EXAMINATIONS COUNCIL OF SWAZILAND
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Swaziland General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0491155900

COMBINED SCIENCE **6886/03**

Paper 3 (Extended) **October/November 2012**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions.
Write your answers in the spaces provided on the question paper.
A copy of the Periodic Table is printed on page 20.

You may use a calculator.

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

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
Total	

This document consists of **18** printed pages and **2** blank pages.

1 Fig. 1.1 shows the human lower jaw.

Tooth **A** has decayed.

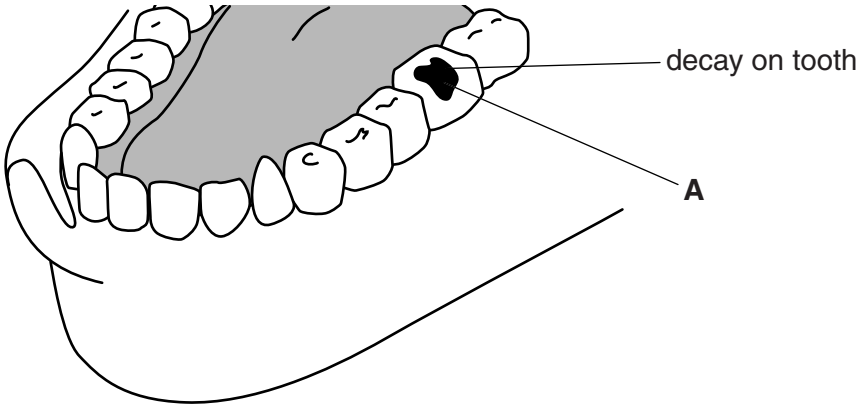

Fig. 1.1

(a) Describe the role of the teeth shown in Fig. 1.1 in the digestion of food.

.....

.....

..... [2]

(b) Describe how the decay on tooth **A** has occurred.

.....

.....

.....

.....

.....

..... [3]

2 Zama lifts a bundle of steel rods, mass 20 kg, from the ground onto the back of a truck, 1.5 m high. He takes 2 seconds to lift the bundle into the truck.

(a) Calculate the power expended in lifting the rods.

(Use $g = 10\,\text{N/kg}$)

..... [2]

(b) The rods feel cold when Zama touched them.

Explain why the rods feel cold.

.....

.....

..... [2]

[Turn over

3 **(a)** Carbon and hydrogen form millions of different compounds known as hydrocarbons.

The compound C_3H_6 is an example of one hydrocarbon.

(i) Name the hydrocarbon C_3H_6.

..... [1]

(ii) Name the homologous series to which the hydrocarbon C_3H_6 belongs.

..... [1]

(iii) Draw the structural formula for the compound with four carbon atoms in this homologous series.

[2]

(b) Fig. 3.2 shows the structure of a different hydrocarbon.

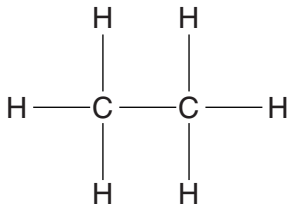

Fig. 3.2

Describe the test you would use to distinguish between the hydrocarbon in **3(a)** and the hydrocarbon in Fig. 3.2.

test .....

.....

result .....

.....
[2]

(c) The hydrocarbon shown in Fig. 3.2 burns in oxygen.

(i) Construct a balanced equation for this reaction.

..... [2]

(ii) Name this type of reaction.

..... [1]

4 **(a)** Fig. 4.1 shows the result of an experiment which was set up to show the composition of air exhaled by a mouse.

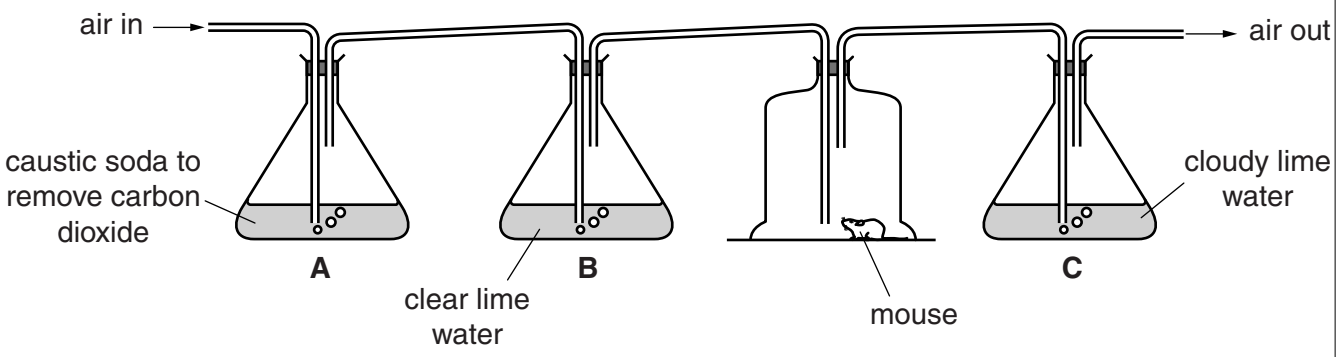

Fig. 4.1

(i) Explain why the lime water in **B** is clear.

..... [1]

(ii) Explain why the lime water in **C** went cloudy.

.....

..... [1]

(iii) Name the process taking place in the mouse that led to the changes observed in **C**.

..... [1]

(b) Three pupils, Thando, Gcina and Banele carried out an experiment to see how breathing rate is affected by exercise.

They engaged in a running exercise and recorded their breathing rates, as shown in Table 4.1.

Table 4.1

Pupil	Breathing rate (breaths/minutes)						
	Before exercise	Minutes after exercise					
		1	2	3	4	5	6
Thando	15	43	36	31	22	17	15
Gcina	14	35	30	20	15	14	14
Banele	13	32	21	14	13	13	13

(i) Describe the effect of exercise on the breathing rate.

..... [1]

(ii) Explain why the breathing rate changes during exercise.

.....

.....

.....

..... [2]

(c) One of the gases inhaled is required to break down lactic acid formed in the muscles during exercise.

(i) Describe the production of lactic acid in the muscles.

.....

.....

.....

..... [2]

(ii) State an effect of lactic acid on the body of the person doing an exercise.

..... [1]

5 Fig. 5.1 shows parts of the electromagnetic spectrum.

Radio waves	**Infra-red**	**Visible light**	**Ultra violet**		**γ-rays**

Fig. 5.1

(a) Name the radiation missing from Fig. 5.1.

..... [1]

(b) Calculate the frequency of an electromagnetic wave that has a wavelength of 1 mm.

..... [2]

6 **(a)** Some elements undergo radioactive decay.

Explain what is meant by radioactive decay.

.....

.....

..... [2]

(b) $^{61}_{26}Fe$ represents the nuclide of a radioactive element.

(i) Calculate the number of neutrons in the nucleus.

..... [1]

(ii) The nucleus $^{61}_{26}Fe$ decays by alpha emission.

Complete the nuclear equation.

$$^{61}_{26}Fe \longrightarrow {}^{4}_{2}He + \text{.....} \quad [2]$$

7 A teacher tests smoke from the chimney of a factory in an industrial area and finds that it contains high concentrations of the gases; carbon monoxide, nitrogen oxides and sulfur dioxide.

(a) **(i)** State an industrial source of sulfur dioxide and state one of its adverse effects.

source: .....

adverse effect of sulfur dioxide: .....

..... [2]

(ii) Car exhaust fumes also release these gases into air.

Explain how nitrogen oxides from the car exhausts can be reduced.

.....

.....

..... [2]

(b) The gases are products of combustion in air. One of the gases does not form if the combustion takes place in pure oxygen.

(i) Name the gas.

..... [1]

(ii) Explain why the gas in **(i)** would not form from combustion in pure oxygen.

.....

.....

..... [2]

(c) Sihle prepares the soluble salt zinc chloride by adding an excess of an oxide to a reagent.

(i) Name the reagent and oxide that Sihle reacts to form the zinc chloride salt.

reagent .....

oxide ..... [2]

(ii) Describe how Sihle can prepare large crystals of zinc chloride.

.....

.....

.....

..... [2]

8 **(a)** Fig. 8.1 shows a boy's hand being accidentally pricked by a drawing pin.

The boy moves his hand quickly in response to the prick.

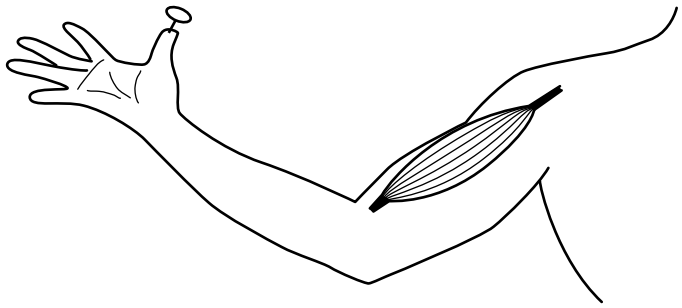

Fig. 8.1

(i) Describe, in terms of transmission of nerve impulses, what happens that results in the boy moving his hand.

.....

.....

.....

.....

.....

.....

..... [4]

(ii) State **two** advantages of a reflex action.

1 .....

.....

2 .....

..... [2]

(b) A constant internal environment is maintained through negative feedback mechanisms.

Using an example, describe *negative feedback*.

.....

.....

.....

..... [2]

9 Fig. 9.1 shows a pendulum that swings between **A** and **C**. The bob takes 1.25 seconds to move from **A** to **C**.

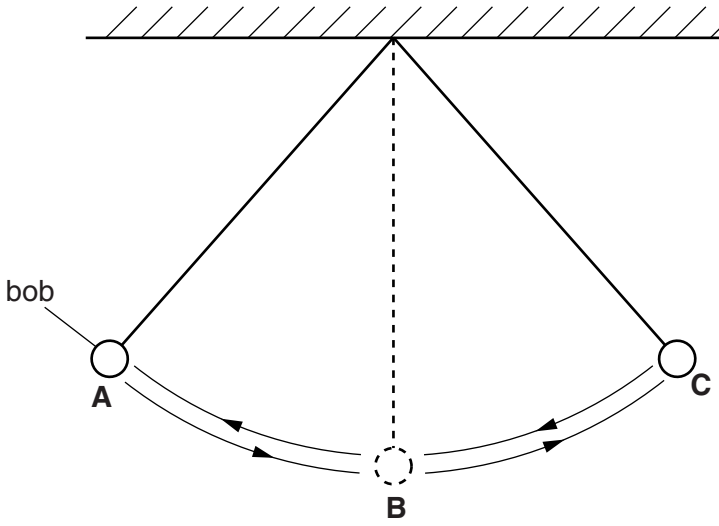

Fig. 9.1

(a) Calculate the period of the pendulum.

..... [1]

(b) The bob is released from **A** and passes **B** to **C**.

State the type of energy the bob has at **A** and at **B**.

A .....

B ..... [2]

(c) The total length of the arc path **ABC** followed by the bob as it swings is 40.0 cm.

Calculate the average speed of the bob as it swings from **A** to **C**.

..... cm/s [1]

10 Aluminium metal can be obtained by heating aluminium oxide with magnesium metal, but not by reacting aluminium oxide with copper metal.

(a) Arrange the three metals in order of their reactivity, starting with the most reactive.

most reactive .....

.....

least reactive ..... [2]

(b) Construct a balanced equation for the reaction between aluminium oxide and magnesium metal.

..... [2]

(c) Calculate the mass of aluminium that would be produced from 50 g of aluminium oxide.

..... [3]

[Turn over

11 Fig. 11.1 shows a simple form of a transformer used for stepping down an alternating voltage supply.

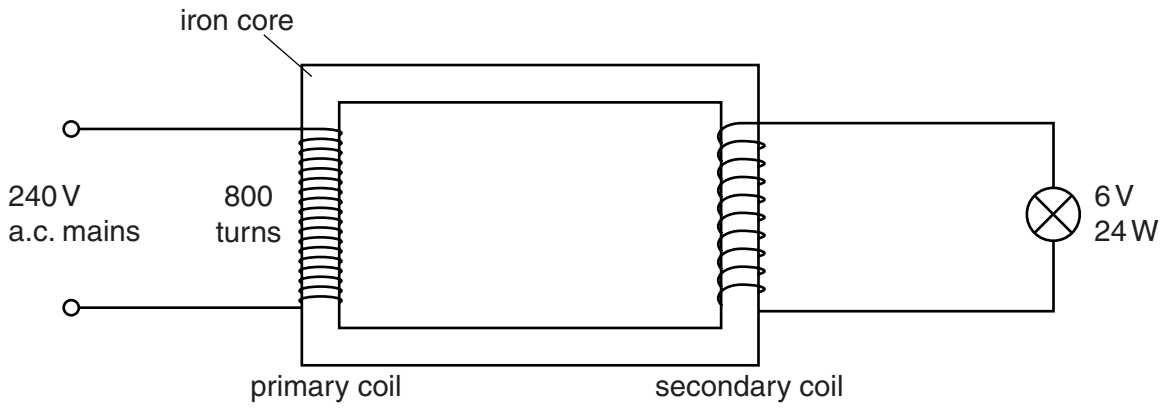

Fig. 11.1

(a) State the advantage of transmitting power

(i) at a very high voltage,

..... [1]

(ii) as an alternating voltage.

..... [1]

(b) Assume that the transformer is 100% efficient.

Calculate the number of turns in the secondary coil, if the lamp is to work at its normal brightness.

State the formula that you use and show your working.

..... [2]

(c) Fig. 11.2 shows a circuit with a battery, a variable resistor and two lamps, L_1 and L_2, connected in series.

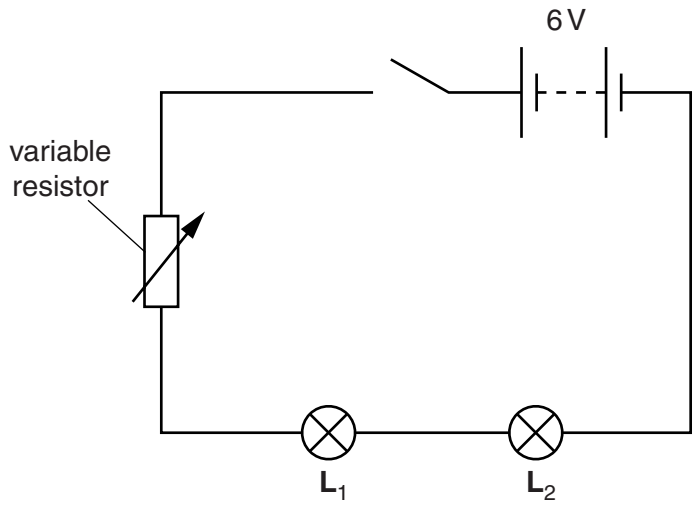

Fig. 11.2

L_1 has a resistance of 15 Ω and L_2 has a resistance of 25 Ω.

(i) Calculate the combined resistance of the lamps L_1 and L_2.

..... Ω [1]

(ii) The variable resistor is set to zero resistance.

Calculate the current in the circuit.

State the formula that you use and show your working.

..... [2]

(iii) Lamps $\mathbf{L}_1$ and $\mathbf{L}_2$ are then connected in parallel.

Calculate the combined resistance of the two lamps in parallel.

..... [2]

12 A farmer uses nitrogen-containing fertilisers year after year in her maize field. She uses a tractor to plough her field, and uses pesticides to control insects.

(a) Describe **one** danger of the overuse of nitrogen-containing fertilisers.

.....

.....

..... [2]

(b) State **one** advantage and **one** disadvantage of using

(i) a tractor,

advantage .....

.....

disadvantage .....

..... [2]

(ii) pesticides.

advantage .....

.....

disadvantage .....

..... [2]

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

* 58–71 Lanthanoid series
† 90–103 Actinoid series

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

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).