



# BEDOK SOUTH SECONDARY SCHOOL END-OF-YEAR EXAMINATION 2017

# 1EXP

CANDIDATE  
NAME

CLASS

REGISTER  
NUMBER

## SCIENCE

3 October 2017

2 hours

Candidates answer on the OMS and Question Booklet.

### READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on the work you hand in.  
Write in dark blue or black ink on both sides of the paper.  
Do not use staples, paper clips, highlighters, glue or correction fluid.

This paper consists of three sections. You are required to answer **ALL** questions in Section A and B and **FOUR** questions in Section C.

#### Section A (30 marks)

There are **30** questions in this section. 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 OMS provided.

#### Section B (30 marks)

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

#### Section C (40 marks)

Answer only **four** questions in this section.

Write your answers in the spaces provided on the question paper.

Show all necessary working. Round off all non-exact answers to 3 significant figures.

The number of marks is given in brackets [ ] at the end of each question or part question.

A copy of the Periodic Table is provided on page 30.

Setter: Ms. Denise Wong

**SECTION A: Multiple Choice Questions (30 marks)**

Each question below is provided with four answers. Select the correct answer and shade either **A**, **B**, **C** or **D** in the OMS provided.

Refer to the experiment below to answer questions 1 and 2.

A series of experiments were designed to test the solubility of substance **P** in water. The following table shows the different variables used in each experiment.

experiment	maximum mass of <b>P</b> dissolved / g	size of particles	volume of water used / cm <sup>3</sup>	temperature of water / °C
1	10	Large lumps	50	30
2	10	Fine powder	50	30
3	15	Fine powder	50	45
4	18	Fine powder	75	30

- Which set of apparatus was used to measure the maximum mass of **P** dissolved and the volume of water used?
  - electronic balance and beaker
  - burette and measuring cylinder
  - spring balance and measuring cylinder
  - electronic balance and measuring cylinder
- Which set of experiments can be used to show that solubility of **P** does **not** depend on the size of particles?
 

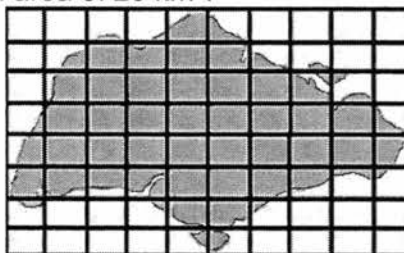
<b>A</b> 1 and 2	<b>B</b> 1 and 3
<b>C</b> 1 and 4	<b>D</b> 2 and 3
- A chemical powder has the following symbol on its bottle.



What precaution should a person take when using the powder?

- Use a spatula when taking out the powder from its bottle.
- Keep the powder away from the flame, spark or any heat source.
- Wash down unused powder into the sink with a lot of running water.
- Wear a face shield and lead-lined clothing before handling the powder.

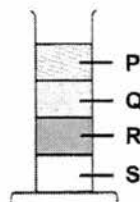
- 4 The figure below shows an outline of the area occupied by Singapore. Each grid square unit measures an area of  $20 \text{ km}^2$ .



What is the approximate area of Singapore?

- A** 80 km<sup>2</sup>
- B** 1 600 km<sup>2</sup>
- C** 800 km<sup>2</sup>
- D** 16 000 km<sup>2</sup>

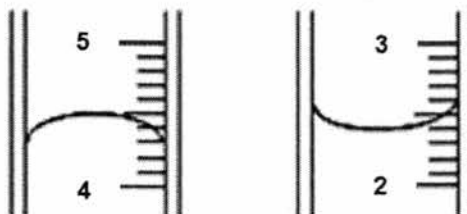
- 5 The diagram below shows four substances **P**, **Q**, **R** and **S**, placed in a measuring cylinder.



Which substance has the greatest mass if the volume of each substance is the same?

- |          |          |          |          |
|----------|----------|----------|----------|
| <b>A</b> | <b>P</b> | <b>B</b> | <b>Q</b> |
| <b>C</b> | <b>R</b> | <b>D</b> | <b>S</b> |

- 6 A student measured the volume of mercury and the volume of alcohol in two separate measuring cylinders, as shown in the diagrams below.



What are the **correct** volumes for each liquid?

	volume of mercury / cm <sup>3</sup>	volume of alcohol / cm <sup>3</sup>
A	2.4	4.5
B	2.6	4.3
C	4.5	2.4
D	5.5	3.6

- 7 Which of these groups of elements has an element that has different properties from the rest in the group?
- A iron, lead, tin, copper
- B helium, gallium, chlorine, neon
- C carbon, sulfur, nitrogen, oxygen
- D sodium, caesium, calcium, magnesium

- 8 Element X is found to have similar chemical properties as nitrogen in the Periodic Table.

Which of the following is true about element **X**?

- A** It is a magnetic material.
- B** It is an electrical insulator.
- C** It has a very high melting point.
- D** It belongs to Group III in the Periodic Table.
- 9** The formula of talcum powder was given in old textbooks as  $\text{MgO} \cdot \text{SiO}_2 \cdot \text{H}_2\text{O}$ . What is the number of oxygen atoms in one molecule of talcum powder?
- A** 2
- B** 3
- C** 4
- D** 5

- 10 Which of the sugar solutions will be the most saturated after the sugar has dissolved?

Figure 1 consists of four beakers labeled A, B, C, and D. Each beaker contains a certain volume of water and a number of small square blocks. Beaker A contains 100 cm³ of water and 3 blocks. Beaker B contains 75 cm³ of water and 1 block. Beaker C contains 60 cm³ of water and 3 blocks. Beaker D contains 20 cm³ of water and 2 blocks. The water level in each beaker is indicated by a horizontal line, and the blocks are represented by small squares.

- 11 The table below shows the colours of four solids **W**, **X**, **Y** and **Z**, and their solubilities in water.

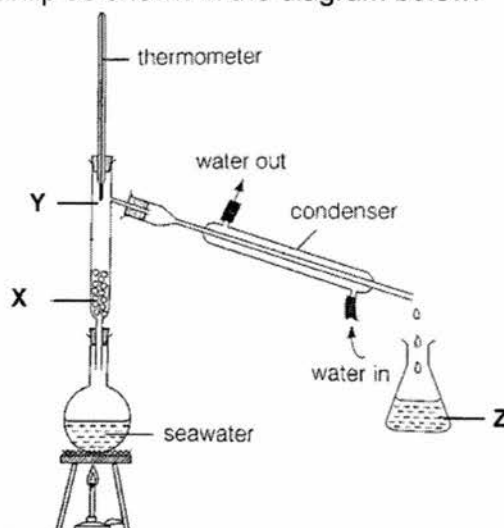
solid	colour	solubility in water
W	blue	insoluble
X	blue	soluble
Y	white	insoluble
Z	white	soluble

A mixture containing two of the solids was added to excess water, stirred and filtered. A blue filtrate and a white residue was obtained.

Which two solids were present in the mixture?

- A** W and X                      **B** W and Y  
**C** X and Y                      **D** X and Z

- 12** An experiment was set up as shown in the diagram below.



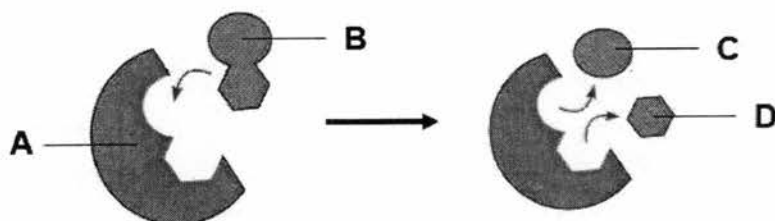
Which correctly identifies the substances found at positions **X**, **Y** and **Z**?

	X	Y	Z
A	seawater	seawater	water vapour
B	seawater	water vapour	pure water
C	water vapour	seawater	pure water
D	water vapour	water vapour	pure water

6

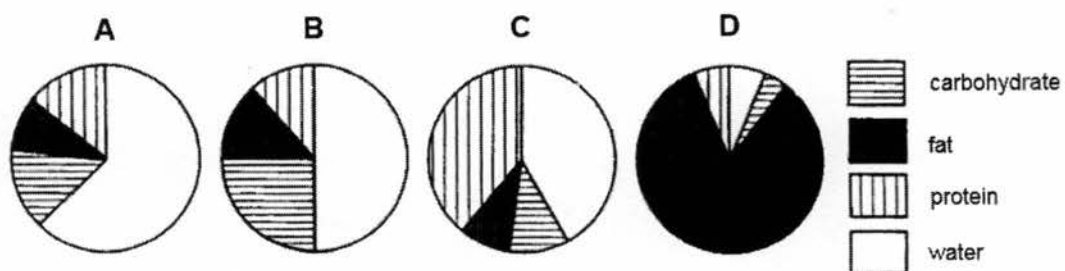
- 13 The diagram below shows the process of breaking down of a substrate molecule into its products.

What represents the substrate?



- 14 The pie charts below show the composition of four different foods, A, B, C and D.

Which food provides the most energy per serving for people living in cold countries?



- 15 The list below shows various secretions produced by the organs in the digestive system.

- I bile
- II gastric juice
- III intestinal juice
- IV pancreatic juice
- V saliva

Which secretion contains proteases?

- A I, II and III only                      B III, IV and V only  
C II, III, IV only                        D II, III, IV and V only

7

- 16 In an experiment, 1 cm<sup>3</sup> of lipase solution was added to a bottle of milk containing bile salts. A few drops of indicator was added. The table below show the colours of the indicator under different conditions.

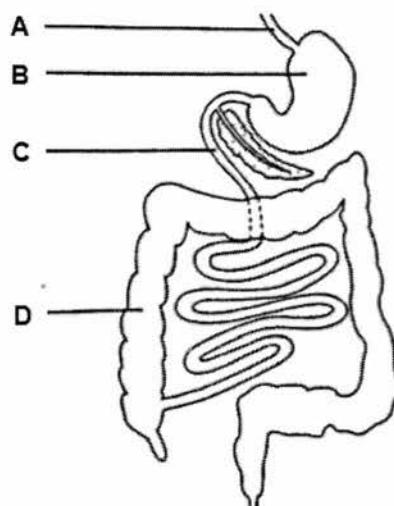
condition	colour
acidic	red
neutral	green
alkaline	purple

Which of the following will most likely be the colour observed at the beginning of the experiment and after 1 hour?

	colour before experiment	colour after experiment
A	red	red
B	green	purple
C	purple	red
D	purple	purple

- 17 The diagram below shows a section of the human digestive system. A man ate a drug encased in a film that can be broken down under acidic conditions. This drug can paralyse muscles and cause their loss of function.

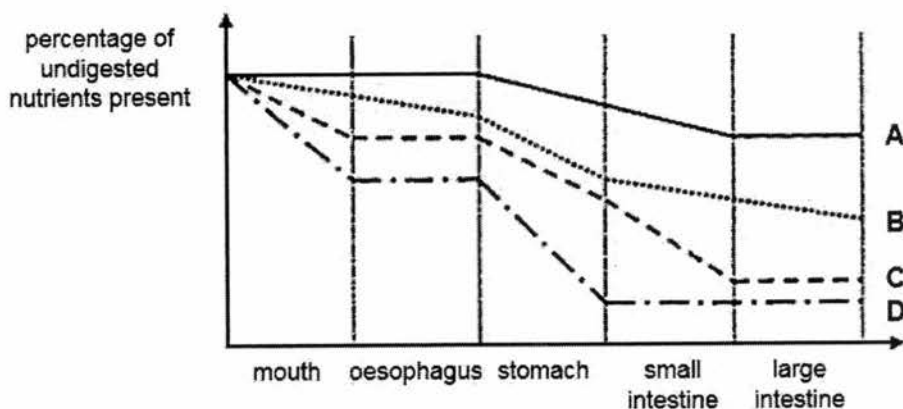
Which part of the digestive system will first experience loss of function?



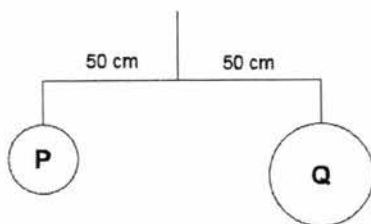
8

- 18 The graph below shows the changes in the percentage of undigested nutrients as food moves along the alimentary canal.

Which graph represents the digestion of protein through the alimentary canal?

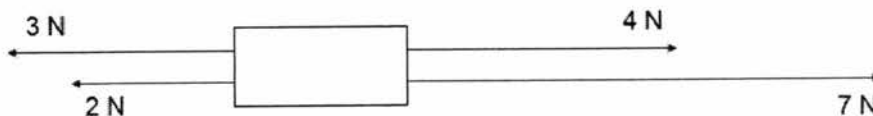


- 19 Two metal balls **P** and **Q** are suspended as shown in the experimental set-up below.



Which statement about **P** and **Q** is true?

- A **P** and **Q** have equal density.
  - B **P** and **Q** have equal volume.
  - C **P** and **Q** have equal mass and weight.
  - D **P** and **Q** have equal mass, volume and density.
- 20 The diagram below shows four forces acting on a block.



What is the resultant force?

- A 0 N
- B 5 N to the left
- C 6 N to the right
- D 11 N to the right



- 21 When an aeroplane flies in the sky, which of the following forces is **not** experienced by it?
- A air resistance
  - B gravitational force from the Earth
  - C normal reaction from the ground
  - D propelling force from the jet engine

- 22 Which diagram shows an application of the turning effect of a force?

A



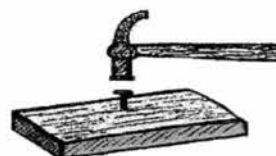
B



C



D



- 23 Two instruments are used on Earth to measure the weight and mass of an object. A spring balance reads 6 N and a beam balance requires 6 pieces of 100 g discs to balance. The measurements are then repeated on the Moon, where the gravitational field strength is 6 times less than on Earth.

Which correctly shows the results expected?

	reading on spring balance / N	number of 100 g discs required to balance
A	1	1
B	1	6
C	6	1
D	6	6

- 24 An elephant weighs 60 000 N. It stands on one foot with an area of 0.1 m<sup>2</sup>.

What is the pressure exerted on the ground when it stands on four feet?

- A 1 500 Pa
- B 60 000 Pa
- C 150 000 Pa
- D 600 000 Pa

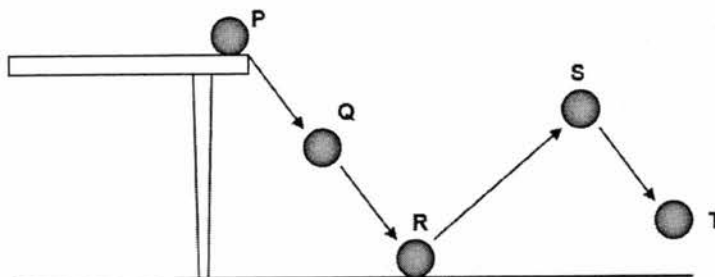
25 Which statements about friction is true?

- A It causes energy conversion to heat.
- B A stationary object is free from friction.
- C It only happens when an object moves.
- D It always acts in the same direction as the motion of an object.

26 Which person has done the most work?

- A A boy weighing 500 N climbing 1 m up a tree.
- B A girl lifting a 10 N book up onto a table 1 m high.
- C A weight-lifter holds a 600 N weight in the same position for 1 minute.
- D A man releasing a 100 N rock which then falls a distance of 10 m into a pit.

27 A ball is pushed from a table onto the floor and follows the path as shown.



Which statements are correct?

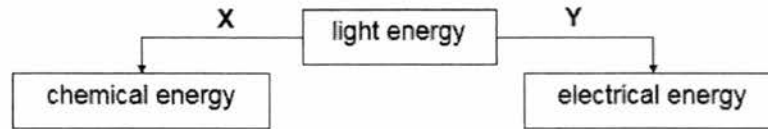
- I At P, the ball has maximum potential energy and minimum kinetic energy.
- II The ball has more kinetic energy at R than at Q.
- III The ball has zero kinetic energy at S.

- A I and II only
- B I and III only
- C II and III only
- D I, II and III only

28 Which object does not possess any form of potential energy?

- A a battery
- B a compressed spring
- C a piece of chocolate
- D a magnet placed on the ground

- 29 The diagram shows how light energy is converted to other forms of energy.



Which examples correctly represents **X** and **Y**?

	<b>X</b>	<b>Y</b>
<b>A</b>	cooking	solar water heater
<b>B</b>	steam engine	fossil fuels in car
<b>C</b>	electric light bulb	battery
<b>D</b>	photosynthesis in plants	solar toy car

- 30 Wendy is standing against a huge tree trunk and pushing against it in an attempt to make the tree fall to the ground. The tree did not move.

Which of the following is true?

	<b>work done</b>	<b>energy used</b>
<b>A</b>	yes	no
<b>B</b>	yes	yes
<b>C</b>	no	no
<b>D</b>	no	yes

**BEDOK SOUTH SECONDARY SCHOOL  
END-OF-YEAR EXAMINATION 2017  
SECONDARY 1 EXPRESS SCIENCE**

FOR EXAMINER'S USE	
SECTION A	
SECTION B	
SECTION C	
TOTAL	100

Class	Register Number	Name
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**SECTION B: Structured Questions (30 marks)**

Answer all questions in the spaces provided.

**B1** A student carried out an experiment to find out the density of a Styrofoam ball. She used a Vernier caliper to measure the diameter,  $d$  cm, of a Styrofoam ball. Fig. B1.1 shows part of the Vernier caliper when its jaws are closed while Fig. B1.2 shows the reading taken when the jaws of the Vernier caliper are used to measure the diameter of the Styrofoam ball.

For  
Examiner's  
Use

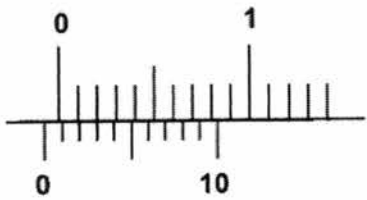


Fig. B1.1

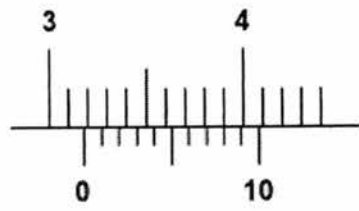


Fig. B1.2

(a) (i) State the zero error on the Vernier caliper.

..... [1]

(ii) Calculate the actual diameter  $d$  of the Styrofoam ball.

actual diameter,  $d$  ..... [1]

- (b) The volume of the Styrofoam ball can be calculated using the formula shown below where  $d$  is the diameter found in (a)(ii).

$$V = \frac{4}{3} \pi \left( \frac{d}{2} \right)^3$$

Given that  $\pi = 3.14$ , calculate the volume of the Styrofoam ball to one decimal place.

volume of Styrofoam ball ..... [1]

- (c) (i) The mass of the Styrofoam ball was measured to be 17.3 g. Calculate the density of the Styrofoam ball in  $\text{g/cm}^3$ .

density of Styrofoam ball ..... [1]

- (ii) State the density of the Styrofoam ball in  $\text{kg/m}^3$ .

..... [1]

- (d) Her friend suggested that a displacement can could be used to measure the volume of the Styrofoam ball. Explain why her suggestion would not work.

.....  
 ..... [1]

[Total : 6m]

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Examiner's  
Use

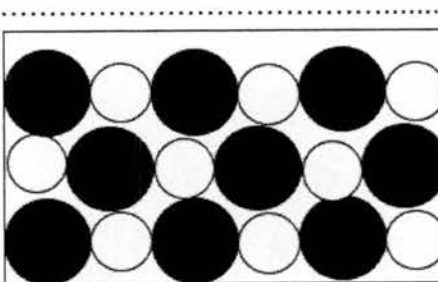
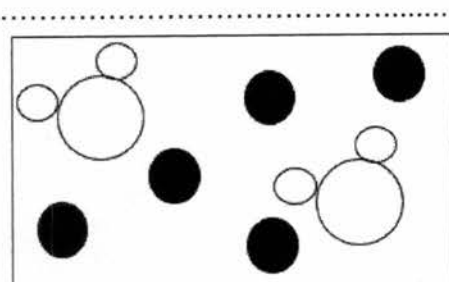
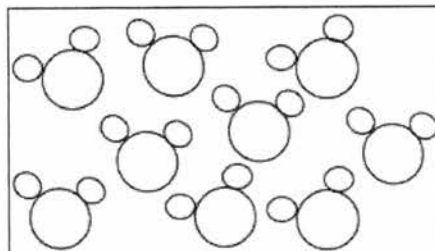
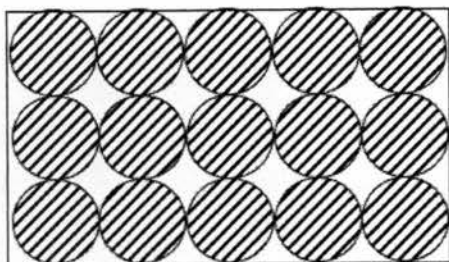
**B2** Table B2 shows some information about four substances, **P**, **Q**, **R** and **S**.

For  
Examiner's  
Use

substance	information
<b>P</b>	It is a colourless liquid. When it is distilled, only a colourless liquid is collected.
<b>Q</b>	It is a white solid formed by burning magnesium in oxygen.
<b>R</b>	It is a grey solid which cannot be decomposed into anything simpler.
<b>S</b>	It is a blue liquid. When it is distilled, a colourless liquid is collected.

**Table B2**

- (a) The diagrams below show four different representations of the four substances. Identify the substance **P**, **Q**, **R** or **S** that matches the diagrams below.



[2]

- (b) State two differences in properties between substance **S** and **Q**.

1 .....

.....

2 .....

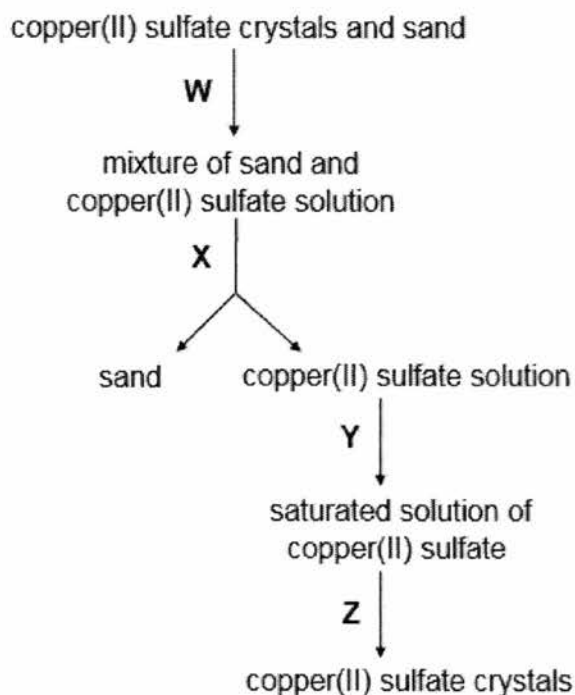
.....

[2]

[Total : 4m]

- B3** Fig. B3 shows a flowchart outlining the methods used to separate a mixture of copper(II) sulfate crystals and sand.

For  
Examiner's  
Use



**Fig. B3**

- (a) Identify the processes **W**, **X**, **Y** and **Z**.

**W** ..... **X** .....

**Y** ..... **Z** ..... [2]

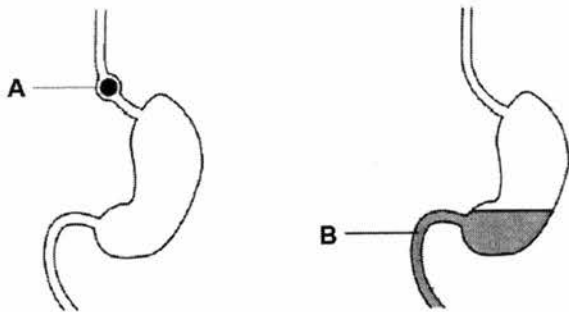
- (b) One of the ways to obtain a saturated solution is to heat the copper(II) sulfate solution under a Bunsen flame. Draw a **labelled** diagram to show the type of flame that is suitable for heating to obtain a saturated solution.

[1]

[Total : 3m]

For  
Examiner's  
Use

**B4** A person consumed a meal of grilled chicken chop that came with a side of mashed potatoes. Fig. B4.1 shows some of the food just before it entered the person's stomach at **A** and the same food as it left the stomach four hours later at **B**.



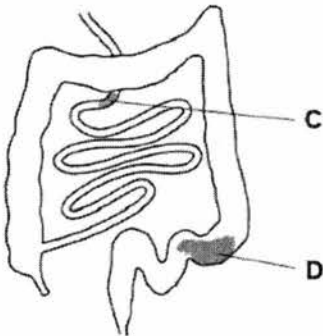
**Fig. B4.1**

(a) By placing ticks ( ✓ ) in the appropriate boxes in the table below, show how the major components of the food compare at positions **A** and **B**.

components of food	more at <b>A</b>	almost the same at <b>A</b> and <b>B</b>
starch		
protein		

[2]

(b) Fig. B4.2 shows the same food at position **C** and 24 hours later at position **D**.



**Fig. B4.2**

Explain what happened to the major components of the food between **C** and **D**.

.....

.....

.....

.....

[2]



- (c) Sometimes a sore can develop on the wall of the stomach. This condition is known as a stomach ulcer, which can cause a person pain. The pain may be relieved by taking a drug that reduces the amount of acid produced in the stomach.

Suggest how taking this drug may affect the processes taking place in the stomach.

.....

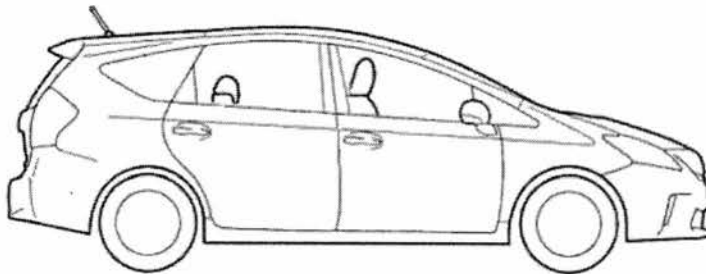
.....

.....

..... [2]

[Total: 6m]

- B5** Fig. B5 shows the outline of a Toyota Prius, a hybrid energy car that runs on both petrol and electricity. The mass of a Toyota Prius is 1325 kg. It has four tyres, each with a contact area of  $0.4 \text{ m}^2$  with the ground.



**Fig. B5**

- (a) (i) The car is reversing backwards when the driver applies the brakes to stop the car. On Fig. B5, draw and label an arrow to indicate the direction and position of the force that acts to stop the car. [1]
- (ii) Assuming that the gravitational field strength on Earth is  $10 \text{ N/kg}$ , calculate the pressure that the car exerts on the ground.

pressure ..... [2]

- (iii) When driving on soft sand, it is recommended that larger tyres are used. Explain why.

.....  
 ..... [1]

- (b) (i) Scientists have been researching on ways to reduce our dependence on fossil fuels to lessen the negative impact on the environment. Suggest a form of renewable energy that can be used to power our vehicles.

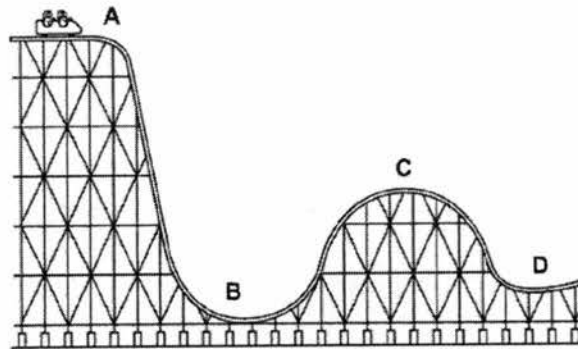
..... [1]

- (ii) Suggest why people still prefer to drive a car that runs on petrol fully, rather than a hybrid car.

..... [1]

[Total: 6m]

- B6** Fig. B6.1 shows part of a roller coaster track. Points **A**, **B**, **C** and **D** mark various positions along the track. A cart is positioned right before point **A**.



**Fig. B6.1**

- (a) Describe the energy changes of the cart from point **A** to **B**.

.....  
 .....  
 .....  
 .....  
 ..... [3]

- (b) Fig. B6.2 shows a simplified diagram of the roller coaster track from point **B** to **C**.

For  
Examiner's  
Use

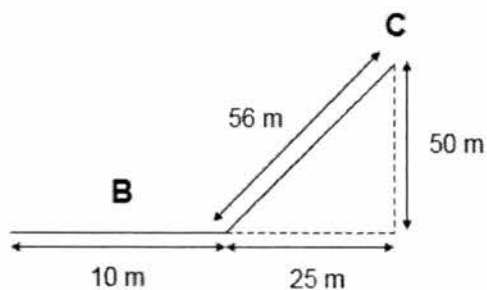


Fig. B6.2

- (i) The speed of the roller coaster was measured to be 25 m/s as it moved horizontally along part **B**. Calculate the time taken for the roller coaster cart to move along part **B**.

speed ..... [1]

- (ii) If the roller coaster cart does 158 000 J of work going up from the bottom of the slope to reach point **C**, calculate the force exerted by the roller coaster cart.

force ..... [1]

[Total: 5m]

- End of Section B -

**SECTION C: Free Response Questions (40 marks)**

For  
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Use

Answer any **four** questions in this section.

- C1** Mars 2020 is Mars rover mission by the National Aeronautics and Space Administration that aims to collect samples of rocks on Mars in 2020 to examine and study the possibility of past life on Mars. Currently, scientists rely on a small number of Martian meteorites that land on Earth to carry out tests. Table C1.1 shows some information about Mars and Earth.

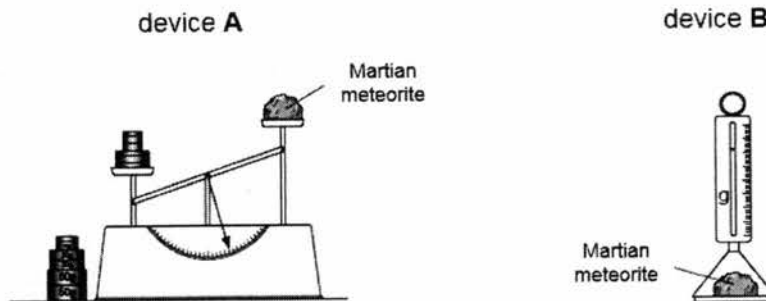
planet	gravitational field strength / N/kg
Earth	9.8
Mars	3.7

**Table C1.1**

- (a) State one attitude of scientists that are essential for working on projects such as Mars 2020.

..... [1]

- (b) The density of the Martian meteorites are determined by scientists. Fig. C1.2 shows two measuring devices that can be used to measure two physical quantities of the meteorite.



**Fig. C1.2**

- (i) Explain why the two devices will give different readings.

.....  
 .....  
 .....  
 ..... [2]

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For  
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Use

- (ii) The volume of a Martian meteorite was found to be  $813 \text{ cm}^3$ . Explain why the volume of the rock cannot be measured using a measuring cylinder.

..... [1]

- (iii) Without any calculation, state and explain the difference, if any, in the values of density of the rock on Earth and on Mars.

.....  
..... [2]

- (c) If the Mars 2020 mission is successful, liquid samples could also be collected back to Earth to analyse for the presence of water on Mars.

- (i) To determine the purity of the liquid samples, scientists may heat small samples of liquid samples to remove excess solvent to obtain any solute. Draw the experimental set-up in the space below and label all the apparatus required.

- (ii) State one safety precaution that must be taken in the lab when carrying out the experiment in (ci). [2]

.....  
..... [1]

- (iii) Describe another method and the results observed that scientists can carry out to conclusively determine if the liquid samples are pure water.

.....  
..... [1]

[Total : 10m]

- C2 (a)** Table C2.1 shows the maximum mass of three solids **A**, **B** and **C** that can dissolve in 100 cm<sup>3</sup> of 3 different solvents **X**, **Y** and **Z** at room temperature.

For  
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liquid	mass of <b>A</b> dissolved / g	mass of <b>B</b> dissolved / g	mass of <b>C</b> dissolved / g
<b>X</b>	25	40	0
<b>Y</b>	0	5	55
<b>Z</b>	35	8	3

**Table C2.1**

- (i) A student dissolved 10 g of solid **B** in 50 cm<sup>3</sup> of liquid **Y** in a beaker at room temperature. Describe and explain what she would observe.

.....  
 .....  
 .....  
 ..... [2]

- (ii) Explain what can be done to increase the rate of dissolving solid **A** in liquid **X**.

.....  
 ..... [1]

- (iii) A student accidentally mixed solids **A** and **C** in a container. Describe what can be done to allow him to separate both substances. Your answer should clearly indicate the apparatus and materials required.

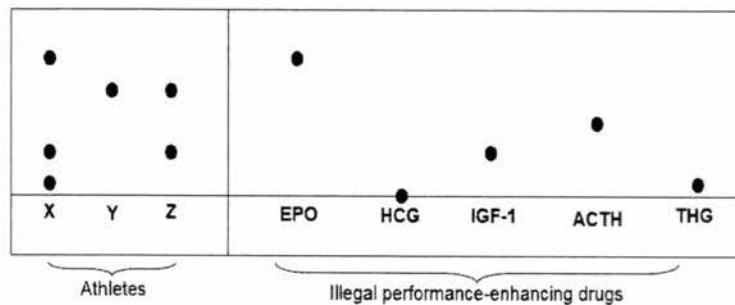
.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 ..... [3]

- (b) A sports official suspects that athletes **X**, **Y** and **Z** have used illegal performance-enhancing drugs to help them boost their running speed.

For  
Examiner's  
Use

Paper chromatography is used to analyse the athletes' urine samples. The results are compared to some known illegal performance-enhancing drugs EPO, HCG, IGF-1, ACTH and THG. Alcohol is used as the solvent.

The resulting chromatogram is shown in Fig. C2.2.



**Fig. C2.2**

- (i) Explain why the final positions of the samples of EPO and ACTH differ on the chromatogram.

.....  
 ..... [1]

- (ii) Explain why the sample of HCG remains at the starting line at the end of the experiment.

.....  
 ..... [1]

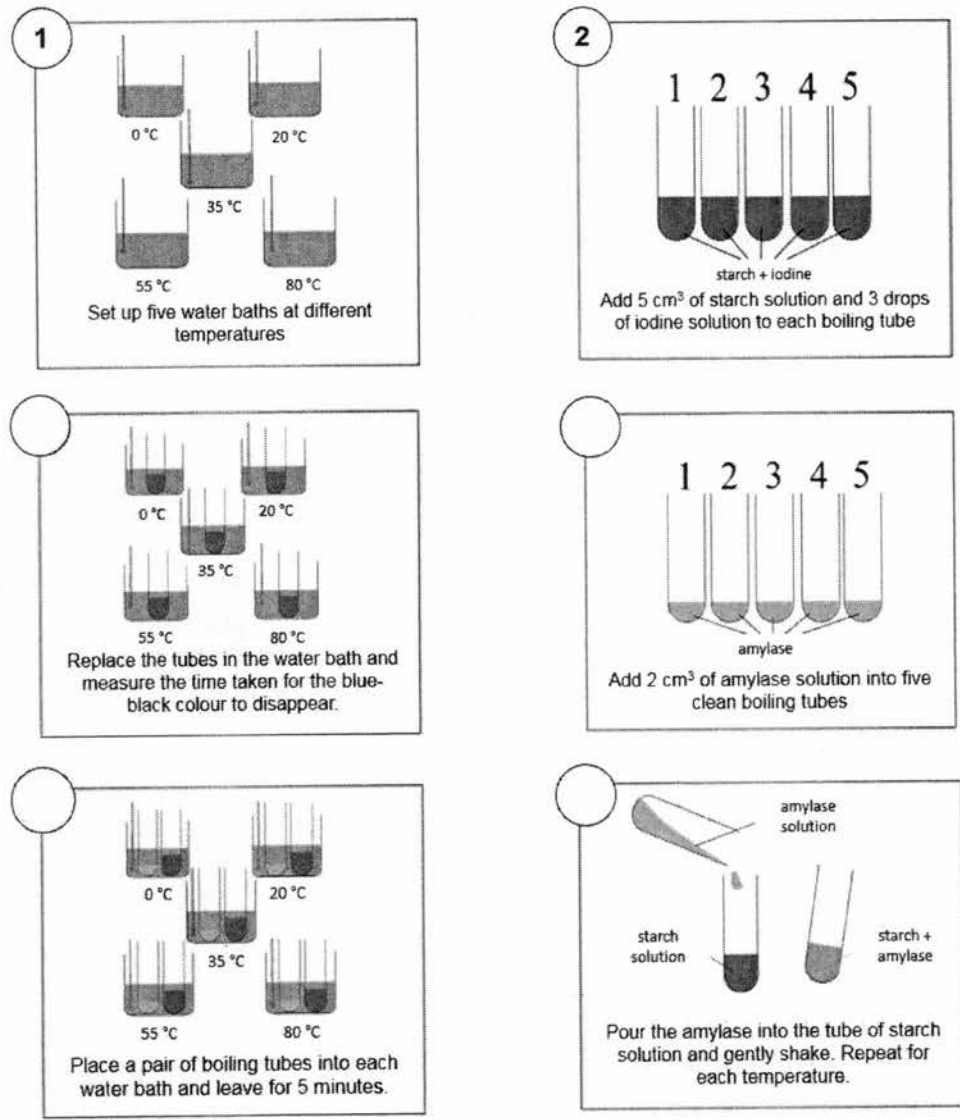
- (iii) Besides athlete **X**, which other athlete should be disqualified from the race? Explain your answer.

.....  
 .....  
 .....  
 ..... [2]

**[Total: 10m]**

**C3** Fig. C3.1 shows the steps of an experimental set-up inside a log book that a student was supposed to follow.

For  
Examiner's  
Use



**Fig. C3.1**

- (a) (i) The order of the steps was missing in the log book. On Fig. C3.1, label the diagrams with the correct order of steps to carry out the experiment. The first two steps have been done for you. [2]
- (ii) State the hypothesis of this experiment. [1]
- .....
- .....



25

- (iii) State the independent variable in this experiment.

..... [1]

- (iv) State the dependent variable in this experiment.

..... [1]

- (v) State a controlled variable in this experiment.

..... [1]

- (b) After the experiment, the student recorded her results as shown in Table C3.2.

temperature / °C	0	20	35	55	80
time taken for starch to be digested / min	30	15	5	40	more than 40

**Table C3.2**

- (i) Explain the result observed at 80 °C.

.....  
 .....  
 .....  
 ..... [2]

- (ii) Her friend suggests that replacing amylase with lipase would produce the same result. Using your knowledge of the lock and key hypothesis, explain why her suggestion is wrong.

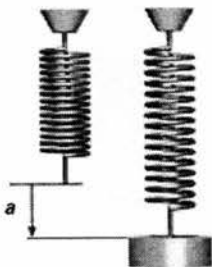
.....  
 .....  
 .....  
 ..... [2]

**[Total: 10m]**

For  
Examiner's  
Use

**C4 (a)** A student carried out an experiment involving weights and an extension spring as shown in Fig. C4.1.

For  
Examiner's  
Use



**Fig. C4.1**

She measured the length of the extension of the spring, **a** cm, each time she added weights to the spring. The results were recorded in Table C4.2.

mass of added weights /g	length of the extension, a /cm
0	0
10	5
20	10
30	
40	20
50	22
60	22

**Table C4.2**

(i) State the relationship between the mass of added weights and the length of the spring for the mass of added weights between 0 and 40 g.

.....  
..... [1]

(ii) Name the force that is causing the length of the spring to extend.

..... [1]

(iii) State the length of spring when the mass of added weight is 30 g.

..... [1]

(iv) The length of the extension of the spring remains at 22 cm when the mass of the added weight is 50 g or more. Suggest a reason why there is a limit to the number of weights added to the spring.

..... [1]

27

- (b) The student conducted another experiment on pressure with wooden blocks. She tested the different positions that the wooden block can be placed on eggs without the eggs cracking as shown in Figure C4.3. The block has a weight of 800 N.

For  
Examiner's  
Use

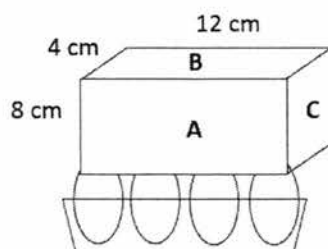


Fig. C4.3

- (i) Calculate the pressure exerted by the block when it is resting on side **B** on the floor.

- (ii) She then placed the block on top of a carton of 12 eggs and recorded the following results. The surface area of the top of each egg is  $1.5 \text{ cm}^2$ .

[2]

side	number of eggs the block is in contact with	condition of the eggs after the experiment
<b>A</b>	12	not cracked
<b>B</b>	8	cracked
<b>C</b>	6	cracked

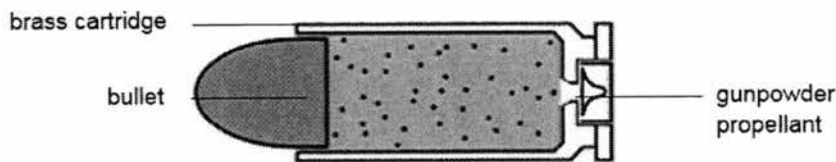
Using appropriate calculations, explain why the eggs cracked when lying on sides **B** and **C** but not **A**.

[4]

[Total: 10m]

- C5 (a)** The Singapore Assault Rifle 21 (SAR 21) is a weapon used by military personnel in Singapore. Fig. C5.1 shows the ammunition that is used with the rifle.

For  
Examiner's  
Use



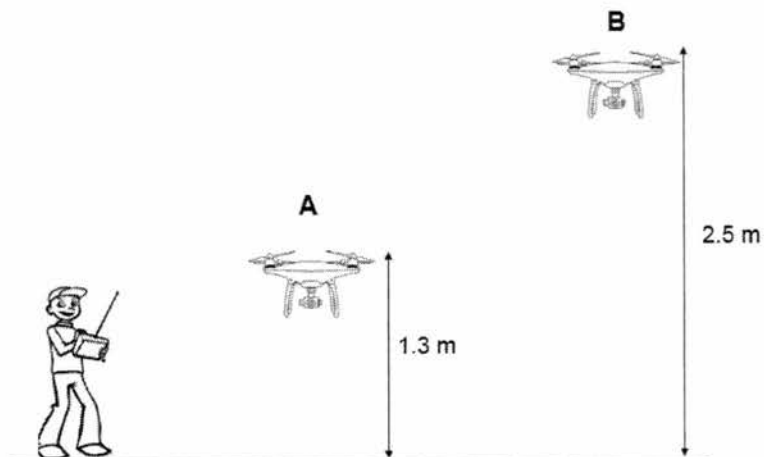
**Fig. C5.1**

The ammunition consists of a gunpowder propellant and a bullet encased in a brass cartridge. When the rifle's trigger is pressed, the propellant burns and pushes the bullet forward, emitting a loud sound.

- (i) State the form of energy that the gunpowder propellant contains.
- ..... [1]
- (ii) The energy stated in (ai) is converted to other forms of energy when the bullet is fired. State two forms of energy it will be converted to by supporting your answer with evidence.
- .....
- .....
- .....
- ..... [2]
- (iii) Hence, explain why the bullet may not be able to hit a target at extremely long distances.
- .....
- ..... [1]

29

- (b) Fig. C5.2 shows a boy flying a drone. The mass of the drone is 800 g.



**Fig. C5.2**

- (i) On Fig. C5.2, draw and label all the forces acting on the drone while it is in the air at position **A**. [2]
- (ii) Assuming that the gravitational field strength on Earth is 10 N/kg, calculate the work done against gravity by the drone in moving from position **A** to position **B**. [2]
- (iii) The boy controls the drone to hover at position **B**. Explain how the drone is able to hover at position **B**. [2]

.....

.....

.....

.....

[2]

[Total: 10m]

**- END OF PAPER -**

For  
Examiner's  
Use

The Periodic Table of Elements

Group																	
I	II	1 H hydrogen 1										III	IV	V	VI	VII	0
<div>Key</div> <div>proton (atomic) number atomic symbol name relative atomic mass</div>																	
3 Li lithium 7	4 Be beryllium 9											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 -	113 Nh nihonium -	114 Fl flerovium -	115 Mc moscovium -	116 Lv livermorium -	117 Ts tennessine -	118 Og oganeson -

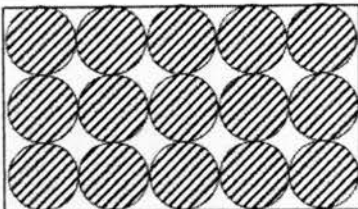
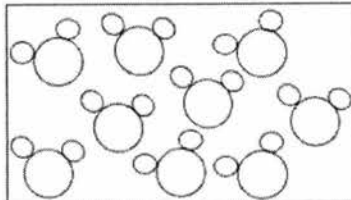
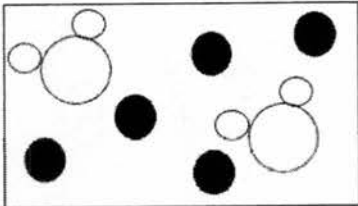
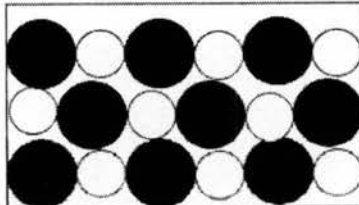
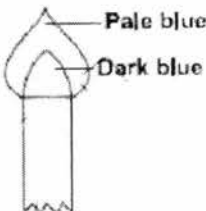
**BEDOK SOUTH SECONDARY SCHOOL**  
**END-OF-YEAR EXAMINATION 2017**  
**Secondary 1 Express**  
**Science**  
**Marking Scheme**

**SECTION A: Multiple Choice Questions (30 marks)**

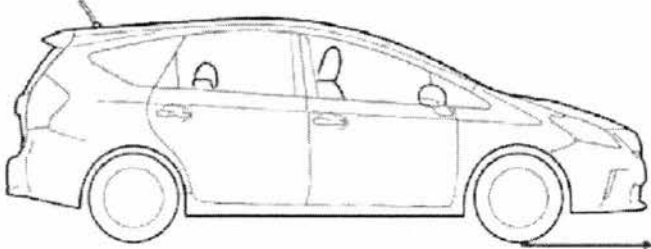
Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
D	A	A	C	D	C	B	B	C	D
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
C	D	B	D	C	C	B	A	C	C
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
C	C	B	C	A	D	A	D	D	D

**SECTION B: Structured Questions (30 marks)**

Qn no.	Suggested answer	Comments to markers	Marks
B1	a (i)	<ul style="list-style-type: none"> <li>- 0.07 cm [1]</li> </ul>	[½] without units 1
	a (ii)	<ul style="list-style-type: none"> <li>Reading with error = 3.18 cm [½]</li> <li><math>d = 3.18 - (-0.07) = 3.25 \text{ cm}</math> [½]</li> </ul>	[½] without units Award ECF 1
	b	<ul style="list-style-type: none"> <li> <math display="block">V = \frac{4}{3} \pi \left( \frac{d}{2} \right)^3</math> <math display="block">= \frac{4}{3} \times 3.14 \left( \frac{3.25}{2} \right)^3 = 18.0 \text{ cm}^3</math> [1] </li> </ul>	[½] without units Award ECF 1
	c (i)	<ul style="list-style-type: none"> <li> <math display="block">\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{17.3}{18} = 0.96 \text{ g / cm}^3</math> [1] </li> </ul>	Award ECF No penalty for units 1
	c (ii)	<ul style="list-style-type: none"> <li>960 kg / m<sup>3</sup> [1]</li> </ul>	1
	d	<ul style="list-style-type: none"> <li>The Styrofoam ball has a lower density than water and would float such that it cannot displace water. [1]</li> </ul>	A: lower density / float R: light so will float 1

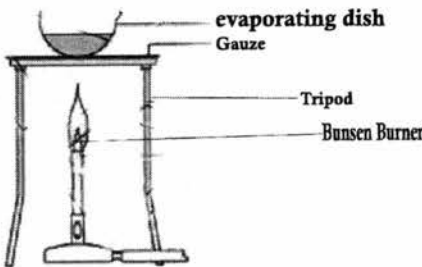
B2	a	<div><div></div><div></div><div></div><div></div><div><div>R</div><div>P</div><div>S</div><div>Q</div></div></div> <div><div>[½] each</div><div>BP2102</div></div>									
	b	<div><ul style="list-style-type: none"><li>• <b>S</b> melts and boils over a range of temperature but <b>Q</b> has fixed melting and boiling points. [1]</li><li>• <b>S</b> has variable composition by mass but <b>Q</b> has fixed composition by mass. [1]</li></ul></div> <div><div>Accept any other correct property</div><div>2</div></div>									
B3	a	<div><ul style="list-style-type: none"><li>• <b>W</b>: dissolving / adding water or solvent [½]</li><li>• <b>X</b>: filtration [½]</li><li>• <b>Y</b>: evaporation to dryness / heating [½]</li><li>• <b>Z</b>: crystallisation [½]</li></ul></div> <div><div></div><div>2</div></div>									
	b	<div><div></div><div><div>[0] if luminous flame drawn or labelled / no labels / orange colour was indicated [½] if indicated as non-luminous</div><div>1</div></div></div>									
B4	a	<table><tr><td>components of food</td><td>more at <b>A</b></td><td>almost the same at <b>A</b> and <b>B</b></td></tr><tr><td>starch</td><td></td><td>✓</td></tr><tr><td>protein</td><td>✓</td><td></td></tr></table> <div><div>[0] if more than 1 tick per row</div><div>2</div></div>	components of food	more at <b>A</b>	almost the same at <b>A</b> and <b>B</b>	starch		✓	protein	✓	
	components of food	more at <b>A</b>	almost the same at <b>A</b> and <b>B</b>								
	starch		✓								
protein	✓										
b	<div><div><b>Any 2:</b><ul style="list-style-type: none"><li>• The proteins are digested to amino acids by proteases in the small intestine. [1]</li></ul></div><div><div></div><div>2</div></div></div>										



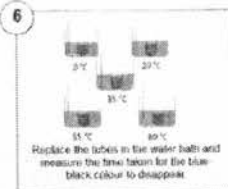
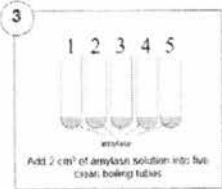
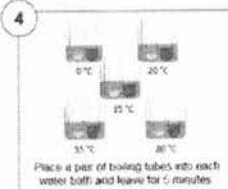
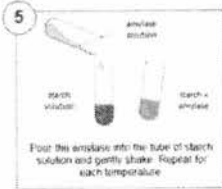
		<ul style="list-style-type: none"> <li>Starch is digested to maltose by amylase. [1]</li> <li>Maltose is digested to glucose by maltase. [1]</li> <li>The amino acids and glucose / digested food substances are absorbed in the small intestine / villi into the bloodstream. [1]</li> </ul>		BP~103
	c	<ul style="list-style-type: none"> <li>Less bacteria / microorganisms are killed. [1]</li> <li>The pH of the environment in the stomach is less acidic so digestion of proteins by proteases is less efficient. [1]</li> </ul>	[½] for digestion of food slower / less	2
B5	a (i)		Arrow must be drawn between tyres and road [½] if correct direction but not at tyres	1
	a (ii)	<ul style="list-style-type: none"> <li><math>W = mg = 1325 \times 10 = 13250 \text{ N}</math> [1]</li> <li><math>P = \frac{F}{A} = \frac{13250}{0.4 \times 4} = 8.28 \times 10^3 \text{ Pa}</math> [1]</li> </ul>	[½] without units	2
	a (iii)	<ul style="list-style-type: none"> <li>With larger tires, the total contact area between the tyres and sand is increased [½] such that the pressure between the tyres and sand is reduced [½].</li> </ul>	Must show relationship between area and pressure	1
	b (i)	<ul style="list-style-type: none"> <li>Biofuels / solar energy / hydrogen fuel cell [1]</li> </ul>		1
	b (ii)	<ul style="list-style-type: none"> <li>Hybrid cars have less power. [1]</li> <li>Hybrid cars are more expensive in Singapore. [1]</li> </ul>	Accept other reasonable answers	1
B6	a	<ul style="list-style-type: none"> <li>At <b>A</b>, the roller coaster has gravitational potential energy only. [1]</li> <li>As it slides down from <b>A</b> to <b>B</b>, some of the gravitational potential energy is <u>converted</u> to kinetic energy, sound and heat energy. [1]</li> <li>At lowest point <b>B</b>, all the gravitational potential energy of the roller coaster is now <u>converted</u> to kinetic energy, sound and heat energy. [1]</li> </ul>		3
	b (i)	<ul style="list-style-type: none"> <li><math>t = \frac{d}{s} = \frac{10}{25} = 0.4 \text{ s}</math> [1]</li> </ul>		1
		<ul style="list-style-type: none"> <li><math>F = \frac{W}{d} = \frac{158\,000}{56} = 2821.4 \text{ N} (2820 \text{ N})</math> [1]</li> </ul>		1

b (ii)	•	
-----------	---	--

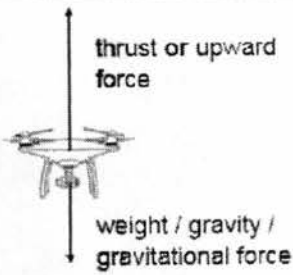
**SECTION C: Free Response Questions (40 marks)**

Qn no.	Suggested answer	Comments to markers	Marks
C1	a	<ul style="list-style-type: none"> <li>Curiosity / Perseverance / Integrity / Objectivity / Open-mindedness [1]</li> </ul>	Accept other reasonable answers 1
	•		
	b (i)	<ul style="list-style-type: none"> <li>Device <b>A</b> is a beam balance that measures the mass of the rock which depends on the amount of matter in the meteorite.</li> <li>Device <b>B</b> is a spring balance that measures the weight of the meteorite which depends on the gravitational field of the planet.</li> </ul>	Award [½] each for mention of mass or weight 2
	•		
	b (ii)	<ul style="list-style-type: none"> <li>The meteorite has a large volume and would not be able to fit into the measuring cylinder. [1]</li> </ul>	A: measuring cylinder cannot measure large vol. 1
	•		
	b (ii)	<ul style="list-style-type: none"> <li>Same density [1]</li> <li>The mass [½] and volume [½] of the meteorite is the same on both planets as it is not affected by the gravitational field.</li> </ul>	2
	•		
c	(i)	 <p>evaporating dish Gauze Tripod Bunsen Burner</p>	evaporation dish tripod correctly drawn [½] each labelled apparatus [½] each 2
	•		
	c (ii)	<ul style="list-style-type: none"> <li>Wear safety goggles during heating. [1]</li> </ul>	Accept other reasonable answers e.g. close air hole 1
	•		
c	(iii)	<ul style="list-style-type: none"> <li>Test for its boiling point. [½] If it is pure water, it should have a fixed boiling point at 100 °C. [½]</li> </ul>	A: density of 1 g/cm <sup>3</sup> 1

		OR		BP~105
		<ul style="list-style-type: none"> <li>Distillation [½] If liquid distills at 100 °C (or same temperature), it is pure water / collect only 1 distillate. [½]</li> </ul>		
		•		
C2	a (i)	<ul style="list-style-type: none"> <li>She would observe a solution with excess solid formed / solid <b>B</b> would not be fully dissolved. [1]</li> <li>The maximum solubility of solid <b>B</b> in liquid <b>Y</b> at room temperature is 50 g / 100 cm<sup>3</sup>. Hence, there would be 7.5 g of solid <b>B</b> undissolved. [1]</li> </ul>	A: cannot dissolve anymore as reached saturation / need more solvent / quoting any reasonable figures to support	2
		•		
	a (ii)	<ul style="list-style-type: none"> <li>Increase the temperature of the solvent / Use finely ground solids / increase rate of stirring [1]</li> </ul>	A: add more solvent	1
		•		
	a (iii)	1. Add liquid <b>X</b> / <b>Y</b> to dissolve the solid <b>A</b> / <b>C</b> in a beaker. [1] 2. Filter the mixture using a filter funnel and filter paper into a conical flask. [1] 3. (If using liquid <b>X</b> ) Solid <b>C</b> will be collected as residue on the filter paper while the solid <b>A</b> is the filtrate collected in a conical flask OR (If using liquid <b>Y</b> ) Solid <b>A</b> will be collected as residue on the filter paper while the solid <b>C</b> is the filtrate collected in a conical flask. [1] OR 4. Heat the filtrate in an evaporating dish to dryness to obtain solid <b>A</b> OR Heat the filtrate in an evaporating dish to dryness to obtain solid <b>C</b> . [1]	No penalty for not stating apparatus A: last step as crystallization instead of evaporation	3
		•		
	b (i)	<ul style="list-style-type: none"> <li>EPO is more soluble than ACTH in alcohol and moves a further distance along the filter paper / EPO and ACTH have different solubilities in alcohol. [1]</li> </ul>		1
		•		
	b (ii)	<ul style="list-style-type: none"> <li>HCG is insoluble [½] in alcohol. [½]</li> </ul>		1
		•		
	b (iii)	<ul style="list-style-type: none"> <li>Athlete <b>Z</b> [1]</li> <li>The urine sample of Z contains IGF-1. [1]</li> </ul>		2
		•		

C3	a (i)	   	[½] for each	
	a (ii)	<ul style="list-style-type: none"> <li>The higher the temperature, the longer/shorter the time taken for the blue-black colour to disappear / the longer/shorter the time taken for starch to be digested. [1]</li> </ul>	A: closer to body temperature, faster digestion	1
	a (iii)	<ul style="list-style-type: none"> <li>Temperature of the water bath [1]</li> </ul>		1
	a (iv)	<ul style="list-style-type: none"> <li>Time taken for the blue-black colour to disappear / Time taken for starch to be digested [1]</li> </ul>		1
	a (v)	<ul style="list-style-type: none"> <li>Volume/concentration of starch solution used/ volume of iodine solution used/ volume/concentration of amylase solution added [1]</li> </ul>		1
	b (i)	<ul style="list-style-type: none"> <li>At 80 °C, the enzyme amylase has been <u>denatured</u>. [1]</li> <li>When the active site shape of amylase is changed by denaturation, it is no longer complementary to / does not fit the shape of the starch substrate, hence <u>starch cannot be digested / take longer time to digest</u>. [1]</li> </ul>		2
	b (ii)	<ul style="list-style-type: none"> <li>The enzyme lipase (enzyme) has an active site shape that is <u>not complementary to</u> / does not fit the substrate starch (key).</li> <li>Hence, lipase would not be able to bind to the starch and there <u>will not be any digestion of starch</u> / Lipase can only digest fat / enzymes digest specific substrates. [1]</li> </ul>		2
	a (i)	<ul style="list-style-type: none"> <li>As the mass of added weight increases, the length of spring increases (proportionally). [1]</li> </ul>		1
	a (ii)	<ul style="list-style-type: none"> <li>Gravitational force / weight [1]</li> </ul>	[½] gravity	1
	a (iii)	<ul style="list-style-type: none"> <li>15 cm [1]</li> </ul>		1

	<b>a</b> <b>(iv)</b>	<ul style="list-style-type: none"><li>Beyond a certain mass, the spring will be permanently stretched and will not revert back to its original form. [1]</li></ul>	Accept other reasonable answers e.g. stretched to max / prevent spring from breaking	BP1107								
		<ul style="list-style-type: none"><li></li></ul>										
	<b>b</b> <b>(i)</b>	<ul style="list-style-type: none"><li><math>area = l \times b = 0.12 \times 0.04 = 0.0048 \text{ m}^2</math> [1]</li><li><math>pressure = \frac{force}{area} = \frac{800}{0.0048} = 1.67 \times 10^5 \text{ Pa}</math> [1]</li></ul>	A: 16.6 N/cm <sup>2</sup> [½] for showing calculating each area correctly (regardless of units)	2								
		<ul style="list-style-type: none"><li></li></ul>										
	<b>b</b> <b>(ii)</b>	<ul style="list-style-type: none"><li><math>pressure \text{ (side A)} = \frac{force}{area} = \frac{800}{12 \times 0.015} = 4.44 \times 10^3 \text{ Pa}</math> [1]</li><li><math>pressure \text{ (side B)} = \frac{force}{area} = \frac{800}{8 \times 0.015} = 6.67 \times 10^3 \text{ Pa}</math> [1]</li><li><math>pressure \text{ (side C)} = \frac{force}{area} = \frac{800}{6 \times 0.015} = 8.89 \times 10^3 \text{ Pa}</math> [1]</li><li>Side <b>A</b> exerts the least pressure and thus does not cause the egg to crack. Sides <b>B</b> and <b>C</b> exert more pressure on the eggs than side <b>A</b>, thus causing the eggs to crack. [1]</li></ul>	[½] for showing calculating each area correctly (regardless of units) A: 18 cm <sup>2</sup> B: 12 cm <sup>2</sup> C: 9 cm <sup>2</sup>	4								
		<ul style="list-style-type: none"><li></li></ul>										
	<b>C5</b>	<b>a</b> <b>(i)</b>	<ul style="list-style-type: none"><li>Chemical potential energy [1]</li></ul>		1							
			<ul style="list-style-type: none"><li></li></ul>									
	<b>a</b> <b>(ii)</b>	<table><tr><th>energy [½]</th><th>evidence [½]</th></tr><tr><td>kinetic energy</td><td>bullet moves at great speeds</td></tr><tr><td>sound energy</td><td>a loud sound is emitted</td></tr><tr><td>heat energy</td><td>heat is released when the gunpowder burns causing the barrel of the gun to be hot</td></tr></table>	energy [½]	evidence [½]	kinetic energy	bullet moves at great speeds	sound energy	a loud sound is emitted	heat energy	heat is released when the gunpowder burns causing the barrel of the gun to be hot		2
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	<ul style="list-style-type: none"><li></li></ul>											
	<b>a</b> <b>(iii)</b>	<ul style="list-style-type: none"><li>The CPE (from the bullet) / kinetic energy (of the moving bullet) / is converted to other forms of energy such as heat energy so there is <u>not enough kinetic energy to propel the bullet over long distances / which slows the bullet down.</u> [1]</li></ul>	A: not all CPE is converted to KE	1								
		<ul style="list-style-type: none"><li></li></ul>										

<b>b</b>	<b>(i)</b>	 <p>thrust or upward force</p> <p>weight / gravity / gravitational force</p>	<p>[1] each force ON the drone</p> <p>[½] if indicate direction of force</p>	2
		•		
	<b>(ii)</b>	<ul style="list-style-type: none"> <li>• <math>W = mg = 0.8 \times 10 = 8 \text{ N}</math> [1]</li> <li>• <math>W = f \times d = 8 \times (2.5 - 1.3) = 9.6 \text{ J}</math> [1]</li> </ul>		2
		•		
	<b>(iii)</b>	<ul style="list-style-type: none"> <li>• The drone is able to hover when the resultant force acting on the drone is 0 N. [1]</li> <li>• This happens when the upward force (thrust) is equal to the downward gravitational force. [1]</li> </ul>		2
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