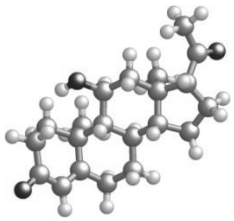


Chem!stry

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Secondary One Science – Interdisciplinary Question – Example

This question concerns the process of photosynthesis. Photosynthesis is a process that takes place in green plants, converting carbon dioxide and water into glucose and oxygen in the presence of sunlight. Photosynthesis involves a complex series of reactions, but in simple terms it can be represented by the balanced chemical equation given below.

carbon dioxide + water $\rightarrow$ glucose + oxygen

$6CO_2(g) + 6H_2O(l) \rightarrow C_6H_{12}O_6(aq) + 6O_2(g)$

1. Photosynthesis is a **system** in which **change** takes place.

(a) Give one generalisation about a **system**. [1]

……...

……...

(b) In addition to science, give a specific example of **change** that you have studied in another discipline. [1]

……...

……...

2. Glucose is a reducing sugar.

(a) Name the three chemical elements present in glucose. [1]

……...

(b) Briefly describe the test for a reducing sugar. [1]

……...

……...

3. Refer to the balanced chemical equation for photosynthesis.

(a) Name all of the compounds. [1]

……...

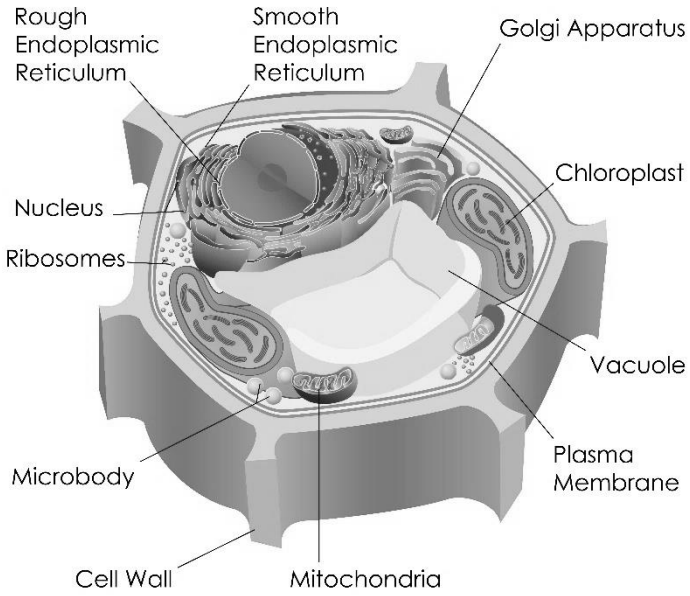
(b) Name one chemical that is diatomic. [1]

……...

4. Glucose is a monosaccharide. Other monosaccharides include fructose, galactose and ribose. Monosaccharides are white crystalline solids that decompose on heating and are soluble in water. Name a method by which a scientist could separate a mixture of fructose, galactose, glucose and ribose. [1]

……...

5. The diagram below shows a plant cell.



(a) Name the organelle which photosynthesis takes place. [1]

……...

(b) Name the organelle in which aerobic respiration takes place. [1]

……...

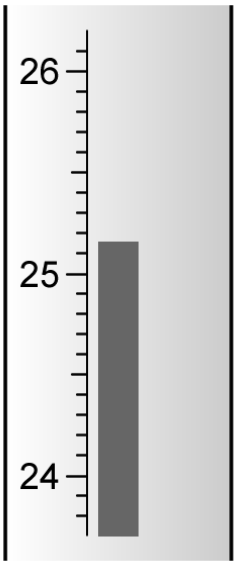
6. Glucose can be used as a fuel. When glucose burns, it reacts with oxygen to produce carbon dioxide and water. This reaction releases energy in the form of heat and light.

$$\text{glucose} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$$

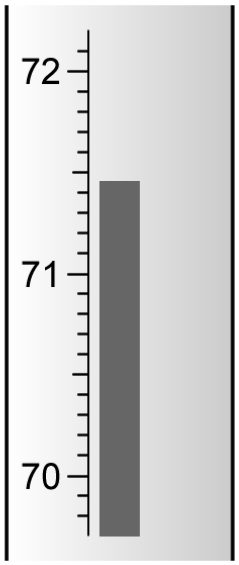
$$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$$

A student performed an experiment to determine how much energy is released when 5.00 g of glucose is completely burned in air. She ignited the glucose and used the heat energy from the flame to increase the temperature of 150 cm^3 of water in a glass beaker. Diagrams of the thermometer showing the initial temperature of the water (before the burning the glucose) and the final temperature of the water (immediately after all of the glucose had been burned) are given below.

Initial temperature of the water / °C



Final temperature of the water / °C



(a) Instead of using a glass beaker, suggest another container that the student could have used that would have ensured better heat transfer from the flame to the water. [1]

……...

……...

(b) To what degree of precision can the thermometer that the student used be read? [1]

……...

(c) By how much did the beaker of water increase in temperature? Show your working [1]

……...

[Total = 12 marks]

- Scan the QR code below for the answers to this assignment.

http://www.nygh.sg/miscellaneous/sec_1_chem/interdisciplinary_ans.pdf

The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H hydrogen 1										4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	64 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	– Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La lanthanum 57 *	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	– Po polonium 84	– At astatine 85	– Rn radon 86
– Fr francium 87	– Ra radium 88	– Ac actinium 89 †															

*58-71 Lanthanoid series

†90-103 Actinoid series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	– Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	162 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	– Pa protactinium 91	238 U uranium 92	– Np neptunium 93	– Pu plutonium 94	– Am americium 95	– Cm curium 96	– Bk berkelium 97	– Cf californium 98	– Es einsteinium 99	– Fm fermium 100	– Md mendelevium 101	– No nobelium 102	– Lr lawrencium 103

Key

a
X
b

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