Name	Register Number	Class	Calculator Model

MANJUSRI SECONDARY SCHOOL
文 殊 中 學

智行兹顥

END OF YEAR EXAMINATION 2017

Subject:	Science (Physics, Chemistry)
Paper:	5076/01
Level:	Secondary 3 Express
Date:	4 Oct 2017
Duration:	1 hour
Setter:	Ms Ada Chen and Mdm Trina Chang

Additional Materials: Optical Choice Answer Sheet (OTAS)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Write your Name, Index Number and Class on the Answer Sheet in the spaces provided unless this has been done for you.
Do not use staples, paper clips, glue or correction fluid.

There are **forty** questions on this paper. Answer **all** questions. 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.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done on this paper.
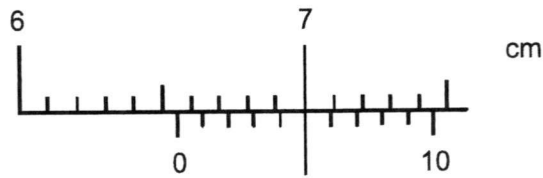A copy of the Periodic Table is printed on page **16**.
The use of an approved scientific calculator is expected, where appropriate.

Marks Obtained
40

This paper consists of **14** printed pages and **2** blank page, including this cover page.

2

Answer **all** questions.

1   The diagram below shows part of a vernier calipers.
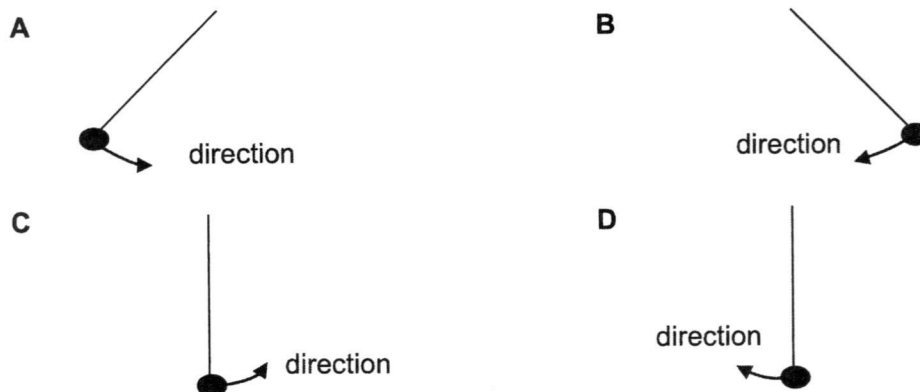

What is the reading on the vernier calipers?

A   6.50 cm   **B**   6.55 cm   **C**   7.00 cm   **D**   7.45 cm

2   A pendulum has a period of 1.0 s. A stopwatch is started when the pendulum is vertical and is moving to the right as shown in the diagram below.
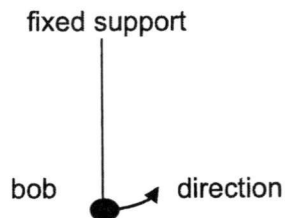
Which diagram shows the position and the direction of the pendulum 2.5 s later?

3   Which of the following best describes the motion of an object, represented by the distance-time graph below?
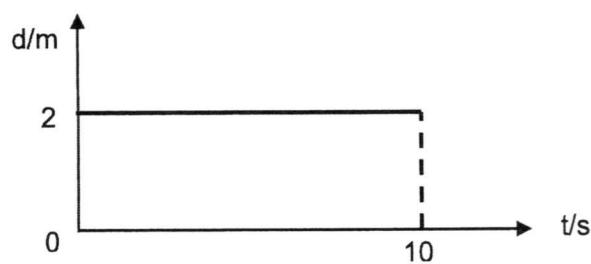
A   The object is stationary.

B   The object travels a total distance of 20 m.

C   The object travels at a constant speed of 2 m/s.

D   The object travels at a constant acceleration of 2 m/s^2.

4 Which of the following speed-time graphs shows a moving object undergoing increasing acceleration?
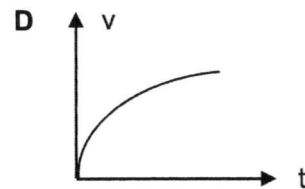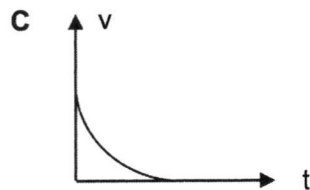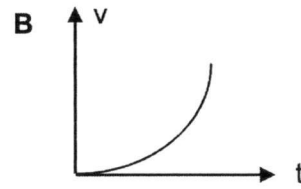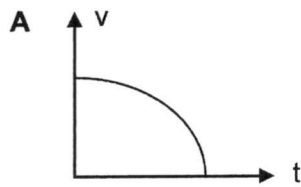
5 The diagram below shows four forces acting on an aircraft.
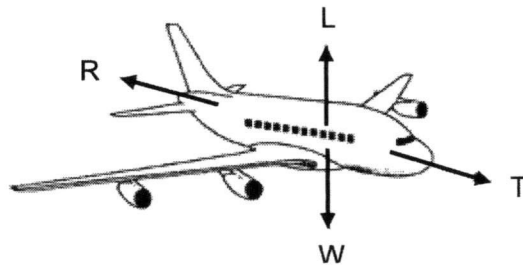
The four forces acting on the aircraft are

L – upward force due to the wings
R – air resistance
T – forward force due to the engine
W – the weight

The aircraft, flying at a constant height, is accelerating.

Which of the following is correct?

	vertical forces	horizontal forces
A	L > W	T = R
B	L > W	T > R
C	L = W	T = R
D	L = W	T > R

4

6   A wooden box is placed on a smooth surface and a force of 50 N acts in the direction as shown in the diagram below.

smooth surface
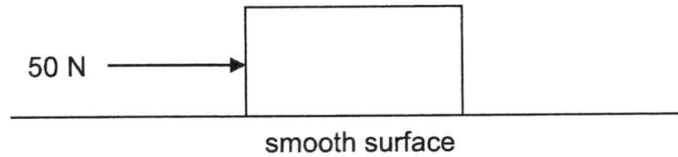
When the 50 N force is removed, the box will

A   stop immediately.

B   slow down and come to a stop.

C   continue to move with a constant acceleration.

D   continue to move in a straight line with a constant speed.

7   Two identical boxes are used to store granite. Box W is used to keep large granite rocks while box Y is used to keep small granite chippings.

box W   box Y
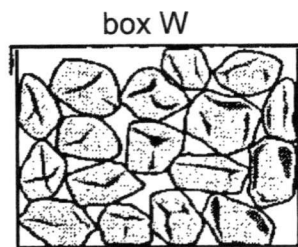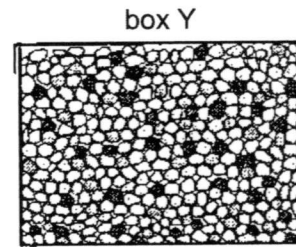
large granite rocks   small granite chippings

Which of the following statements is correct?

A   Box Y is heavier as there is less air in box Y.

B   Box W is heavier as there is more air in box W.

C   Box Y is heavier as the density of granite chippings is greater than the density of granite rocks.

D   Box W is heavier as the density of granite rocks is more than the density of granite chippings.

8   The mass of an object on the Moon is 60 kg.

Take gravitational field strength on the Moon to be 1.7 N/kg.

What is the mass of the object on Earth?

A   35.3 kg   B   60 kg   C   102 kg   D   600 kg

9 The diagram below shows an empty wine glass placed on a table.
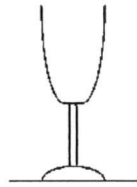
What is the effect on its stability and inertia when the wine glass is filled with water?

	stability	inertia
A	increases	increases
B	increases	decreases
C	decreases	increases
D	decreases	decreases

10 The diagram below shows a seesaw balanced by two girls sitting on opposite sides of the pivot O.

2.2 m   d

O

550 N   600 N
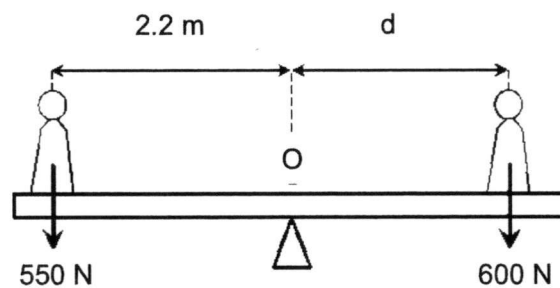
What is distance d?

A 2.0 m **B** 2.1 m **C** 2.2 m **D** 2.3 m

11 A sharp knife can cut through meat more easily than a blunt knife.

Which of the following statements about the sharp knife explains this correctly?

A It has a smaller surface area, thus producing a greater pressure.

B It has a larger surface area, thus producing a smaller pressure.

C It has a smaller area in contact with the meat, thus producing a greater pressure.

D It has a larger area in contact with the meat, thus producing a smaller pressure.

12 Mark is sitting on a four-legged chair as shown in the diagram below. The total area of contact of all four legs of the chair with the floor is 0.02 m².

If the pressure exerted on the floor is 20 000 Pa, what is the combined weight of the boy and the chair?

A   200 N   **B**   400 N   **C**   1000 N   **D**   1600 N

Refer to the diagram below to answer questions **13** and **14**.

A 120 kg car travelled up a smooth slope at a constant speed of 10 m/s. The car started at X and stopped at Y. Take gravitational field strength to be 10 N/kg.
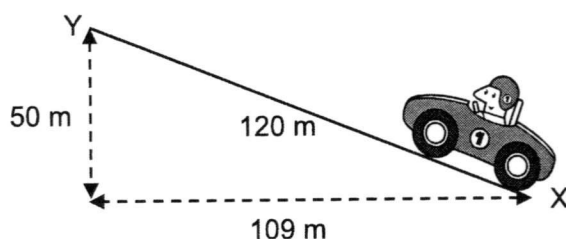
13 What was the gain in gravitational potential energy of the car when it travels from X to Y?

A   6000 J   **B**   12 000 J   **C**   60 000 J   **D**   120 000 J

14 What was the rate of work done by the car when it travelled from X to Y?

A   5000 W   **B**   5500 W   **C**   7000 W   **D**   12 000 W

15 Smoke particles in a transparent box are observed using a microscope. Small specks of light are seen to move around as shown in the diagram below.

What does this experiment demonstrate about air molecules?

A   They are in continuous random motion.

B   They can be seen through a microscope.

C   They move more quickly when they are heated.

D   They move because of collisions with smoke particles.

16 In which of the following are the particles furthest apart?

   A cold gas   **B** hot gas
   C cold liquid   **D** hot solid

17 In an air-conditioned room, standing on carpeted floor feels warmer than standing on ceramic-tiled floor.

   What is the best explanation for this?

   A Carpets are poorer emitters of heat than ceramics.
   B Carpets are made of materials which are poor conductors of heat.
   C Carpets are made of materials which are poorer absorbers of heat than ceramics.
   D Convection is more effective with ceramic-tiled floors as ceramic is a poor conductor of heat.

18 Amy was at a barbeque party. She felt warm while standing next to the barbeque pit made up of bricks.

   What were the main processes by which thermal energy from the burning charcoal in the pit was transferred through the brick wall and to Amy?

	through brick wall	to Amy
A	conduction	convection
B	convection	conduction
C	radiation	convection
D	conduction	radiation

19 Evaporation of a liquid produces a cooling effect.

   Which of the following statements about evaporation explains this correctly?

   A There are lesser liquid molecules in the remaining liquid.
   B The remaining liquid has less kinetic energy and more potential energy.
   C The average internal energy of all the remaining molecules is now lesser.
   D There is more thermal energy leaving the liquid than thermal energy entering it.

20 Some ice is placed in a beaker and heated until the beaker contains boiling water. The diagram below shows the temperature of the beaker and its contents during the experiment.
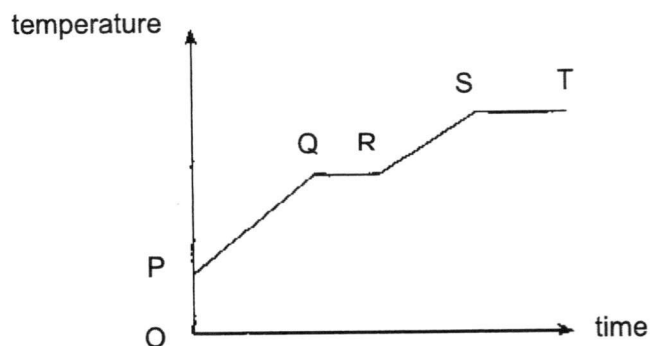
Which section of the graph indicates a mixture of solid and liquid?

A PQ

B QR

C RS

D ST

21 Which behaviour of the particles in a gas is incorrect?

A The particles are very far apart.

B The particles move at high speeds.

C The particles are arranged in regular patterns.

D The forces of attraction between the particles are negligible.

22 Iridium is one of the most corrosion resistant metals in the world.

Which property of iridium proves that it is pure?

A It is a reactive metal.

B It melts at a fixed temperature.

C It is neither acidic nor basic in nature.

D It reacts with hydrogen to produce an ionic compound.

23 A mixture of two sugars was compared with four different sugars using chromatography. The results are shown in the chromatogram below.

solvent flow

mixture | sugar 1 | sugar 2 | sugar 3 | sugar 4

start line

Which two sugars does this mixture contain?

A	1 and 2	B	1 and 4
C	2 and 3	D	2 and 4

24 A bottle of copper(II) oxide has been contaminated with some solid sodium chloride.

How can sodium chloride be removed from copper(II) oxide?

A   heat the mixture and allow it to cool.

B   add dilute acid to the mixture and filter.

C   place the mixture in a separating funnel.

D   adding excess water to the mixture and filter.

25 In which set do the three particles have the same total number of electrons?

	particle		
A	Cl^-	Br^-	I^-
B	F^-	Ne	Na^+
C	K^+	Ca^{2+}	Br^-
D	Li^+	K^+	Na^+

26 An element **X** has two isotopes which may be represented as ^{238}**X** and ^{235}**X**.

How does ^{238}**X** differ from ^{235}**X**?

A ^{238}**X** has 3 more protons and 3 more neutrons.

B ^{238}**X** has 3 more electrons and 3 more neutrons.

C ^{238}**X** has 3 more neutrons and the same number of electrons.

D ^{238}**X** has 3 more protons and the same number of electrons.

27 Propane has the structure shown.

$$
\begin{array}{ccccc}
 & H & H & H & \\
 & | & | & | & \\
H - & C - & C - & C & - H \\
 & | & | & | & \\
 & H & H & H &
\end{array}
$$
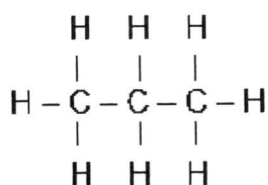
How many electrons in a molecule of propane, C_3H_8 are **not** involved in bonding?

A 0   **B** 6

C 3   **D** 8

28 Which two statements about ionic compounds are correct?

I They can dissolve in ethanol but not in water.
II They can conduct electricity in the aqueous and molten states.
III Their melting and boiling point is a result of the electrostatic forces of attraction present.
IV Their melting and boiling point is a result of the intermolecular forces of attraction present.

A I and II   **B** I and III

C II and III   **D** II and IV

29 Which of the following is most likely to be the melting point of an ionic compound?

A -182°C   **B** 54°C

C 114°C   **D** 943°C

30 Which of the following reactions would not liberate hydrogen gas?

A calcium and water

B zinc and dilute sulfuric acid

C magnesium and ethanoic acid

D iron and aqueous sodium hydroxide

31 Hydrogen chloride dissolves in water to produce a solution.

Which of the following ions is responsible for the acidic property of the solution?

A Cl^- **B** OH^-

C H^+ **D** H^+ and Cl^-

32 Which of the following oxides reacts with both dilute hydrochloric acid and aqueous sodium hydroxide?

A	calcium oxide	**B**	copper(II) oxide
C	magnesium oxide	**D**	zinc oxide

33 A student tests four different solutions with Universal Indicator.

Solution	E	F	G	H
Colour with Universal Indicator	purple	green	red	yellow

What are the pH values of the four solutions?

	E	F	G	H
A	2	9	4	7
B	4	7	8	9
C	9	5	12	2
D	12	7	2	5

34 Which compound is not used to prepare zinc sulfate by reaction with sulfuric acid?

A	zinc carbonate	**B**	zinc chloride
C	zinc hydroxide	**D**	zinc oxide

35 Which of the following does not increase across a period of the Periodic Table?

A nucleon number

B number of electron shells

C number of outermost electrons

D number of protons

36 The elements **J**, **K** and **L** in the Periodic Table have consecutive increasing atomic numbers.

If element **L** is a noble gas, what is the formula of the compounds formed between **J** and **K**?

A	JK	**B**	J_2K
C	JK_2	**D**	J_2K_2

37 Which of the following is not a product of the reaction sequence below?
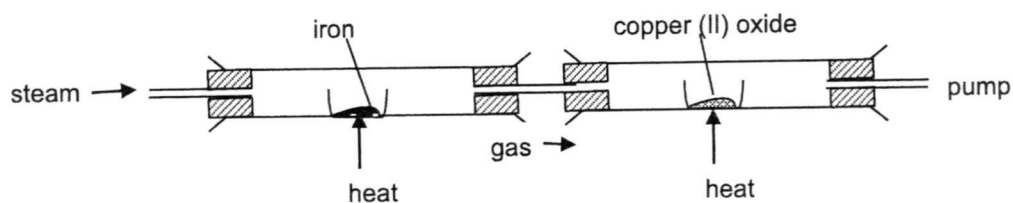
A	copper	**B**	oxygen
C	iron(III) oxide	**D**	water vapour

38 The diagram shows metal **X** reacting with water.
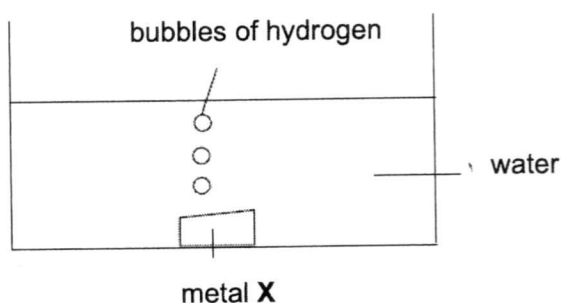
Which of the following could **X** be?

A	calcium	**B**	copper
C	potassium	**D**	sodium

39 Which air pollutant is **not** correctly matched to its source?

	air pollutant	source
A	carbon monoxide	complete combustion of fossil fuels
B	nitrogen oxides	lightning activity
C	sulfur dioxide	volcanoes
D	unburned hydrocarbons	incomplete combustion of fossil fuels

40 The apparatus shown was set up with 100 cm^3 volume of air in the graduated tube. The volume of gas in the graduated tube was measured at intervals for five days.
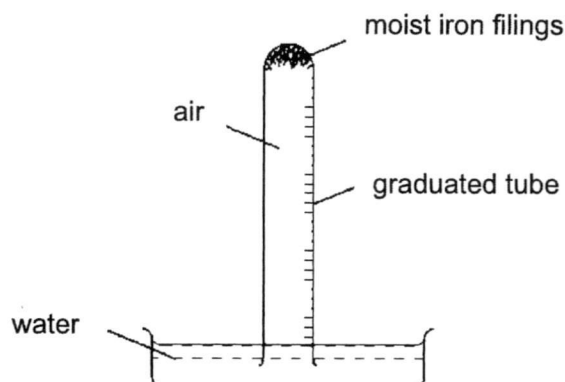
Which graph best represents how the volume of gas changes with time?

A

B

C

D

END OF PAPER

14

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15

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The Periodic Table of the Elements

Group

I	II												III	IV	V	VI	VII	0
							1 H Hydrogen 1											4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4												11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12												27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30		70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48		115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80		204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac actinium 89 †																

*58-71 Lanthanoid series

†90-103 Actinoid series

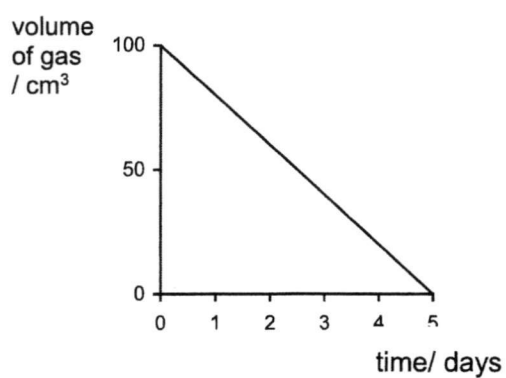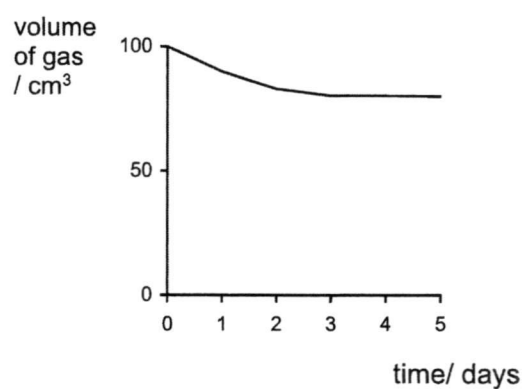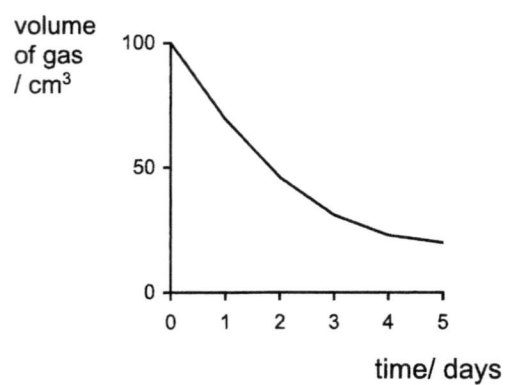|													
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

Key

$$\begin{array}{c} a \\ X \\ b \end{array}$$

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Name		Register Number	Class	Calculator Model

MANJUSRI SECONDARY SCHOOL
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智行慈願

END OF YEAR EXAMINATION 2017

Subject:	Science (Physics)
Paper:	5076/02
Level:	Secondary 3 Express
Date:	6 Oct 2017
Duration:	1 hour 15 minutes
Setter:	Ms Ada Chen

READ THESE INSTRUCTIONS FIRST

Write your Name, Register Number and Class in the spaces at the top of this page.
You may use a pencil for any diagrams, graphs or rough workings
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** 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 **65**.

For Examiner's Use	
Section A	**/ 45**
Section B	
	/ 10
	/ 10
Total	**/ 65**

This paper consists of **15** printed pages and **1** blank page, including this cover page.

Section A
Answer **all** questions.

1 Complete the following conversions.

(a) 1800 μs = ... s [1]

(b) 0.043 MW = ... kW [1]

(c) 640 kg/m³ = ... g/cm³ [1]

2 A pendulum bob was released from a height of 5.0 cm at position A. The pendulum took 0.40 s to swing from A to the lowest point at B.
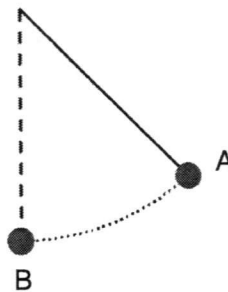
Fig 2.1

(a) Calculate the period of the pendulum.

period = ... s   [1]

(b) Some changes were then made to the pendulum. The string was shortened and the pendulum bob was replaced with one of larger mass.

State the effect on the period of the pendulum for each of the changes made:

(i) shortened string,

.... [1]

(ii) heavier pendulum bob.

.... [1]

3   A catapult is constructed as shown in Fig. 3.1. A small marble of mass 80 g is held
at the midpoint of the rubber cord. The rubber cord is then stretched with a force F
and the marble moves backwards. The tension in each cord is 20 N and the angle
between the cords is 60°, as shown in Fig. 3.2.

marble

F   rubber
cord

Fig 3.1

tension of
the rubber
cord,
$T_1 = 20$ N

60°

tension of
the rubber
cord,
$T_2 = 20$ N
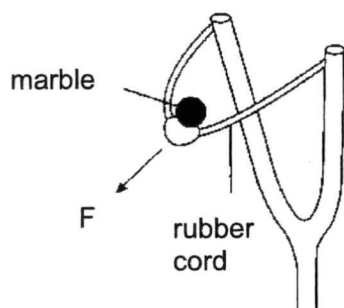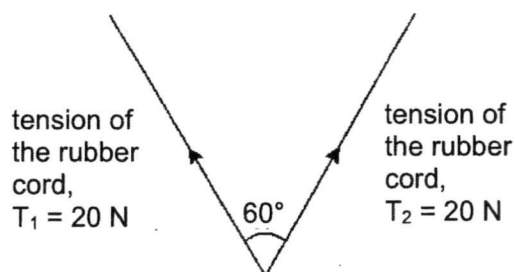
Fig 3.2

(a) State the difference between a scalar quantity and a vector quantity.

....

.... [1]

(b) In the space below, draw a scaled diagram to determine the magnitude of the
resultant force produced by T_1 and T_2.

resultant force = ... N   [4]

4   Fig. 4.1 shows a 500 kg car, initially at rest, being towed along a straight road. The
car accelerates at 1.25 m/s^2. During this time, the frictional force between the tyres
and the road surface is constant at 500 N.

force by the towing
vehicle on the car
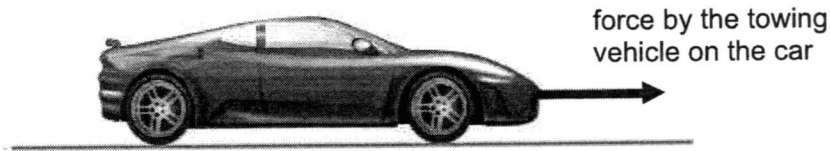
Fig 4.1

(a)   On Fig. 4.1, draw and label the frictional force acting on the car.   [1]

(b)   Calculate the resultant force on the car while it accelerates.

resultant force = ... N   [2]

(c)   Calculate the force exerted by the towing vehicle on the car.

force = ... N   [2]

5   Fig. 5.1 shows the largest gem-quality rough diamond ever found, the Cullinan Diamond. It weighs 3,106.75 carats (621.35 g).

Three years after it was found, the Cullinan Diamond was cut into about 100 pieces, resulting in nine large diamonds and many smaller diamonds. The density of the diamond is 3.52 g/cm^3.
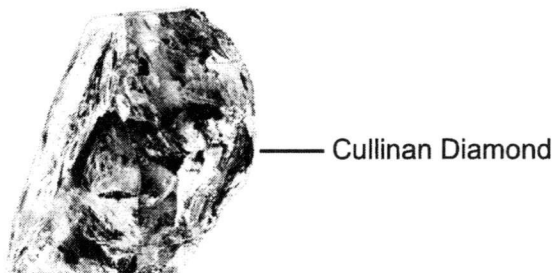
— Cullinan Diamond

Fig 5.1

(a) Calculate the volume of the Cullinan Diamond in cm^3.

volume = ... cm^3 [2]

(b) The Cullinan Diamond is placed in an alcohol solution. The density of the alcohol solution is 0.785 g/cm^3.

State whether the Cullinan Diamond will *float*, *sink* or *suspend* in the alcohol solution. Explain your answer.

....

....

....   [2]

(c) After cutting, one of the small diamonds has a mass of 6540 mg.

State the instrument a jeweller should use to measure the mass of the small diamond.

....   [1]

6 A farmer has two tractors. Each tractor has six wheels and a mass of 2400 kg. However the vehicles are fixed with different wheels as shown in Fig. 6.1.
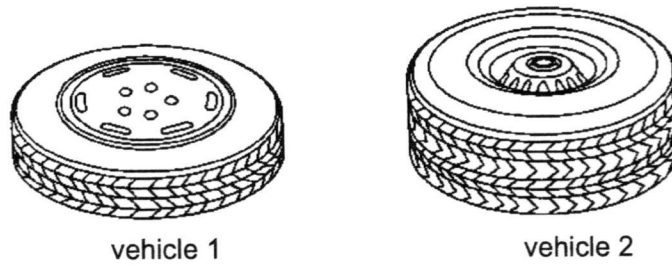
vehicle 1   vehicle 2

Fig. 6.1

(a) Which vehicle should the farmer use to drive across fields when the ground is muddy and soft?

Explain your answer.

....

....

....

.... [2]

(b) When vehicle 2 is driven on a flat ground, each wheel exerts a pressure of 100 kPa on the ground.

Assume that the mass of the vehicle is distributed uniformly over the six wheels and take gravitational field strength to be 10 N/kg.

Calculate the area of contact of each wheel with the ground.

area of contact = ... m² [3]

7   Fig. 7.1 shows a simplified diagram of a hydraulic jack used to raise a car.
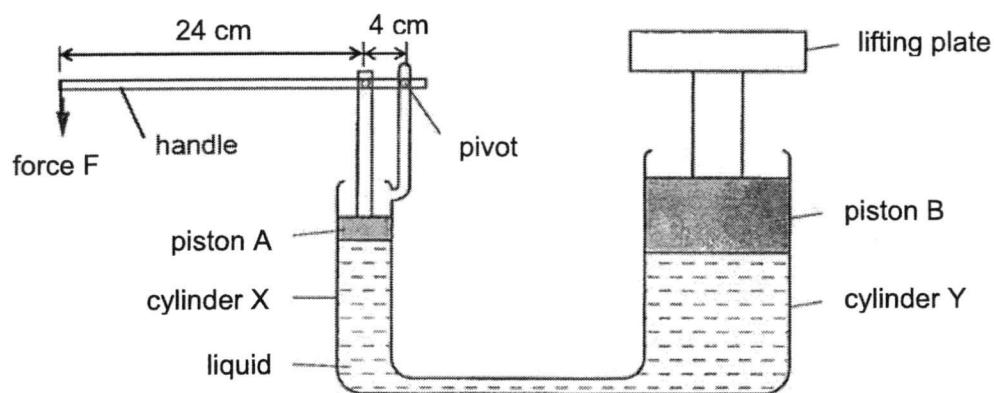
Fig. 7.1

When the jack is used, a force F is exerted at the handle as shown in Fig. 7.1. This causes piston A to exert a force on the liquid, producing pressure in the liquid. The pressure of the liquid in cylinder Y is the same as the pressure of the liquid in cylinder X.

(a) Define the moment of a force.

....

.... [1]

(b) A downward force F of 30 N is applied at the handle.

Calculate the moment produced by force F about the pivot.

moment = ... Nm   [2]

(c) Hence, calculate the force at piston A.

force = ... N   [2]

8   A unique beverage known as *teh tarik* can be bought from coffee shops in Singapore. Fig. 8.1 shows a person preparing *teh tarik*. He first dissolves the tea powder into the boiling water and condensed milk. He pours the tea from one mug to another and at the same time "pulls" the tea to increase its length between the two mugs.

Fig. 8.1

(a) Using kinetic theory of particles, describe the motion of the tea powders in the tea.

....

....

.... [3]

(b) Explain what causes the motion of the tea powders in **(a)**.

....

.... [1]

(c) Explain how the pulling action increases the rate of cooling of the tea.

....

.... [2]

9

9   Sarah is boiling some water in a metal saucepan. Fig. 9.1 shows the metal saucepan containing water placed on a hot plate.

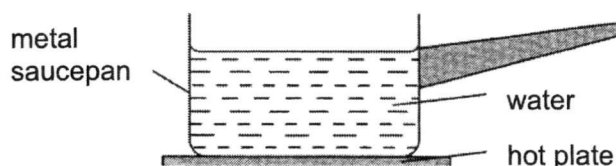metal saucepan

water

hot plate

Fig 9.1

(a) Using kinetic theory of particles, describe how thermal energy is transferred from the inner surface of the saucepan to the water next to it.

....

....

....

.... [3]

(b) Explain the process of how thermal energy is transferred throughout the water.

....

....

....

.... [3]

(c) After the water starts to boil, the saucepan is removed and left on a cork mat. Sarah wants to keep the water hot for as long as possible.

Suggest a suitable colour and texture for the saucepan. Explain your answer.

....

....

.... [2]

10

Section B

Answer any **two** questions.

10   Fig. 10.1 shows a small ball bearing rolling down a hemispherical bowl. The ball bearing has a mass of 0.045 kg.
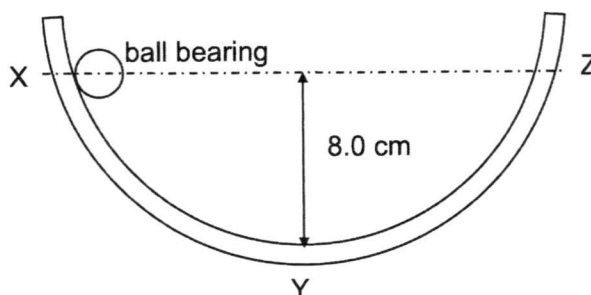
The ball bearing is released from rest from X.

Fig. 10.1

(a) State the Principle of Conservation of Energy.

....

....

.... [3]

(b) Calculate the loss in gravitational potential energy of the ball bearing as it rolls from X to Y.

loss in gravitational potential energy = ... J   [2]

(c) Calculate the speed of the ball bearing when it is at Y.

speed = ... m/s   [3]

11

10 **(d)** Provide a possible reason why the ball is not able to reach point Z.

....

....

.... [2]

12

11 Jolyn pushes a carton box along a straight and flat road for 35 s. The box first accelerates uniformly from rest to a speed of 1.5 m/s in 10 s. It then moves at a uniform speed of 1.5 m/s for a further 21 s, before decelerating uniformly to rest in 4 s.

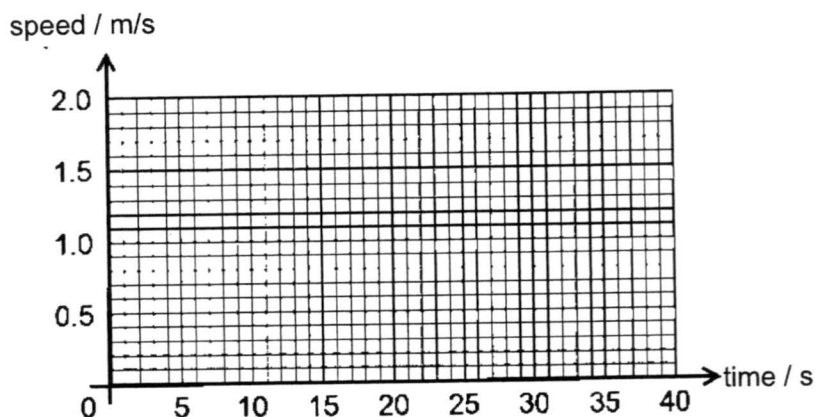**(a)** Complete Fig. 11.1 to show how the speed of the box varies in 35 s. [3]

speed / m/s

Fig 11.1

(b) Define acceleration.

.... [1]

(c) Calculate Jolyn's acceleration in the first 10 s.

acceleration = ... m/s² [2]

(d) Calculate the total distance travelled by Jolyn in the 35 s.

total distance = ... m [2]

11 (e) Hence, calculate the average speed of the box.

average speed = ... m/s   [2]

12 (a) Substance X is used in the cooling system of a refrigerator. The liquid form of X vaporizes easily. Liquid X is pumped through metal pipes around the food compartments and absorbs thermal energy along the way.

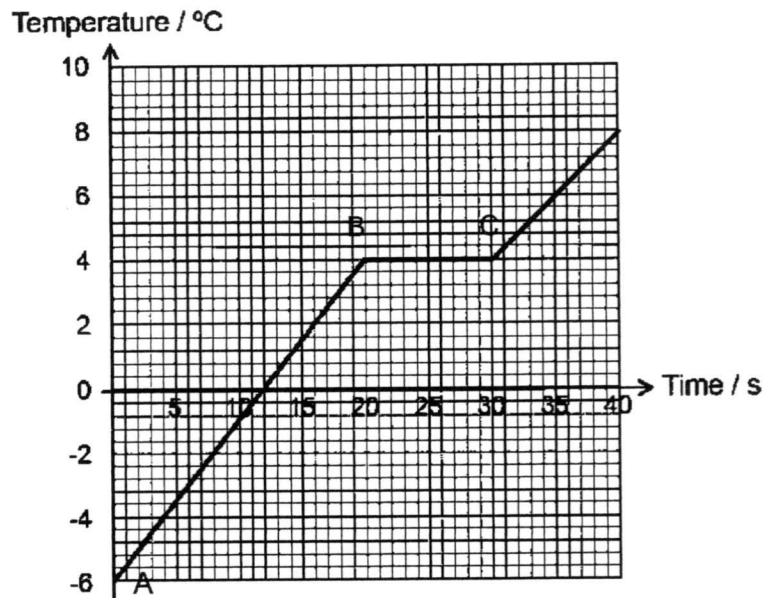Fig. 12.1 shows the heating curve of substance X.

Fig. 12.1

(i) State the boiling point of substance X.

boiling point = ... °C   [1]

(ii) Describe the changes in motion of the molecules in section AB as temperature increases.

....   [1]

(iii) Explain why there is no change in temperature in section BC, even though heat is being absorbed by X.

....

....

....

....   [3]

(iv) After reaching C, gas X will then be cooled to become liquid.

Name the process described above.

....   [1]

12 (b) A vacuum flask is usually used to store hot or cold content for extended period of time. A simplified diagram of a vacuum flask containing hot liquid is shown in Fig. 12.2.
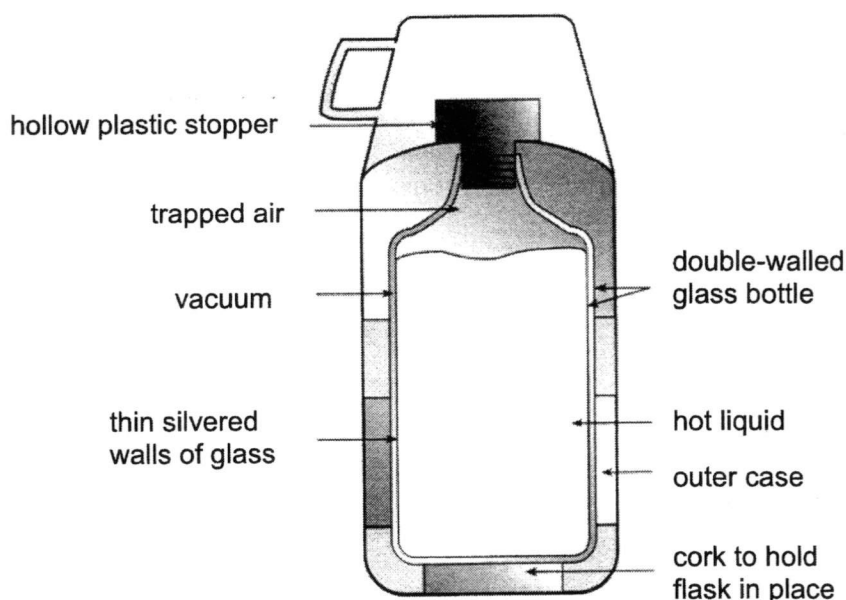

hollow plastic stopper

trapped air

vacuum

double-walled
glass bottle

thin silvered
walls of glass

hot liquid

outer case

cork to hold
flask in place

Fig. 12.2

List two features of the vacuum flask and explain how they help to retain the temperature of the content in it.
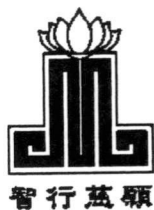
....

....

....

....

....

.... [4]

END OF PAPER

16

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17

5076/02/3EXP/EOY/17

Name		Register Number	Class	Calculator Model

MANJUSRI SECONDARY SCHOOL
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智行慈願

END OF YEAR EXAMINATION 2017

Subject:	Science (Physics, Chemistry)
Paper:	5076/01
Level:	Secondary 3 Express
Date:	4 Oct 2017
Duration:	1 hour
Setter:	Ms Ada Chen

Additional Materials: Optical Choice Answer Sheet (OTAS)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Write your Name, Index Number and Class on the Answer Sheet in the spaces provided unless this has been done for you.
Do not use staples, paper clips, glue or correction fluid.

There are **forty** questions on this paper. Answer **all** questions. 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.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done on this paper.
A copy of the Periodic Table is printed on page **14**.
The use of an approved scientific calculator is expected, where appropriate.

Marks Obtained
40

This paper consists of **2** printed pages including this cover page.

1	2	3	4	5	6	7	8	9	10
B	D	A	B	D	D	A	B	C	A
11	12	13	14	15	16	17	18	19	20
C	B	C	A	A	B	B	D	C	B
21	22	23	24	25	26	27	28	29	30
C	B	B	D	B	C	B	C	D	D
31	32	33	34	35	36	37	38	39	40
C	D	D	B	B	C	B	A	A	B

Name		Register Number	Class	Calculator Model
	Marking Scheme			

MANJUSRI SECONDARY SCHOOL
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智行慈顯

END OF YEAR EXAMINATION 2017

Subject:	Science (Physics)
Paper:	5076/02
Level:	Secondary 3 Express
Date:	6 Oct 2017
Duration:	1 hour 15 minutes
Setter:	Ms Ada Chen

READ THESE INSTRUCTIONS FIRST

Write your Name, Register Number and Class in the spaces at the top of this page
You may use a pencil for any diagrams, graphs or rough workings
W
Do not use staples, paper clips, highlighters, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section A
Answer **all** questions.
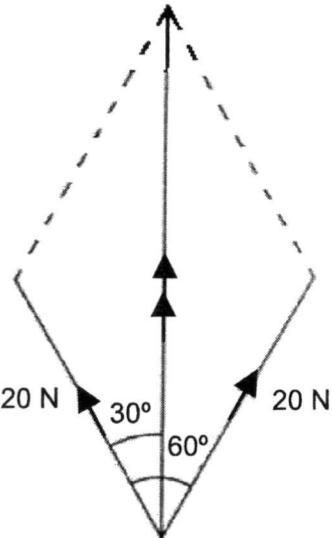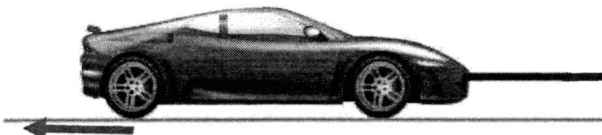Write your answers in the spaces provided on the question paper.

Section B
Answer any **two** 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 **65**.

For Examiner's Use	
Section A	/ 45
Section B	/ 20
Total	/ 65

This paper consists of 4 printed pages, including this cover page.

2

1a	0.001 8 s	1
1b	43 kW	1
1c	0.64 g/cm³	1
2a	period = 0.4 x 4 = 1.6 s	1
2b	(i) Decrease	1
	(ii) No change	1
3a	Scalar has only magnitude while vector has both magnitude and direction.	1
3b	 appropriate scale e.g. 1 cm to 4 N forces are drawn in the correct length forces are drawn in the correct direction resultant force = 34.6 N (+/- 1 N)	1 1 1 1
4a	 force by the towing vehicle on the car frictional force = 500 N	1

4b	$F_{resultant}$ = mass × acceleration
	            = 500 × 1.25
	            = 625 N
		1
		1

4c	force exerted on the car by the towing vehicle = 625 + 500 = 1125 N	1 1

5a	volume = mass / density
	            = 621 / 3.52
	            = 176.5199
	            = 177 cm³ (3 s.f.)
		1
		
		1

5b	Sink. The density of the diamond is larger than the density of the alcohol solution.	1 1
5c	Electronic balance / beam balance	1
6a	Vehicle 2. Since the area of contact between the wheels and ground is larger, the pressure is smaller, thus it is not likely to sink into the soft and muddy ground.	1 1

6b	pressure = force/area
	  100 000 = (2400×10) / area
	      area = 0.24 m²
		1
		1

	area of contact for each wheel = 0.24/6 = 0.04 m²	1
7a	The product of the force and the <u>perpendicular</u> distance from the <u>pivot</u> to <u>the line of action of the force</u>	1
7b	moment = force x perpendicular distance = 30 x 0.28 = 8.4 N m	1 1
7c	force = moment / perpendicular distance = 8.4 / 0.04 = 210 N	1 1
8a	The tea powders are in random [1] and continuous [1] motion, sliding pass one another.	2 1
8b	The water molecues bombard the tea powder.	1
8c	The surface area of the tea is increased. The tea evaporates faster/losses thermal energy faster through evaporation.	1 1
9a	Particles of metal gain kinetic energy and vibrate vigorously, colliding with the neighbouring water molecules and transfer some of their kinetic energy to the water molecules.	1 1 1
9b	The warm water at the bottom expands, becomes less dense and rises. The cool water at the top is denser and sinks. A convection current is formed which transfers energy to all parts of the water.	1 1 1
9c	Silvery and shiny surface. Poor emitter of infrared radiation.	1 1
10a	Energy cannot be created or destroyed, only can convert from one form to another. Total energy remains constant in a closed system.	1 1 1
10b	GPE = mgh = 0.045 x 10 x 0.08 = 0.036 J	1 1
10c	Loss in GPE = gainiin KE 0.036 = 0.5 x 0.045 x v² v = 1.2649 = 1.26 m/s	1 1 1
10d	Surface of the bowl is rough. There is energy loss due to friction and air resistance.	1 1
11a	 1 m for each section of the graph	3
11b	Acceleration is defined as the rate of change of velocity.	1
11c	a = (1.5 – 0) / 10 = 0.15 m/s²	1 1

4

11d	total distance = area under speed - time graph	
	$\qquad$ = ½ ×10 x 1.5 +1.5 × 21 +½ ×4 x 1.5	1
	$\qquad$ = 42 m	1
11e	average speed = 42 / 35	1
	$\qquad$ = 1.2 m/s	1
12a	(i) 4 °C	1
	(ii) The molecules move faster and more vigorously	1
	(iii) The heat absorbed is used to overcome the strong intermolecular force and	1
	change of state from liquid to gas takes place.	1
	There is no change in kinetic energy of the particles, thus there is no change in	1
	temperature.	
	(iv) Condensation	1
12b	Any two of the following:	4
	1. The <u>vacuum</u> between the walls of the flask [1] reduces heat loss by <u>conduction and convection</u> because these processes <u>need medium</u> [1].	
	2. The <u>silvered surfaces</u> [1] reduce heat loss by <u>radiation</u> because silvery colour and texture is a <u>bad emitter and absorber of radiation</u>	
	3. The <u>stopper made of plastic</u> [1] <u>is a poor conductor of heat</u> by <u>conduction</u> [1].	
	4. The <u>air trapped in the hollow stopper is a poor conductor of heat</u> and reduces heat loss by conduction.	