Name	Class	Index Number

ANG MO KIO SECONDARY SCHOOL
MID YEAR EXAMINATION 2016
SECONDARY ONE EXPRESS

SCIENCE

Total Mark: 100 **4 May 2016 / Wednesday**

Setter: Miss Ang Xiu Qin **2 hours**

Additional Materials: OTAS Sheet, Writing Papers

READ THESE INSTRUCTIONS FIRST

Write your Name, Class and Index Number in the spaces at the top of this paper.
You **must** use a soft pencil for any diagrams, graphs or rough working.
You must show essential workings in any calculations.
No marks will be awarded for answers that are NOT clearly shown.

Section A: Multiple-Choice Questions

Answer **ALL** the questions in Sections A on the OTAS provided. Read the instructions on the OTAS carefully. Use only 2B pencils.

Section B: Structured Questions

Answer **ALL** the questions in Section B in the spaces provided on the question paper.

Section C: Free Response Questions

Answer only 4 out of 5 questions in Section C. Begin each question on a FRESH page of the writing paper.

At the end of the examination, hand in your OTAS, Section B and Section C separately.

For Examiner's use	
Section A	
Section B	
Section C	
TOTAL	

This document consists of **21** printed pages, including the cover page.

[Turn over]

Section A: Multiple Choice Questions (30 marks)

Answer **ALL** questions in Section A on the OTAS paper provided.

A1 Unused chemicals should **never** be poured back into their containers because it may _____.

A cause an explosion

B cause wastage

C contaminate the rest of the chemicals

D dilute the chemical

A2 Which of the following shows the correct procedure to light a Bunsen burner?

A turn on the gas, strike the lighter, close the air-hole

B turn on the gas, close the air-hole, strike the lighter

C close the air-hole, strike the lighter, turn on the gas

D close the air-hole, turn on the gas, strike the lighter

A3 Which of the following is an **abuse** of science and technology?

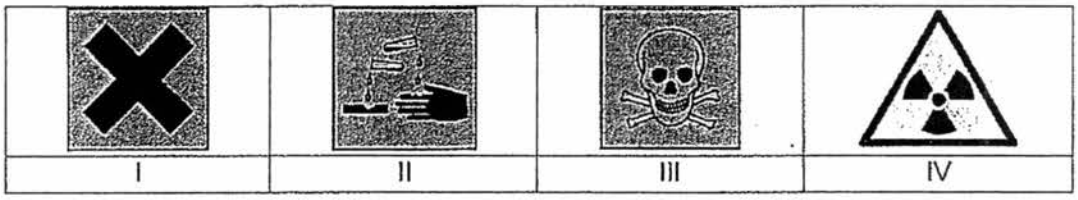
A developing vaccines for diseases

B developing biological warfare

C using sensors to detect tremors

D using 3D printing to build houses

A4 A laboratory technician was given a bottle containing substance **X** which is toxic, corrosive and radioactive. Which of the following hazard symbols would be found on the bottle?



A I, II, III

B I, II, IV

C I, III, IV

D II, III, IV

A5 A displacement can is filled with water up to the level of the spout. A measuring cylinder containing 8 cm^3 of water is placed beneath the spout. An object is placed into the displacement can and the water level in the measuring cylinder rose to 35 cm^3. What is the volume of the object?

A 8 cm^3

B 27 cm^3

C 35 cm^3

D 43 cm^3

A6 Which of the following readings is most likely taken by using a metre rule?

A 5 cm

B 5.2 cm

C 5.24 cm

D 5.245 cm

A7 The mass of a block of iron is greater than the mass of a styrofoam block of the same volume because _____.

A the iron block contains more matter than the styrofoam block

B the styrofoam block contains more matter than the iron block

C both block have the same amount of matter

D styrofoam is denser

A8 What are the S.I. units for length, mass and time?

	Length	Mass	Time
A	centimetre	grams	minute
B	centimetre	kilograms	second
C	metre	grams	minute
D	metre	kilograms	second

A9 Jack is given a piece of plasticine and was asked to mould it into different objects. From this, it shows that force can _____.

A change the physical dimensions of objects
B change the direction of a moving object
C produce a turning effect
D stop a moving object

A10 Which of the following is **true** about mass and weight?

	Mass	Weight
A	Measured using spring balance.	Measured using beam balance.
B	Constant value.	Varies from location.
C	Refers to the amount of matter in an object.	Refers to the force of gravity acting on an object.
D	Refers to the substance per unit area.	Refers to the substance per unit volume.

A11 In which of the following scenarios is friction **useful**?

A cycling uphill
B pulling a trolley
C walking
D skateboarding

A12 Consider a person suspended from an opened parachute, gliding downwards. Which of the following statements is **correct**?

A There is no force acting on the parachute.
B Only air resistance acts on the parachute.
C Only gravitational force acts on the parachute.
D Air resistance and gravitational force act on the parachute.

A13 Which of the following is a way to **reduce** the turning effect (moment) of a force?

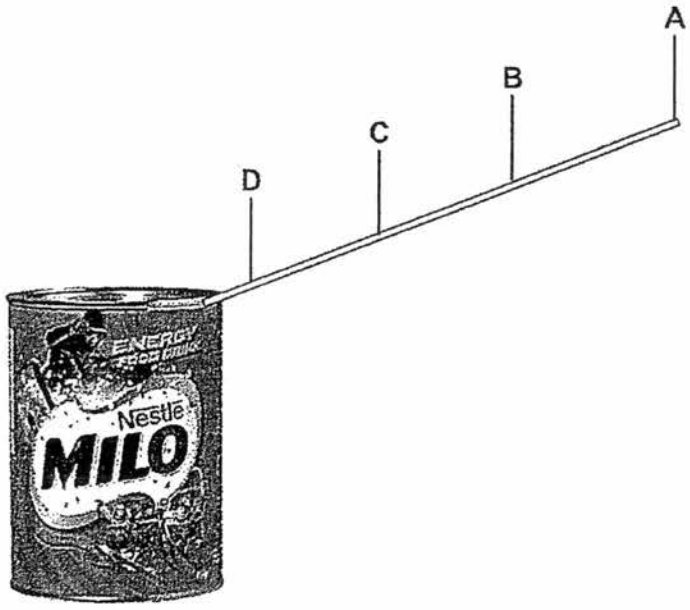
A Increase the magnitude of the applied force.

B Move the pivot nearer to the applied force.

C Move the pivot further away from the applied force.

D Use of ball bearings to reduce surface area of contact.

A14 The diagram below shows a metal ruler placed at the lid of the milo tin in order to open it. On which position on the metal ruler should the force be exerted to open the milo tin with the least force?



A15 The gravitational field strength on Earth is 10 N/kg while on Moon, it is 1.6 N/kg. An object has a weight of 10 N on Earth. Which of the following shows the mass and weight of the object on Moon?

	Mass on Moon	**Weight on Moon**
A	1 kg	1.6 N
B	1 kg	10 N
C	1.6 kg	1.6 N
D	1.6 kg	10 N

A16 Which of the following statements **correctly** describe the relationship between force, area and pressure?

A For objects with the same contact area, the pressure exerted will be doubled when the force applied is doubled.

B For objects with the same contact area, the pressure exerted will be decreased by half if the applied force is doubled.

C When the applied force is constant, the pressure exerted will be doubled when the contact area is doubled.

D When the applied force is constant, the pressure exerted will be decreased by half if the contact area is doubled.

A17 The work done on an object depends on _____.

I. Size of the force
II. Size of object
III. Distance travelled by object
IV. Direction of object movement

A I and II

B I, II and III

C I, III and IV

D All of the above

A18 A boy holds a 20 N dumbbell and walks 10 m forward. His arm is 1.5 m above the ground. What is the work done by the boy on the 20 N dumbbell when he is holding it?

A 0 J

B 15 J

C 30 J

D 200 J

A19 Which of the following statements best describes a scenario where work is done by a force?

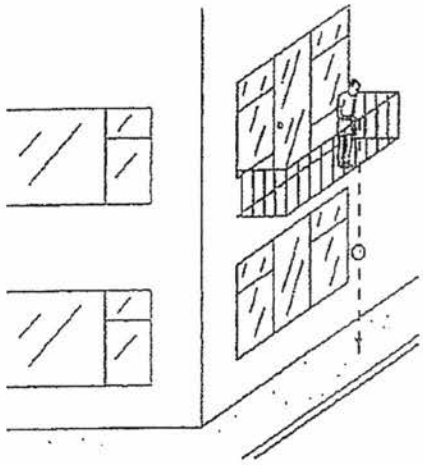
A When the object moves in the direction of force applied.

B When the object moves perpendicularly to the force applied.

C When the object moves in the opposite direction of the force applied.

D When the object remains stationary.

A20 John drops the ball off the balcony as shown in the picture below. The ball hits the pavement and bounces upwards.



Initially the ball possesses **gravitational potential energy**. Which of the following shows the energy conversion when the ball is dropped?

A Elastic potential energy → Kinetic energy → Chemical potential energy

B Elastic potential energy → Kinetic energy → Elastic potential energy

C Kinetic energy → Elastic potential energy → Kinetic energy

D Kinetic energy → Gravitational potential energy → Elastic potential energy

A21 A stretched rubber band is an example of an object storing _____.

A chemical potential energy

B elastic potential energy

C gravitational potential energy

D kinetic energy

A22 The sum of gravitational potential energy and kinetic energy is mechanical energy. Which of the following options shows the energy change when an object falls from the table to the ground?

	Gravitational potential energy	Kinetic energy	Mechanical energy
A	decrease	decrease	increase
B	decrease	increase	remains the same
C	increase	decrease	decrease
D	increase	increase	remains the same

A23 A car is moving on a flat horizontal road and it slowly increases its speed to two times its initial speed. What happens to the gravitational potential energy of the car?

A It remains the same.

B It doubles.

C It decreases.

D It increases.

A24 Which of the following energy conversions is **incorrect** for the sources of renewable resource?

	Renewable energy	Energy conversion
A	biofuel	gravitational potential energy → heat energy
B	hydroelectricity	gravitational potential energy → kinetic energy → electrical energy
C	geothermal energy	heat energy → kinetic energy → electrical energy
D	solar energy	light energy → electrical energy

A25 Which of the following is the **best** thermal insulator?

A cotton

B copper

C water

D vacuum

A26 Which of the following examples **best** demonstrates the process of **conduction**?

A burning a piece of paper

B hot air rising as it is less dense

C using a metal spoon to stir hot milo to cool it down

D wearing white when working under the sun

A27 A metal spoon and a plastic spoon are placed on a table in a room. The metal spoon is colder to the touch because _____.

A metal is a better conductor of heat thus it conducts heat quickly away from our hands.

B metal is a better conductor of heat thus it conducts coldness to our hands.

C metal is a better insulator of heat thus it conducts heat quickly away from our hands.

D metal is a better insulator of heat thus it conducts coldness to our hands.

A28 There are often gaps in between railway tracks to counter the effects of expansion and contraction due to _____.

A wear and tear of the railway tracks

B the changes in the surrounding temperature

C the difference in the amount of light exposure

D the difference in the amount of rain

A29 A glass jar of jam has a metal lid which was tightly capped. In order to open it, Gilbert immersed the jar lid in warm water. This causes the _____.

A glass to contract

B glass to expand

C metal lid to contract

D metal lid to expand

A30 A bimetallic strip is effective because it is made of _____.

A one unique metal that expands and contracts rapidly

B one unique metal that expands and contracts slowly

C two different metals that expand at different rates

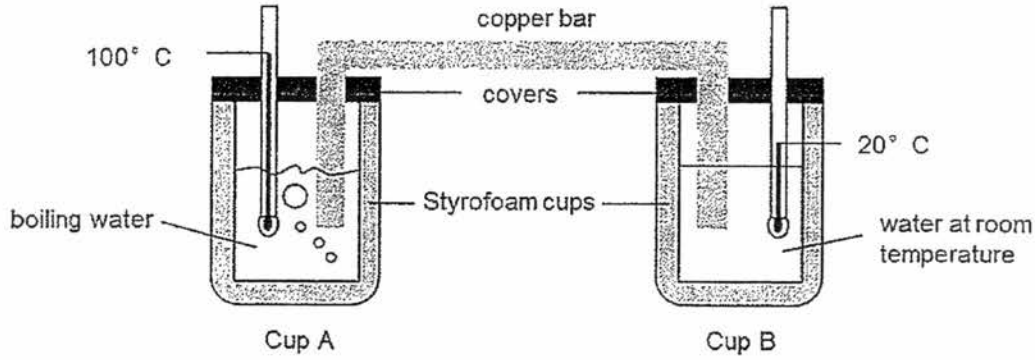
D two different metals that expands at the same rate

End of Section A

Section C: Free Response Questions (40 marks)

Answer **any FOUR questions** on the writing papers provided.

C1 The diagram below shows the setup for a heat-flow experiment. A copper bar connects two insulated Styrofoam cups of water at different temperatures. The thermometers indicate the initial temperature of the water in Cup A and Cup B.

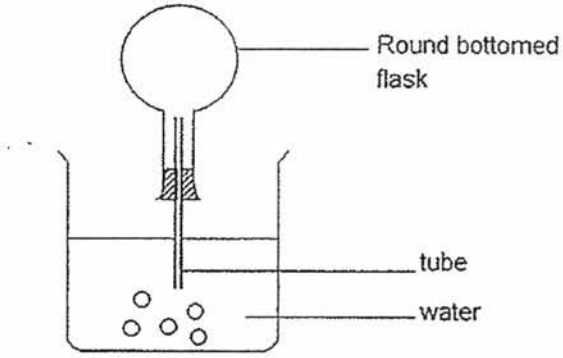


a Explain how thermal energy is generally transferred in the environment. [1]

b **i** Describe the changes that are most likely to occur in the next few minutes. [2]

ii Explain your answer in part **bi**. [2]

Joel did an experiment setup using a glass flask containing air as seen below. He dipped part of the tube attached to the flask in water.

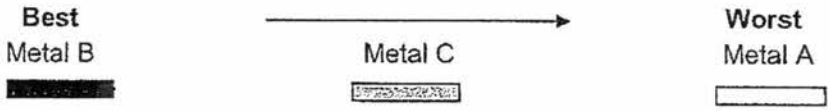


c **i** Joel rubbed his hands together and placed them on the flask. He then observed the formation of bubbles in the water. Explain why bubbles are seen. [2]

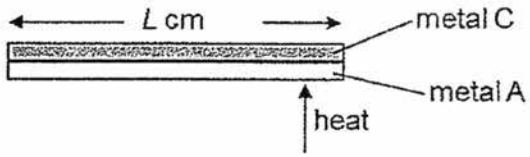
ii Predict what would happen when the glass flask is later cooled while remaining in the same position shown in the diagram. [1]

iii Explain your answer to **cii**. [2]

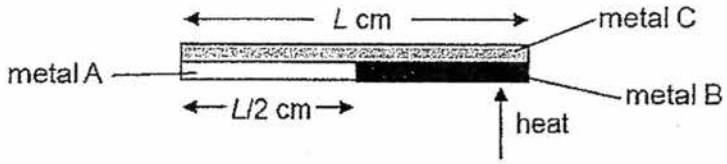
C2 Three metals, A, B and C, are used to make different bimetallic strips. The heat conduction properties of the metals are ranked below:



a A bimetallic strip of length L centimetres is made from metals A and C, as shown below. Describe and explain the shape of the bimetallic strip when heated. [2]



b A bimetallic strip of length L centimetres is made from metals A, B and C, as shown below. Describe and explain the shape of the bimetallic strip. [3]



A football game started when one of the players, Andrew kicked the stationary ball towards his teammate, Jason. To score for their team, Jason then kicked the ball towards the goalkeeper.

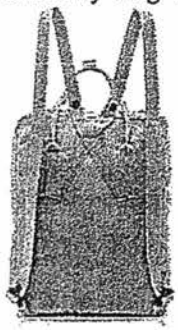
c **i** Define force. [1]

ii From the above description of the football game, give two effects of forces on the motion of the ball. [2]

iii Using one example each, show how friction can be both an advantage and a disadvantage. [2]

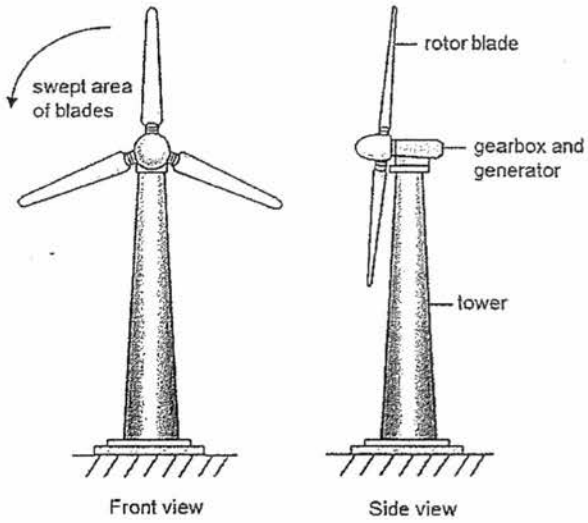
C3 a i Define pressure. [1]

ii Explain why it hurts to carry a heavy bag with thin straps. [2]



iii Explain why wearing skis prevents the skier from sinking into the soft snow. [2]

The diagram below shows the wind turbine found commonly in wind farms.

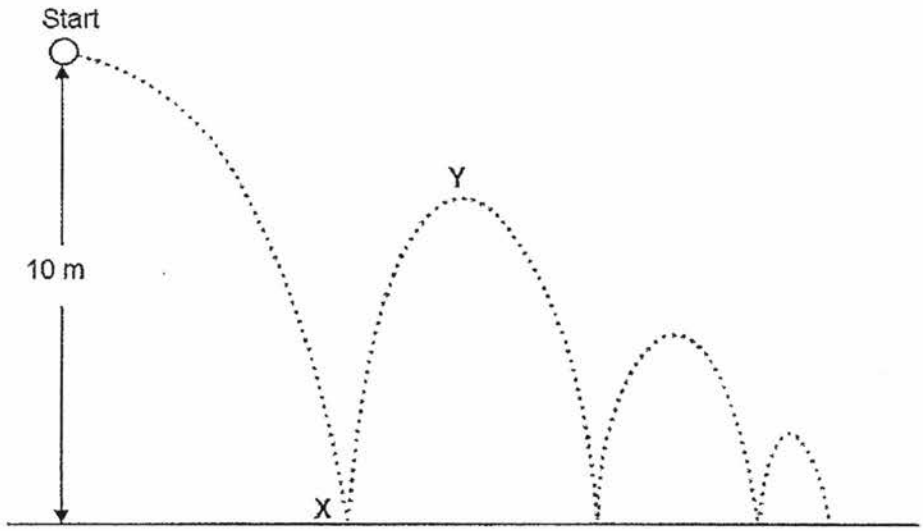


b i What is the energy conversion that happens in the wind turbine? [1]

ii List two advantages (besides cost) of using wind turbines. [2]

iii List two disadvantages (besides cost) of using wind turbines. [2]

C4 The diagram below shows a rubber ball being dropped from a vertical height of 10 metres. The ball bounces several times off the level ground before coming to a rest. Each subsequent bounce of the rubber ball reaches a lower vertical height compared to the previous bounce. Assume that air resistance is negligible in this scenario. The initial gravitational potential energy of the rubber ball is **60 J**.



a Define energy. [1]

b **i** State the amount of gravitational potential energy when the ball is **5 m** above the ground. [1]

ii State the amount of kinetic energy when the ball is **5 m** above the ground. [1]

iii State the amount of kinetic energy just before the ball hits the ground at point **X**. [1]

iv State the law of conservation of energy. [1]

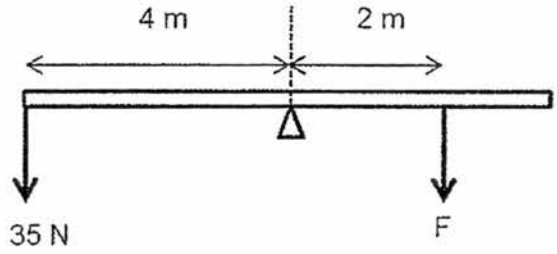
c **i** Given that gravitational potential energy, E_p = 60 J at the start and g = 10N/kg, calculate the mass of the rubber ball. [2]

ii Assuming all the gravitational potential energy, E_p is converted to kinetic energy, E_k, calculate the maxium speed of the rubber ball. [2]

d Explain why each subsequent bounce of the rubber ball reaches a lower vertical height compared to the previous bounce [1]

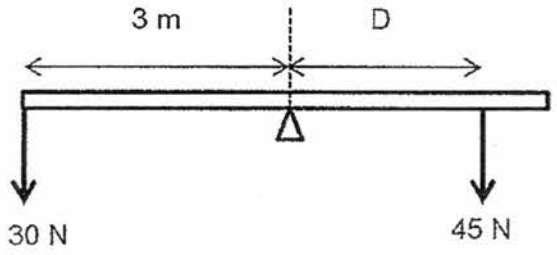
C5 **a** State the principle of moments. [1]

b For the following examples, calculate the unknown quantity.



i Calculate the **anti-clockwise moment.** [1]

ii Calculate the **force, F** needed to keep the rod balanced. [1]



iii Calculate the **anti-clockwise moment.** [1]

iv Calculate the **perpendicular distance, D** needed to keep the rod balanced. [1]

c You are tasked to find the density of an irregularly-shaped solid, **R**, using the apparatus as stated in the table below. You need not use all the apparatus. [5]

measuring cylinder	string	spring balance
electronic balance	conical flask	stopwatch

List down the procedures for finding the density of **R**.
R is small enough to fit into the measuring cylinder and it sinks in water.

End of Section C

Ang Mo Kio Secondary School

Mid-Year Examination 2016

Secondary One Express Science

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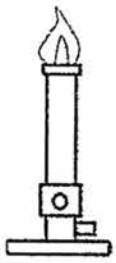
Name: _____( ) Class: _____

Section B: Structured Questions (30 marks)

Answer **ALL** the questions in the space provided. Show all workings clearly.

B1 Alice and Mary were asked by the teacher to heat up a small amount of liquid in a round bottomed flask clamped to a retort stand.

a In the space provided below, draw the experimental setup of the heating of liquid using a sharp and dark pencil. The Bunsen burner has been drawn for you. [2]



b State one safety rule that Alice and Mary must follow while heating substances in the laboratory. [1]

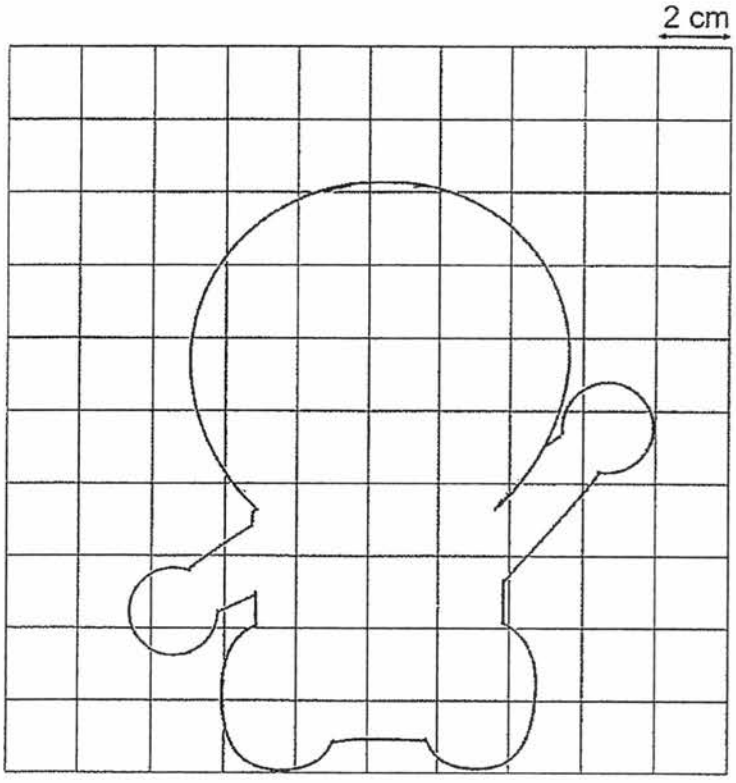
.....

c The Bunsen burner is used for heating of the chemical. State and explain the type of flame that should be used. [2]

.....

.....

B2 **a** The outline of an irregular object is drawn on a piece of grid paper as shown below. Given that the length of each side of one square is 2 cm, estimate the area of the object. Show your working clearly in the space provided. [3]

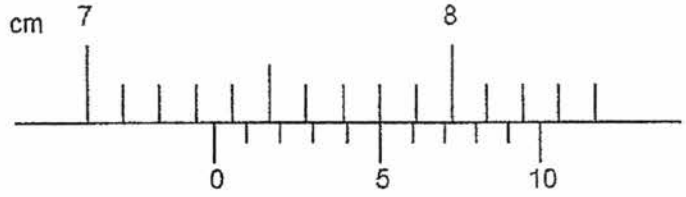


b Convert the following readings to the units indicated. [2]

i 3 000 000 μm = ... m

ii 5.67 h = ... min

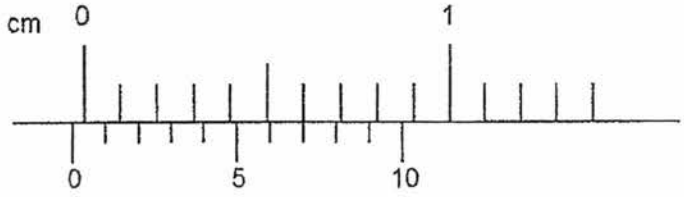
c A pair of Vernier calipers is used to measure the diameter of a tube, and the reading is shown below.



i State the reading of the Vernier calipers. [1]

.....

ii The Vernier calipers has a zero error as shown below. [1]



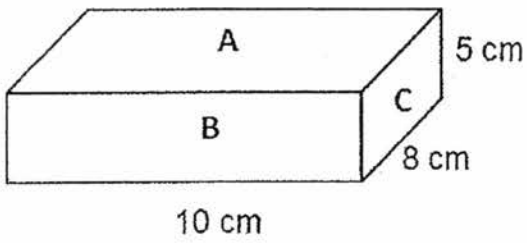
State the reading of the zero error.

.....

iii Calculate the **actual** diameter of the tube. [1]

.....

B3 A block of density 0.5 g/cm^3 has dimensions of 10 cm by 8 cm by 5 cm, as shown below.



a i Define density. [1]

.....

ii Calculate the mass (in kg) of the block. [2]

iii If the block is placed in water (which has density of 1 g/cm^3), what will happen to the block? [1]

.....

b When the block is placed on a piece of sponge, it will leave a depression in the sponge due to the pressure exerted.

i Calculate the force (weight) that the block will exert on the sponge. (g = 10 N/kg) [1]

ii Pressure exerted (in Pascal) when placed on face **A.** [2]

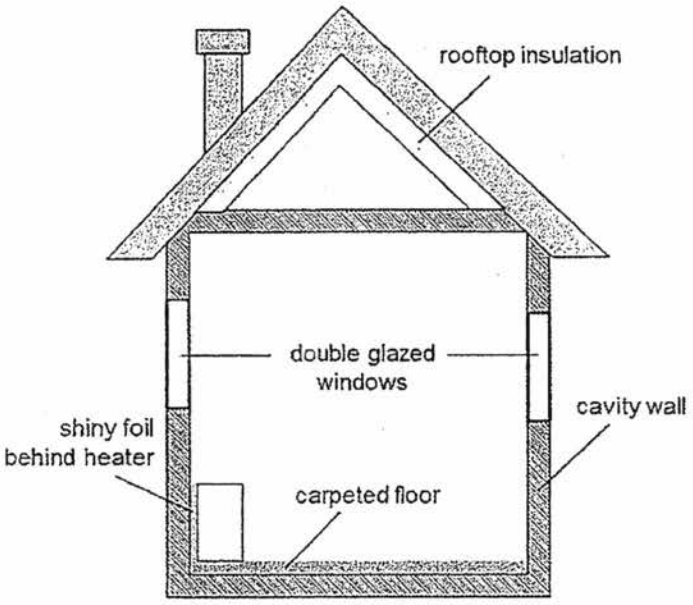
iii Pressure exerted (in Pascal) when placed on face **B.** [2]

iv Pressure exerted (in Pascal) when placed on face **C.** [2]

v State the face that the block should be placed on to leave the **shallowest depression.** [1]

.....

B4 The diagram below shows a typical house found in cold countries. These houses usually have a thick layer of fibreglass in the rooftop for insulation. The windows of the house are either double- or even triple-glazed. The walls of the house are cavity walls and the floors are mostly carpeted. The house owners take these measures to reduce heat loss in the house, especially during the winter season.



a Explain why the reduction of heat loss for houses in temperate countries is important. [1]

.....

.....

b Explain how each of the following method of insulation reduces heat loss.

i Cavity wall with air trapped. [1]

.....

.....

.....

ii Double glazed window with vacuum in between the glass. [1]

.....

.....

.....

c Different substances have different thermal conductivity. List the following substances according to their thermal conductivity. [2]

copper	wood	plastic	glass

Best → Worst

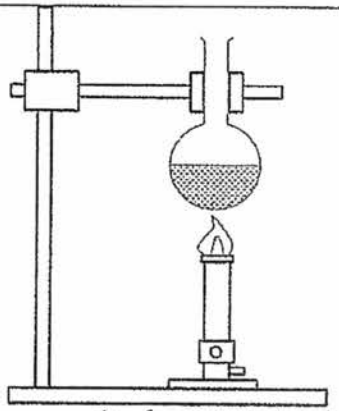
END OF PAPER

1E Science Mid-Year Exam 2015 Answer Keys

Section A: MCQ (30%)

1. C	6. B	11. C	16. A	21. B	26. C
2. D	7. A	12. D	17. C	22. B	27. A
3. B	8. D	13. B	18. A	23. A	28. B
4. D	9. A	14. A	19. A	24. A	29. D
5. B	10. C	15. A	20. C	25. D	30. C

Section B: Structured Questions (30%)

Question	Answer	Mark allocation
B1a	 - 1m for retort stand - 1m for RBF	2

	Reject: - Enclosed RBF - Closed clamps - No clamps	
b	Wearing of safety goggles ***Reject:*** wear goggles, laboratory spectacles, tie up long hair (question did not mention that they have long hair) ***Accept:*** never heat flammable liquids over naked flame, leave the Bunsen burner on unattended, point the mouth of test-tube away from people, not open airhole completely to prevent strike-back, safety glasses	1
c	Non-Luminous. Non-luminous flame is hotter and does not produce soot. ***Reject:*** If luminous flame is written, the whole question is wrong, unluminous ***Accept:*** higher temperature, more steady	1 1
B2a	Number of squares = 38 Area of 1 square = $2 \times 2 = 4\ cm^2$ Area of irregular object = $38 \times 4 = 152\ cm^2$	1 1 1
bi	3 m	1

ii	340.2 min	1
ci	7.35 cm	1
ii	-0.03 cm	1
iii	7.38 cm *ECF:* if working is correct and student uses the answer from ci-ii for calculation - 1m for no units	1
B3ai	Density is the **mass per <u>unit</u> volume.** ***Reject:*** mass over volume, mass divide by volume	1
ii	mass = density x volume or 0.5 x (10 x 8 x 5) = 200 g = 0.2 kg	1 1
iii	The block will float.	1
bi	Weight = m × g = 0.2 kg × 10 N/kg = 2 N *ECF:* from aii	1
ii	Area of face A = 8×10 = 80 cm^2 = 0.008 m^2	1

	Accept: if area is calculated correctly with proper word statement Pressure = (0.2 × 10) / 0.008 m^2 = 250 Pa	1
iii	Area of face B = 5×10 = 50 cm^2 = 0.005 m^2 *Accept:* if area is calculated correctly with proper word statement Pressure = (0.2 × 10) / 0.005 m^2 = 400 Pa	1 1
iv	Area of face C = 5×8 = 40 cm^2 = 0.004 m^2 *Accept:* if area is calculated correctly with proper word statement Pressure = (0.2 × 10) / 0.004 m^2 = 500 Pa	1 1
v	Face **A**	1
B4a	Less energy will be needed to keep the house warm, so that there will be less damage to the environment (e.g. pollution from a coal-fired power plant)/ save cost/ trap heat in the house. ***Reject:*** people will not freeze. Question emphasis is on the **house** so have to answer accordingly. ***Accept:*** less energy used, less pollution or less cost to keep house warm, trap heat in the house.	1
bi	Air is a **poor conductor of heat.** The layer of air trapped between the internal and external walls of the house **reduces heat loss due to conduction.**	1

	Accept: insulator/ bad conductor of heat; trap heat	
ii	The **vacuum** between the glass **cannot conduct heat.**	1
c	<table><tr><td>Best</td><td></td><td></td><td>Worst</td></tr><tr><td>copper</td><td>glass</td><td>plastic</td><td>wood</td></tr></table>	2 (2 correct 1m)

Section C: Free Response Questions (40%)

Question	Answer	Mark allocation	Markers' report
C1a	Thermal energy is transferred from a region of **higher temperature to a region of lower temperature.** *Reject:* • Heat travels from hotter place to colder place • Heat is transferred by air to the surrounding • Travel from high temperature to low temperature (no mention of heat) *Accept:* • Heat in A is conducted away by copper to B • Heat is transferred through a medium • Copper gained heat from boiling water and lost heat to the surrounding	1	• Must specify heat from a region of **higher temperature** to a region of **lower temperature.** • Explanation on conduction is accepted.

bi	The temperature in cup **A** will drop While the temperature in cup **B** will rise *Reject:* • A lost heat, B gain heat *Accept:* • Boiling water will cool down, the water at room temperature will become hotter	1 1	
bii	There is a **net transfer** of heat from Cup A to Cup B by **conduction** through the copper bar. *Accept:* • Heat is conducted away from A to B	1 1	• Many did not write **"net"** transfer of heat. • Many did not state the process of conduction.
ci	Joel rubs his hands together and heat is produced. The **heat** from his hand causes the **air** in the flask to **expand.** Thus, the air increases in volume and **escape through the tube** into water. *Accept:* • Air pushed out as bubbles	1 1	
ii	When the flask is cooled, the **water will rise up the tube.**/ Water **enter flask.**	1	

	Reject: • Water in the basin decrease		
iii	This is because the **air contracts** and **volume decreases,** creating **space for the water** to travel up the tube. *Reject:* • Air decrease so water can enter the tube • Air gets smaller • Water enters the tube *Accept:* • Air takes up less space • Partial vacuum is created and the difference in pressure inside the tube and outside the tube allows water to enter	1 1	• Many did not write **volume decreased**
C2a	Metal C is a **better heat conductor (1/2)** than metal A hence it will **expand more (1/2)** This results in the bimetallic strip **bending downwards** *Reject:* • Bends towards where it is heated *Accept:* • Metal C gain more heat • Metal C gain heat faster • Bimetallic strip curve inwards in A's direction • Bends towards A	1 1	

b	On the left side, metal C on the top **expands more (1/2)** resulting in the bimetallic strip **bending downwards (1/2)** On the right side, metal B at the bottom is a **better heat conductor (1/2)** that **expands more (1/2)** Resulting in the bimetallic strip **bending upwards**	1 1 1	
ci	Force is a **push or a pull.**	1	Poor
ii	Forces can move a stationary object. Forces can change the direction in which an object is moving. Forces can change the speed of a moving object. Forces can stop a moving object. ***Reject:*** • Force can move an object (must specify a stationary object) • Force can stop an object (must specify a moving object) • Gravitational force and frictional force	2 (any 2)	
iii	Friction can be an advantage (or a useful force) when it enables us to walk without slipping. Friction can be a disadvantage (or a nuisance) when it wears away materials or objects such as shoe soles, car tyres, machine parts. ***Reject:***	1 1	

	• Friction change the direction of the ball • Friction allows the ball to be kicked *Accept:* • Friction can stop the ball from rolling		
C3ai	Pressure is the **amount of force acting perpendicularly over a unit area.** *Reject:* • Force over area • Force divided by surface area *Accept:* • Force per unit area	1	
ii	The thin straps have a **small surface area** on which the heavy bag acts on the carrier. Hence **pressure** exerted on the carrier is **large** with a small area. *Reject:* • Pressure is heavier • Force is bigger, hence pressure is larger *Accept:* • Pressure is higher	1 1	• Many did not specify "**surface**" area • Many did not explain that the **surface area is small,** hence the pressure is large.

iii	The skis provide a **large surface area** on which force acts, which helps in **reducing the pressure** to allow the skier to move on soft snow without sinking into the snow.	1 1	
bi	Kinetic energy → electrical energy *Accept:* • Wind energy → kinetic energy → electrical energy	1	
ii	Wind energy does not require the extraction of raw materials and is therefore, renewable/ unlimited supply Wind turbines do not pollute the air or release greenhouse gases such as carbon dioxide. ***Reject:*** • Wind can produce a lot of energy *Accept:* • Wind is environmental-friendly / eco-friendly • Wind turbines can work at night • Wind can be found easily / readily	1 1	
iii	Wind energy may not be as reliable or consistent as fossil fuels in supplying energy./ requires large area of land for wind farm The rotating blades of wind turbines cause deaths and injuries to birds and bats.	1 1	

	Reject: • It is noisy • Need a lot of manpower • Troublesome to repair when damaged • The electrical energy produced is too little *Accept:* • It will cause noise pollution • It produce low frequency noise		
C4a	Energy is the ability to do work.	1	Very badly done
bi	30 J	1	
ii	30 J	1	
iii	60 J	1	
iv	Energy can **neither be created nor destroyed** but only **converted from one form to another.**	1	Many students left out "can only be **converted from one form to another.**"
ci	$E_p = m\ g\ h$ $m = 60\ J / (10\ N/kg \times 10\ m)$ $= 0.6\ kg$	 1 1	
ii	$E_k = ½\ m\ v^2$		

	$v^2 = 60\ J / (0.5 \times 0.6\ kg)$ $v = 14.1\ m/s$	1 1	
d	Some of the kinetic energy of the ball is **converted into sound energy and heat** when it hits the ground.	1	
C5a	When a body is in equilibrium, the sum of **clockwise moments** about a pivot is **equal** to the sum of **anticlockwise moments** about the **same pivot.**	1	• Very badly done • Many left out " When a body is in equilibrium" and " about the **same pivot.**"
bi	$4\ m \times 35\ N = 140\ Nm$	1	• No working for each question (-1/2) • No or wrong units for one or more questions (-1) for all (5bi to 5biv)
ii	$2\ m \times F = 140\ Nm$ $F = 70\ N$	1	
iii	$30\ N \times 3\ m = 90\ Nm$	1	
iv	$90\ Nm = 45\ N \times D$ $D = 2\ m$	1	
c	1. Use the electronic balance to measure the mass of R. The mass reading is m. 2. Fill the measuring cylinder with some water. The volume reading is V1. 3. **Tie a string to R. Insert R gently into the measuring cylinder** in step 2. The volume reading is V2. 4. Volume of R = V2 – V1	1 1 1 1	• Many wrote "measure mass" after inserting into the measuring cylinder. (R will be wet, making the mass inaccurate) • Many did not write both points for step 3

	5. Density of R = m / (V2 – V1) ***Reject:*** • Use spring balance to measure mass • Measure the weight of R • Subtract to volume of water	1	