground. Its weight is 10 kg. Taking gravitational field strength to be 10 N/kg,



(a) Calculate the pressure exerted by the object on the ground.

A = 0.4 x 0.5
= 0.2 m^2 [1]

F = m x g
= 10 x 10
= 100 N [1]

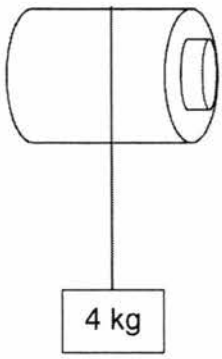
P = F / A
= 100 / 0.2
= 500 N/m^2 [1]

pressure= **500** Pa [3]

(b) The object is made to stand on the shaded area. State and explain how this affects the pressure of the box exerting on the ground.

When it is standing, the **contact area is smaller [1]**. Hence its **pressure is Greater [1]**. [2]

B3 An electric motor is used to lift a box of mass 4 kg as shown in the diagram below. The box moves vertically up through a distance of 2 m in 5 s.



(a) State the energy conversion in raising the box.

electrical energy to kinetic energy to gravitational potential energy [1]

(b) Calculate the average speed of the box

Speed = 2 m / 5 s
= 0.4 m/s

average speed = ***0.4*** m/s [1]

(c) Calculate the work done in raising the box. (Take g to be 10 N/kg)

F = W = m x g
= 4 x 10
= 40 N [1]

Wd = F x d
= 40 x 2
= 80 J [1]

work done = ***80*** J [2]

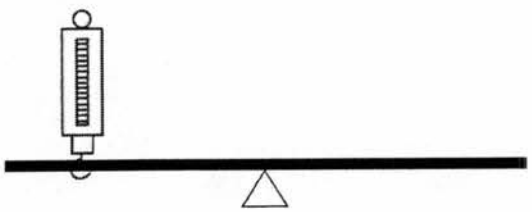
(d) Determine the change in gravitational potential energyafter it was raised 2m.

gravitational potential energy = ***80*** J [1]

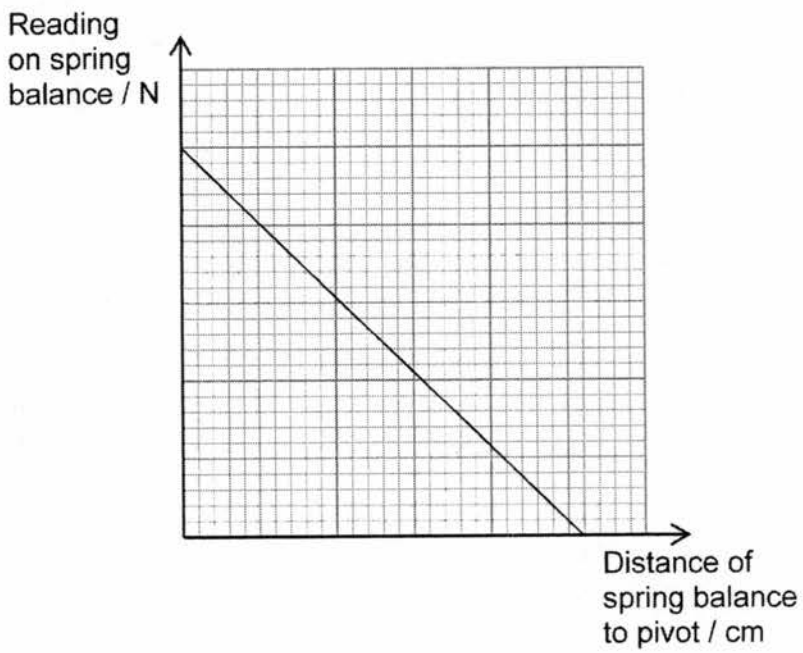
(e) Determine the kinetic enegy when it is stationary at the highest point.

kinetic

B4 A student carried out an experiment by balancing a light beam horizontally on a pivot using a spring balance as shown in the diagram below. The pivot is placed in the middle of the beam.



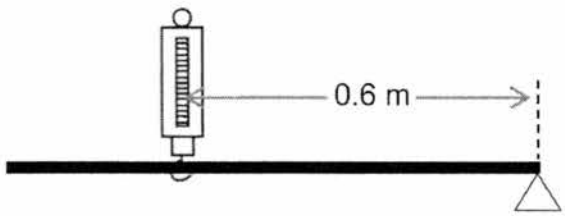
(a) The student concluded his findings through the graph shown below and it proved that his hypothesis for the experiment was accurate.



State the student's hypothesis for the experiment.

The **closer the spring balance is to the pivot**, the **more force** is required to balance the beam [1]

(b) The arrangement was adjusted such that the spring balance was 0.6 m away from the pivot, and it showed a reading of 7.5 N.

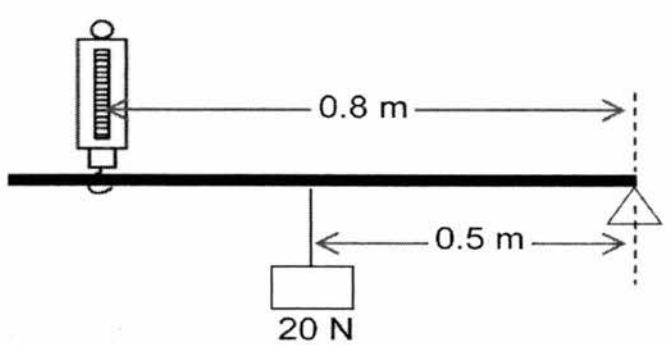


Calculate the moment produced by the spring balance about the pivot.

M = F x perpendicular distance [1]
= 7.5 x 0.6
= 4.5 Nm [1]

M\moment = ... **4.5** Nm [2]

(c) The student then positioned the spring balance 0.8 m away from the pivot and added a box in the middle of the beam as shown in the diagram below.



If the weight of the box is 20 N, calculate the new reading on the spring balance.

ACWm = CWm [1]
20N x 0.5m = F x 0.8m [1]
F = 12.5 N [1]

reading on spring bal

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Section C: Free Response / Structured Questions [20 marks]

Answer **all** questions.

C1 A large irregular-shaped object of volume 37.5 cm^3 has a density of 70 g/cm^3. Taking gravitational field strength on Earth and on the Moon to be 10 N/kg and 1.6 N/kg respectively,

(a) Calculate the cuboid's,

(i) mass on Earth,

Mass = Density x volume [1]
= 37.5 x 70
= 2625 g [1]

mass = **2630** g [2]

(ii) weight on the Moon.

2625 g = 2.625 kg [1]

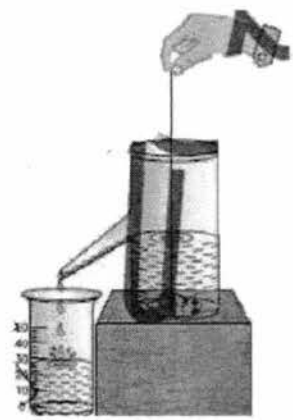
W = mg
= 2.625 x 1.6
= 4.2 N [1]

weight = **4.2** N [2]

(b) Describe, with the help of label and diagrams, the steps of an experiment to prove that the density of the large irregular-shaped object is 70 g/cm^3. [6]

1. *Use a beam balance to measure the mass of the object. [1]*
2. *Fill up the displacement can until water overflows from its spout. Wait till the water stop flowing out from the spout [1]*
3. *Tie the object with a string, and gently lower the object into the displacement can. [1]*
4. *The volume of water collected in the measuring cylinder, is the volume of the irregular shaped object. [1]*
5. *Density = mass / volume [1]*

Diagram and label [1]



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