STUDENT EDUCATION NUMBER									

GOVERNMENT OF SAMOA
MINISTRY OF EDUCATION, SPORTS AND CULTURE

Samoa School Certificate

PHYSICS

2018

QUESTION and ANSWER BOOKLET

Time allowed: 3 Hours & 10 minutes

INSTRUCTIONS

1. You have 10 minutes to read **before** you start the exam.
2. Write your **Student Education Number (SEN)** in the space provided on the top left hand corner of this page.
3. **Answer ALL QUESTIONS.** Write your answers in the spaces provided in this booklet.
4. If you need more space, ask the Supervisor for extra paper. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets at the appropriate places in this booklet.

NOTE: All required formulas are provided on the last page.

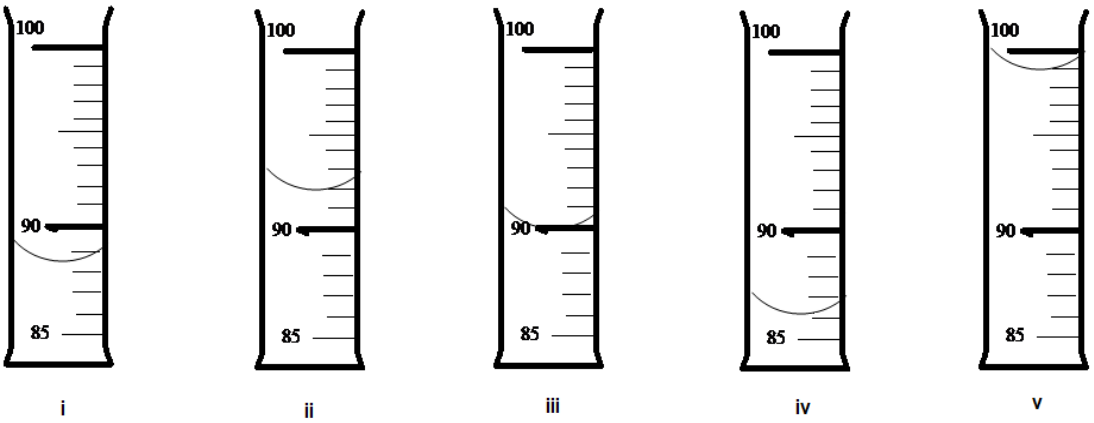
Check that this booklet contains pages 2-22 in the correct order and that none of these pages are blank.

HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION

STRAND 1: MEASUREMENT Weighting 11

1. Five different volumes of water (mm^3) in the measuring cylinder glass are presented in the figure below.

Enter the correct volume of water in the table given below.



SL 3

Measuring cylinder	Volume (mm^3)
(i)	
(ii)	
(iii)	
(iv)	
(v)	

2. Use your ruler to measure the length and the width of the rectangular shape given below. Give your answer in meters (m).

SL 3

Length : _____

Width: _____

3. What differences would you expect between the measurements you get from using a ruler and a vernier caliper?

SL 1

_____

_____

4. State a relevant title for the task you did in Number 1.

SL 1

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5. Describe the relevant instruments or a relevant approach to measure the mass of the water in the measuring cylinder in Number 1.

SL 2

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6. Express 20,000,000 nanoseconds in seconds.

SL 1

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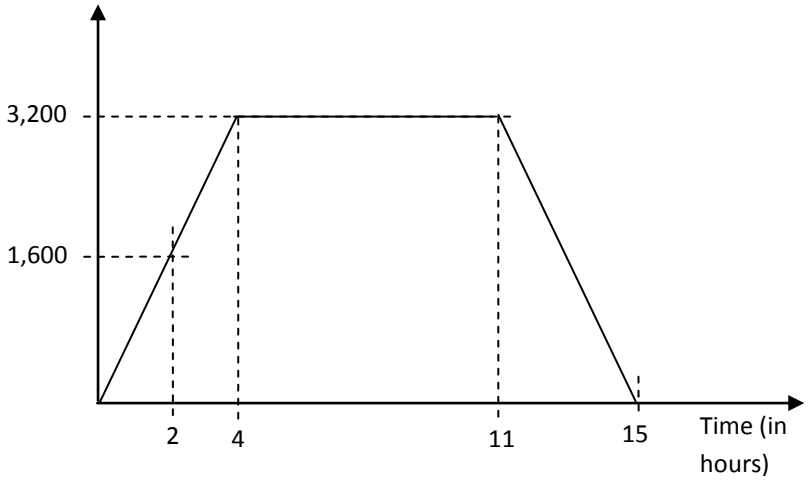
7. The diagram below shows the average daily trips of a passenger plane, travelling between two countries, A and B. The journey starts from country A, which is at a distance of 0 km every morning. **(The diagram is not in scale).**



SL 3

Use the information in the graph to answer the following questions.

(i) What is the distance between the two countries, A and B?

_____

(ii) Determine the velocity of the plane, in the first four hours, (i.e. from 0 – 4 hours) of the journey.

_____

(iii) If the plane leaves country A for country B at 5.00 am o'clock every morning, what time on the clock would the plane arrive back at country A?

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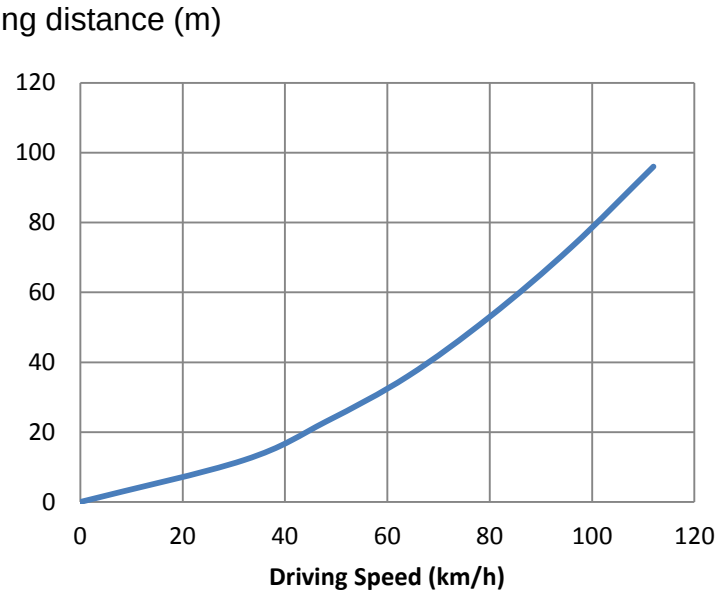
The graph given below shows the safe stopping distance of a car with respect to its speed.



8. Suppose you work as a road safety officer and you are required to assign the speed limits at different places in the community. Use the graph to determine a recommended speed limit for drivers for the following places.

(i) When driving inside a school compound with a safe stopping distance of 1 to 2 metres.

SL 4

(ii) When you drive along the main road from Malifa to Taufusi with a safe stopping distance of 20 metres.

(iii) A novice driver of a Toyota Camry was following a Hyundai Tucson. Both vehicles were travelling at the same speed of 70 km/h. The Toyota was 30 metres behind the Hyundai when the Hyundai was suddenly break to a stop. Use the graph to determine whether the Toyota Camry crashed into the Hyundai Tucson or not. Explain your answer.

A vehicle is approaching a small hill when suddenly the engine is cut off. The vehicle continues to climb up the hill until it stops just before it reaches the top and then it starts to go downhill again.

9. Explain the energy conversion that takes place on the vehicle when the engine goes off. (Assume that the driver never used the brakes).

_____ | SL 2

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Define the following terms:

10. Efficiency _____ | SL 1

_____

11. Moments _____ | SL 1

_____

12. Kinetic Energy _____ | SL 1

_____

State ONE example for the following types of forces.

13. Magnetic force _____ | SL 1

14. Electrical force _____ | SL 1

15. Frictional force _____ | SL 1

16. A car is moving toward north at the speed of 40 km/hr for 30 minutes. Then it turns west and moves at the speed of 30 km/hr for 20 minutes. Finally, it moves to the south at the speed of 20 km/hr for 10 minutes. Determine the average speed of the car.

SL 2

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17. State the principle of Energy of Conservation.

SL 1

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18. State a factor that affects the amount of potential energy on an object.

SL 2

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A box with a mass of 200 kg is needed to be placed on the truck. One option is to use a lever as in Diagram 1 below. The other option is to lift it straight onto the truck as in Diagram 2.

Diagram 1

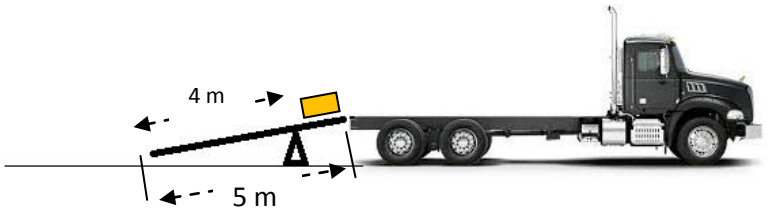

Diagram 2

19. Explain why it is easier to use Option 1 in moving the box on the truck than Option 2.

SL 3

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Chef Peter uses a frying pan to cook food. As soon as the food is cooked, he places it immediately in the polystryrene paper foam plates.

20. Explain how heat is stopped or transferred by conduction, convection and radiation for each part of the frying pan and the polystyrene paper plate.

(i) **Frying pan**

(a) Plastic Handle_____

_____

SL 4

(b) Aluminium Metal Pan_____

_____

(ii) **Foam Plate**

(a) Lid cover _____

_____

(b) Plate is made with polystyrene foam_____

_____

During a party, Rita left a glass bottle of Coca Cola drink and a glass bottle of alcohol, Rum, in the freezer overnight. The next morning she found that the bottle of Coca Cola drink was cracked but not the bottle of alcohol.

21. Explain why one bottle cracked and not the other one.

Hint:
(i) Assume that the glass bottles are made from the same material.
(ii) The Coca Cola drink is mainly water.
(iii) The table shows some of the information which maybe helpful to answer the question.

Freezing point of water	0^oC
Boiling point of water	100^oC
When water cools from 100^oC to 4^oC	It contracts
When water cools from 4^oC to 0^oC	It expands
Freezing point of alcohol	-24^oC
Boiling point of alcohol	80^oC
When alcohol cools from 80^oC to -24^oC	It contracts
Freezer's lowest temperature	-18^oC

SL 3

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Rita, also found an inflated balloon in one of the compartments of the refrigerator, which is kept at 0^oC. Someone in the party must have put it there.

She took the balloon out and places it on the table, which was at room temperature of 25^{o}C. About an hour later, Rita noticed that the balloon has gone bigger than it was in the fridge.

22. Explain why.

SL 2

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23. Convert 200^{o}C into Kelvin.

SL 1

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24. Define conduction in heat transfer.

SL 1

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25. Define convection in heat transfer.

SL 1

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26. Define radiation in heat transfer.

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SL 1

STRAND 4: MAGNETISM Weighting 15

27. State the law of magnetism.

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SL 1

28. State an example where an electromagnet is used.

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SL 1

29. State why soft iron and not a piece of steel is used in the core of an electromagnet.

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SL 1

30. State an example of a metal that is not a magnetic material.

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SL 1

31. A bar magnet has two magnetic poles, South and North. When it is broken into 3 pieces, what is the total number of magnetic poles from the 3 pieces?

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SL 1

32. Describe ONE way of making a permanent magnet.

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SL 2

33. Describe how the earth acts as a magnet. (You may draw a diagram to illustrate).

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SL 2

34. Explain why like poles repel and unlike poles attract.

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SL 3

35. Show by using a diagram how an electromagnet is made.

SL 4

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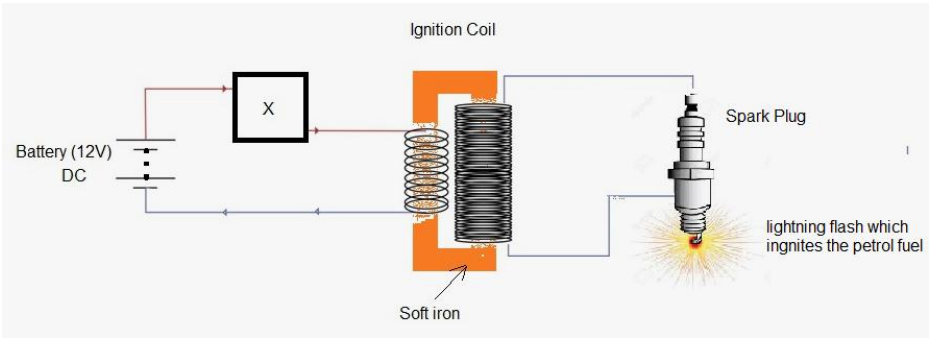
STRAND 5: ELECTRICITY Weighting 19

36. One of the most important components of a car engine is the ignition coil. The purpose of the ignition coil is to convert the 12V from the car battery to generate 20,000V for the spark plugs. The high voltage will cause sparks at the spark plugs and ignite the petrol fuel in the engine. The diagram given below is the basic ignition system of the car.



SL 4

(i) The ignition coil is actually a step up transformer.
Explain how the ignition coil converts a 12V battery to 20,000V.

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(ii) In order for the ignition coil to continuously provide 20,000V for the spark plugs, a fast switching (on/off) device labeled ‘x’ is necessary. The switch keeps switching between ‘on’ and ‘off’ and never stops on either, ‘on’ or ‘off’ modes.

Explain why the fast switching device is needed in tie circuit.

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37. In an ideal ignition coil, the power generated in primary coil is the same as the power generated in the secondary coil. Referring to the ignition coil used in Number 36. If the power generated in the primary coil is 24W, what is the current produced in the secondary coil in milliampere (mA).

SL 3

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38. Explain ONE factor that can affect the current produced in the secondary coil of an ignition coil.

SL 3

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39. If a positively charged rod is applied to a metal sphere, no charge is found inside the metal sphere but only on the outer surface of the sphere.

Describe the characteristics of the positive charges, which caused the charges to be found outside the sphere and not the inside.

SL 3

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40. Describe how the two materials, the hairs and a plastic ruler become charge if they rubbed against each other.

SL 2

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41. Define electroplating.

SL 1

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42. Define electrostatic.

SL 1

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43. Define electric field.

SL 1

44. List examples of how electricity is stored.

SL 1

45. Define the term ‘resistance’ including its SI unit.

SL 1

STRAND 6: WAVES Weighting 19

46. Discuss how a human eye responses and accommodates for following situations in order to see objects clearly. (**Hint:** To help you with your discussion, you should draw the structure of the eye).

(i) When the eye is focus on a distant object, what happens to the lens of the eye?

SL 4

(ii) When the eye is focus to a nearby object, like when reading a book. What happens to the lens of the eye?

(iii) When the eye respond to lights with low level of intensity. For example, when you enter inside a dark room, what happens to the pupil of the eye?

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(iv) When the eye respond to lights with high level of intensity. For example, when someone flashes a torch light into your eyes, what happens to the pupil of the eye?

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47. An object is placed 2cm in front of a concave mirror, which has a focal length of 4cm. Use a **ray diagram** to locate the image of the object in the concave mirror.

SL 3

48. A diverging lens (or concave lens) has a focal length of -10cm. Calculate the position of the image if the object is located 25cm from the lens.

SL 3

49. Describe the corrections appropriate for the person's eye, if this person has myopia, which is a shortsightedness condition.

SL 2

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50. The evidence of light travelling in straight line is the inverted image formed in the pin-hole camera.

Describe how the image formed is the evidence.

SL 2

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51. Does the frequency increases, decreases or remains the same, if light travels from water to air?

SL 1

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52. Define a virtual image.

SL 1

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53. Give an example of a longitudinal wave.

SL 1

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54. Define lateral inversion.

_____

SL 1

55. If the image formed in the curved mirror has a height of 40cm. How much has the object magnified if the height of the object is 10cm?

_____

SL 1

PHYSICS EQUATIONS SHEET

Kinematics

$v = u + at$

$d = ut + \frac{1}{2}at^2$

$v^2 = u^2 + 2ad$

$v = \frac{\Delta d}{\Delta t}$

$a = \frac{\Delta v}{\Delta t}$

$F = ma$

Electricity and Magnetism

$P = \frac{W}{t}$

$I = \frac{Q}{t}$

$V = IR$

$P = VI$

$B = \frac{kI}{d}$

$F = Bqv$

$V = Bvl$

List of constants

$g = 10\frac{m}{s^2}$

$k = 2 \times 10^{-7} NA^{-2}$

$m_e = 9 \times 10^{-31} kg$

$G = 6.67 \times 10^{-11} Nm^2 / kg^2$

$k = 9.0 \times 10^9 Nm^2 C^{-2}$

Heat

$Q = mc\Delta T$

$c = 4200\ J/kgK$

Energy and Mechanics

$W = Fd$

$E_P = mgh$

$E_k = \frac{1}{2}mv^2$

$P = F/A$

$P = W/t$

Light and Waves

$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o}$

$m = \frac{H_i}{H_o} = \frac{d_i}{d_o}$

$n_1 \sin\theta_1 = n_2 \sin\theta_2$

$T = \frac{1}{f}$

$v = f\lambda$

STUDENT EDUCATION NUMBER									

PHYSICS

2018

(For Scorers only)

STRANDS	Weighting	Scores	Chief Scorer
STRAND 1: MEASUREMENTS	11		
STRAND 2: MECHANICS	22		
STRAND 3: HEAT	13		
STRAND 4: MAGNETISM	16		
STRAND 5: ELECTRICITY	19		
STRAND 6: WAVES	19		
TOTAL	**100**		