3102/3

BGCSE

School Number	Candidate Number
Surname and Initials	

COMBINED SCIENCE

PAPER 3 3102/3

Wednesday 3 JUNE 2015 9:00A.M.–10:30A.M.

Additional materials:
Graph paper

MINISTRY OF EDUCATION
NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION FOR CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided on this question booklet.

Answer **ALL** questions in **Section A** (1–4) in the spaces provided.

Answer **ANY** two (2) out of the three (3) questions from **Section B** on the lined pages provided in this booklet.

Candidates are advised to spend no more than 35 minutes on Section A.

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 2.

Calculators are permitted, however **NO** graphing calculators are allowed.

For Examiner's Use	
SECTION A	
1	
2	
3	
4	
SECTION B	
5	
6	
7	
TOTAL	

This question paper consists of 16 printed pages, 4 lined pages and 4 blank pages.

Section A

Answer all questions

1. The nutrition labels give information on **TWO** potato products.

Baked Potato

Nutrition Facts

Serving size 1 potato (148 g/5.3 oz)

Amount Per Serving	
Calories 100	Calories from Fat 0
	% Daily Value*
Total Fat 0 g	0%
Saturated Fat 0 g	0%
Cholesterol 0 mg	0%
Sodium 0 mg	0%
Potassium 720 mg	21%
Total Carbohydrate 26 g	9%
Dietary Fiber 3 g	12%
Sugars 3 g	
Protein 4 g	

Vitamin A	0%	• Vitamin C	45%
Calcium	2%	• Iron	6%
Thiamin	8%	• Riboflavin	2%
Niacin	8%	• Vitamin B_6	10%
Folate	6%	• Phosphorous	6%
Zinc	2%	• Magnesium	6%

*Percent Daily Values are based on a 2,000 calorie diet.

French Fries

Nutrition Facts

Serving size 1 potato (147 g/5.3 oz)

Amount Per Serving	
Calories 453	Calories from Fat 193
	% Daily Value*
Total Fat 22 g	33%
Saturated Fat 4 g	19%
Trans Fat	
Cholesterol 0 mg	0%
Sodium 290 mg	12%
Total Carbohydrate 57 g	19%
Dietary Fiber 5 g	21%
Sugars 0 g	
Protein 7 g	

Vitamin A	0%	• Vitamin C	30%
Calcium	1%	• Iron	6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

(a) (i) List **FOUR** minerals found in baked potatoes but not in French Fries.

1. _____

2. _____

3. _____

4. _____ [4]

(ii) Find the amount of protein in 222 g of baked potato.

_____ [1]

(iii) State what happens to the vitamin C in a potato when it is fried.

_____ [1]

(b) State and explain about the dangers of eating too many French Fries.

_____

_____

_____

_____ [3]

(c) Name the nutrient in potatoes which can be recommended to improve poor night vision and unhealthy skin.

_____ [1]

TOTAL MARKS [10]

2. A large amount of unwanted plastic materials are sent to the Harold Road Dump where they are placed in landfills. Plastics are non-biodegradable.

(a) To reduce the amount of materials sent to the dump some of the plastic could be reused or recycled.

Explain the meaning of the term non-biodegradable.

_____

_____ [1]

(b) Name **ONE** other type of material found at the Dump that could be recycled.

_____ [1]

(c) (i) The Ministry of The Environment is planning to implement a recycling programme for all households in New Providence.

Give **TWO** advantages of recycling materials.

_____

_____

_____

_____ [2]

(ii) In order for the recycling programme to work, the household waste must be sorted.

How and why must household waste be sorted and what problem might this cause?

_____

_____

_____

_____

_____ [2]

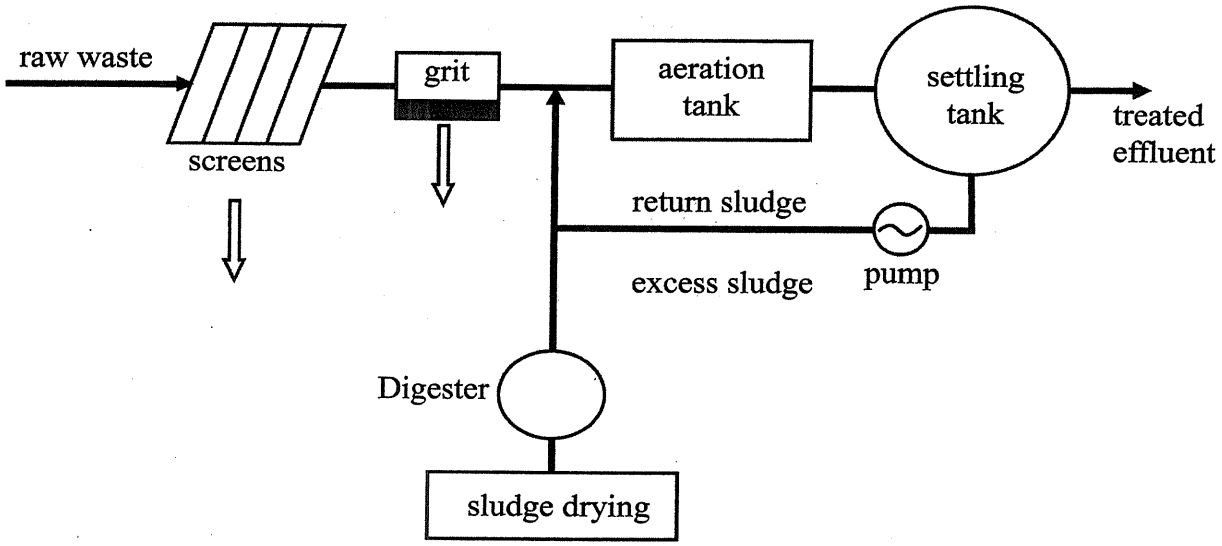
(d) Approximately 200 000 kilogrammes of household waste is sent to the dump per week. 50 000 kilogrammes of this is plastic materials.

Calculate the percentage of the household waste that is plastic material.

[1]

(e) Untreated sewage is one of the main causes of water pollution.

The diagram shows an outline of a sewage treatment plant.



Give the name of the micro-organisms and describe their functions in the aeration and settling tanks of a sewage treatment plant.

(i) **aeration tank**

micro-organism _____

function _____

_____ [2]

(ii) **settling tank**

micro-organism _____

function _____

_____ [2]

TOTAL MARKS [10]

3. Fossil fuels are often called **non-renewable** resources.

(a) Explain the meaning of non-renewable.

_____

_____ [1]

(b) Name **TWO** fossil fuels.

1. _____

2. _____ [1]

(c) A few farmers in Andros installed generators that run on methane gas. The methane gas is produced from rotting vegetation and animal waste.

(i) Name this type of alternative energy source.

_____ [1]

(ii) Give **ONE** advantage of the energy source named in (c)(i) over fossil fuels.

_____

_____ [1]

(d) A farmer's electrical energy bill from BEC is $1 500 per month. The farmer purchases and installs a generator that runs on methane gas for $18 000. It provides for all of his electricity needs.

(i) Calculate how long it will take before he recovers the cost of purchasing and installing the new generator.

[2]

(ii) Energy from the wind is being harnessed to provide electrical energy.

Suggest **ONE** disadvantage of using a wind turbine generator as an energy source.

_____

_____ [1]

(iii) Explain **TWO** possible reasons why the use of solar energy is not more widespread in The Bahamas.

1. _____

_____

2. _____

_____ [1]

(e) Explain how some scientists think that alternative energy sources could help to reduce climate change.

_____

_____

_____

_____ [2]

TOTAL MARKS [10]

4. Iron is the fourth most abundant metal in the Earth's crust and is used in manufacturing a wide range of products. The blast furnace is used to extract iron from its ore.

Shown is a partial schematic diagram of the process of the extraction of iron.

1. $C(s) + O_2 \longrightarrow CO_2(g)$	$\Delta H = -394$ kJ/mol	molten iron slag
2. $CO_2(g) + C(s) \longrightarrow 2\,CO(g)$	$\Delta H = +173$ kJ/mol	
3. $Fe_2O_3(s) + 3\,CO(g) \longrightarrow 2\,Fe(s) + 3\,CO_2(g)$	$\Delta H = +4$ kJ/mol	molten iron
4. $CaCO_3(g) \longrightarrow CaO(s) + CO_2(g)$	$\Delta H = +178$ kJ/mol	

(a) Name the raw materials that are put into a blast furnace to provide:

(i) iron (III) oxide _____

(ii) carbon _____

(iii) calcium carbonate _____

(iv) oxygen _____ [4]

(b) Name the main reducing agent used in the furnace.

_____ [1]

(c) State the number of the reaction that provides heat to maintain the temperature of the furnace.

_____ [1]

(d) State why the calcium carbonate in reaction 4 is used in the extraction process.

_____ [1]

(e) The waste gases from the blast furnace contain oxides of nitrogen and carbon.

Explain **ONE** effect of these gases on the environment.

_____ [1]

Section B

Answer any two questions

5. The diagram shows a section of a coral reef ecosystem in The Bahamas.

(a) (i) Draw a diagram of a coral polyp. Label **THREE** structures on your diagram. [3]

(ii) State the conditions which corals need to thrive and grow well. [2]

(b) Many animals living on the coral reef are interdependent on each other.

(i) State the name given to this kind of relationship. [1]

(ii) Describe how each of the organisms benefit from this relationship. [2]

(c) Two types of corals can be seen in the diagram.

(i) Both hard and soft corals are shown in the diagram.

Compare the **TWO** types of coral and give examples of each type. [3]

(ii) State **THREE** reasons why coral reefs are important features of the marine environment. [3]

(d) Man's actions are a threat to coral reefs.

(i) Describe **THREE** ways in which coral reefs can be damaged. [3]

(ii) Describe **THREE** ways to preserve the coral reefs. [3]

TOTAL MARKS [20]

(f) Most of the iron collected during this process is converted into steel.

(i) Give the name for the chemical classification of steel.

_____ [1]

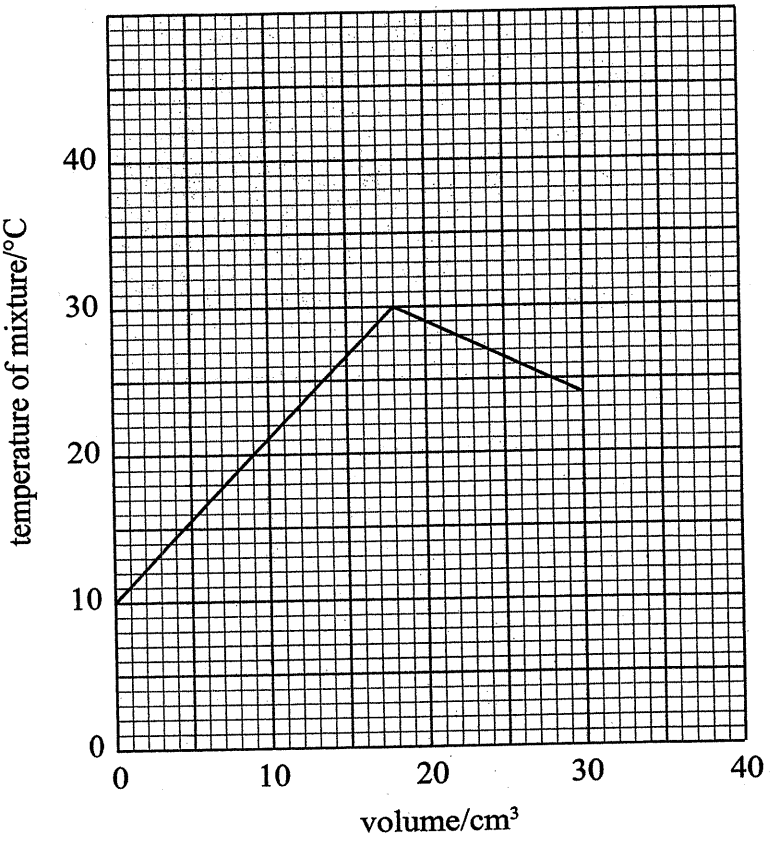
(ii) Explain why iron in its pure form is not used for constructing frameworks for houses.

_____ [1]

TOTAL MARKS [10]

6. This question is about the production of energy.

A student carries out an investigation between sodium hydroxide solution and sulfuric acid.
She places 50 cm^3 of sulfuric acid in a Styrofoam cup and adds fixed volumes of sodium hydroxide solution.
The mixture is stirred and the temperature recorded. The results are plotted on the graph shown.



(a) (i) Name and describe the nature of the energy change that occurs when sodium hydroxide reacts with sulfuric acid. [2]

(ii) Describe the difference in energy changes for bond making and bond breaking in the reaction between sodium hydroxide and sulfuric acid. [1]

(iii) Briefly explain why a Styrofoam cup is used. [1]

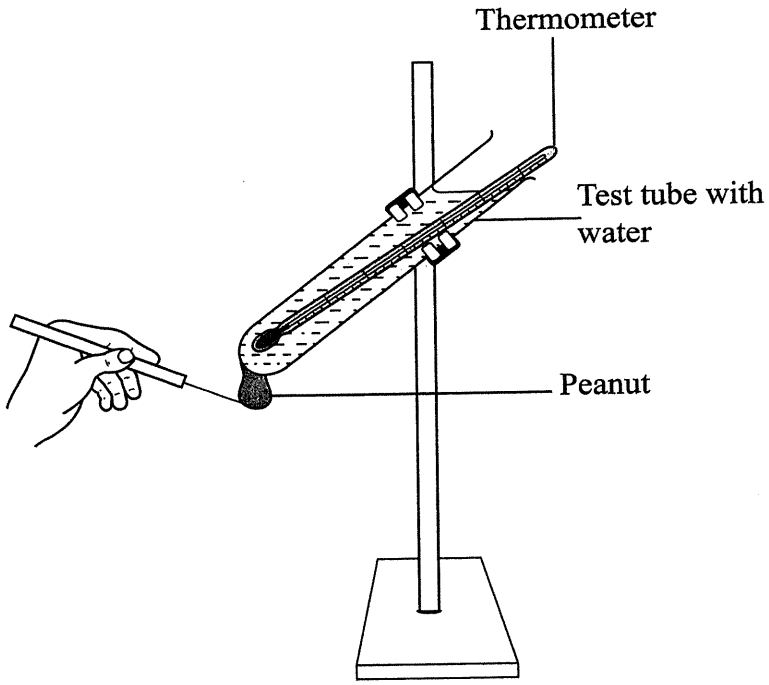
(iv) State the volume of sodium hydroxide which gives the highest temperature reading. [1]

(v) State why the temperature begins to decrease. [1]

(vi) Calculate the change in temperature for the reaction. [1]

(vii) Write a balanced chemical equation for the reaction. [2]

(b) The diagram shows an experiment set up by a student to investigate the release of energy from food.



The experiment is repeated and the results recorded in the table.

expt.	mass of peanut/g	initial temperature of water/°C	final temperature of water/°C	temperature change/°C
1	1	24	60	36
2	1	26	64	

(i) Name the type of chemical reaction shown in the diagram. [1]

(ii) State another **variable** other than mass which can be held constant in this experiment. [1]

(iii) Suggest **ONE** reason why the experiment is repeated. [1]

The final temperature readings of experiments 1 and 2 were lower than expected.

(iv) Suggest **ONE** reason for this observation and state two ways of improving the experiment. [3]

(v) Calculate the average temperature change of Experiments 1 and 2. [1]

(vi) Assuming that the temperature increase of the water is due to the energy released from the peanut.

Using the equation to calculate the energy released from 1 g of burning peanut. Show all working. [2]

Energy released in Joules = (100)(4.2)(avg. temp. change of water)

(c) Fuels also burn to release energy.

Name the products formed when methane gas burns in an ample supply of air. [2]

TOTAL MARKS [20]

7. This question is about temperature conversion and heat transfer.

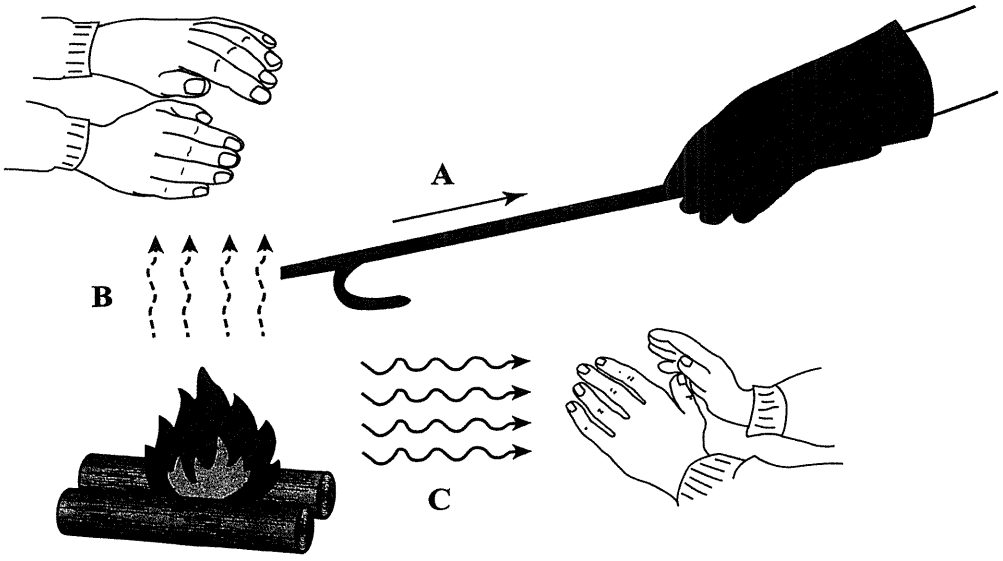
(a) Name the instrument used to measure temperature. [1]

(b) Show all calculations and working. Convert 250 K to

(i) °C [2]

(ii) °F [2]

(c) The diagram shows the various ways heat is transferred.



(i) For each situation A, B, and C, **identify** the method by which heat is transferred from the fire to the hands. [3]

(ii) For each named method, explain how heat is transferred from the fire to the hands. [6]

(iii) Explain how the glove allows the heated rod to be held directly above the flame. [2]

(d) Figure P shows an instrument used to measure the time the sun shines during a day. The blackened glass tube contains mercury and is supported inside an evacuated glass case.

Figure Q shows how the connecting wires are arranged inside tube A.

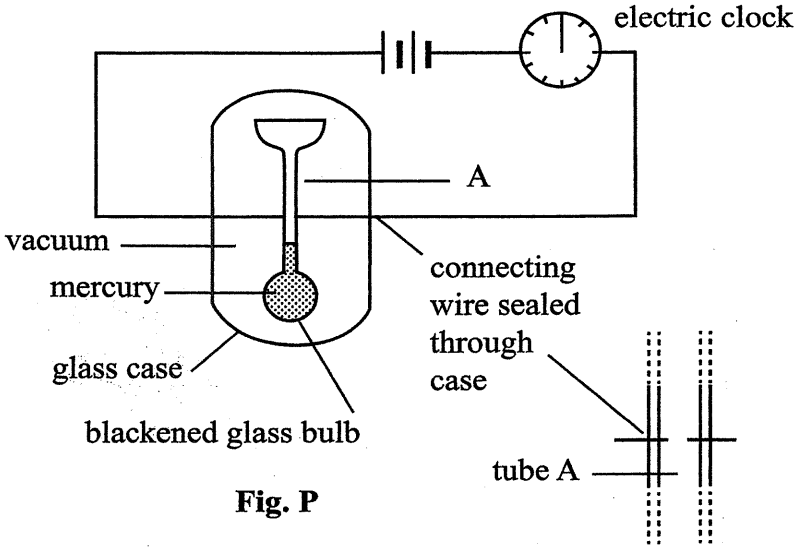


Fig. P

Fig. Q

(i) Describe how the energy from the Sun reaches the Earth. [2]

(ii) Explain why blackening the bulb ensures that the mercury level falls rapidly when the sun ceases to shine. [2]

TOTAL MARKS [20]

Question .....
Write on both sides of the paper

Question .....
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