



DEPARTMENT OF  
EDUCATION

UPPER SECONDARY  
SCHOOL CERTIFICATE  
EXAMINATIONS

**APPLIED SCIENCE**

Monday

22 October 2012

Time allowed:

2 hours and 30 minutes  
(11:00am – 1:30 pm)

NO EXTRA TIME  
(NO OTHER TIME)

Candidates are advised to fully  
utilise the allocated time

AS

## INSTRUCTIONS TO CANDIDATES

*To be read by the external invigilator to all candidates*

1. The **subject code** for **Applied Science** is **9**
2. There are **11** printed pages in the question booklet.
3. An Electronic Answer Sheet and **10 printed** pages of Section B Answer Booklet are inserted in the centre of the question booklet.
4. There are two sections in this paper.

### **Section A : Multiple Choice (Question 1 – 30) 30 marks**

This section will be electronically marked.

All answers to the Multiple Choice Section **MUST** be answered on this Answer Sheet.

Carefully following the instructions, fill in your Candidate Information and Subject Information.

### **Section B: Short Answers (Question 31 – 40) 70 marks**

Write your name, your school name and complete your 10 digit candidate number on the Section B Answer Booklet provided.

5. You are required to only write the correct answer in the space provided.
6. Answers written on the question paper or any other paper will not be marked. Write answers neatly in spaces as allocated on the answer booklet. Answer **ALL** questions.
7. Correction Fluid is not allowed on the answer sheet. If you decide to change an answer, make sure it is absolutely clear to the marker what your final answer is.

**PENALTY FOR CHEATING OR ASSISTING TO CHEAT IN NATIONAL EXAMINATIONS IS NON-CERTIFICATION.**

**DO NOT TURN OVER THE PAGE  
AND DO NOT WRITE  
UNTIL YOU ARE TOLD TO START.**

**SECTION A: Multiple Choice (Questions 1 to 30) 30 Marks**

**For each question, choose the best answer and shade in the circle representing the letter of your choice A, B, C, or D printed on the electronic answer sheet.**

**QUESTION 1**

Which one of these ways cannot make hard water soft?

- A. Adding calcium bicarbonate
- B. Boiling
- C. Distilling
- D. Adding sodium bicarbonate

**QUESTION 2**

Eutrophication of water systems is characterized by all of the following except

- A. water system receiving too many nutrients
- B. depleted oxygen levels
- C. increased hydrogen carbonate levels
- D. increasing populations of aquatic organisms

**QUESTION 3**

What is meant by the statement, “water is potable”?

- A. Water can be carried around
- B. Water is safe to consume
- C. Water is lacking nutrients
- D. Water is scarce

**QUESTION 4**

One of these is not a significant cultural and economical reason for valuing Papua New Guinea rainforests.

Which one is it?

- A. Uses for food and shelter
- B. Uses for medicinal purposes
- C. Uses for sorcery
- D. Uses in carbon trade

**QUESTION 5**

What would be the most prominent effect on biodiversity if we continued to log and destroy our rainforests in PNG?

- A. Increased open land for roaming
- B. Species extinction
- C. Increase in species numbers due to easy mating
- D. Increase in biodiversity in different ecosystems

**QUESTION 6**

Which one of these is not a readily biodegradable object?

- A. broken vehicle windscreen
- B. national newspaper
- C. tapa cloth
- D. cooked corn

**QUESTION 7**

Which statement best defines the word “reafforestation”?

- A. Restocking of existing forests that have been logged
- B. Renaming an existing forest
- C. Reassuring forest management process
- D. Reducing existing forests

**QUESTION 8**

Which one of these statements is not true of Electrocardiography (ECG)?

- A. A test for evaluating cardiac status
- B. It graphically records electrical potential generated by the heart
- C. It's use is restricted to the elderly age group
- D. It uses electrode tabs to measure electrical potential

**QUESTION 9**

Which one of these microorganisms is not a causative agent of sexually transmitted diseases?

- A. *Neisseria gonorrhoea*
- B. *Treponema pallidum*
- C. *Saccharomyces cerevisiae*
- D. *Chlamydia*

**QUESTION 10**

The fuel formed under the earth's surface by decomposition of organic matter is called \_\_\_\_\_.

- A. organic fuel
- B. biogas
- C. fossil fuel
- D. underground fuel

**QUESTION 11**

Which of the following causes the least pollution when burnt?

- A. Petrol
- B. Diesel
- C. Natural gas
- D. Coal

**QUESTION 12**

Floating generators are used in the sea to harness \_\_\_\_\_.

- A. tidal energy
- B. wave energy
- C. wind energy
- D. hydro energy

**QUESTION 13**

The fuel used in nuclear reactor is \_\_\_\_\_.

- A. Radium
- B. Cadmium
- C. Thorium
- D. Uranium

**QUESTION 14**

Which one of these processes could be least considered as a traditional method of food preservation in PNG?

- A. Immersion in brine
- B. Smoking
- C. Immersion in water
- D. Sun-drying

**QUESTION 15**

Analysis of cooked sago showed that it predominantly consists of water and

- A. fats and oils
- B. protein, starch and glucose
- C. protein and vitamins
- D. starch and glucose only

**QUESTION 16**

All these statements are correct about antibiotics except for;

- A. originally derived from fungi
- B. have ability to treat bacteria infections
- C. can be synthetically made
- D. are produced by a combination of fermentation and distillation

**QUESTION 17**

Which one of these processes uses an enzyme catalyst in an enclosed vessel to create its end products?

- A. Filtration
- B. Separation
- C. Fermentation
- D. Distillation

**QUESTION 18**

One of the following statements is not a benefit of biogas production.

- A. Cheap- using surplus materials
- B. Reduces landfill problems
- C. Accumulates human or animal waste
- D. Reduces use of other sources of power

**QUESTION 19**

Which one of the following is not a biogas fuel?

- A. Charcoal
- B. Acetone
- C. Alcohol
- D. Methane

**QUESTION 20**

The traditional technology used in making fires requires the following physical parameters;

- A. Force, Energy and Pressure
- B. Force, Energy and Gravity
- C. Force, Energy and Light
- D. Force, Energy and Charge

**QUESTION 21**

Clay pots were used as cooking utensils in the past.

Which of these modes of heat transfer best describes the process in boiling sweet potatoes in a clay pot?

- A. Conduction, convection and radiation.
- B. Conduction and radiation only.
- C. Conduction and convection only.
- D. Convection and radiation only.

**QUESTION 22**

Which is not true about radio communications?

- A. Radio communication is prone to interference from disturbances that are electromagnetic in nature.
- B. Requires transmitter and receiver.
- C. Radio frequencies are transmitted in many different frequencies.
- D. Radio signals cannot be transmitted in vacuum.

**QUESTION 23**

FM Radio stations transmit audio data like music, news and advertisements to listeners who tune their radio receivers to the specified frequency, which the FM Station is transmitting on. In the FM radio transmitter circuit, which of the two devices determine the frequency of transmission?

- A. Resistor and diode
- B. Capacitor and resistor
- C. Capacitor and inductor
- D. Transistor and resistor

**QUESTION 24**

Which of the following modes of signal best describes communication of radio signal under water?

- A. Submarine cable.
- B. Seismic wave.
- C. Electromagnetic wave.
- D. Tidal wave.

**QUESTION 25**

Traditional food processing and preservation is a type of traditional technology. Which of the following is an example of this type of technology?

- A. Smoking yam gardens
- B. Storing water in bamboos
- C. Drying fish over hot charcoals
- D. Wrapping food in leaves

**QUESTION 26**

Firing a bullet from a gun to a target operates on the same principles as releasing an arrow from a drawn back string to its target.

Which of the following principles does *not* apply?

- A. Gravity
- B. Work
- C. Kinetic energy
- D. Potential energy

**QUESTION 27**

What is the main step in the production of soap?

- A. Esterification
- B. Polymerisation
- C. Saponification
- D. Bleaching

**QUESTION 28**

The table below shows the two district methods used in the extraction of palm oil.

Which of the options is true?

	Method	Uses	Objective
A	Dry	Mechanical process	To break down the oil-bearing cells
B	Wet	Hot water	To leach out oil
C	Wet	Cold water	To solidify oil
D	Dry	Mechanical process	To emulsify the fat

**QUESTION 29**

Which of the following is a mineral product?

- A. Cement                      B. Gold                      C. Ore                      D. Potassium

**QUESTION 30**

Which substance below is made by melting a mixture of sand and other materials in a furnace at a high temperature?

- A. Gold                      B. Cement                      C. Glass                      D. Steel

**SECTION B: Short Answers**

**(Questions 31 to 40)**

**70 marks**

**Write your answer to the questions in the spaces provided in your Section B Answer Booklet.**

**QUESTION 31**

A light bulb of 1.5 Amps is operated by a direct current (DC) 12 V battery powered by a solar panel. The light is operated for four hours in the evenings.

- a) Calculate the output power of the light bulb. (2 marks)
- b) Calculate the energy usage of the light bulb for a month of 31 days. (2 marks)
- c) A home owner wants to use the solar lighting system to replace a 20-Watt light bulb he is currently using at a cost of K0.52 per kilowatt-hour. How much would he save per month (31 days)? (3 marks)

**QUESTION 32**

- (a) Outline two effects of oil pollution in water systems. (2 marks)
- (b) Name the bio-chemical method for cleaning up oil spills. (1 mark)
- (c) The following questions refer to sewage treatment systems.
  - i) Name the two biological stages in the sewage treatment system. (2 mark)
  - ii) Why is it important to allow grit to settle in the sedimentation process? (1 mark)
  - iii) At what stage of the treatment is methane gas a by-product. (1 mark)

**QUESTION 33**

- a) If the swamps on the outskirts of Port Moresby were found to be eutrophic; what could be the most probable cause for them becoming eutrophic? (1 mark)
- b) Name two human activities that can have a profound effect in modifying or destroying grasslands in PNG. (2 marks)
- c) Acid rain is one of the problems that occur with earth's atmosphere. Name two oxides of fossil fuel combustion that when combined with water produce acid rain. (2 marks)
- d) What is Ecotourism? (2 marks)

**QUESTION 34**

- a) In blood pressure readings, what do the following two readings reflect of the person's heart?
  - i) Systolic pressure (1 mark)
  - ii) Diastolic pressure (1 mark)
- b) Name two characteristic symptoms of Diabetes mellitus that occurs in humans. (2 marks)
- c) What is Hepatitis? (2 marks)
- d) Why is occupational health and safety important? (1 mark)



**QUESTION 35**

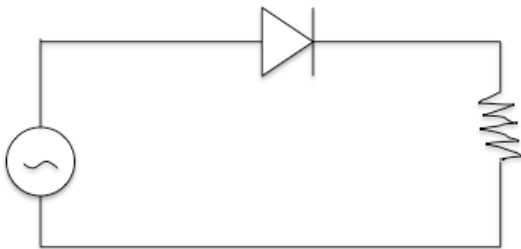
- a) What is one disadvantage of using irradiation to preserve food? (1 mark)
- b) Outline how anti-oxidants help to preserve food? (2 marks)
- c) Name a bacterium that is commonly implicated in food poisoning. (1 mark)
- d) Describe one way in which bacteria can cause food poisoning. (1 mark)
- e) How does UHT pasteurization differ from basic pasteurization? (2 marks)

**QUESTION 36**

- a) Name two ideal conditions under which fermentation processes for biogas can occur optimally. (2 marks)
- b) What is **biotechnology**? (2 marks)
- c) What is **virgin oil**? (2 marks)
- d) What is the name given to fuel produced from virgin oil? (1 mark)

**QUESTION 37**

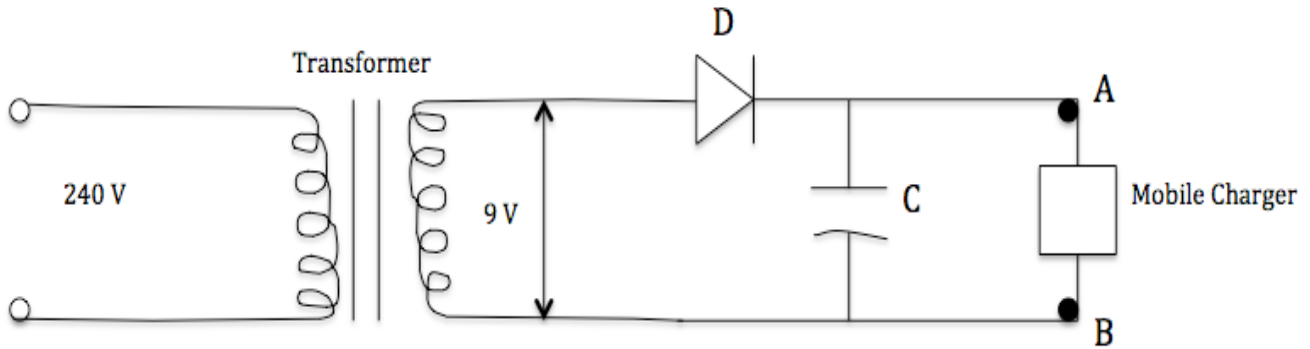
- a) A transducer is a device that converts a signal in one form to a signal in another form.
- i) Name a transducer or a device that converts sound wave into electrical signal. (1 mark)
- ii) Name a transducer that converts an electrical signal into a sound wave. (1 mark)
- b) What is the major difference between an electronic analog signal and a digital signal? (2 marks)
- c) A diode circuit is supplied from an AC circuit as shown below.



- i) Give the function of the diode in the circuit. (1 mark)
- ii) Sketch the output waveform to two cycles. (1 marks)
- iii) True or False: A diode is a p-n junction device. (1 mark)

**QUESTION 38**

An electronic technician designed a 9-volt mobile charger circuit below.



- a) What is the function of the transformer in the circuit? (1 mark)
- b) What is the function of the capacitor, C? (1 mark)
- c) What is the voltage drop across the capacitor? Assume the diode is ideal (that is, no voltage drop across it). (1 mark)
- d) Sketch the waveform across the points AB. (2 marks)
- e) Is the circuit design appropriate for mobile phone charging? Explain your answer. (2 marks)

**QUESTION 39**

Use the following words to complete the table on Traditional Technology.

**Words:** Bows and arrows, Bamboo flute, Textiles, Grass skirt, Transportation, Musical Instrument, Tools, Axe, Clay pot, Boat.

Type of Traditional Technology	Modern Day form	Traditional Form
(i)	(ii)	Canoe
Weapon	Gun	(iii)
(iv)	(v)	Stone axe
Cooking utensil	Sauce pan	(vi)
(vii)	Drums	Kundu

(7 marks)

**QUESTION 40**

- a) Lime is an example of a mineral product that can be produced in several ways. List down the two common materials from which lime can be made in Papua New Guinea. (2 marks)
- b) Lime can be used in many different ways. Write down two uses of lime in PNG. (2 marks)
- c) The table below shows two types of lime. Fill in the blanks. (3 marks)

Forms of Lime	Chemical Formula	Chemical Name
Slaked lime	_____ (i) _____	Calcium Hydroxide
Quick lime	_____ (ii) _____	_____ (iii) _____

**END OF EXAMINATION**

# APPLIED SCIENCE—2012

## SECTION B - ANSWER BOOKLET

Write your name, your province and school codes and your candidate number correctly and clearly in the space provided below.

Year		Province		School			Candidate No		
1	2								

Candidate Name: \_\_\_\_\_

School Name: \_\_\_\_\_

Answers written on the QUESTION paper or any other paper will NOT be marked. Write answers in the spaces as provided on this answer booklet.

### FOR MARKERS USE ONLY

	Score	Markers Initials	
		M1	M2
<b>Section B:</b>			
Question 31			
Question 32			
Question 33			
Question 34			
Question 35			
Question 36			
Question 37			
Question 38			
Question 39			
Question 40			
<b>FINAL TOTAL</b>			

**SECTION B - ANSWERS**

**Write your answer in the space provided below. Your answers must be clear and precise.**

**QUESTION 31**

a)	2
b)	2
c)	3
<b>For Markers Use Only</b>	<b>Q31 Total</b>

**QUESTION 32**

a) i) _____	2
ii) _____	
b) _____	1
c) i) (1) _____	2
(2) _____	
ii) _____	1
_____	
iii) _____	1
_____	
<b>For Markers Use Only</b>	<b>Q32 Total</b>

**QUESTION 33**

a) _____	1
_____	
_____	
b) (1) _____	
_____	
(2) _____	2
_____	
c) (1) _____	
(2) _____	2

d) _____ _____	2
For Markers Use Only	<b>Q33 Total</b>

**QUESTION 34**

a) (i) _____	1
(ii) _____	1
b) (1) _____	2
(2) _____	2
c) _____ _____	2
d) _____ _____	1
For Markers Use Only	<b>Q34 Total</b>

**QUESTION 35**

<p>a) _____ _____</p> <p>b) _____ _____</p> <p>c) _____</p> <p>d) _____ _____</p> <p>e) _____ _____ _____</p>	<p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p>
<p>For Markers Use Only</p>	<p><b>Q35 Total</b></p>



**QUESTION 36**

<p>a) (1) _____</p> <p>(2) _____</p> <p>b) _____</p> <p>_____</p> <p>_____</p> <p>c) _____</p> <p>_____</p> <p>_____</p> <p>d) _____</p>	<p>2</p> <p>2</p>
<b>For Markers Use Only</b>	<b>Q36 Total</b>

**QUESTION 37**

a) (i) _____	1
(ii) _____	1
b) _____ _____ _____ _____	2
c) (i) _____	1
(ii)	1
(iii) _____	1
<b>For Markers Use Only</b>	<b>Q37 Total</b>

**QUESTION 38**

a) _____ _____	1
b) _____ _____	1
c) _____ _____	1
d) _____ _____ _____ _____ _____	2
e) _____ _____ _____ _____	2
For Markers Use Only	<b>Q38 Total</b>

**QUESTION 39**

(i) _____	1
(ii) _____	1
(iii) _____	1
(iv) _____	1
(v) _____	1
(vi) _____	1
(vii) _____	1
<b>For Markers Use Only</b>	<b>Q39 Total</b>

**QUESTION 40**

<p>a) (1) _____</p> <p>(2) _____</p> <p>b) (1) _____</p> <p>(2) _____</p> <p>c) (i) _____</p> <p>(ii) _____</p> <p>(iii) _____</p>	<p>2</p> <p>2</p> <p>3</p>
<p>For Markers Use Only</p>	<p><b>Q40 Total</b></p>