<table>
<thead>
<tr>
<th></th>
<th>School Name</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bedok View Secondary</td>
<td>SA1</td>
</tr>
<tr>
<td>2</td>
<td>Bendemeer Secondary</td>
<td>SA1</td>
</tr>
<tr>
<td>3</td>
<td>Deyi Secondary</td>
<td>SA1</td>
</tr>
<tr>
<td>4</td>
<td>Jurong West Secondary</td>
<td>SA1</td>
</tr>
<tr>
<td>5</td>
<td>Manjusri Secondary</td>
<td>SA1</td>
</tr>
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<td>6</td>
<td>Unity Secondary</td>
<td>SA1</td>
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</table>
LOWER SECONDARY SCIENCE
Secondary 1 Express

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name and index number on the Answer Sheet in the spaces provided unless this has been done for you.

Information for Candidates

Section A
There are twenty 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 separate Answer Sheet.

Section B
Answer all questions.
Write your answers in the spaces provided on the Question Paper.
Candidates are reminded that all quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of concepts than for correct answers.

At the end of the examination, fasten all your work securely together. The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner’s Use

<table>
<thead>
<tr>
<th>Section A</th>
<th>/ 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>/ 5</td>
</tr>
<tr>
<td>22</td>
<td>/ 4</td>
</tr>
<tr>
<td>23</td>
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<td>24</td>
<td>/ 6</td>
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<td>27</td>
<td>/ 5</td>
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<td>/ 4</td>
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<tr>
<td>Section B</td>
<td>/ 40</td>
</tr>
<tr>
<td>Total</td>
<td>/ 60</td>
</tr>
</tbody>
</table>

% / Grade /

 Setter(s): Ms Wong W L

 Parent’s / Guardian’s Signature: ....................................

This document consists of 16 printed pages.

Do not turn over the page until you are told to do so.
Section A

Answer all the questions in this section.

1. Which of the steps could be carried out first before formulating a hypothesis?
   A. decide on the variables  
   B. gather relevant information  
   C. share of results with others  
   D. design an experiment

2. Laboratory tests showed that a patient is suffering from radioactive poisoning. Which hazard symbol did the patient most likely ignore before the incident?
   
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>
   

3. In mining fields, drills are used to remove rocks to search for the valuable metal ores below. The intense drilling generates high amount of frictional heat. Which physical properties should be considered when we choose a material to make the drills?
   A. strength, melting point, transparency  
   B. strength, electrical conductivity, thermal conductivity  
   C. hardness, strength, melting point  
   D. hardness, electrical conductivity, boiling point

4. Tommy used a metre scale to measure the length of a wooden block in the diagram below. What is the length of the block of wood?
   A. 13.5 m  
   B. 14.0 m  
   C. 14.5 m  
   D. 15.0 m
5  During an experiment, Janany placed a cube of nata de coco into the measuring cylinder below.

![Diagram of a cube with dimensions 2 cm x 2 cm x 2 cm]

What is the final water level in the measuring cylinder if the nata de coco sinks in water?

A. 42 cm³  
B. 46 cm³  
C. 48 cm³  
D. 52 cm³

6  Three balls of the same size but different densities are immersed in four beakers carrying different liquids.

The densities of the balls are 0.8 g/cm³, 1.1 g/cm³, 1.4 g/cm³.

Which beaker holds a liquid of density 1.2 g/cm³?

A  
B  
C  
D

7  Which of the following gives the correct SI units for length and time respectively?

<table>
<thead>
<tr>
<th></th>
<th>length</th>
<th>time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>m</td>
<td>h</td>
</tr>
<tr>
<td>B</td>
<td>m²</td>
<td>min</td>
</tr>
<tr>
<td>C</td>
<td>m³</td>
<td>h</td>
</tr>
<tr>
<td>D</td>
<td>m</td>
<td>s</td>
</tr>
</tbody>
</table>

8  Which of the following is correct?

<table>
<thead>
<tr>
<th></th>
<th>name of element</th>
<th>chemical symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>nitrogen</td>
<td>Ni</td>
</tr>
<tr>
<td>B</td>
<td>cobalt</td>
<td>Co</td>
</tr>
<tr>
<td>C</td>
<td>carbon</td>
<td>Ca</td>
</tr>
<tr>
<td>D</td>
<td>beryllium</td>
<td>B</td>
</tr>
</tbody>
</table>
9  Which of the following diagrams represents a mixture?

A  

\[ \text{Diagram A} \]

B  

\[ \text{Diagram B} \]

C  

\[ \text{Diagram C} \]

D  

\[ \text{Diagram D} \]

10  Which of the following shows the correct classification of substances?

<table>
<thead>
<tr>
<th></th>
<th>element</th>
<th>compound</th>
<th>mixture</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>mineral water</td>
<td>carbon dioxide</td>
<td>diamond</td>
</tr>
<tr>
<td>B</td>
<td>diamond</td>
<td>mineral water</td>
<td>carbon dioxide</td>
</tr>
<tr>
<td>C</td>
<td>carbon dioxide</td>
<td>diamond</td>
<td>mineral water</td>
</tr>
<tr>
<td>D</td>
<td>diamond</td>
<td>carbon dioxide</td>
<td>mineral water</td>
</tr>
</tbody>
</table>

11  Which of the following gives the correct description of a compound?

A  A compound has the same properties as its constituent elements.
B  A compound can only be decomposed by heat into its constituent elements.
C  A compound consists of two or more elements chemically combined together.
D  A compound has the same physical state as its constituent elements.
12 The graph below shows how the solubility of solute S in solvent F and solvent G changes with temperature.

Which of the following statements regarding the solubility of solid S is correct?

A Solid S has the same solubility in both solvents.
B Solid S has higher solubility in Solvent F than in solvent G in general.
C Solid S has lower solubility in Solvent F than in solvent G in general.
D Solid S is insoluble in both solvents.

13 Some sugar and steel powder are mixed together.
Which is the most appropriate method to separate the mixture?

A distillation
B filtration
C evaporation
D magnetic attraction

14 Water that is safe for consumption can be obtained by ....................... .

1 chromatography
2 distillation
3 evaporation

A 1 only
B 1 and 2 only
C 2 only
D 2 and 3 only
The table below shows the colour and solubilities of four types of solids in water.

<table>
<thead>
<tr>
<th>solid</th>
<th>colour</th>
<th>solubility in water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>white</td>
<td>soluble</td>
</tr>
<tr>
<td>2</td>
<td>white</td>
<td>insoluble</td>
</tr>
<tr>
<td>3</td>
<td>blue</td>
<td>insoluble</td>
</tr>
<tr>
<td>4</td>
<td>blue</td>
<td>soluble</td>
</tr>
</tbody>
</table>

A mixture containing two of the four types of solids undergoes filtration as shown below.

Which are the two solids in the mixture?

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

Which of the following is the correct sequence to obtain dry salt and sand from a salt-and-sand mixture?

A crystallisation → dissolving → filtration → heating  
B dissolving → crystallisation → evaporation → filtration  
C dissolving → filtration → evaporation → crystallisation  
D heating → dissolving → crystallisation → filtration

Chromatography is a suitable separation technique for substances which

A have different solubilities.  
B decompose upon heating.  
C have the same colour.  
D do not dissolve in a solvent.
18 Study the classification below.

Which of the following matches the classification shown above?

<table>
<thead>
<tr>
<th></th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>chicken</td>
<td>frog</td>
<td>aloe vera</td>
<td>orchid</td>
</tr>
<tr>
<td>B</td>
<td>mackerel</td>
<td>elephant</td>
<td>grass</td>
<td>crab</td>
</tr>
<tr>
<td>C</td>
<td>rabbit</td>
<td>clownfish</td>
<td>pine tree</td>
<td>water lettuce</td>
</tr>
<tr>
<td>D</td>
<td>lion</td>
<td>starfish</td>
<td>pine tree</td>
<td>stingray</td>
</tr>
</tbody>
</table>

19 Which of the following groups are all vertebrates?

A leopard, owl, rabbit  
B monkey, cat, earthworm  
C zebra, jellyfish, rat  
D beetle, octopus, starfish

20 Which of the following statements about a dichotomous key is not correct?

A We can understand things easier with the use of a dichotomous key.  
B It can help us to differentiate between living things and non-living things.  
C A dichotomous key divides things based on their similarities and differences.  
D At each stage of the dichotomous key, three smaller groups of classifications always appear.
21. **Fig. 21.1** shows an experimental set-up to determine the boiling point of a liquid.

(a) Name the apparatus labelled J and K in Fig. 21.1 above. [2]

(b) Write down a safety precaution you should take when you conduct the experiment above. ........................................................................................................................ [1]

(c) State the type of flame that should be used in the experiment above. Give a reason for your answer. .................................................................................................................................................. [2]

[Total:5]
Moh’s scale of hardness is a scale used to classify the hardness of matter. The higher the number, the harder the substance is. Hence, the hardest substance will be given 10 and the least hard will be given 1 on the Moh’s scale.

Table 22.1 below shows a list of substances and their respective hardness on Moh’s scale. With reference to the table, answer the following questions.

Table 22.1

<table>
<thead>
<tr>
<th>substance</th>
<th>Moh’s scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>talc</td>
<td>1</td>
</tr>
<tr>
<td>fingernail</td>
<td>2.5</td>
</tr>
<tr>
<td>calcite</td>
<td>3</td>
</tr>
<tr>
<td>fluorite</td>
<td>4</td>
</tr>
<tr>
<td>steel</td>
<td>6</td>
</tr>
<tr>
<td>quartz</td>
<td>8</td>
</tr>
<tr>
<td>diamond</td>
<td>10</td>
</tr>
</tbody>
</table>

(a) Write down the hardness (Moh’s scale) required to scratch calcite.

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

(b) Jessica has a piece of glass that she thinks has a hardness of about 5. What can she do to check if she is correct?

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

[Total:4]
23 (a) Convert the following physical quantities

(i) 1.25 kg = ................................................. g
(ii) 1.44 km = ................................................. cm

(b) Fig. 23.1 shows the outline of mainland Singapore.

Given that each grid square unit represents an area of 18 km², calculate the approximated area of mainland Singapore. Show your working.

approximated area of mainland Singapore = .......................km²

[Total: 4]
Read the following passage titled Landfills “The Good and Bad of Semakau Landfill”.

Semakau Landfill, the world’s first man-made offshore landfill opened in 1999, is home to more than 700 types of plants, animals and several endangered species. Having been transformed into an eco-park, mangroves and coral reefs ring the island and many nature-related recreational activities are held here.

By locating it offshore, 8 miles south of Singapore, the risk for soil pollution is greatly decreased. Through innovative engineering solutions, the waste is effectively contained within the landfill area, which is lined with impermeable membrane, marine clay and rock layers.

Every year, about 200,000 tonnes of solid waste and ash are received at this landfill. At the rate in which waste is being sent there, it is projected to run out of space by 2035.

(adapted from http://blog.nus.edu.sg/pollutionistheword/2015/04/02/landfills-the-good-and-bad-of-semakau-landfill/)

(a) State what are used to contain the waste in the landfill area.
........................................................................................................................................... [1]

(b) Suggest what the rock layers are used for.
........................................................................................................................................... [1]

(c) Suggest what the marine clay is used for.
........................................................................................................................................... [1]

(d) Explain why there is a need for an impermeable membrane around the landfill.
............................................................................................................................................... [2]
............................................................................................................................................... [2]
............................................................................................................................................... [2]

(e) Explain why using landfill to hold waste disposal is not sustainable in Singapore.
........................................................................................................................................... [1]
........................................................................................................................................... [1]
........................................................................................................................................... [1]

[Total: 6]
Fig. 25.1 below shows the different species of sea snails found in an ocean.

(a) Name the apparatus required to measure the
(i) mass of a shell. ..............................................................
(ii) volume of a shell. ........................................................... [2]

(b) Table 25.2 shows some information about the two other species of snails, *H. physis* and *O. olivacea*.

<table>
<thead>
<tr>
<th></th>
<th>mass of shell</th>
<th>volume of shell</th>
<th>density</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>H. physis</em></td>
<td>9 g</td>
<td>5.5 cm³</td>
<td></td>
</tr>
<tr>
<td><em>O. olivacea</em></td>
<td>4 g</td>
<td>7.0 cm³</td>
<td>0.57 g/cm³</td>
</tr>
</tbody>
</table>

* These two species are not included in Fig. 25.1 above

(i) Calculate the density of the shell of *H. physis* and fill up Table 25.2. Show your working. [2]

(ii) Sea water has a density of 1.02 g/cm³. State where you are most likely to find *O. olivacea* in the ocean. Explain why.

...............................................................................................................

............................................................................................................. [2]
(c) The main component of the shells on sea snails is calcium carbonate, CaCO₃. Write down the number of atoms in one molecule of calcium carbonate, CaCO₃.
........................................................................................................................................ 
[1]

(d) Occupying less than 1% of the ocean floor, coral reefs are home to more than 25% of marine life. Write down one threat to the survival of corals.
........................................................................................................................................ 
[1]

26 Joanne set up the experiment in Fig. 26.1 below to investigate whether the particle size of the sodium chloride affects the rate of dissolving.

(a) Identify the independent and dependent variable for the above experiment.
Independent variable : ............................................................................................
Dependent variable : ........................................................................................... [2]

(b) State which beaker will allow sodium chloride to dissolve faster. Explain why.
........................................................................................................................................
........................................................................................................................................
........................................................................................................................................ 
[2]

[Total:8]

[Total:4]
Fig. 27.1 below shows a simple distillation setup.

(a) Indicate with an ‘X’ on Fig. 27.1, the position where the bulb of the thermometer should be placed. [1]

(b) (i) State the function of M.

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

..................................................................................................................................................

(ii) Suggest why cold water enters from the bottom of apparatus M.

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

..................................................................................................................................................

(c) Give a reason why smooth boiling is crucial during distillation.

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

..................................................................................................................................................

..................................................................................................................................................

[Total: 5]
An investigation was carried out on two different fruit juices, P and Q and four known coloured dyes, 1, 2, 3 and 4. The results are shown in the chromatogram below. Dye 2 is found in a list of banned dyes.

![Chromatogram](image)

**Fig. 28.1**

(a) Which dye is most soluble in the solvent?

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

(b) Which dye(s) is/are found in Q?

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

(c) Are both fruit juices safe to drink? Explain your answer.

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

[Total:4]
DATA SHEET

The Periodic Table of the Elements

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>D</th>
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<tbody>
<tr>
<td>3</td>
<td>Li</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
<td>F</td>
<td>He</td>
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<td>11</td>
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<td>S</td>
<td>Cl</td>
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<td>Sr</td>
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<td>Zr</td>
<td>Nb</td>
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<td>Tc</td>
<td>Ru</td>
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<td>Ta</td>
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<td>Re</td>
<td>Os</td>
<td>Ir</td>
</tr>
<tr>
<td>137</td>
<td>178</td>
<td>181</td>
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<td>Ra</td>
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<td>Db</td>
<td>Sg</td>
<td>Bh</td>
<td>Hs</td>
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<td>109</td>
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<td></td>
<td>lanthanoids</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>actinoids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
Section A – Multiple Choice Questions [10 marks]

<table>
<thead>
<tr>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
<th>Q5</th>
<th>Q6</th>
<th>Q7</th>
<th>Q8</th>
<th>Q9</th>
<th>Q10</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>C</td>
<td>C</td>
<td>D</td>
<td>B</td>
<td>B</td>
<td>D</td>
</tr>
<tr>
<td>Q11</td>
<td>Q12</td>
<td>Q13</td>
<td>Q14</td>
<td>Q15</td>
<td>Q16</td>
<td>Q17</td>
<td>Q18</td>
<td>Q19</td>
<td>Q20</td>
</tr>
<tr>
<td>C</td>
<td>B</td>
<td>D</td>
<td>C</td>
<td>A</td>
<td>C</td>
<td>A</td>
<td>C</td>
<td>A</td>
<td>D</td>
</tr>
</tbody>
</table>

Section B- [40 marks]

21  
| a) | J: beaker  
K: tripod stand  
No marks for spelling error |

| b) | Wear safety googles when heating/  
Long hair should be tied up when handling the Bunsen burner/ heating.  
Any 1 point  
(close air –hole: must state when turning on Bunsen Burner to prevent strike-back) |

| c) | Non-luminous flame.  
It is hotter flame. This allows more efficient heating.  
Accept: hotter flame/ burns more completely. |

22  
| a) | At least 3 |

| b) | If steel scratches glass, glass is less than 6.  
If the glass scratches fluorite, glass is more than 4.  
If fluorite scratches glass, glass is less than 4. |

23  
| aii) | 1.25 kg = 1250 g |

| aii) | 1.44 km = 144000 cm |

| b) | 40 grid units (accept between 40 to 43 grids)  
Area = 18 km² x 40 = km²  
(accept range 720 km² to 774 km²) |
<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 a)</td>
<td>The landfill is lined with impermeable membrane, marine clay and rock layers.</td>
</tr>
<tr>
<td>(b)</td>
<td>To trap/filter/prevent the large waste particles from entering the soil or sea.</td>
</tr>
<tr>
<td>(c)</td>
<td>To trap/filter/prevent the fine waste particles from entering the soil or sea.</td>
</tr>
<tr>
<td>(d)</td>
<td>Not all the solid waste can be filtered or trapped by the clay and rocks. This also stops waste liquid from passing into the ocean.</td>
</tr>
<tr>
<td>(e)</td>
<td>Any 1 point: With limited landscape, space for dumping waste will run out/ not be enough. Some waste takes up space for a long time to breakdown e.g. non-biodegradable waste.</td>
</tr>
<tr>
<td>25 a)</td>
<td>Mass: electronic balance / beam balance R: weighing scale</td>
</tr>
<tr>
<td>(ii)</td>
<td>Volume: Measuring cylinder Or Displacement can and measuring cylinder.</td>
</tr>
<tr>
<td>(ii)</td>
<td>Density of shell (H, physis) = 9 / 5.5 = 1.64 g/cm³</td>
</tr>
<tr>
<td>bi)</td>
<td>Please note future assessments: students should expressed in decimal place to 3 significant figures</td>
</tr>
<tr>
<td>(ii)</td>
<td>O. olivacea floats on the ocean/ sea water. O. olivacea has a density of 0.57 g/cm³ which is lower than density of sea water.</td>
</tr>
<tr>
<td>c)</td>
<td>5</td>
</tr>
<tr>
<td>d)</td>
<td>Any one: Increase in temperature of the ocean (accept decrease in temperature of ocean) Pollution of the ocean Invasion of predator such as crown of thorns starfish</td>
</tr>
<tr>
<td>26 a)</td>
<td>Independent variable: size of the sodium chloride/ particle size [1] R: type of sodium chloride</td>
</tr>
<tr>
<td>(ii)</td>
<td>Dependent variable: rate of dissolving/t ime taken for sodium chloride to dissolve [1]</td>
</tr>
<tr>
<td>b)</td>
<td>Beaker B. [1] Fine/small particles have larger surface area [1] that comes in contact with the solvent.</td>
</tr>
</tbody>
</table>
a) Position of X must be just before vapour enters the condenser.

b) Cools the vapour to liquid. (must have all the 3 keywords)

bii) For efficiency/effective of cooling of vapour to obtain maximum amount of distillate.

Accept: Effective of cooling of vapour To obtain maximum amount of distillate.

c) Any one:

Smooth boiling is required to prevent splattering [1] of the mixture which may affect the thermometer reading of vapour. [1]

Smooth boiling is required to prevent splattering [1] of the mixture which may affect the quality/purity of the distillate collected. [1]

Violent boiling may affect the stability of the apparatus set-up [1] and cause accidents e.g. burns or damage to the apparatus [1]

28

a) Dye 4

b) Dyes 1, 3 and 4

c) No. One of the component in fruit juice P matches dye 2 which is banned/illegal.

Accept: Fruit juice P is unsafe as it contains dye 2 which is banned/illegal.
DATE : 7 May 2018
DURATION : 45 minutes

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on the work you hand in.
Write in dark blue or black pen.
You may use a 2B pencil for any diagrams or graphs.
Do not use paper clips, glue or correction fluid.

Section A
There are ten 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 the boxes on page 2.

Section B
Answer all questions in the space provided.

Candidates are reminded that all quantitative answers should include appropriate units.
The use of an approved scientific calculator is expected, where appropriate.
The number of marks is given in brackets [ ] at the end of each question or part question.

A copy of the Periodic Table is printed on page 11.
Section A: Multiple Choice Questions [10 marks]
Answer all the questions in the boxes provided.

1. An earthquake struck in 2017 resulting in severe damage to the nuclear plants in Bendewich that gave out radiation to the atmosphere.

Which hazard symbol should be placed at the nuclear plant area?

![Hazard Symbols]


2. Which apparatus will be most suitable to measure an accurate volume of 25.0 cm³ of dilute hydrochloric acid?

![Apparatuses]

3 A petri dish containing a blackish-yellow substance was given in an experiment. When a magnet was placed over the cover of the dish, the black particles were observed to move towards the magnet while the yellow powder remained at the base of the dish.

What can be concluded based on these observations?

A The black particles and yellow powder are not chemically combined.
B The black particles and yellow powder are present in a fixed ratio.
C The black particles and yellow powder are two different compounds.
D The black particles and yellow powder have fixed boiling points.

4 Chlorine is an element in the Periodic Table.

Which statement about chlorine is not true?

A Chlorine is a non-metal.
B Chlorine is in a different period from fluorine.
C Chlorine is in the same group as calcium.
D Chlorine has similar chemical properties to iodine.

5 The table below shows some differences between milo drink and sugar solution.

Which description correctly shows the difference between them?

<table>
<thead>
<tr>
<th></th>
<th>milo drink</th>
<th>sugar solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>homogenous</td>
<td>not homogenous</td>
</tr>
<tr>
<td>B</td>
<td>does not allow light to pass through</td>
<td>allows light to pass through</td>
</tr>
<tr>
<td></td>
<td>clear</td>
<td>cloudy</td>
</tr>
<tr>
<td>C</td>
<td>no particles settle at the bottom</td>
<td>many particles seen at the bottom</td>
</tr>
</tbody>
</table>

[Turn over]
The composition of air is shown in the following table.

<table>
<thead>
<tr>
<th>component</th>
<th>percentage by volume (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>nitrogen gas</td>
<td>78.0</td>
</tr>
<tr>
<td>oxygen gas</td>
<td>20.9</td>
</tr>
<tr>
<td>argon</td>
<td>0.9</td>
</tr>
<tr>
<td>water vapour</td>
<td>depends on local conditions</td>
</tr>
<tr>
<td>other gases</td>
<td>0.2</td>
</tr>
</tbody>
</table>

Which statement best explains why air is a mixture?

A The components of air are not fixed.
B Air contains different types of elements.
C The components of air cannot be separated.
D The components of air react with each other.

The diagram below shows the decomposition of water using an electric current. Only oxygen and hydrogen are produced. They are trapped in two separate test tubes as shown below. The unit volume of hydrogen collected is twice that of oxygen.

Which statements below can be concluded based on the experiment described?

I Oxygen and hydrogen are the constituent elements of water.
II Oxygen and hydrogen are combined in a fixed proportion by mass.
III Compounds can be broken down by physical means.
IV Water is a compound.

A I and II only
B II and III only
C I, II and III only
D I, II and IV only
8 A student wants to separate a mixture of X, Y and Z into the three individual substances. The student pours the mixture into a separating funnel. The tap is opened and a mixture of substance X and Y is collected first. Z remains in the separating funnel. The student then uses simple distillation to separate X and Y. X is the distillate and Y is the residue.

Which of the following shows the correct identity of X, Y and Z?

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>water</td>
<td>salt</td>
<td>oil</td>
</tr>
<tr>
<td>B</td>
<td>salt</td>
<td>water</td>
<td>oil</td>
</tr>
<tr>
<td>C</td>
<td>water</td>
<td>salt</td>
<td>alcohol</td>
</tr>
<tr>
<td>D</td>
<td>salt</td>
<td>water</td>
<td>alcohol</td>
</tr>
</tbody>
</table>

9 Which method of separation will not obtain a sample of salt from seawater?

A

B

C

D
It is thought that spinach leaves contain one or more of three different pigments L, M and N. Spots of each of these pigments are put on the starting line of two chromatograms along with a spot of spinach extract. The first chromatogram is developed with ethanol, the second with water.

The results are shown below:

Which pigment(s) is/are present in the spinach extract?

A  L only  
B  L and M only  
C  L and N only  
D  L, M and N
Section B: Structured Questions [30marks]
Answer all the questions in the spaces provided.

1 (a) May decided to boil two beakers of water, to see which type of flame would boil the water in a shorter time as shown in Fig. 1.1

![Fig. 1.1](image)

(i) Predict which water sample will boil in a shorter time.

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

(ii) Give a reason to explain your answer in (a)(i).

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

(iii) List two other differences between a luminous and non-luminous flame.

.................................................................................................................................................
.................................................................................................................................................
.................................................................................................................................................
.................................................................................................................................................[2]
(b) Fig. 1.2 shows an experiment in which a substance is being heated.

Name the apparatus used in Fig. 1.2.

(i) ........................................[1] (ii) ........................................[1]

(iii) .........................................[1] (iv) ........................................[1]

(v) ...........................................[1]

2 Table 2.1 gives some information about four substances M to P. Use the information to decide whether each of these substances is an element, a mixture or a compound.

<table>
<thead>
<tr>
<th>substance</th>
<th>changes on heating</th>
<th>element / mixture / compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>A colourless liquid which is split up by electricity into two different gases.</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>A grey solid which burns in air to form an oxide.</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>A white solid which does not have a constant composition and melts over a range of temperature.</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>A colourless liquid which boils off to leave a white residue.</td>
<td></td>
</tr>
</tbody>
</table>
3 Fig. 3.1 shows an experimental set-up used to obtain pure water from sea water.

(a) State the method of separation used.

(b) Name the apparatus used in Fig. 3.1.

A: .................................................................[1]

B: .................................................................[1]

C: .................................................................[1]

(c) What are the two main physical processes that occur in this method of separation?

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

(d) Indicate on the diagram ‘water in’ and ‘water out’.

(e) State the purpose of boiling chips in the experimental setup.

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

(f) What would be the reading on the thermometer?

.................................................................[1]
4  The inks used for making EZ-Link cards are a mixture of different colours. The chromatogram of two such inks, X and Y, is shown in Fig. 4.1.

(a) Using information from Fig. 4.1, describe two similarities between inks X and Y.

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

(b) Explain whether inks X and Y are the same ink.

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

(c) The chromatography is repeated for another ink, Z. Ink Z contains only two colours, which are not found in inks X and Y. Draw the chromatogram of ink Z on Fig. 4.2.

Fig. 4.2

(d) Explain why the starting line cannot be drawn in pen.

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

(e) Use your knowledge of EZ-Link cards to suggest why water would not be a suitable solvent to use for this chromatography.

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

End of Paper
The volume of one mole of any gas is 24 dm$^3$ at room temperature and pressure (r.t.p.).
### Section A

<table>
<thead>
<tr>
<th>Qn</th>
<th>Marked</th>
<th>Suggested Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>B</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td></td>
</tr>
</tbody>
</table>

### Section B

<table>
<thead>
<tr>
<th>Qn</th>
<th>Suggested Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1ai</td>
<td>Non-luminous flame</td>
<td>[1]</td>
</tr>
<tr>
<td>ii</td>
<td>Non-luminous flame is hotter than luminous flame so it will boil the water at a shorter time.</td>
<td>[1]</td>
</tr>
<tr>
<td>iii</td>
<td>1. Luminous flame is <strong>orange</strong> but non-luminous flame is <strong>blue</strong>.</td>
<td>[2]</td>
</tr>
<tr>
<td></td>
<td>2. Luminous flame can be seen easily but non-luminous flame cannot be seen easily</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Luminous flame is unsteady but non-luminous flame is steady</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Little soot is produced in non-luminous flame but soot is produced in luminous flame</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The air-holes for non-luminous flame is opened but air-holes for luminous flame is closed</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>any 2 differences</em></td>
<td></td>
</tr>
<tr>
<td>bi</td>
<td>retort stand</td>
<td>[1]</td>
</tr>
<tr>
<td>ii</td>
<td>Bunsen burner</td>
<td>[1]</td>
</tr>
<tr>
<td>iii</td>
<td>round-bottomed flask</td>
<td>[1]</td>
</tr>
<tr>
<td>iv</td>
<td>wire gauze</td>
<td>[1]</td>
</tr>
<tr>
<td>v</td>
<td>tripod stand</td>
<td>[1]</td>
</tr>
<tr>
<td>2</td>
<td>M- compound</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>N- element</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>O- mixture</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>P- mixture</td>
<td>[1]</td>
</tr>
</tbody>
</table>
### 3a
- **simple distillation**

### b
- A - thermometer
- B – condenser
- C – measuring cylinder

### c
- boiling and condensation

### d
- **Diagram of distillation setup**

### e
- To smoothen the boiling.

### f
- 100 °C

### 4a
- Both contain 3 components/ dyes/ colours.
- Both contain 2 components that are the same.
- Both are impure.

*Any 2 similarities*

### b
- No, as they contain one colour/ component that is not the same.
- No, as the spot that travelled the furthest/ fastest is not aligned/ not the same.
- No, as the spot furthest from the starting line/ nearest to the solvent front are not aligned/ not the same.

**Accept:**
- They each have one colour that are of different solubility.
- The third spot of X is not in line with the third spot of Y.
- Not all the spots of X are aligned with Y.

*Any 1*

### c
- Show on diagram: 2 components, both are not aligned to any components in X and Y.

### d
- Pen ink is **soluble in the solvent** and will be separated together with the inks and **interferes with results** of the chromatography.

### e
- EZ-Link cards are exposed to moisture and water so the inks used should not be soluble in water.
READ THESE INSTRUCTIONS FIRST

Write your name, class and register number on the cover page of the question booklet.

This paper consists of three sections.

**Section A** (20 marks)
There are 20 questions in this section.
For each question, there are four possible answers A, B, C and D.
Choose the one you consider correct and record your choice in soft pencil on the OTAS provided.

**Section B** (30 marks)
Answer all the questions in the spaces provided on the question booklet.

**Section C** (30 marks)
Answer all the questions in the spaces provided on the question booklet.

At the end of the examination, hand in separately
(i) OTAS
(ii) Question Booklet

A copy of the Periodic Table is printed on page 15.

**CALCULATORS MAY BE USED.**
Section A (20 marks)

Answer all the questions on the OTAS provided.

1. Aston needs to fill a bottle with exactly 55.0 cm$^3$ of a solution. Which apparatus is most appropriate for this task?
   
   A. Beaker  
   B. Conical flask  
   C. Displacement can  
   D. Measuring cylinder

2. Benjamin came across a bottle of chemical powder with the following symbol.

   ![Chemical Symbol]

   Which of the following describes the correct way that he should follow when handling this chemical powder?

   A. He must keep the chemical powder away from the flame as it is explosive.  
   B. He must not wash the chemical powder down the sink as it can harm the aquatic environment.  
   C. He must store the chemical powder in a lead-lined container as it emits radiation.  
   D. He must use a spatula when handling the chemical powder as it can irritate the skin.

3. Which of the following sequences of steps is correct for lighting up a Bunsen burner?

   A. close the air-hole $\rightarrow$ light up the burner $\rightarrow$ turn on the gas tap $\rightarrow$ open the air-hole
   B. close the air hole $\rightarrow$ turn on the gas tap $\rightarrow$ light up the burner $\rightarrow$ open the air-hole
   C. open the air-hole $\rightarrow$ light up the burner $\rightarrow$ turn on the gas tap $\rightarrow$ close the air-hole
   D. open the air hole $\rightarrow$ turn on the gas tap $\rightarrow$ light up the burner $\rightarrow$ close the air-hole

4. The diagram below shows a Bunsen flame. Which part of the flame is the hottest?

   ![Bunsen Flame Diagram]
5 Which of the following is the correct reason why crystallisation is used to obtain sugar from sugar solution, instead of evaporation by direct heating?

A Sugar decomposes into carbon and water upon direct heating.
B Sugar obtained by direct heating is less pure than the sugar obtained by crystallisation.
C The amount of sugar obtained by direct heating is less than the amount of sugar obtained by crystallisation.
D The time taken to obtain sugar through direct heating is longer than crystallisation.

6 The diagram below shows a set-up to separate a mixture of salt, sesame seed and water.

Which of the following correctly identifies the labels W, X, Y and Z after the separation?

<table>
<thead>
<tr>
<th></th>
<th>W</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>filter funnel</td>
<td>salt solution</td>
<td>beaker</td>
<td>sesame seed suspension</td>
</tr>
<tr>
<td>B</td>
<td>filter funnel</td>
<td>sesame seeds</td>
<td>conical flask</td>
<td>salt solution</td>
</tr>
<tr>
<td>C</td>
<td>filter paper</td>
<td>salt solution</td>
<td>beaker</td>
<td>sesame seed suspension</td>
</tr>
<tr>
<td>D</td>
<td>filter paper</td>
<td>sesame seeds</td>
<td>conical flask</td>
<td>salt solution</td>
</tr>
</tbody>
</table>

7 An unknown substance (X) is suspected to be one of four substances, L, M, N or O. Chromatography was carried out using two different solvents, and the chromatograms are shown below.

From the chromatograms, deduce the identity of X.

A It must be L.
B It must be M.
C It must be N.
D It must be O.
8 The diagram below shows the length of the side of a cube.

What is the volume of the cube, expressed in SI unit?

A 0.000027 m³  
B 0.0009 m³  
C 9 cm³  
D 27 cm³  

9 A student used a pair of vernier calipers to measure the external diameter of a beaker. The diagram below shows the measurement obtained.

Given that the vernier calipers have a negative zero error of value –0.07 cm, what is the actual diameter of the beaker?

A 9.95 cm  
B 10.02 cm  
C 10.09 cm  
D 10.27 cm  

Refer to the diagram below for Questions 10 and 11.

An experiment was set up to measure the volume of an object by displacement method.

10 What is the volume of the water before and after the object is fully submerged in the water?

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>After</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>53 cm³</td>
<td>102 cm³</td>
</tr>
<tr>
<td>B</td>
<td>54 cm³</td>
<td>103 cm³</td>
</tr>
<tr>
<td>C</td>
<td>80 cm³</td>
<td>120 cm³</td>
</tr>
<tr>
<td>D</td>
<td>90 cm³</td>
<td>130 cm³</td>
</tr>
</tbody>
</table>
11. Which one of the following situations will make displacement method **unsuitable** for measuring the volume of the object?
   
   A. When the liquid is changed from water to oil.
   B. When the liquid is not colourless.
   C. When the object has a lower density than the liquid.
   D. When the object is insoluble in the liquid.

12. Which of the following contains an element, a compound and a mixture?

   A. air, carbon and salt
   B. air, tap water and tea
   C. carbon dioxide, salt and sugar
   D. carbon, iron and oxygen

13. Which of the following diagrams represents a mixture of molecules of a compound and molecules of an element?

   ![Diagram Options](image)

14. How many atoms can be found in a molecule of potassium dichromate, $K_2Cr_2O_7$?

   A. 3  
   B. 4  
   C. 11  
   D. 12

15. Which of the following pairs of substances will form a solution when mixed?

   A. carbon dioxide and lime water
   B. oil and water
   C. pepper and water
   D. salt and water

[Turn over]
Refer to the diagram below for Questions 16 and 17.
The diagram shows the solubility of substances S and T at different temperatures.

16 At which temperature does substances S and T have the same solubility in water?
   A 0 °C  
   B 40 °C  
   C 60 °C  
   D 100 °C

17 What is the solubility of substance T in 50 g of water when the temperature is 60 °C?
   A 20 g  
   B 40 g  
   C 50 g  
   D 100 g

Refer to the diagram below for Questions 18 and 19.
The diagram shows a specialised cell, obtained from the small intestine, which plays a role in the absorption of digested food.
18 Which of the labelled structures is partially permeable?

A  structure V  
B  structure W  
C  structure Y  
D  structure Z

19 Which of the labelled structures stores food and water?

A  structure V  
B  structure X  
C  structure Y  
D  structure Z

20 The diagram below shows four structures in a human being with each representing a level of organization of life.

<table>
<thead>
<tr>
<th>structure 1</th>
<th>structure 2</th>
<th>structure 3</th>
<th>structure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="structure1.png" alt="Image" /></td>
<td><img src="structure2.png" alt="Image" /></td>
<td><img src="structure3.png" alt="Image" /></td>
<td><img src="structure4.png" alt="Image" /></td>
</tr>
</tbody>
</table>

Note: the structures are not drawn to scale

Which of the following correctly identifies the level of organization of life that these structures belong to?

<table>
<thead>
<tr>
<th></th>
<th>structure 1</th>
<th>structure 2</th>
<th>structure 3</th>
<th>structure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>cell</td>
<td>organ</td>
<td>tissue</td>
<td>system</td>
</tr>
<tr>
<td>B</td>
<td>cell</td>
<td>system</td>
<td>tissue</td>
<td>organ</td>
</tr>
<tr>
<td>C</td>
<td>tissue</td>
<td>system</td>
<td>cell</td>
<td>organ</td>
</tr>
<tr>
<td>D</td>
<td>tissue</td>
<td>organ</td>
<td>cell</td>
<td>system</td>
</tr>
</tbody>
</table>
Section B (30 marks)

Answer all the questions in the spaces provided on the question booklet.

1  (a) Complete the table below by naming the Globally Harmonized System (GHS) symbols shown. [2]

<table>
<thead>
<tr>
<th>Symbol 1</th>
<th>Symbol 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol 1" /></td>
<td><img src="image2" alt="Symbol 2" /></td>
</tr>
</tbody>
</table>

(b) In the table below, draw a two-dimensional diagram of each piece of the following apparatus. [2]

<table>
<thead>
<tr>
<th>(i)</th>
<th>(ii)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Diagram" /></td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>beaker</td>
<td>tripod stand</td>
</tr>
</tbody>
</table>

2 The diagrams below show the results of two test tubes after each was moved 20 times in and out of two types of Bunsen flames.

![Diagram 2.1](image5)  
**test tube X**  
black stains  

![Diagram 2.2](image6)  
**test tube Y**

(a) What are the black stains on the surface of test tube X? [1]

(b) Identify the type of Bunsen flame used in diagrams 2.1 and 2.2. [2]

Diagram 2.1 : __________________________

Diagram 2.2 : __________________________

(c) State one other difference between the two types of Bunsen flames. [1]

__________________________________________________________________________
(d) Give two safety measures that one must follow when heating a solution in a test tube over the Bunsen flame. [2]

Safety measure 1: __________________________

Safety measure 2: __________________________

3 Five athletes have been suspected of taking banned drugs, erythropoietin and steroid, to enhance their performance in the Olympics Games.

During the investigation, chromatography was done on their urine samples to detect whether the drugs were present. The diagram below shows the chromatogram for the two drugs and the five urine samples.

(a) Which athlete(s) took the drug, erythropoietin? [1]

(b) Which of the drugs is a pure substance? [1]

(c) During the testing process, the urine sample of athlete X was contaminated with another athlete’s urine sample.

Which urine sample (V, W, Y or Z) was the one that contaminated urine sample X? [1]

(d) Explain why the starting line cannot be drawn with a pen. [2]
Chris accidentally mixed three substances, P, Q, and R, in the laboratory. The properties of the 3 substances are stated in the table below.

<table>
<thead>
<tr>
<th>Attracted to a magnet?</th>
<th>Substance P</th>
<th>Substance Q</th>
<th>Substance R</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Soluble in alcohol?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Soluble in water?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

The statements below describe the steps that Chris could do to get back dried substance R.

Fill in the blanks or circle the correct answers to complete the statements.

Step 1 : Use a magnet to remove substance _______ from the mixture.

Step 2 : Add alcohol / water (circle one) into the remaining mixture and stir to dissolve substance _______.

Step 3 : Separate the mixture through a filtration / chromatography / distillation / evaporation (circle one) set-up. Substance _______ will be trapped on the filter paper as __________ while substance _______ will flow through as ____________.

Step 4 : _________________ the alcohol / water (circle one) to obtain dried substance R.

5 (a) Define an element.

__________________________

(b) The diagram below shows the outline of a Periodic Table.

```
  P  
  |   |
  |   |
  | Q |
  |   |
  |   |
  |   |
```

(i) State the Group and Period of Element Q.

Group : ____________ Period : ____________

(ii) List all the elements (P, Q, R, S, T) that are good conductors of electricity.

__________________________
(iii) With reference to the Periodic Table on Page 15, state the name of Element R and write down its chemical symbol. [2]

Name : 
Chemical symbol : 

(c) Christina performed an experiment as shown below.

When heating substance 3 with a strong flame, she noticed that it gave off a bright light. After cooling down, substance 4 was formed.

The properties of substances 1, 2, 3 and 4 are shown in the table below.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Attracted to a magnet?</th>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>no</td>
<td>yellow powder</td>
</tr>
<tr>
<td>2</td>
<td>yes</td>
<td>black powder</td>
</tr>
<tr>
<td>3</td>
<td>some parts yes, some parts no</td>
<td>yellowish-black powder</td>
</tr>
<tr>
<td>4</td>
<td>no</td>
<td>black solid</td>
</tr>
</tbody>
</table>

(i) Is substance 4 a compound or mixture? [1]

(ii) Is substance 3 a compound or mixture? [1]

(iii) Explain your answer for c(ii). [1]

(iv) State one other difference between a compound and mixture. [1]
1 Solid A with a dimension of 4 cm by 4 cm by 4 cm has a corner chipped off. The corner which was chipped off (solid B) has a mass of 4.32 g.

Solid B is then submerged in a measuring cylinder containing water as shown below.

(a) Find the volume of solid B.

(b) Calculate the density of solid B.

(c) Calculate the mass of the remaining solid A after being chipped off.

(d) Explain why solid A and solid B have the same density.

(e) Define density.
(f) Using the concept of density, explain how a hot air balloon works.

[2]

2 John noticed that 5 g of fine sugar dissolved quickly in 200 ml of water at 40 °C when the mixture was stirred continuously.

(a) John concluded that the sugar-water mixture is a solution after doing three tests. Write down what he had observed in the tests.

<table>
<thead>
<tr>
<th>Test</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 1</td>
<td>Look at the mixture to see whether it is clear or cloudy.</td>
</tr>
<tr>
<td>Test 2</td>
<td>Filter the mixture</td>
</tr>
<tr>
<td>Test 3</td>
<td>Let the mixture stand for 30 minutes.</td>
</tr>
</tbody>
</table>

(b) Describe two ways to decrease the rate of dissolving of sugar in water. Explain your answer.

[4]

(c) When John repeated the experiment with 50 g of fine sugar, he observed that there was some sugar remaining at the bottom of the beaker.

(i) State what could have happened to the mixture.

[1]

(ii) Suggest two ways to make the remaining sugar in c(i) dissolve in the water.

[2]
3 (a) The diagram below shows a typical plant cell.

Diagram 3.1

(i) Identify the labelled structures V to Z.

V : ______________________  Y : ______________________

W : ______________________  Z : ______________________

X : ______________________

(ii) Name two structures that cannot be found in animal cells.

________________________________________________________________________

________________________________________________________________________

(b) The diagram below shows a root hair cell obtained from the root of a plant.

Diagram 3.2

(i) Compare the cells in diagrams 3.1 and 3.2, and identify the structure that is missing in the root hair cell.

________________________________________________________________________

(ii) Explain why the root hair cell does not have the structure identified in (b)(i).

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

End of Paper
### The Periodic Table of Elements

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>proton (atomic number) and atomic symbol</td>
<td>H</td>
<td>He</td>
<td>lithium</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
</tr>
<tr>
<td>name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>relative atomic mass</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Li</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Na</td>
<td>Mg</td>
<td>Al</td>
<td>Si</td>
<td>P</td>
<td>S</td>
<td>Cl</td>
<td>Ar</td>
</tr>
<tr>
<td>19</td>
<td>K</td>
<td>Ca</td>
<td>Ti</td>
<td>V</td>
<td>Cr</td>
<td>Mn</td>
<td>Fe</td>
<td>Co</td>
</tr>
<tr>
<td>37</td>
<td>Rb</td>
<td>Sr</td>
<td>Zr</td>
<td>Nb</td>
<td>Mo</td>
<td>Tc</td>
<td>Ru</td>
<td>Rh</td>
</tr>
<tr>
<td>55</td>
<td>Cs</td>
<td>Ba</td>
<td>Hf</td>
<td>Ta</td>
<td>W</td>
<td>Re</td>
<td>Os</td>
<td>Ir</td>
</tr>
<tr>
<td>87</td>
<td>Fr</td>
<td>Ra</td>
<td>Rf</td>
<td>Db</td>
<td>Sg</td>
<td>Bh</td>
<td>Hs</td>
<td>Mt</td>
</tr>
</tbody>
</table>

#### Lanthanoids

<table>
<thead>
<tr>
<th>57</th>
<th>La</th>
<th>Ce</th>
<th>Pr</th>
<th>Nd</th>
<th>Pm</th>
<th>Sm</th>
<th>Eu</th>
<th>Gd</th>
</tr>
</thead>
<tbody>
<tr>
<td>139</td>
<td>140</td>
<td>141</td>
<td>142</td>
<td>143</td>
<td>144</td>
<td>145</td>
<td>146</td>
<td>147</td>
</tr>
</tbody>
</table>

#### Actinoids

<table>
<thead>
<tr>
<th>89</th>
<th>Ac</th>
<th>Th</th>
<th>Pa</th>
<th>U</th>
<th>Np</th>
<th>Pu</th>
<th>Am</th>
<th>Cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>232</td>
<td>233</td>
<td>234</td>
<td>235</td>
<td>236</td>
<td>237</td>
<td>238</td>
<td>239</td>
<td>240</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19. A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A: 5</td>
<td>B: 5</td>
<td>C: 6</td>
</tr>
<tr>
<td>D: 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Deduct 1 mark from the total mark if a student makes any of the following mistakes in scientific drawings.
- Did not use a pencil
- Did not use a ruler when straight lines are required
- Lines are broken/fuzzy

Deduct 1 mark from the total mark if the student did not leave the answer in 3.s.f. or forget to put units.

Section B

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Explosive Corrosive</td>
<td>1</td>
</tr>
<tr>
<td>b i</td>
<td>Diagram 2.1: Luminous flame Diagram 2.2: Non-luminous flame</td>
<td>1</td>
</tr>
</tbody>
</table>
| ii       | Any of the following points
| c        | - Non-luminous flame is hotter than luminous flame.
|          | - Non-luminous flame is steadier than luminous flame. | 1 |
| d        | Any two of the following or logical points
|          | - Use a test tube holder to hold onto the test tube.
|          | - Ensure that the solution is not flammable.
|          | - Wear safety goggle.
|          | - Ensure that the mouth of the test tube is pointed away from people.
|          | - Do not fill test tube to the brim with the solution.
|          | - Long hair needs to be tie back
<p>|          | - Ensure that there is no lose item/fittings on the body (e.g. lanyard, tie) | 2 |
|          | Note: General safety rules that are not related to heating will not be accepted (e.g. Do not eat and drink in the lab) |
| a        | V and Y (no half mark) | 1 |
| b        | steroid | 1 |
| c        | Z | 1 |
| d        | Pen ink can dissolve in the solvent, [1] hence, affecting the results. [1] | 2 |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
| a     | A pure substance that cannot be broken down into simpler substances by chemical method.  
| i     | Group: II Period: 6  
| ii    | P, Q and R  
| iii   | Copper; Cu  
| i     | Compound  
| ii    | Mixture  
| iii   | It retains the properties of its components (substances 1 and 2). Accept if students convey above point by stating the characteristics (e.g. substance 3 is yellowish black, which is a mixture of the characteristics of 1 (yellow) and 2 (black))  
| iv    | Any one of the answer:  
| c     |   |
|       |   |
|       | **Compound** | **Mixture** |
|       | Made up of two or more different elements chemically combined together | Made up of two or more substances (elements or compounds) add together |
|       | Cannot be separated easily using physical method | Can be separated easily using physical method |
|       | Chemical reaction/Energy change is involved during the formation of compound | No chemical reaction/Energy change is involved during the formation of mixture |
|       | Must be formed with a fixed proportion of its elements | Can be formed with any proportion of its components |
### Section C

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>28.9 – 25.3 = 3.6 cm³ -------------- (1m for answer)</td>
<td>1</td>
</tr>
</tbody>
</table>
| b | Density = 4.32/3.6 ------ (1m for applying formula correctly: mass/ρ)  
= 1.2 g/cm³ ------ (1m for correct answer; allow ecf if is due wrong value of (a)) | 2 |
| c | Volume of A = (4x4x4) – 3.6  
= 60.4 cm³ ------ (1m for answer; allow ecf if is due to wrong value of (a))  
Mass = 60.4 x 1.2 --------- (1m for working: volume of A X (b))  
= 72.5 g --------------- (1m for answer; allow ecf provided that previous 2 working mark are awarded) | 3 |
| d | Solid A and Solid B is made of the same material. | 1 |
| e | Density is defined as mass per unit volume. | 1 |
| f | When the air in the balloon is heated, the hot air becomes less dense than the outside air. [1]  
This causes the hot air balloon to rise as a result of density difference between the hot air inside the balloon and the cold air outside the balloon? [1] | 2 |

| Test 1 | Look at the mixture to see whether it is clear or cloudy. |  |
| Test 2 | Filter the mixture |  |
| Test 3 | Let the mixture stands for 30 minutes. |  |

<table>
<thead>
<tr>
<th>Way</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use coarse sugar</td>
<td>To decrease the surface area to volume ratio of the sugar.</td>
</tr>
<tr>
<td>Lower the temperature</td>
<td>Sugar and water molecules will move slower</td>
</tr>
<tr>
<td>Do not stir the mixture</td>
<td>Longer time for water molecules to reach the covered sugar</td>
</tr>
</tbody>
</table>

| i | The mixture is satiated. | 2 |
| ii | 1) Increase the temperature of the water to higher than 40 °C.  
2) Increase the volume of water to more than 200 ml. | 2 |

| V : nucleus | Y : cell membrane |
| W : large central vacuole | Z : cell wall |
| X : chloroplast |

| i | large central vacuole (W), chloroplast (X) OR cell wall (Z) | 2 |
| ii | Root hair cell is not expose to sunlight/buried underground/buried in soil,  
hence, it does not carry out photosynthesis/does not need chloroplasts to capture sunlight. | 2 |

<table>
<thead>
<tr>
<th>b</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Jurong West Secondary School
Mid-Year Examinations 2018

LOWER SECONDARY SCIENCE
Secondary One Express

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in. Write in dark blue or black pen. You may use an HB pencil for any diagrams, graphs, tables or rough working. Do not use staples, paper clips, 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
There are twenty questions. 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 the boxes provided on Page 2. Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this question paper.

Section B and C
Answer all questions in the spaces provided. 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 20.

<table>
<thead>
<tr>
<th>After checking of answer script</th>
<th>For Examiner's Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Checked by Student</td>
<td>Signature</td>
</tr>
<tr>
<td>Section A</td>
<td></td>
</tr>
<tr>
<td>Section B</td>
<td></td>
</tr>
<tr>
<td>Section C</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

This document consists of 20 printed pages.
**Section A: Multiple Choice (20 marks)**

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 the boxes below.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A2</td>
<td>A3</td>
<td>A4</td>
<td>A5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A6</td>
<td>A7</td>
<td>A8</td>
<td>A9</td>
<td>A10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>A12</td>
<td>A13</td>
<td>A14</td>
<td>A15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A16</td>
<td>A17</td>
<td>A18</td>
<td>A19</td>
<td>A20</td>
</tr>
</tbody>
</table>
A1 The diagram shows some water in a measuring cylinder, and the same measuring cylinder with a stone completely immersed in the water.

What is the volume of the stone?
A 50 cm³  B 60 cm³  C 70 cm³  D 130 cm³

A2 What is the reading shown on the micrometer screw gauge?
A 0.23 mm  B 2.523 mm  C 2.73 mm  D 5.23 mm

A3 What is the reading shown on the Vernier callipers?
A 1.46 cm  B 1.66 cm  C 2.12 cm  D 2.26 cm

A4 A scientist reported a new discovery. A few scientists did not agree with the results of the new discovery. What is the best thing the rest of the scientists can do?
A Have other scientists repeat the scientist’s experiments.
B Ignore the scientists who disagree with the discovery.
C Reject the discovery that was reported.
D Take a vote to decide who is correct.
Read the description of the experiment in the box below to answer questions A5 and A6.

- 120 pea seeds were put in petri dishes covered with moist paper towels.
- Each petri dish was wrapped inside a black plastic bag.
- The seeds in their petri dishes were then divided into 3 groups.
- 1 group of 40 pea seeds were placed in an incubator set to 20°C.
- Another group of 40 seeds were placed in an incubator set to 30°C.
- The last group of seeds were placed in an incubator set to 40°C.

**A5** In this experiment, what was the independent variable?

A. Amount of light  
B. Amount of moisture  
C. Temperature of the incubator  
D. The number of pea seeds

**A6** Which of the following was the likely aim of this experiment?

A. To determine if pea seeds can germinate without light.  
B. To determine if petri dishes are suitable for germinating pea seeds.  
C. To determine if temperature of the incubator can be adjusted.  
D. To determine if temperature affects the germination of pea seeds.

**A7** The mass and volume of three liquids are measured.

<table>
<thead>
<tr>
<th>liquid</th>
<th>mass / g</th>
<th>volume / cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>corn syrup</td>
<td>10.8</td>
<td>10</td>
</tr>
<tr>
<td>salad oil</td>
<td>23.0</td>
<td>25</td>
</tr>
<tr>
<td>vinegar</td>
<td>30.3</td>
<td>30</td>
</tr>
</tbody>
</table>

What is the difference in density between the least dense and densest liquids listed in the table?

A. 0.07 g/cm³  
B. 0.09 g/cm³  
C. 0.16 g/cm³  
D. 1.08 g/cm³

**A8** The diagram shows a rectangular block.

![Diagram of a rectangular block]

The density of the block is 2.5 g/cm³. What is the mass of the block?

A. 18 g  
B. 24 g  
C. 50 g  
D. 150 g
A9 When a car stops suddenly, a passenger inside the car tends to keep moving because of his ______.

- A inertia
- B mass
- C volume
- D weight

A10 Sam conducts an experiment to see if a marble floats or sinks in some liquids. His results are shown in the table.

<table>
<thead>
<tr>
<th>liquid</th>
<th>marble</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>sinks</td>
</tr>
<tr>
<td>Q</td>
<td>floats</td>
</tr>
<tr>
<td>R</td>
<td>floats</td>
</tr>
<tr>
<td>S</td>
<td>sinks</td>
</tr>
</tbody>
</table>

Based on this data, what is the best conclusion?

- A The marble is denser than all the four liquids.
- B Liquid P has the same density as liquid S.
- C Liquid P is denser than liquid Q.
- D Liquid R is denser than liquid S.

A11 Which of the following are examples of animal cells?

1 2 3 4

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

A12 Which of the following is not true?

- A An organ is made up of one type of cell working together.
- B Tissues are made up of similar cells with the same function working together.
- C An organ system is made up of many organs working together.
- D An organ is a group of different tissues working together.
For questions A13 and A14, refer to the animal cell below.

A13 What is the function of X and Y?

<table>
<thead>
<tr>
<th>Function of X</th>
<th>Function of Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A storage of dissolved substances</td>
<td>carry out aerobic respiration</td>
</tr>
<tr>
<td>B storage of dissolved substances</td>
<td>place for chemical reactions</td>
</tr>
<tr>
<td>C carry out aerobic respiration</td>
<td>provide energy for the cell</td>
</tr>
<tr>
<td>D carry out aerobic respiration</td>
<td>place for chemical reactions</td>
</tr>
</tbody>
</table>

A14 What is Z?

A nucleus
B cytoplasm
C cell wall
D cell membrane

A15 A light microscope was used to observe a cell under a total magnification of 400×. The magnification of the ocular lens used is 10×. What is the magnification of the objective lens used?

A 4×  B 40×  C 400×  D 4000×

A16 When air is heated, it expands because

A the air molecules are getting bigger.
B the number of air molecules increases.
C the air molecules are moving faster and further apart.
D the air molecules move at the same speed but further apart.

A17 Which of the following is not true?

A Compounds are made up of two or more elements.
B Matter can be made up of atoms and molecules.
C Non-metallic elements are found on the left side of the Periodic Table.
D The Periodic Table consists of only elements.
A18 Substance T is made up of elements hydrogen and oxygen and the particles of T are arranged as shown below.

Which of the following is not true?
A  T comprises molecules only.
B  T does not have a fixed melting point.
C  T has properties different from those of hydrogen and oxygen.
D  T is made up of hydrogen and oxygen combined in a specific ratio.

For questions A19 and A20, refer to the table below showing the melting and boiling points of four substances A to D.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Melting point / °C</th>
<th>Boiling point / °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>44</td>
<td>890</td>
</tr>
<tr>
<td>B</td>
<td>98</td>
<td>180</td>
</tr>
<tr>
<td>C</td>
<td>–39</td>
<td>357</td>
</tr>
<tr>
<td>D</td>
<td>–112</td>
<td>–18</td>
</tr>
</tbody>
</table>

A19 Which substance exists as a liquid over the smallest range of temperature?

A20 Which of the substance(s) is/are a solid at room temperature of 25°C?

A  A only
B  C only
C  A and B
D  C and D
**Section B**: Structured Questions (35 marks)
Answer all the questions in the spaces provided.

**B1 (a)** Write the names of the apparatus represented by the following diagrams. [2]

<table>
<thead>
<tr>
<th>diagram</th>
<th>name of apparatus</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Diagram 1]</td>
<td></td>
</tr>
<tr>
<td>![Diagram 2]</td>
<td></td>
</tr>
<tr>
<td>![Diagram 3]</td>
<td></td>
</tr>
</tbody>
</table>

**B1 (b)** State what the following GHS symbols mean. [2]

<table>
<thead>
<tr>
<th>GHS symbol</th>
<th>meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>![GHS Symbol 1]</td>
<td></td>
</tr>
<tr>
<td>![GHS Symbol 2]</td>
<td></td>
</tr>
<tr>
<td>![GHS Symbol 3]</td>
<td></td>
</tr>
</tbody>
</table>
B2 Fig. 2 shows a part of an animal cell.

Fig. 2

(a) The function of structure X is to synthesize proteins. State the name of X.

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

(b) For X to synthesize proteins quickly, it needs instructions that can only be obtained from DNA which is found in structure Y.

(i) State the name of structure Y and describe its main function.

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

(ii) If structure Y is damaged, suggest what might happen to the cell.

........................................................................................................................................
........................................................................................................................................[1]
B3  Fig. 3 shows the cell wall and nucleus of a plant cell.

![Cell diagram]

**Fig. 3**

(a) Draw an arrow to show and label the cell structure
   (i) which stores dissolved substances,
   (ii) which contains chlorophyll. [1]

(b) A cell structure is not labelled in Fig. 3. This structure is partially permeable. Describe the function of this cell structure.

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

(c) Using ideas of cell structures, explain why an elephant requires a skeleton but a rain tree does not.

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

(d) A student states, “All plant cells contain chlorophyll.”
   State, giving a reason, whether you agree with this statement.

.................................................................................................................................................................
.................................................................................................................................................................
................................................................................................................................................................. [2]
B4  (a) Describe the arrangement of the particles in a solid substance.

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

(b) The substance is heated until it melts and then boils to form a gas.

(i) Explain why heat has to be supplied in order to melt the substance.

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

(ii) Describe the changes in the arrangement of the particles when the substance is in the gaseous state.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................[2]
Fig. 5 shows water droplets forming on the side of a cup that was taken out from the refrigerator.

(a) Using ideas involving heat gain or loss, explain how the water droplets are formed.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................(2)

(b) Describe the change in the forces of attraction between the water particles during the formation of the water droplets.

...........................................................................................................................................
...........................................................................................................................................
...........................................................................................................................................(2)
A mixture is prepared using the steps shown below.

1) Mix 10 g of sand and 10 g of fine sugar with 50 cm$^3$ of water.
2) Stir the mixture.
3) Filter the mixture using the appropriate apparatus.

(a) State what is the filtrate in step 3.

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

(b) If the fine sugar in step 1 is replaced with sugar cubes, state and explain how this will affect the rate of dissolving the sugar.

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

(c) Two students, Donald and Daisy, are discussing how to speed up the rate of dissolving sugar in this experiment.
Donald suggested using 200 cm$^3$ of water.
Daisy suggested using 100 cm$^3$ of hot water.
For each suggestion, state and explain if it will lead to a faster rate of sugar dissolving.

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The table in Fig. 7 shows diagrams of the particles of some elements and compounds. Some parts of the table have been filled up.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Diagram</th>
<th>Atom or Molecule?</th>
<th>Element or Compound?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><img src="image1" alt="Diagram A" /></td>
<td></td>
<td>Element</td>
</tr>
<tr>
<td>B</td>
<td><img src="image2" alt="Diagram B" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td><img src="image3" alt="Diagram C" /></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td><img src="image4" alt="Diagram D" /></td>
<td>Atom</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 7**

(a) Explain what is meant by a *compound*.

(b) Complete the table in Fig. 7 by filling in all the blanks. 

(c) State whether substance D is a solid, liquid or gas. 

(d) Substance B, which is brown, was added to substance C, which is blue. As a result, a white solid is formed with some heat given out. State and explain whether a compound or a mixture has been formed.
C1 (a) The melting points of some Group 1 metals are shown in Fig. 1.1.

(i) Caesium has a melting point of 30°C. On Fig. 1.1, draw a bar to show this information. \[1\]

(ii) A computer chip requires metals in the solid state to function. If the maximum temperature the chip operates at is 80°C, which metal(s) listed above is/are suitable for use in the computer chip?

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

(iii) Look up the positions of the metals in the Periodic Table and state the relationship between melting point and the position of the metal.

.........................................................................................................................................................

.........................................................................................................................................................
.........................................................................................................................................................[2]
(b) When a mass is attached to a spring, the spring stretches. Leela conducts an experiment where she hangs different masses on the same spring and then measures the length the spring is stretched for each mass.

Fig 1.2 shows how the experiment is set up.

![Fig. 1.2](image)

Table 1.3 shows the results of Leela’s experiment.

<table>
<thead>
<tr>
<th>attached mass / g</th>
<th>stretched length / cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>2.0</td>
</tr>
<tr>
<td>200</td>
<td>4.2</td>
</tr>
<tr>
<td>300</td>
<td>6.4</td>
</tr>
<tr>
<td>400</td>
<td>8.5</td>
</tr>
<tr>
<td>450</td>
<td>9.6</td>
</tr>
<tr>
<td>500</td>
<td>10.6</td>
</tr>
</tbody>
</table>

Table 1.3

[Question continues on the next page]
(i) Plot a graph of stretched length of the spring against the attached mass. Write the axis labels in the boxes provided and draw the best-fit line for your graph.

(ii) State the relationship between the mass attached and the length the spring is stretched.

(iii) Use your graph to determine the mass attached to the spring which will stretch the spring by 5.0 cm.

attached mass = ...............g [1]

(iv) Suggest what Leela can do to read the length of the spring more accurately.

---------------------------------------------------------------[1]
C2 (a) Define inertia.

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

(b) A space shuttle carrying a big satellite is moving through space. To stop its motion, the shuttle fires its retro rockets for 30 seconds.

If the space shuttle is empty, state and explain whether the shuttle needs to fire its retro rockets for a longer, shorter or same amount of time to stop its motion.

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

(c) Fig. 2.1 shows an experiment conducted to find the densities of a stone and a wooden block. The different stages of the experiment are shown.

![Fig. 2.1](image)

At each stage, the total mass of the set-up and the volume of the water level are measured. Table 2.2 shows the data collected for each of the three stages.

<table>
<thead>
<tr>
<th></th>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mass</strong></td>
<td>63.6 g</td>
<td>142.8 g</td>
<td>164.3 g</td>
</tr>
<tr>
<td><strong>Volume of water level</strong></td>
<td>40 cm³</td>
<td>76 cm³</td>
<td>103 cm³</td>
</tr>
</tbody>
</table>

**Table 2.2**

[Question continues on the next page}
From the data given,

(i) find the density of the stone,

\[ \text{density of stone} = \ldots \text{g/cm}^3 \] [3]

(ii) find the density of the wooden block.

\[ \text{density of wooden block} = \ldots \text{g/cm}^3 \] [2]

(iii) explain why the stone is needed to find the density of the wooden block. The density of water is 1.00 g/cm\(^3\).

…………………………………………………………………………………………….
…………………………………………………………………………………………….
…………………………………………………………………………………………….
…………………………………………………………………………………………….[2]
# The Periodic Table of Elements

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Li</td>
<td>Be</td>
<td>B</td>
<td>C</td>
<td>N</td>
<td>O</td>
<td>F</td>
<td>Ne</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>lithium</td>
<td>beryllium</td>
<td>boron</td>
<td>carbon</td>
<td>nitrogen</td>
<td>oxygen</td>
<td>fluorine</td>
<td>neon</td>
<td></td>
</tr>
<tr>
<td>Na</td>
<td>23</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>23</td>
<td>4</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>16</td>
<td>18</td>
<td>36</td>
<td>84</td>
</tr>
<tr>
<td>sodium</td>
<td>magnesium</td>
<td>carbon</td>
<td>oxygen</td>
<td>chlorine</td>
<td>argon</td>
<td>krypton</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key**
- proton (atomic) number
- atomic symbol
- relative atomic mass

## Elements

### Group I (Alkali Metals)
- **Li**: Lithium
- **Na**: Sodium
- **K**: Potassium
- **Rb**: Rubidium
- **Cs**: Cesium
- **Fr**: Francium

### Group II (Alkaline Earth Metals)
- **Be**: Beryllium
- **Mg**: Magnesium
- **Ca**: Calcium
- **Sr**: Strontium
- **Ba**: Barium

### Group III (A Group)
- **B**: Boron
- **Al**: Aluminum
- **Ga**: Gallium
- **In**: Indium
- **Tl**: Thallium

### Group IV (B Group)
- **C**: Carbon
- **Si**: Silicon
- **Ge**: Germanium
- **Sn**: Tin
- **Pb**: Lead

### Group V (N Group)
- **N**: Nitrogen
- **P**: Phosphorus
- **As**: Arsenic
- **Sb**: Antimony
- **Bi**: Bismuth

### Group VI (O Group)
- **O**: Oxygen
- **S**: Sulphur
- **Se**: Selenium
- **Te**: Tellurium
- **Xe**: Xenon

## Group VII (Halogens)
- **F**: Fluorine
- **Cl**: Chlorine
- **Br**: Bromine
- **I**: Iodine
- **Xe**: Xenon

## Group VIII ( noble gases)
- **Ne**: Neon
- **Ar**: Argon
- **Kr**: Krypton
- **Xe**: Xenon

## Periodic Table Continues...

**Lanthanoids**
- **La**: Lanthanum
- **Ce**: Cerium
- **Pr**: Praseodymium
- **Nd**: Neodymium
- **Pm**: Promethium
- **Sm**: Samarium
- **Eu**: Europium
- **Gd**: Gadolinium
- **Tb**: Terbium
- **Dy**: Dysprosium
- **Ho**: Holmium
- **Er**: Erbium
- **Tm**: Thulium
- **Yb**: Ytterbium

**Actinoids**
- **Ac**: Actinium
- **Th**: Thorium
- **Pa**: Protactinium
- **U**: Uranium
- **Np**: Neptunium
- **Pu**: Plutonium
- **Am**: Americium
- **Cm**: Curium
- **Bk**: Berkelium
- **Cf**: Californium
- **Es**: Einsteinium
- **Fm**: Fermium
- **Md**: Mendeleevium
- **No**: Nihonium

The volume of one mole of any gas is 24 cm³ at room temperature and pressure (r.t.p.).
S1E SCIENCE MARK SCHEME

Section A

<table>
<thead>
<tr>
<th></th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
<th>A10</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>C</td>
<td>B</td>
<td>A</td>
<td>C</td>
<td>D</td>
<td>C</td>
<td>D</td>
<td>A</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>A11</td>
<td>A12</td>
<td>A13</td>
<td>A14</td>
<td>A15</td>
<td>A16</td>
<td>A17</td>
<td>A18</td>
<td>A19</td>
<td>A20</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>A</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td></td>
</tr>
</tbody>
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Section B

B1 (a)

<table>
<thead>
<tr>
<th>filter funnel</th>
<th>wire gauze</th>
<th>conical flask</th>
</tr>
</thead>
</table>

All correct – 2 mks
2 correct – 1 mk

(b)

<table>
<thead>
<tr>
<th>irritant</th>
<th>health hazard</th>
</tr>
</thead>
</table>

1 mk for each correct answer
B2 (a) ribosomes
(b) (i) nucleus
controls cell activities
(ii) cell cannot function properly OR cell cannot reproduce

B3 (a) Both correct
(b) controls substances entering or leaving the cell
(c) rain tree has plant cells which have cell walls to provide support
animal cells in elephant do not have cell walls so cannot provide support
(d) disagree
those cells that do not receive sunlight need not have chlorophyll

B4 (a) closely packed
regular / orderly arrangement
(b) (i) heat energy is required to overcome the forces of attraction between the particles
so that the particles break free from their fixed positions OR until they can slide past each other
(ii) particles become far apart
orderly arrangement changes to disorderly

B5 (a) water vapour in air condenses on cup
by losing heat to the cup
(b) forces of attraction between particles are very weak in water vapour
they become stronger when water is formed

B6 (a) sugar solution (no marks for sugar)
(b) rate is slower
surface area in contact with water is reduced when in cube form
(c) Donald’s suggestion does not work as increasing volume does not affect rate of dissolving
Daisy’s suggestion will work as increasing temperature speeds up rate of dissolving [1]

B7 (a) substance formed when two or more elements are chemically joined together [1]
(b) A – atom, B – molecule, C – molecule all correct [1]
     B – element, C – compound, D – element all correct [1]
(c) liquid [1]
(d) compound formed
     product colour is different OR heat is given out [1]

Section C

C1 (a) (i) bar at caesium to correct value of 30 [1]
     lithium and sodium [1]
     (ii) The lower the metal’s position in group 1, [1]
     the lower the melting point [1]
     (iii) answer based on dotted line correctly drawn [1]
     (iv) take reading at eye-level to avoid parallax error OR bring ruler nearer to [1]
     the spring to reduce chance of parallax error

C2 (a) reluctance to change object’s state of rest or motion [1]
(b) shorter time [1]
     empty means smaller mass so smaller inertia [1]
(c) (i) evidence of m = 79.2 g and V = 36 cm³ [1]
     D = m/V [1]
     = 2.2 g/cm³ [1]
     (ii) evidence of m = 21.5 g and V = 27 cm³ [1]
     D = 0.796 g/cm³ [1]
     (iii) wooden block is less dense than water so it floats on water [1]
     stone is needed to make the wooden block completely sink in water to [1]
     measure its total volume
READ THESE INSTRUCTIONS FIRST

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

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

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

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

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

<table>
<thead>
<tr>
<th>For Examiner’s Use</th>
<th>Physics</th>
<th>Biology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section A</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Section B</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Section C</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Subtotal</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

This paper consists of 29 printed pages and 3 blank pages, including the cover page.
Section A
Answer all questions.

A1 Which one of the following sets shows only the symbols of SI units?
A kg, kg/m\(^3\), s, K
B g, cm, g/cm\(^3\), °C
C kg, cm, s, °C
D g, km, m/s, °F

A2 A quantity is quoted as having a value of 6.2 ms.
In what units is it measured?
A metres
B metres per second
C microseconds
D milliseconds

A3 The diagram below shows a vernier scale.

What is the reading shown?
A 2.02 cm
B 2.10 cm
C 2.20 cm
D 3.10 cm
A4 The diagram below shows part of a micrometer screw gauge.

What is the reading shown on the scale?

A 9.48 mm  B 9.98 mm  C 10.98 mm  D 19.48 mm

A5 When designing an experiment to find out the volume of an irregular solid, which of the following apparatus can be used?

A displacement can
B displacement can and measuring cylinder
C displacement can and test tube
D round-bottomed flask

A6 The diagram below shows a measuring cylinder containing water. From which position will the most accurate reading of the volume of the water be made?

A position 1
B position 2
C position 3
D position 4
A7  A pupil has to find the volume of a cork by using a measuring cylinder. The cork floats, so he uses a stone to keep it under the water. He then measures the volume of the stone. The results for each stage of the experiment are shown.

What is the volume of the cork?
A  4.0 cm³  B  5.0 cm³  C  7.0 cm³  D  8.0 cm³

A8  A measuring cylinder containing some water stands on a scale pan. A solid ball is lowered into the water.

The water level rises from the 30 cm³ mark to the 40 cm³ mark.

The scale reading increases from 100 g to 180 g.

What is the density of the material of the ball?
A  0.125 g/cm³  B  4.5 g/cm³  C  8.0 g/cm³  D  18 g/cm³

A9  Which statement correctly describes the mass of an object?
A  The pull of gravity on the object.
B  The material from which the object is made.
C  The amount of space taken up by the object.
D  The amount of substance the object contains.
A10 When force is applied to a body, several effects are possible. Which of the following effects could not occur?

A The body rotates.
B The body speeds up.
C The mass of the body decreases.
D The pressure on the body increases.

A11 A brick is placed on a spring balance X and then on a beam balance Y.

What is measured by each balance?

<table>
<thead>
<tr>
<th></th>
<th>balance X</th>
<th>balance Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>weight</td>
<td>mass</td>
</tr>
<tr>
<td>B</td>
<td>weight</td>
<td>weight</td>
</tr>
<tr>
<td>C</td>
<td>mass</td>
<td>mass</td>
</tr>
<tr>
<td>D</td>
<td>mass</td>
<td>weight</td>
</tr>
</tbody>
</table>

A12 Jane, a school librarian, finds it easier to use a trolley to move boxes of books around the library. Which force is reduced due to the usage of the trolley?

A contact force
B frictional force
C gravitational force
D magnetic force
A13  The diagram below shows four forces acting on a block.

![Diagram of forces](image)

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

A14  The diagram shows a glass block resting on a table top.

The area of the block in contact with the table is X and the area of the table top is Y.

The weight of the block is P and the weight of the table is Q.

Which expression gives the pressure exerted on the table by the block?

A  \( \frac{P}{X} \)
B  \( \frac{P}{Y} \)
C  \( \frac{Q}{X} \)
D  \( \frac{Q}{Y} \)

A15  Objects with different weights are placed on a rigid, horizontal surface.

Which row shows the correct pressure acting on the surface?

<table>
<thead>
<tr>
<th>weight / N</th>
<th>area in contact / m²</th>
<th>pressure / N/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 10</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>B 20</td>
<td>0.2</td>
<td>0.01</td>
</tr>
<tr>
<td>C 30</td>
<td>0.1</td>
<td>300</td>
</tr>
<tr>
<td>D 40</td>
<td>0.2</td>
<td>8</td>
</tr>
</tbody>
</table>
A16 A curved arrow was cut from a uniformly thick piece of cardboard as shown in the diagram.
Which letter is at the centre of gravity of the piece of cardboard?

A17 Which diagram shows an application of the turning effect of a force?

A18 If a nut and bolt are difficult to undo, it may be easier to turn the nut by using a longer spanner.
This is because the longer spanner gives
A a larger turning moment.
B a smaller turning moment.
C less friction.
D more friction.
A19  A uniform beam is balanced at its midpoint. An object is placed on the beam, as shown.

Which force will rebalance the beam?

A  30 N acting upwards, 60 cm to the left of the midpoint
B  30 N acting upwards, 60 cm to the right of the midpoint
C  45 N acting downwards, 45 cm to the right of the midpoint
D  90 N acting downwards, 20 cm to the left of the midpoint

A20  The diagram shows a wheelbarrow and its load, which have a total weight of 150 N. This is supported by a vertical force F at the ends of the handles.

What is the value of F?

A  60 N  B  75 N  C  100 N  D  150 N
A21 Which of the following cells is responsible for transmitting electrical signals around the body?

A

B

C

D

A22 Which of the following is true about the nucleus?

I It controls the repair of cells.
II It regulates cell reproduction.
III It contains genetic material for cellular reproduction.
IV It controls the movement of substances in and out of cells.

A I and III
B I, II and III
C II, III and IV
D All of the above

A23 Michelle notices that there is an additional outer layer of surrounding each plant cell observed under a light microscope. This additional layer is not present in animal cells. What is the main function of this additional layer?

A To provide support for the cells.
B To convert light energy into plant food.
C To provide an environment for chemical reactions to occur.
D To control the movement of substances in and out of the cells.
A24 Below are the descriptions of a specialised cell. Which of the following describe xylem?

I It is a living cell.
II It transports sugars.
III It has a hollow tube.
IV It has lignified walls.

A I and II only
B I and III only
C II and III only
D III and IV only

A25 A drop of red dye is put into a beaker of water and left for two hours. After two hours, the red dye has spread throughout the solution.

Which of the following best describes this observation?

A The red dye molecules move from a region of higher concentration to a region of lower concentration down the concentration gradient.
B The red dye molecules move from a region of lower concentration to a region of higher concentration down the concentration gradient.
C The red dye molecules move from a region of higher concentration to a region of lower concentration against the concentration gradient.
D The red dye molecules move from a region of lower concentration to a region of higher concentration against the concentration gradient.
A26 Which of the following is an example of osmosis?

A  The breakdown of food substances into simpler substances by enzymes.
B  The absorption of water from the intestinal tract from intestines into the blood vessels.
C  The movement of simple food particles from the intestinal tract into the blood vessels.
D  The exchange of useful and waste substances across the partially permeable intestinal lining.

A27 Sam filled a Visking tubing with distilled water. He weighed the Visking tubing before and then one hour after placing it in a beaker containing 20% sucrose solution.

Which of the following will be the expected observation and process responsible after one hour?

<table>
<thead>
<tr>
<th>mass of Visking tubing</th>
<th>molecules involved</th>
<th>direction of movement</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  increase</td>
<td>water</td>
<td>into tubing</td>
</tr>
<tr>
<td>B  decrease</td>
<td>water</td>
<td>out of tubing</td>
</tr>
<tr>
<td>C  increase</td>
<td>sucrose</td>
<td>into tubing</td>
</tr>
<tr>
<td>D  decrease</td>
<td>sucrose</td>
<td>out of tubing</td>
</tr>
</tbody>
</table>
The diagram below shows the structure of an air sac in a human lung.

Which of the following will account for the movement of gases across the air sac?

<table>
<thead>
<tr>
<th></th>
<th>air sac</th>
<th>blood capillary</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>high in oxygen</td>
<td>high in carbon dioxide</td>
</tr>
<tr>
<td>B</td>
<td>high in oxygen</td>
<td>low in carbon dioxide</td>
</tr>
<tr>
<td>C</td>
<td>low in oxygen</td>
<td>high in carbon dioxide</td>
</tr>
<tr>
<td>D</td>
<td>low in oxygen</td>
<td>low in carbon dioxide</td>
</tr>
</tbody>
</table>
A29  The diagram below shows a root hair cell in soil.

Which of the following will account for the water potential of cell sap compared to the soil and movement of water molecules across the cell to ensure its survival?

<table>
<thead>
<tr>
<th>concentration of cell sap compare to the soil</th>
<th>movement of water molecules</th>
</tr>
</thead>
<tbody>
<tr>
<td>A  higher water potential</td>
<td>move into cell via osmosis</td>
</tr>
<tr>
<td>B  higher water potential</td>
<td>move out of cell via osmosis</td>
</tr>
<tr>
<td>C  lower water potential</td>
<td>move into cell via osmosis</td>
</tr>
<tr>
<td>D  lower water potential</td>
<td>move out of cell via osmosis</td>
</tr>
</tbody>
</table>

A30  The diagram below shows a blood sample under a microscope. Which component helps to transport digested food molecules?
A31  Anaemia is a condition where a person does not have enough functional red blood cells in the body. A person suffering from anaemia may

- A feel hyperactive.
- B feel hungry often.
- C feel dizzy and faint.
- D have loss of memory.

A32  A red blood cell is biconcave in shape to allow

- A more space for oxygen to bind.
- B haemoglobin to occupy the space.
- C it to squeeze through the small capillaries.
- D a greater surface area to volume ratio for efficient absorption of oxygen.

A33  Which of the following statements below correctly describe vascular bundles in plants?

- I They are specialised tissues.
- II They carry oxygen within the plant.
- III They carry water, mineral salts and food.
- IV They can be found throughout the plant in parts such as leaves, stem and roots.

- A II and IV only
- B I, II and III only
- C I, III and IV only
- D All of the above
A34 The diagrams below show the different parts of the plant.

Which of the following correctly identifies the parts of plants shown?

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>root</td>
<td>stem</td>
<td>leaf</td>
</tr>
<tr>
<td>B</td>
<td>root</td>
<td>leaf</td>
<td>stem</td>
</tr>
<tr>
<td>C</td>
<td>leaf</td>
<td>root</td>
<td>stem</td>
</tr>
<tr>
<td>D</td>
<td>leaf</td>
<td>stem</td>
<td>root</td>
</tr>
</tbody>
</table>

A35 What process is responsible for the movement of water in the xylem?

A diffusion
B osmosis
C translocation
D transpiration

A36 The diagram below shows a green plant.

Where will food made by leaf be transported?

A I and II only
B II and III only
C I, II and III only
D I, II, III and IV
A37 Which of the following statements best defines a community?

A A group of organisms of the same species that live in an area.
B Many groups of organisms of different species that live in an area.
C Many groups of organisms of different species interacting with each other and the environment in which they all live in.
D The study of the interactions between many groups of organisms of different species and the environment in which they all live in.

A38 The graph below shows the global carbon dioxide levels from the year 1900 to 2000.

What can be concluded from the graph?

A The amount of carbon dioxide has increased slowly from 1900 to 2000.
B The amount of carbon dioxide has increased drastically from 1900 to 2000.
C The amount of carbon dioxide has increased slowly from 1900 to 1950 and increased drastically to 2000.
D The amount of carbon dioxide has increased drastically from 1900 to 1950 and increased slowly to 2000.
A39 Energy is lost in a food web as it is transferred from one organism to another. Which of the following is not a means by which energy is lost?

A defecation  
B excretion  
C photosynthesis  
D respiration

A40 A food chain is shown below.

\[ \text{tree} \rightarrow \text{caterpillar} \rightarrow \text{X} \rightarrow \text{eagle} \]

What is organism X?

A primary producer  
B primary consumer  
C secondary consumer  
D tertiary consumer
Section B
Answer all questions.

B1 Complete the table by filling in the most suitable instrument that can be used to measure each of these physical quantities and their respective accuracy.

The first line is done for you.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Instrument</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exactly 36.3 cm³ of water</td>
<td>Measuring cylinder</td>
<td>0.1 cm³</td>
</tr>
<tr>
<td>Depth of a paper cup</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Circumference of a tree</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thickness of copper wire</td>
<td></td>
<td>[3]</td>
</tr>
</tbody>
</table>

B2 Convert the following readings to the units indicated. Show your workings clearly.

(a) 0.045 cm = …………………………… m  [1]

(b) 3.04 l = …………………………… m l  [1]

B3 Fig. 3 shows a pendulum oscillating between positions X and Z. It takes 1.5 s to go from X to Z and back to the mid-point Y.

(a) Determine the period of the pendulum.

period =  [1]
(b) State what you can do to ensure that the measurement of the period of the pendulum is as accurate as possible during an experiment.

(c) State one thing you can do to increase the period of the oscillation.

B4 (a) Fig. 4.1 shows two different types of excavators of the same mass.

excavator A  excavator B

caterpillar tracks  wheels

Fig. 4.1

Which excavator is more suitable for operating on soft, muddy ground? Explain your answer using the concept of pressure.
(b) Fig. 4.2 shows a fork-lift tractor with a mass of 3000 kg transporting a load of 2400 N. The centre of gravity of the tractor is labelled as CG in Fig. 4.2. The engine of the tractor is switched off and the tractor is slowing down to a stop.

![Fig. 4.2](image)

(i) On Fig. 4.2, using the letters \( f \), \( W \), \( N_1 \) and \( N_2 \), draw labelled arrows to show the following:
   1. friction between the wheels and the floor, \( f \)
   2. weight of the tractor, \( W \) and
   3. contact force(s) exerted on the tractor by the floor \( (N_1 \text{ and } N_2) \). [3]

(ii) Calculate the total weight of the tractor and load, given gravitational field strength is 10 N/kg.

\[
\text{total weight} = \quad [2]
\]

(iii) The contact area of each wheel is 0.80 m².

Calculate the pressure exerted on the floor by the tractor and load if the tractor has 4 wheels.

\[
\text{pressure} = \quad [2]
\]
The weight of the bricks produces a turning effect, or moment, on the arm of the crane about the point P. The weight of the bricks is 12000 N.

(a) Calculate the moment of this force, using the distance marked on Fig. 5.

$$\text{moment} = \ldots$$

(b) State the direction of the moment caused by the weight of the counterweight about the pivot P.
Fig. 6 below shows the human transport system, which carries blood throughout the body.

(a) Name blood vessels E to H.

E
F
G
H

(b) Which side of the heart, L or M, contains deoxygenated blood? Explain your answer.

(c) Explain why capillaries are one-cell thick.
(d) Give two differences between vessels E and F.

B7 Fig. 7.1 shows a simple food web for an African grassland ecosystem.

Fig. 7.1

(a) (i) The vultures feed on the carcasses of dead animals for energy. State the role of the vultures in this ecosystem.

(ii) Suggest how the population of vultures will change over a period of time during a drought (dry season) in the grassland.
(b) The relationship between grass, zebras and lions in the African grassland is shown in the following Graph 7.2.

Graph of population of grass, zebras and lions against time

<table>
<thead>
<tr>
<th>Time/months</th>
<th>Population size</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>200</td>
</tr>
<tr>
<td>10</td>
<td>150</td>
</tr>
<tr>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

Graph 7.2

(i) State what will happen to the grass population if the number of zebras increases. Explain your answer clearly.

(ii) Explain why there are more zebras than lions in the African grassland.
Fig 8.1 shows a young flowering plant placed in a red dye solution for one day.

Fig 8.2 shows the cross-section of a plant stem under a light microscope.

(a) Identify and state the function of regions X and Y.

(i) region X

function

(ii) region Y

function

(b) Which region X or Y will be stained with the red dye? Explain your answer.

END OF SECTION B
C1 A measuring cylinder contains 30 cm³ of liquid. When 600 identical spherical polyvinyl chloride (PVC) pellets are dropped into the liquid, they sink to the bottom and the liquid level rises to 36 cm³. The density of a PVC pellet is 1.39 g/cm³.

(a) (i) State the density of 600 pellets.

\[
\text{density} = \quad [1] 
\]

(ii) Determine the mass of 600 pellets.

mass = \quad [2]

(b) Table 9.1 shows the density of three substances.

<table>
<thead>
<tr>
<th>Substances</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>paraffin oil (liquid)</td>
<td>0.80</td>
</tr>
<tr>
<td>carbon tetrachloride (liquid)</td>
<td>1.60</td>
</tr>
<tr>
<td>glycerine (liquid)</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Table 9.1

An equal volume of the three liquids in Fig. 9.1 are poured into a beaker, as shown on Fig. 9.2.

![Fig. 9.2](image)
(i) Using the information given in Table 9.1, identify the liquids on Fig. 9.2 by writing their names in the spaces provided in Fig. 9.2. [1]

(ii) In Fig. 9.2, use a cross (X) to indicate where the PVC pallet would be if it is put into the beaker. [1]

(iii) Which liquid from Table 9.1 would you use to find the volume of a piece of PVC pallet using the displacement method with a measuring cylinder? Explain your answer. [2]

(c) The pallet is brought from Earth to Moon. State whether the following quantities will increase, decrease, or remain the same.

Explain the reason for each of your answers.

(i) mass [1]

(ii) weight [1]

(iii) density [1]
Table 10 shows the results of an experiment carried out using five potato strips of the same length. The strips were placed in tubes containing different concentration of sucrose solutions. The length of each potato strips were measured after 2 hours.

<table>
<thead>
<tr>
<th>Tube</th>
<th>Concentration of sucrose solution (mol/dm³)</th>
<th>Length of potato at start (mm)</th>
<th>Length of potato after 2 hours (mm)</th>
<th>Change in length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>40</td>
<td>40.7</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>0.2</td>
<td>40</td>
<td>39.9</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>0.4</td>
<td>40</td>
<td>39.2</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>0.6</td>
<td>40</td>
<td>38.4</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>0.8</td>
<td>40</td>
<td>37.7</td>
<td>-2.3</td>
</tr>
</tbody>
</table>

(a) Fill in the table with the correct values. [1]

(b) Define the process that occurred in the potato strips, causing a change in length. [2]

(c) Explain why the potato strips in tube E decrease in length? [2]
(d) Plot the graph of change in length against concentration of sucrose solution on the graph provided.

(e) Based on the graph, state and explain the concentration of the potato cell sap.

END OF PAPER
### 2018 1EXP MYE Answers

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
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<tbody>
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<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
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<tr>
<td>B</td>
<td>B</td>
<td>A</td>
<td>D</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>A</td>
<td>C</td>
<td>D</td>
</tr>
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<td>36</td>
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<td>38</td>
<td>39</td>
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<tr>
<td>C</td>
<td>D</td>
<td>C</td>
<td>B</td>
<td>D</td>
<td>D</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>C</td>
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</tbody>
</table>

### Section B

<table>
<thead>
<tr>
<th>No</th>
<th>Suggested Answer</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>E: pulmonary artery&lt;br&gt;F: pulmonary vein&lt;br&gt;G: vena cava&lt;br&gt;H: aorta</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>b</strong> Part L [1]&lt;br&gt;Part L transport <strong>deoxygenated</strong> blood from the heart to the lungs to <strong>remove</strong> carbon dioxide [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>c</strong> To allow substances to <strong>diffuse across the walls quickly</strong>. [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>d</strong> Vessel E carries deoxygenated blood while Vessel F carries oxygenated blood. [1]&lt;br&gt;Vessel E do not have valves but vessel F does [1]&lt;br&gt;Vessel E carries blood at high pressure but vessel F carries blood at lower pressure. [1]&lt;br&gt;Vessel E has thick muscular and elastic walls, but vessel F has thinner and less muscular and elastic walls. [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>2ai</strong> It is a scavenger [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>ii</strong> During drought, the <strong>number of dead animals will increase</strong>, [1] hence there are more food for the vultures [1] and the numbers of vultures will increase. [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>bi</strong> The <strong>grass population will decrease</strong>.&lt;br&gt;When there are more zebras, more of them feed on the grass. [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>ii</strong> Population of zebra must be greater than lions to ensure there is sufficient energy available to be transferred to the next population. [1] This is due to the loss of energy [1] in the form of heat during respiration.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>3ai</strong> X: phloem [1]&lt;br&gt;Function: Transport food/sugar (do not accept glucose or starch) from leaves to all parts of the plant [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Accept ECF [-1 mark]</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>ii</strong> Y: xylem [1]&lt;br&gt;Function: Transport water and mineral salts from roots to all parts of the plant [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Accept ECF [-1 mark]</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>b</strong> Region Y as <strong>water dissolved with the red (region Y) staining the vessel</strong>, [1]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Accept ECF if they can explain correctly. [1]</td>
<td></td>
</tr>
</tbody>
</table>
### Section C

<table>
<thead>
<tr>
<th>Tube</th>
<th>Concentration of sucrose solution (mol/dm³)</th>
<th>Length of potato at start (mm)</th>
<th>Length of potato after 2 hours (mm)</th>
<th>Change in length (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>40</td>
<td>40.7</td>
<td>+ 0.7</td>
</tr>
<tr>
<td>B</td>
<td>0.2</td>
<td>40</td>
<td>39.9</td>
<td>- 0.1</td>
</tr>
<tr>
<td>C</td>
<td>0.4</td>
<td>40</td>
<td>39.2</td>
<td>- 0.8</td>
</tr>
<tr>
<td>D</td>
<td>0.6</td>
<td>40</td>
<td>38.4</td>
<td>- 1.6</td>
</tr>
<tr>
<td>E</td>
<td>0.8</td>
<td>40</td>
<td>37.7</td>
<td>-2.3</td>
</tr>
</tbody>
</table>

2 correct – 1 marks
Must include the sign. No sign minus ½ marks

b Osmosis is the **net movement of water molecules** from a **region of higher water potential** to a **region of lower water potential** across a **partially permeable membrane**.

1 1

c There is a **lower water potential in the solutions than in the cell sap**. [1] **Water molecules move out of the cell sap via osmosis** [1] hence the length of the potato decrease.

1 1

d
Correct labelling of axis with units each [1]
Axes drawn with appropriate scale and units each [1]
Correctly plotted points and best-fit line [1]

| e | 0.18 mol/dm³. There is no change in length since cell sap and solution concentration are similar |
2018 MYE 1EXP Answers

Section A

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>A</td>
<td>D</td>
<td>C</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>C</td>
<td>B</td>
<td>A</td>
</tr>
</tbody>
</table>

Section B

Answer all questions.

B1 Complete the table by filling in the most suitable instrument that can be used to measure each of these physical quantities and their respective accuracy.

The first line is done for you.

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Instrument</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exactly 36.3 cm³ of water</td>
<td>Measuring cylinder</td>
<td>0.1 cm³</td>
</tr>
<tr>
<td>Depth of a paper cup</td>
<td>Vernier calipers</td>
<td>0.01 cm [1]</td>
</tr>
<tr>
<td>Circumference of a tree</td>
<td>Measuring tape</td>
<td>0.1 cm [1]</td>
</tr>
<tr>
<td>Thickness of copper wire</td>
<td>micrometer</td>
<td>0.01 mm [1]</td>
</tr>
</tbody>
</table>

B2 Convert the following readings to the units indicated. Show your workings clearly.

(a) (i) 0.045 cm = …………………………… m 

0.045 / 100 = 0.00045 m or 4.5 x 10⁻⁴ m

(ii) 3.04 ml = ……………………………… m³ / 

3.04 x 1000 = 3 040 ml

(a) Determine the period of the pendulum.

1.0 x 2 = 2.0 s

period = [1]

(b) State what you can do to ensure that the measurement of the period of the pendulum is as accurate as possible during an experiment.

Take the time for 20 oscillations then calculate the average time for one oscillation.
(c) State one thing you can do to increase the period of the oscillation.

Increase length of string.

B4 (a) Fig. 4.1 shows two different types of excavators of the same mass.

excavator A

excavator B

caterpillar tracks

wheels

Fig. 4.1

Which excavator is more suitable for operating on soft, muddy ground? Explain your answer using the concept of pressure.

Excavator A [1]. A has a larger surface area in contact with the ground compared to B thus it exerts a smaller pressure [1] on the ground.
(b) Fig. 4.2 shows a fork-lift tractor with a mass of 3000 kg transporting a load of 2400 N. The centre of gravity of the tractor is labelled as CG in Fig. 4.2. The engine of the tractor is switched off and the tractor is slowing down to a stop.

(i) On Fig. 4.2, draw labelled arrows to show the following

1. friction between the wheels and the floor [1]
2. weight of the tractor, and [1]
3. contact force(s) exerted on the tractor by the floor. [1] for 2 contact forces [3]

(ii) Calculate the total weight of the tractor and load, given gravitational field strength is 10 N/kg.

\[ W = mg = 3000 \times 10 = 30\,000\, N \]

Total weight = 30 000 + 2400 = 32 400 N

No deduction for wrong units.

\[ \text{total weight} = \] [1]

(iii) The contact area of a wheel is 0.80 m².

Calculate the pressure exerted on the floor by the tractor and load if the tractor has 4 wheels.

\[ P = \frac{F}{A} = \frac{32\,400}{(0.80 \times 4)} = 10\,100\, Pa \] [1] [1]

Allow ecf. No marks deduction for wrong units

\[ \text{pressure} = \] [2]
Fig. 5 shows a crane lifting some bricks during the building of a house.

![Diagram of crane and bricks](image)

The weight of the bricks produces a turning effect, or moment, on the arm of the crane about the point P. The weight of the bricks is 12000 N.

(a) Calculate the moment of this force, using the distance marked on Fig. 5.

\[ 12000 \times 20 = 240000 \text{ Nm} \]

Deduct 1 mark for wrong units

\[
\text{moment} = \frac{12000 \times 20}{1000} \quad \text{Nm} \]

[2 marks]

(b) State the direction of the moment cause by

(i) the weight of the counterweight about pivot P,

Anti clockwise
A measuring cylinder contains 30 cm³ of liquid. When 600 identical spherical polyvinyl chloride, PVC pellets are dropped into the liquid, they sink to the bottom and the liquid level rises to 36 cm³. The density of a PVC pellet is 1.39 g/cm³.

(a)  
(i) State the density of 600 pellets.

\[ \text{density} = \frac{\text{mass}}{\text{volume}} = \frac{600 \times 1.39 \text{ g}}{600 \text{ cm}^3} \]

\[ = 1.39 \text{ g/cm}^3 \]  

(ii) Determine the mass of 600 pellets.

\[ \text{Mass} = \text{density} \times \text{volume} = 1.39 \times 36 = 8.34 \text{ g} \]

Allow ecf

\[ \text{mass} = \frac{600 \times 1.39 \text{ g}}{600} \]  

(b) Fig. 1.1 shows the density of three substances.

<table>
<thead>
<tr>
<th>Substances</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>paraffin oil (liquid)</td>
<td>0.80</td>
</tr>
<tr>
<td>carbon tetrachloride (liquid)</td>
<td>1.60</td>
</tr>
<tr>
<td>glycerine (liquid)</td>
<td>1.26</td>
</tr>
</tbody>
</table>

Fig. 1.1

An equal volume of the three liquids in Fig. 1.1 are poured into a beaker, as shown on Fig. 1.2.

Fig. 1.2
(i) Using the information given in Fig. 1.1, identify the liquids on Fig. 1.2 by writing their names in the spaces provided in Fig. 1.2. [1]

(ii) In Fig. 1.2, use a cross (X) to indicate where the PVC pallet would be if it is put into the beaker. [1]

(iii) Which liquid from Table 4.1 would you use to find the volume of a piece of PVC pallet using the displacement method with a measuring cylinder? Explain your answer.

Glycerine or paraffin oil [1] as the pallet can be fully submerge in them thus the volume increase will be equal to the volume of the pallet. [1]

(d) The pallet is brought from Earth to Moon. **State whether the following quantities will increase, decrease, or remain the same.**

Explain the reason for each of your answers.

(i) mass

*Same, as mass is the amount of substance that makes up the object.* [1]

(ii) weight

*Decrease, as the weight is a force that depends on the location of the object.* [1]

(iii) density

*Same, as density is mass per unit volume. Both the mass and volume remains the same on Moon.* [1]

END OF PAPER
READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and register number in the spaces provided at the top of
the answer booklet.

There are thirty 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 Optical Answer Sheet.

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 in this booklet.

A copy of the Periodic Table is printed on page 2 of Paper 1.
The total marks for this booklet is 30 marks.

This paper consists of 13 printed pages, including this cover page.
The Periodic Table of Elements

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H</td>
<td>hydrogen</td>
</tr>
<tr>
<td>2</td>
<td>He</td>
<td>helium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Key</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Li</td>
<td>lithium</td>
</tr>
<tr>
<td></td>
<td>Be</td>
<td>beryllium</td>
</tr>
<tr>
<td>11</td>
<td>Na</td>
<td>sodium</td>
</tr>
<tr>
<td></td>
<td>Mg</td>
<td>magnesium</td>
</tr>
<tr>
<td>19</td>
<td>K</td>
<td>potassium</td>
</tr>
<tr>
<td>37</td>
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<td>55</td>
<td>Cs</td>
<td>caesium</td>
</tr>
<tr>
<td>87</td>
<td>Fr</td>
<td>francium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>lanthanoids</th>
<th>57</th>
<th>58</th>
<th>59</th>
<th>60</th>
<th>61</th>
<th>62</th>
<th>63</th>
<th>64</th>
<th>65</th>
<th>66</th>
<th>67</th>
<th>68</th>
<th>69</th>
<th>70</th>
<th>71</th>
</tr>
</thead>
<tbody>
<tr>
<td>La</td>
<td>cerium</td>
<td>praseodymium</td>
<td>neodymium</td>
<td>promethium</td>
<td>samarium</td>
<td>europium</td>
<td>gadolinium</td>
<td>terbium</td>
<td>dysprosium</td>
<td>holmium</td>
<td>erbium</td>
<td>thulium</td>
<td>ytterbium</td>
<td>lutetium</td>
<td></td>
</tr>
<tr>
<td>139</td>
<td>140</td>
<td>141</td>
<td>144</td>
<td>–</td>
<td>150</td>
<td>152</td>
<td>157</td>
<td>163</td>
<td>166</td>
<td>169</td>
<td>173</td>
<td>175</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>actinoids</th>
<th>89</th>
<th>90</th>
<th>91</th>
<th>92</th>
<th>93</th>
<th>94</th>
<th>95</th>
<th>96</th>
<th>97</th>
<th>98</th>
<th>99</th>
<th>100</th>
<th>101</th>
<th>102</th>
<th>103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ac</td>
<td>thorium</td>
<td>protactinium</td>
<td>uranium</td>
<td>neptunium</td>
<td>plutonium</td>
<td>americium</td>
<td>curium</td>
<td>berkelium</td>
<td>californium</td>
<td>einsteinium</td>
<td>fermium</td>
<td>mendelevium</td>
<td>nobelium</td>
<td>lawrencium</td>
<td></td>
</tr>
<tr>
<td>–</td>
<td>232</td>
<td>231</td>
<td>238</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).
Section A: Multiple Choice Questions (30 marks)
Answer all the questions in the Optical Answer Sheet provided.

1. Russell lighted the Bunsen burner and opened the air hole of the Burner.
   Which statement best describes the flame that Russell will get?
   A. A luminous flame that is orange-yellow.
   B. A luminous flame that is pale blue.
   C. A non-luminous flame that is orange-yellow.
   D. A non-luminous flame that is pale blue.

2. Nurul was given a vernier caliper to find out the accurate dimension of the thickness of the beaker (the shaded part).
   Which part(s) of the vernier caliper should she use?
   A. inside jaw and tail.
   B. outside jaw and tail.
   C. only the inside jaws.
   D. only the outside jaws.

3. A substance contains a biological agent that can spread through air and cause allergic reactions when inhaled.
   Which symbol should be used to label it?
   A. 
   B. 
   C. 
   D.
4  Ahmad saw two bottles on the workbench. They are labelled as shown in the diagram.
   ! [Diagram of two bottles labeled liquid W and liquid X]

Based on the labels, which of the following is the best conclusion he can make about the liquids?

A  Both liquids are acidic.
B  Both liquids cannot be mixed.
C  Liquid W should be heated before use.
D  Liquid X cannot be touched with bare hands.

5  A ruler is used to measure the diameter of five plastic balls.

What is the average diameter of each ball?

A  0.70 cm
B  0.76 cm
C  0.82 cm
D  3.50 cm

6  Which of the following shows the correct SI unit for each physical quantity?

<table>
<thead>
<tr>
<th></th>
<th>length</th>
<th>mass</th>
<th>temperature</th>
<th>time</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>centimetre</td>
<td>kilogram</td>
<td>degree celcius</td>
<td>second</td>
</tr>
<tr>
<td>B</td>
<td>centimetre</td>
<td>gram</td>
<td>kelvin</td>
<td>hour</td>
</tr>
<tr>
<td>C</td>
<td>metre</td>
<td>kilogram</td>
<td>kelvin</td>
<td>second</td>
</tr>
<tr>
<td>D</td>
<td>metre</td>
<td>gram</td>
<td>degree celcius</td>
<td>hour</td>
</tr>
</tbody>
</table>

7  Ai Ling was given cup Q and cup P. Cup Q is made using material Q. Cup
P is made using material P. Both materials are waterproof. She wants to find out which material is best for keeping water cold as long as possible.

What must she do to ensure a fair test?

A  Place both cups in a science laboratory.
B  Place both cups the same distance apart.
C  Pour cold water into each cup at the same speed.
D  Pour equal volumes of cold water in each cup.

Jill was asked to calculate the density of Singapore’s 50-cent coin.

Which set of apparatus should she use to take the measurements of the coin?

<table>
<thead>
<tr>
<th></th>
<th>diameter and thickness</th>
<th>mass</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>measuring tape</td>
<td>electronic balance</td>
</tr>
<tr>
<td>B</td>
<td>metre rule</td>
<td>spring balance</td>
</tr>
<tr>
<td>C</td>
<td>vernier calipers</td>
<td>spring balance</td>
</tr>
<tr>
<td>D</td>
<td>vernier calipers</td>
<td>electronic balance</td>
</tr>
</tbody>
</table>

The diagram shows two wooden blocks made from the same material.

![A](mass = 20.0 g)  ![B](mass = 10.0 g)

Which statement about the densities of the wooden blocks is true?

A  Block A has a higher density than Block B.
B  Block A has a lower density than Block B.
C  Blocks A and B have the same density.
D  There is insufficient information to determine the densities of the blocks.
The diagram shows two rods, X and Y, made from different materials. When load is placed on them, rod X bent a little while rod Y broke into two pieces.

Before load is placed

<table>
<thead>
<tr>
<th>Rod X</th>
<th>Rod Y</th>
</tr>
</thead>
</table>

After load is placed

<table>
<thead>
<tr>
<th>Rod X</th>
<th>Rod Y</th>
</tr>
</thead>
</table>

Rod X bent a little.

Rod Y breaks into two pieces.

Which of the following conclusions is correct about the two rods?

A  Rod X is harder than rod Y.
B  Rod X is more dense than rod Y.
C  Rod X is more flexible than rod Y.
D  Rod X is softer than rod Y.

The diagram below shows a cooking pot containing hot soup.

Which of the following best describes the materials used for the parts of the pot?

<table>
<thead>
<tr>
<th>lid</th>
<th>handle</th>
<th>pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>glass</td>
<td>stainless steel</td>
</tr>
<tr>
<td>B</td>
<td>stainless steel</td>
<td>stainless steel</td>
</tr>
<tr>
<td>C</td>
<td>glass</td>
<td>plastic</td>
</tr>
<tr>
<td>D</td>
<td>stainless steel</td>
<td>plastic</td>
</tr>
</tbody>
</table>
12. An iron block with the length of 5 cm, height of 3 cm, breath of 2 cm and density of 7.9 g/cm³ is immersed in a beaker containing 20 cm³ of water.

What is the mass of the iron block?

A  0.553 kg  
B  0.395 kg  
C  0.237 kg  
D  0.079 kg

13. 10 g of each of the following materials was to be placed in a container.

Which material would require the largest container?

A  glass with density of 2.5 g/cm³  
B  seawater with density of 1.03 g/cm³  
C  lead with density of 11.3 g/cm³  
D  alcohol with density of 0.79 g/cm³

14. Theobromine has a bitter taste and is found in cocoa beans. The formula for theobromine is C₇H₈N₄O₂.

Which of these elements is found in Group V, period 2?

A  carbon  
B  hydrogen  
C  nitrogen  
D  oxygen
15 The diagram shows a section of the Periodic Table with elements P, Q, R, S and T. The letters P, Q, R, S and T are not symbols of the elements.

Which of the following pairs of elements contains only non-metals?

A  P and T  
B  P and S  
C  Q and R  
D  S and T

16 Which element belongs to group II and period 3 of the Periodic Table?

A  boron  
B  beryllium  
C  calcium  
D  magnesium

17 Which of the following **does not** contain a mixture?

A  water, air, carbon dioxide  
B  tungsten, brass, sulfur trioxide  
C  iodine, astatine, ammonia  
D  sodium, water vapour, air
Refer to the following diagram for questions 18 and 19.

18 Which of the following substances has the highest solubility at a temperature of 50 °C?

A substance P
B substance Q
C substance R
D substance S

19 At what temperature do substances Q and R have the same solubility?

A 20 °C
B 30 °C
C 42 °C
D 65 °C
20 Some properties of substances P, Q, R and S are given in the table below:

<table>
<thead>
<tr>
<th>substance</th>
<th>percentage composition by mass</th>
<th>solid conducts electricity</th>
<th>changes on heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>varies</td>
<td>no</td>
<td>liquid burns to form carbon dioxide and water</td>
</tr>
<tr>
<td>Q</td>
<td>constant</td>
<td>yes</td>
<td>solid burns in air to form an oxide</td>
</tr>
<tr>
<td>R</td>
<td>constant</td>
<td>no</td>
<td>solid decomposes</td>
</tr>
<tr>
<td>S</td>
<td>varies</td>
<td>yes</td>
<td>solid melts</td>
</tr>
</tbody>
</table>

Which classification of the substances is correct?

<table>
<thead>
<tr>
<th>element</th>
<th>mixture</th>
<th>compound</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>S, Q</td>
<td>P</td>
</tr>
<tr>
<td>B</td>
<td>Q</td>
<td>P, S</td>
</tr>
<tr>
<td>C</td>
<td>S</td>
<td>P</td>
</tr>
<tr>
<td>D</td>
<td>R</td>
<td>P, S</td>
</tr>
</tbody>
</table>

21 Which of the following statements concerning compounds is incorrect?

A  The amount of elements in a compound is in fixed ratio.
B  No energy changes take place when a compound is formed.
C  A compound can be separated into elements by chemical methods.
D  The properties of a compound are very different from the elements it contains.
Study the table and answer questions 22 and 23.

The table below shows the masses of four solids dissolved in various solvents.

<table>
<thead>
<tr>
<th>solvent</th>
<th>mass of solids dissolved (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>P</td>
</tr>
<tr>
<td>solvent J</td>
<td>0</td>
</tr>
<tr>
<td>solvent K</td>
<td>12</td>
</tr>
<tr>
<td>solvent L</td>
<td>10</td>
</tr>
<tr>
<td>solvent M</td>
<td>1</td>
</tr>
</tbody>
</table>

22  Which solid is insoluble in solvent K?

A  P  
B  Q  
C  R  
D  S

23  If solids R and S are mixed together by mistake, which of the following solvents can be used to separate them?

A  J  
B  K  
C  L  
D  M

24  Sarah has a mixture of salt and sugar that is dissolved in a beaker of water. She tried to separate the mixture of salt and sugar by filtration but it was unsuccessful. What could be the reason that sugar and salt cannot be separated by filtration?

A  Both salt and sugar are white crystals.  
B  Both salt and sugar are soluble in water.  
C  Salt and sugar have different tastes.  
D  The water is purified after the mixture is filtered.
The diagram shows three beakers, X, Y and Z. Beaker X contains water, beaker Y contains sodium chloride crystals and beaker Z contains a mixture of sodium chloride and water. Sodium chloride crystals can be dissolved in water.

Based on the information above, which of the following correctly represents the solute, solvent and solution?

<table>
<thead>
<tr>
<th></th>
<th>X</th>
<th>Y</th>
<th>Z</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>solute</td>
<td>solution</td>
<td>solvent</td>
</tr>
<tr>
<td>B</td>
<td>solution</td>
<td>solute</td>
<td>solvent</td>
</tr>
<tr>
<td>C</td>
<td>solute</td>
<td>solvent</td>
<td>solution</td>
</tr>
<tr>
<td>D</td>
<td>solvent</td>
<td>solute</td>
<td>solution</td>
</tr>
</tbody>
</table>

Which of the following is a suspension?

1. Ice and water
2. Orange juice
3. Salt and water
4. Chalk and water

A 1 only
B 1 and 2
C 2 and 4
D 1, 3 and 4
27 Which one of the following pairs of features is present in both plant and animal cells?
   A chloroplasts and vacuoles
   B chloroplasts and cellulose cell wall
   C large, central vacuole and cytoplasm
   D plasma membrane and cytoplasm

28 Which of the following groups shows the correct order of organisation in a multicellular organism?
   A cell → tissue → organs → system
   B organ → cell → tissue → system
   C system → tissue → organ → cell
   D tissue → organ → system → cell

29 A cell contains genetic materials which will be passed down from generation to generation.
   Which part of the cell contains the genetic materials?
   A chromosome
   B cytoplasm
   C nucleus
   D vacuole

30 Jay has some solution K. He wants to evaporate it to make it more concentrated.
   Which of the following laboratory apparatus is not necessary for the experimental setup?

-- END OF PAPER --
UNITY SECONDARY SCHOOL
MID YEAR EXAMINATION 2018
SECONDARY ONE EXPRESS

SCIENCE 7 MAY 2018
Paper 2 Paper 1 & 2: 2 HOURS

READ THESE INSTRUCTIONS FIRST
Write in dark blue or black ink only.
Do not use staples, paper clips, highlighters, glue or correction fluid.
Write your name, class and register number in the spaces provided at the top of
the answer booklet.
All workings are to be shown clearly in the spaces provided for the questions.

Section A:
Answer all questions in the spaces provided.

Section B:
Answer three out of the four questions in this section. Circle the question number
of the questions you attempted.

A copy of the Periodic Table is printed on page 2 of Paper 1.
The total marks for this booklet is 70 marks.

This paper consists of 17 printed pages, including this cover page.
Section A: Structured Questions (40 marks)
Answer all the questions and write your answers in the spaces provided.

A1 Aqueous sodium chloride can be prepared by adding an exact volume of sodium hydroxide with an exact volume of dilute hydrochloric acid.

This is called a neutralisation reaction.

The reaction is shown below.

\[
\text{Sodium hydroxide + hydrochloric acid} \rightarrow \text{sodium chloride + water}
\]

You are given a bottle of **sodium hydroxide** and asked to **measure accurately 25.0 cm}^3 of it and pour it into a beaker. Hydrochloric acid is slowly added into the beaker, as shown in the diagram below.

(a) (i) The hazard symbol seem on the bottle of sodium hydroxide and hydrochloric acid is as shown below:

![Hazard Symbol](image)

What does the symbol tells us about the 2 substances? [1]

(ii) What should a student do when some hydrochloric acid accidentally splashes into her eyes? [1]
(b) Name two possible pieces of apparatus that can be used to measure the volumes of the sodium hydroxide and hydrochloric acid for this reaction. [2]

_________________________________________________________

(c) Given that sodium hydroxide, hydrochloric acid and the sodium chloride solution formed are all colourless, hence no visual observation could be seen of the reaction.

From your understanding of the formation of compounds, what other observation could be made that shows a chemical reaction had occurred. [1]

_________________________________________________________

(d) Describe how you would obtain a pure dry sample of sodium chloride from the sodium chloride solution at the point of neutralisation. [2]

_________________________________________________________

_________________________________________________________

_________________________________________________________
A2 Using the table of densities, identify substance A to F.

<table>
<thead>
<tr>
<th>substance</th>
<th>density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>cork</td>
<td>0.25</td>
</tr>
<tr>
<td>gold</td>
<td>19.3</td>
</tr>
<tr>
<td>lead</td>
<td>11.3</td>
</tr>
<tr>
<td>mercury</td>
<td>13.6</td>
</tr>
<tr>
<td>turpentine</td>
<td>0.9</td>
</tr>
<tr>
<td>water</td>
<td>1.0</td>
</tr>
</tbody>
</table>

A: ___________________
B: ___________________
C: ___________________
D: ___________________
E: ___________________
F: ___________________

A3 A piece of burning sodium is lowered into a gas jar containing chlorine gas. A white solid, sodium chloride, was formed.

(a) Suggest a method which sodium chloride can be changed back into sodium and chlorine.  [1]

(b) Sodium chloride is a compound and sodium is an element. Using your knowledge of elements and compounds, state one difference in properties between sodium chloride and sodium.  [2]
A4 You are given a piece of irregular shaped metal.

Given apparatus below, the mass of the metal is measured using the electronic balance and recorded as $M$. The measuring cylinder is filled with 30cm$^3$ of water. A string is tied around the metal and lower it gently into the measuring cylinder and the new volume is measured and recorded as $V$.

(a) Name the method used to find the volume of the metal and describe how you can find the density of an irregular shaped piece of metal using the information given. [3]

(b) State one precaution that you will take to ensure that the volume measured is accurate. [1]

(c) Styrofoam block floats on water. [1]

Using the same apparatus as above, suggest how you can modify your procedure stated in (a) to measure the volume of the styrofoam block.
A5  Table below shows the physical properties of different materials.

<table>
<thead>
<tr>
<th>material</th>
<th>heat conductivity</th>
<th>electrical conductivity</th>
<th>strength</th>
<th>hardness</th>
<th>density</th>
</tr>
</thead>
<tbody>
<tr>
<td>wood</td>
<td>no</td>
<td>poor</td>
<td>good</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td>granite</td>
<td>no</td>
<td>poor</td>
<td>good</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>steel</td>
<td>yes</td>
<td>good</td>
<td>good</td>
<td>high</td>
<td>high</td>
</tr>
</tbody>
</table>

Some students have identified the uses of the above materials as follows: In each case, indicate if each of the identified usage is ‘appropriate’ or ‘inappropriate’.

Explain your answers using data from Table above. If the identified usage is ‘inappropriate’, recommend another material from Table above and explain your choice.

(a)  Steel is used to make aircraft bodies.  

(b)  Wood is used to make the base of cooking pots.  

(c)  Granite is used to make tiles.
A6 The diagram below shows two types of unknown cells, X and Y.

Cell X  
- mitochondrion  
- DNA  
- nucleus  
- chloroplast  
- cell membrane  
- cytoplasm  
- flagellum

Cell Y  
- cell membrane  
- DNA  
- cytoplasm  
- flagellum

(a) Describe the possible function of the flagellum in both cells X and Y. [1]

(b) Is cell X a plant cell, an animal cell or both? [3]
   Provide two reasons for your answer.

(c) Cell X is able to survive by itself when it is exposed to sunlight. [1]
   Explain this observation.
A7  (a)  A student accidentally dropped some chalk powder into his saltwater. Complete the diagram below to show how the student can separate the chalk powder from the saltwater. Label your diagram. You should indicate the apparatus, the separated chalk powder and the remaining saltwater. [3]

(b) The student can obtain pure salt from the saltwater after the chalk powder is removed using a set-up to separate the solid-liquid mixtures is shown below.

(i) Name the separation technique shown. [1]

(ii) Label the parts P, Q, R and S. [2]

P: .........................................................................................

Q: .........................................................................................

R: .........................................................................................

S: .........................................................................................

(iii) Describe the function of R. [1]

.........................................................................................
A student carried out an experiment to determine the time taken for ice cubes of different volumes to melt. The student used the experimental set-up as shown in the diagram.

(a) Suggest one hypothesis of this experiment. [1]

(b) State the independent variable that the student changed. [1]

(c) State the dependent variable that the student observed. [1]

(d) Suggest how the time taken for the ice cube to melt will change if a luminous flame was used. [1]
Section B: Free Response Questions (30 marks)
Choose any THREE out of FOUR questions. Write your answers in the spaces.

B1 The diagram below shows the reading of a vernier caliper when it is used to measure the length of the cube.

![Diagram of vernier caliper reading](image)

(a) (i) State the length of the cube. [1]

(ii) Given that the cube has a mass of 40 g, calculate the density of the cube. Give your final answer correct to 3 significant figures. [3]

(iii) Describe what will happen if the cube is placed in a liquid of density 2.0 g/cm³. Explain your answer. [1]
(b) A necklace is made of both pure iron and silver. 0.01 kg of iron and 20 g of silver is used. The densities of iron and silver are 19.32 g/ cm³ and 10500 kg/ m³ respectively.

(i) Calculate the volume of iron. Give your answer in cm³. [1]

(ii) Calculate the volume of silver. Give your answer in cm³. [2]

(iii) Calculate the density of the necklace. Give your answer in g/ cm³. [2]

Give all your answers above correct to 3 significant figures.
B2 (a) Calcium chloride and potassium chloride are white solids that are soluble in water. The graph below shows the solubility of calcium chloride and potassium chloride at different temperatures.

Solubility (g/100 cm³ of water)

(i) If you need 26 g of potassium chloride to be dissolved in 100 cm³ of water, what should the temperature of water be? [1]

(ii) What can you deduce about the solubility of potassium chloride as the temperature increases? [1]

(iii) What can you deduce about the solubility of calcium chloride compared to that of potassium chloride as temperature increases? [1]
(b) (i) You are provided with some potassium chloride crystals and a beaker of water. Other than increasing the volume of water, state one other method to increase the rate of dissolving the potassium chloride in water. [1]

(ii) Explain how the method mentioned in b(i) helps to increase the rate of dissolving. [1]

(c) The diagram below shows two mixtures A and B. Mixture A contains 1g of sodium chloride and 100 cm\(^3\) of water, stirred for 1 minute. Mixture B contains 1g of chalk powder and 100 cm\(^3\) of water, stirred for 1 minute. The sodium chloride dissolves and a colourless solution is formed. Chalk powder is insoluble in water.

(i) Describe two methods to differentiate between mixture A and mixture B. [2]

(ii) Using one of the methods you have mentioned in (c)(i), describe the observations you would see for mixture A and mixture B. [2]

(iii) Which mixture, A or B is a suspension? [1]
B3  (a)  A student wants to find out how to dissolve antacid tablets in the fastest way in order to ease stomach indigestion. All experiments were stirred at 500 revolutions per minute ("rpm"). The larger the rpm, the faster the rate of stirring. The results are presented in the table below.

<table>
<thead>
<tr>
<th>experiment</th>
<th>size of antacid</th>
<th>temperature (°C)</th>
<th>time taken for antacid to dissolve (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>fine powder</td>
<td>25</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>fine powder</td>
<td>60</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>whole tablet</td>
<td>25</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>whole tablet</td>
<td>60</td>
<td>13</td>
</tr>
</tbody>
</table>

(i) Define the term 'solubility' of a solute. [1]

(ii) Other than the rate of stirring, state two other variables to be kept constant for the experiment. [2]

(iii) Which two experiments should be chosen to test the following relationship?

Relationship: The larger the surface area of the antacid, the faster the rate of dissolving. [1]

(iv) Predict what would be observed if the stirring rate was increased to 800 rpm for experiment 3. [2]

Explain your answer.
(b) A student placed an unknown object on a beam balance to measure its mass as shown in the diagram below. The student found that four counterweights, each with a mass of 100 g, were required to balance the beam balance.

The volume of the unknown object was found to be 500 cm³.

(i) Calculate the density of the unknown object. [2]
   Show your working clearly in the space provided.

(ii) Would the unknown object float or sink in water (density = 1 g/cm³)? [2]
   Explain your answer.
B4 (a) The diagrams show two cells A and B. State one similarity and one difference, observed from the diagram, between cells A and B.

similarity: [1]

difference: [1]

(b) The diagram below shows the onion cell when seen under the microscope. There were 5 identified parts of the onion cell and a student managed to label the cell membrane, nucleus and cytoplasm.

(i) Using your knowledge of a typical plant cell, predict and name the 2 unlabelled parts labelled A and B.

A: ___________________
B: ___________________
(not very visible in the diagram)
(ii) State the functions of part B. [1]

(iii) If the cell membrane is unable to perform its function properly, explain how it will affect the cell. [2]

(c) The figure below shows a root hair cell in the soil. It absorbs water from the soil by the process of osmosis.

Osmosis is the movement of water from a place of higher water potential to a place of lower water potential.

![Diagram of a root hair cell in the soil](image)

(i) On the diagram, draw an arrow to indicate how the water moves between the root hair cell and the soil. [1]

(ii) The root hair cell has a different shape to a typical plan cell. Explain how this difference helps the root hair cell to absorb water. [2]

-- END OF PAPER --
The graph below shows how the solubilities of two solids change with temperature.

(a) Name the science apparatus used to measure the volume of solvent used. [1]

(b) Identify the solvent used in this experiment. [1]
(c) Use the data provided and plot a graph to represent the solubility of ammonium sulfate on page 7. [2]

<table>
<thead>
<tr>
<th>temperature (°C)</th>
<th>solubility (g/100g of water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>28</td>
</tr>
<tr>
<td>10</td>
<td>32</td>
</tr>
<tr>
<td>20</td>
<td>36</td>
</tr>
<tr>
<td>30</td>
<td>41.5</td>
</tr>
<tr>
<td>40</td>
<td>45</td>
</tr>
</tbody>
</table>

(d) How does the solubility of ammonium sulfate change with temperature? [1]

(e) At which temperature is the solubility of sodium sulfate and ammonium sulfate the same? Show your working clearly on your graph. [2]

A vernier caliper is used to measure the thickness of the rubber used to make the rubber tubing.

(a) Figure A shows the reading taken using the internal jaw of the vernier caliper.

Figure A

What is the internal diameter of the rubber tubing? [1]
(b) Figure B shows the reading taken using the outer jaw of the vernier caliper.

![Figure B](image)

What is the external diameter of the rubber tubing? [1]

(c) What is the thickness of the rubber tubing? [1]

Jane added three spoonfuls of copper sulfate powder to 60 cm$^3$ of water in beaker A and three spoonfuls of chalk powder to 60 cm$^3$ of water in beaker B. Study the diagram shown below carefully.

![Diagram](image)

She let the mixture in beakers A and B stand for 10 minutes each.

(a) What changes, if any, will she observe in beakers A and B? [2]

There will be no change in beaker A. [1]
In beaker B, the particles of undissolved solids will begin to settle at the bottom of the beaker. [1]

(b) Jane thinks that mixture B is a suspension.

State two tests that she should conduct to confirm her hypothesis. [2]

Filter the mixture in beaker B. If solid particles are left on the filter paper, then the mixture in beaker B is a suspension.

If the mixture in beaker B appears cloudy and she cannot see through it, then the mixture in beaker B is a suspension.

Allow the mixture in beaker B to stand for some time. If the solid particles settle at the bottom of the beaker, then the mixture in beaker B is a suspension. [Any 2 differences]

<table>
<thead>
<tr>
<th>experiment</th>
<th>rate of stirring (oscillation/s)</th>
<th>size of salt grains</th>
<th>time taken for salt crystals to dissolve completely (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>fine</td>
<td>?</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>coarse</td>
<td>30</td>
</tr>
<tr>
<td>C</td>
<td>15</td>
<td>coarse</td>
<td>21</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>coarse</td>
<td>12</td>
</tr>
</tbody>
</table>

(a) Define the term 'solubility' of a solute. [1]
(b) State the dependent variable in this experiment. [1]
(c) What can you conclude from experiments B, C and D? [1]
(d) Predict the time taken for the salt crystals to dissolve completely in experiment A. Give a reason for your answer. [2]

Angela wanted to find the fastest way to dissolve 10 g of sodium chloride salt crystals in 20 cm³ of water at room temperature (25 °C). Table 2 shows the results from her experiments.

4 The properties of four solids M, N, O and P are shown in the table below.

<table>
<thead>
<tr>
<th>solid</th>
<th>percentage composition by mass</th>
<th>broken down by chemical methods or separated by physical methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>constant</td>
<td>chemical methods</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>constant</td>
<td>cannot be broken down</td>
</tr>
<tr>
<td><strong>O</strong></td>
<td>varies</td>
<td>physical methods</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>constant</td>
<td>chemical methods</td>
</tr>
</tbody>
</table>

(a) (i) Which solid(s) is/are a compound? Explain your answer.

Solids M and P. [1]
Their percentage composition by mass is constant AND the solids can be broken down by chemical methods [1]

(ii) One of the unknown solid is a magnesium metal. State which of the solid is the magnesium metal. Explain your answer.

Solid N. [1]
Solid N cannot be broken down by chemical methods. [1]

(b) A small sample of mixture consists of hydrogen gas (H₂) and hydrogen fluoride gas (HF).

Describe three differences in properties between hydrogen fluoride gas and the mixture of hydrogen and hydrogen fluoride gas.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Hydrogen fluoride (Compound)</th>
<th>Hydrogen and hydrogen fluoride gas (Mixture)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting and boiling point</td>
<td>Fixed</td>
<td>Not fixed / over a range (Do not accept varies)</td>
</tr>
<tr>
<td>Composition by mass</td>
<td>Fixed</td>
<td>Not fixed</td>
</tr>
<tr>
<td>Separation</td>
<td>By chemical methods only</td>
<td>By physical means</td>
</tr>
<tr>
<td>Energy taken in or given out</td>
<td>Energy given off in the formation</td>
<td>No energy given off</td>
</tr>
</tbody>
</table>

(Any 3 differences)
**Fig 1** and **Fig 2** shows two structures present in the plant. The structure in **Fig 1** is part of the structure in **Fig 2**.

![Diagram of Fig 1](image1)

**Fig 1**

![Diagram of Fig 2](image2)

**Fig 2**

---

<table>
<thead>
<tr>
<th>(a)</th>
<th>With reference to Fig 1,</th>
<th>[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i)</td>
<td>identify structure A.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Large, central vacuole; (reject: vacuole) [1]</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>describe how this cell is adapted for absorption.</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>Long protrusion/extension increases SA: Vol ratio for faster absorption; [1]</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td>This cell is an example of a specialised cell. State one advantage of cell specialisation.</td>
<td>[1]</td>
</tr>
<tr>
<td></td>
<td>Division of labour/cells become more efficient at their function/multiple functions can be performed at the same time in the organism; [1]</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>(b)</th>
<th>Explain whether the structure in Fig 2 is a cell, tissue or organ, and state its function.</th>
<th>[2]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The structure in Fig. 3.2 is an organ (ie. The root); [1]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>It is made up of a group of tissues working together to perform a specific function; Which is absorption of water and minerals; [1]</td>
<td></td>
</tr>
</tbody>
</table>
UNITY SECONDARY SCHOOL
2018 Mid-Year Examination
1 EXP Science
Marking Scheme

PAPER 1 (30 marks)

<p>| | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D</td>
<td>6</td>
<td>C</td>
<td>11</td>
<td>C</td>
<td>16</td>
<td>D</td>
<td>21</td>
<td>B</td>
<td>26</td>
<td>C</td>
</tr>
<tr>
<td>2</td>
<td>D</td>
<td>7</td>
<td>D</td>
<td>12</td>
<td>C</td>
<td>17</td>
<td>C</td>
<td>22</td>
<td>B</td>
<td>27</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>8</td>
<td>D</td>
<td>13</td>
<td>D</td>
<td>18</td>
<td>B</td>
<td>23</td>
<td>A</td>
<td>28</td>
<td>A</td>
</tr>
<tr>
<td>4</td>
<td>D</td>
<td>9</td>
<td>C</td>
<td>14</td>
<td>C</td>
<td>19</td>
<td>B</td>
<td>24</td>
<td>B</td>
<td>29</td>
<td>C</td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>10</td>
<td>C</td>
<td>15</td>
<td>A</td>
<td>20</td>
<td>B</td>
<td>25</td>
<td>D</td>
<td>30</td>
<td>B</td>
</tr>
</tbody>
</table>

PAPER 2 Section A: Structured Questions (40 marks)

*1m minus for entire paper if units not given

A1 (a)   (i)   Corrosive
        (ii)   Splash/rinse her eyes with plenty of running water from the tap.

(b)   Burette and pipette (measuring cylinder and beaker not accepted) (zero for spelling errors)

(c)   Heat is given off and the beaker feels hot.

(d)   **Heat/evaporate the solution** to ensure that all the solvent water is completely boiled off/to dryness and a pure dry sample of sodium chloride will be left behind.

A2      A: cork
        B: turpentine
        C: water
        D: lead
        E: mercury
        F: gold

1m for every 2 correct answers

A3 (a)   Electrolysis/ passing electricity through it (decomposition by strong heating → B.O.D)
(b) **Sodium chloride** is a compound which **can be broken down by chemical methods**. **Sodium** being an element **cannot be broken down into simpler substances by any methods**.

(Others properties not accepted as the difference must be applicable to all elements and compounds)

<table>
<thead>
<tr>
<th>A4</th>
<th>(a)</th>
<th>Displacement of water/ measuring cylinder method</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(b)</td>
<td>Lower the object gently to <strong>avoid water from splashing out/ reading at eye level/ prevent parallax error/ ensure that the object is fully submerged</strong>.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(c)</td>
<td>Tie the metal weight to the styrofoam block and immerse completely into the water</td>
<td>1</td>
</tr>
</tbody>
</table>

| A5 | (a) | **Inappropriate** because steel has a **high density**, aircrafts should be made of relatively **low density material** such as aluminium, which provides the aircraft the buoyancy to fly. or **Appropriate** as steel is strong and hardness, hence it is **able to withstand the high pressure and forces** when flying at high speed/ able to carry a heavy load. | 1 1 |
|    | (b) | **Inappropriate** because **wood is a poor conductor of heat** hence it will take a long time for the food to be cooked. A more appropriate material will be steel as it is a **good conductor of heat** and **food will be cooked faster**. | 1 |
|    | (c) | **Appropriate** because granite is **strong and hard hence able to withstand scratches and carry heavy load/** It is also a **poor conductor of heat** and feels cool when walked on even on a hot day. | 1 |

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### A6

| (a) | The function of the flagellum is for motility/ability to move without help for the cells. | 1 |
| (b) | Cell X has characteristics of both animal and plant cell. The absence of cell wall/a large central vacuole/presence of flagellum indicates the characteristics of an animal cell. The presence of chloroplasts indicates that it has characteristic of a plant cell. | 1 |
| (c) | Cell X contains chloroplasts which absorbs light energy/traps sunlight from the sun to make food through photosynthesis. (All key words must be present for marks to be awarded) | 1 |

### A7

| (a) | 
| ![Diagram](image.png) | 
| **chalk** | 1 |
| **saltwater** | 1 |
| **Correct set-up;** | 
| - Proportion of funnel and mouth of flask must fit | 1 |
| - Funnel tip must be 'open' | 1 |
| - Filter paper (tip to be 'closed') | 1 |
| **Correct label for “chalk”;** (residue not accepted) | 1 |
| **Correct label for “saltwater”;** (filtrate not accepted) | 1 |

### A8

| (a) | The larger the volume of ice cubes, the longer the time taken for it to melt. (size of ice cube NOT accepted) (Give marks as long as student make a connection using volume and time) | 1 |
| (b) | Volume of ice cubes | 1 |
| (c) | Time taken for the ice to melt | 1 |
| (d) | Time taken would increase. | 1 |

### B1

<p>| (a) | 10.02 cm | 1 |</p>
<table>
<thead>
<tr>
<th>(ii)</th>
<th>10.02 x 10.02 x 10.02 = 1006.012 cm³</th>
<th>1 (ecf)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Density = 40/1006.012</td>
<td>1 (ecf)</td>
</tr>
<tr>
<td></td>
<td>= 0.0397 g/cm³ (3 s.f)</td>
<td>1 (ecf)</td>
</tr>
<tr>
<td>(iii)</td>
<td>It will float, the cube is less dense than the liquid.</td>
<td>1</td>
</tr>
<tr>
<td>(b)</td>
<td>(i) Mass of iron = 0.01kg x 1000g</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>= 10 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volume of iron = 10/19.32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 0.518 cm³ (3 s.f)</td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>Mass of silver = 20g/1000g</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>= 0.02 kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Volume of silver = 0.02/10500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 0.0000019 m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.0000019 m³ x 1000000 cm³ = 1.90 cm³ (3 s.f)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(award 1 mark as for working showing unit conversion of either mass → 0.02kg or density → 10.5 g/cm³ or volume → 1.90 cm³)</td>
<td></td>
</tr>
<tr>
<td>(iii)</td>
<td>Density of the necklace = (10 + 20) / (0.518 + 1.90)</td>
<td>1(ecf)</td>
</tr>
<tr>
<td></td>
<td>= 12.4 g/cm³ (3 s.f)</td>
<td>1(ecf)</td>
</tr>
<tr>
<td></td>
<td>(minus 1 mark for whole question if answers not in 3sf or missing units)</td>
<td></td>
</tr>
</tbody>
</table>

**B2**  

<table>
<thead>
<tr>
<th>(a)</th>
<th>(i) 14 °C</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(ii) Increases with temperature</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(iii) Solubility of calcium chloride increases at a slower rate as compared to potassium chloride.</td>
<td>1</td>
</tr>
<tr>
<td>(b)</td>
<td>(i) Increase the temperature of water/Grind the potassium chloride into powder/Stir the solution</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) Temperature: Increase in temperature allow the solute particles to spread faster throughout the solvent. or Size: Smaller pieces of solute have larger surface area to volume ratio in contact with solvent so it dissolves faster. or Stir: Stirring allows solute particles to spread evenly throughout the solution at a faster rate.</td>
<td>1</td>
</tr>
<tr>
<td>(c)</td>
<td>(i) Filter the mixture/Filtration Left it to stand for some time Shine light through the mixture [any 2 for 2 m]</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(ii) Method</td>
<td>Mixture A</td>
</tr>
<tr>
<td></td>
<td>Filtration</td>
<td>No residue left on the filter paper.</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>---</td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Left it to stand</td>
<td>Solution remains colourless and homogenous</td>
<td>Chalk powder settled at the bottom of the mixture</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shine light through</td>
<td>Light can be seen clearly</td>
<td>Light cannot be seen clearly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) Mixture B</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B3 (a) (i)</td>
<td>Solubility is the <strong>amount of solute</strong> that can <strong>dissolve in a given volume of solvent at a given temperature</strong>.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii)</td>
<td>Volume of water OR mass of antacid used OR type/ brand of antacid OR type of solvent used OR size of beaker&lt;br&gt;&lt;br&gt;&lt;br&gt;&lt;br&gt;<strong>Not accepted:</strong> material of beaker/ location where beaker is placed/temperature of water/ particle size of antacid</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(iii) Experiments 1 &amp; 3 OR Experiments 2 &amp; 4:</td>
<td></td>
<td></td>
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<tr>
<td>(iv) The <strong>time taken</strong> for the antacid to dissolve will be&lt;br&gt;&lt;br&gt;&lt;br&gt;&lt;br&gt;<strong>lesser</strong> / it dissolve faster. The faster the rate of stirring, the faster the rate of dissolving;</td>
<td></td>
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<tr>
<td>(b) (i)</td>
<td>Approximate mass of unknown solid&lt;br&gt; = 100 g x 4&lt;br&gt; = 400 g&lt;br&gt;Density of unknown solid&lt;br&gt; = 400 ÷ 500&lt;br&gt; = 0.8 g/cm³</td>
<td></td>
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<td></td>
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<tr>
<td>(ii) <strong>Float in water</strong> as&lt;br&gt;&lt;br&gt;&lt;br&gt;&lt;br&gt;density of the unknown solid is lower than the density of water./ density of water is higher than the density of the unknown solid.</td>
<td></td>
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<td></td>
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<tr>
<td>B4 (a)</td>
<td>- similarity: both are specialized cells/ both cells are elongated/ have a nucleus&lt;br&gt;&lt;br&gt;- difference: cell A has no cell wall while cell B has cell wall/ cell A has many small vacuoles but cell B has a large vacuole</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) (i) A: cell wall&lt;br&gt;B: vacuole</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>(ii) - store water and nutrients for the cell to survive</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) - control movement of substances in and out of the cell - plant may not be protected from its surroundings</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(c) (i) 

| (ii) | - elongated shape to **increase surface area-volume ratio**  
|      | - **absorb more water/ easily** | 1 |

(arrow must start from soil and point into the root hair cell)