STUDENT EDUCATION NUMBER									

GOVERNMENT OF SAMOA
MINISTRY OF EDUCATION, SPORTS AND CULTURE

Samoa School Certificate

PHYSICS

2020

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 right 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.

CURRICULUM STRANDS		Page	Time (min)	Weighting
STRAND 1:	MEASUREMENT	2	20	11
STRAND 2:	MECHANICS	4	41	22
STRAND 3:	HEAT	8	24	13
STRAND 4:	MAGNETISM	11	27	16
STRAND 5:	ELECTRICITY	13	34	19
STRAND 6:	WAVES	16	34	19
TOTAL			**180**	**100**

Check that this booklet contains pages 2-20 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. Define **scalar** and **vector quantities**.

SL 1

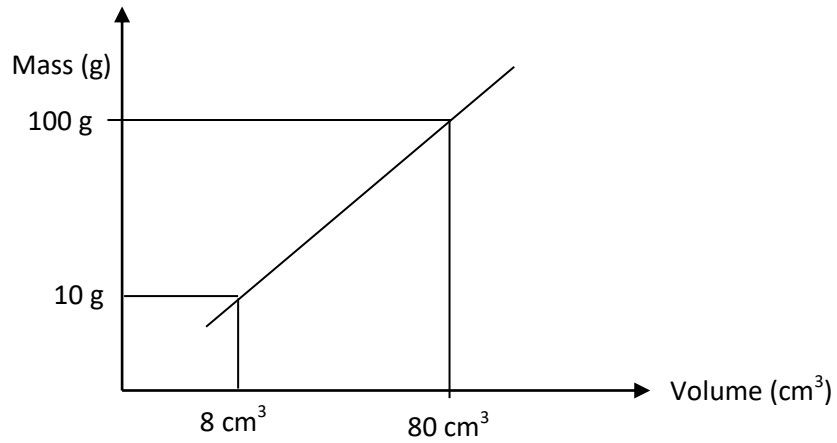
2. Two cars, A and B, are moving in opposite directions. The car A, is travelling North at the velocity of 20 km/h due North and car B is travelling South at the speed of 20 km/h due South. Describe the concepts of scalar and vector of these two cars.

SL 3

3. Simi walked 3 m east and then 4 m south. Use a scaled vector diagram to determine the resultant displacement. (**Hint:** Use a scale of 1 m = 1 cm)

SL 2

4. The graph given below shows the mass versus the volume of a liquid. Determine the volume of the liquid if the mass is 250g. *(Note that the graph is not drawn to scale).*



SL 3

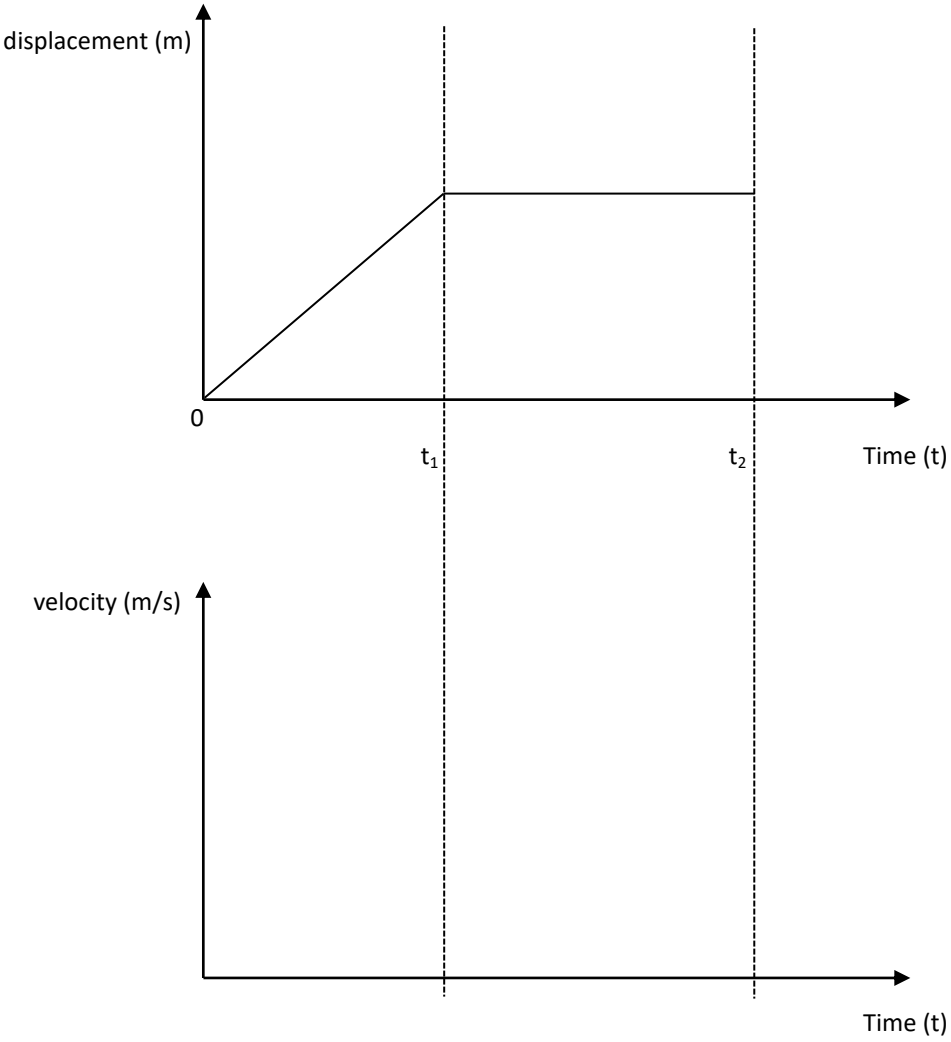
5. Change 51,200 microampere into ampere.

SL 1

6. Express 0.07465000 V in scientific notation.

SL 1

7. Use the displacement-time graph to sketch the velocity-time.



SL 3

Use the sketch in Number 7 to answer Numbers 8 and 9.

8. State the motion of the car between time t_1 and time t_2.

SL 1

9. What is the acceleration of the car between these time intervals, 0 to t_1 and t_1 to t_2?

SL 1

10. A car that was travelling at a constant velocity slowed down at the rate of 1 m/s^2 until it stopped at the red lights in 6.5 seconds. Calculate the constant velocity of the car at which it was travelling before it started to slow down for the red lights.

SL 4

11. A car is moving forward with a forward force of 8,000 N provided by its engine. The frictional force experienced by the car is 2,000 N. Describe the effect of the unbalanced force on the car.

SL 2

12. State an example of gravitational force.

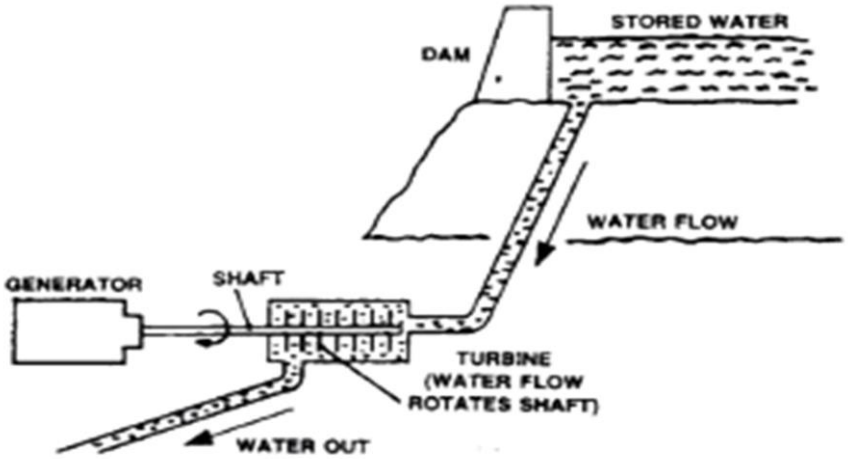
SL 1

13. Sina, who is a weight watcher, has a mass of 70 kg. She wants to climb Mount Vaea to work out a bar of chocolate she ate. Assume that the amount of energy in the chocolate bar is 120 kilocalories (120 kcal). Calculate how high she would need to climb in order to work out the chocolate bar energy? *(Use the conversion factor: 1kcal = 4200J and g = 10 N/kg).*

SL 3

Use the information below to answer Question 14.

In the Hydro Power System, the water reservoir is usually kept at a higher level above the power house. The power house contains the turbine and the generator that produces electricity.



14. Use the diagram to explain how energy is converted from the stored water to generate electrical energy.

SL 2

15. State **any** factor that affects the amount of potential energy stored in an object.

	SL 1

16. Describe an application at which torque or moment is involved.

	SL 2

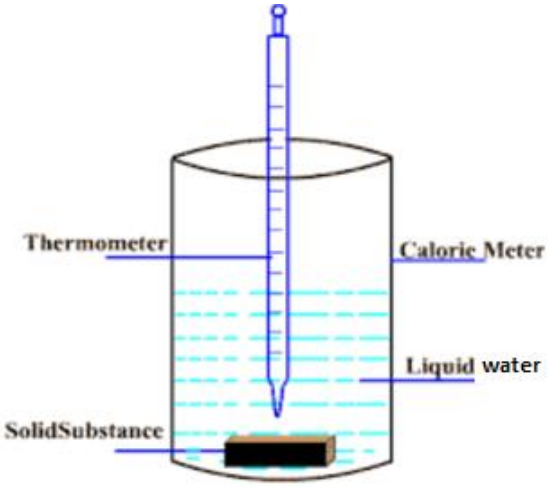
17. Displacement, velocity and acceleration are terms used in the study of motion. Define the concept of acceleration in motion.

	SL 1

18. State the principle of energy conservation.

	SL 1

A method of mixture was used to determine the specific heat capacity of an unknown solid metal substance with a mass of 0.2 kg. The unknown piece of metal was first heated in a beaker of hot boiling water at 100^0C. After 3 minutes, the unknown piece of metal was then transferred from the beaker of hot water and immersed in the calorie meter. The mass of water in the calorie meter is 0.056 kg, and its initial temperature is 25^0C. The water in the calorie meter was gently stirred until the mixture (unknown piece of metal and liquid water) reached a final temperature of 52^0C.



19. Calculate the specific heat capacity of the unknown piece of metal.

SL 4

20. Refer to Question 19, all of the three modes of heat transfer, conduction, convection and radiation, took place in the experiment. Identify which part of the experiment that the heat transfer by conduction occurred.

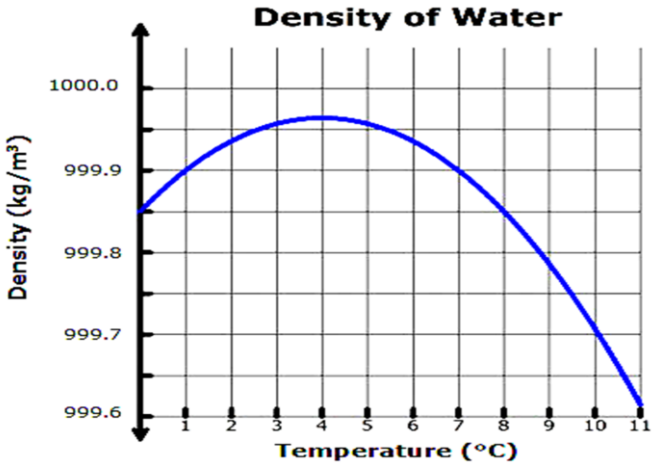
	SL 1

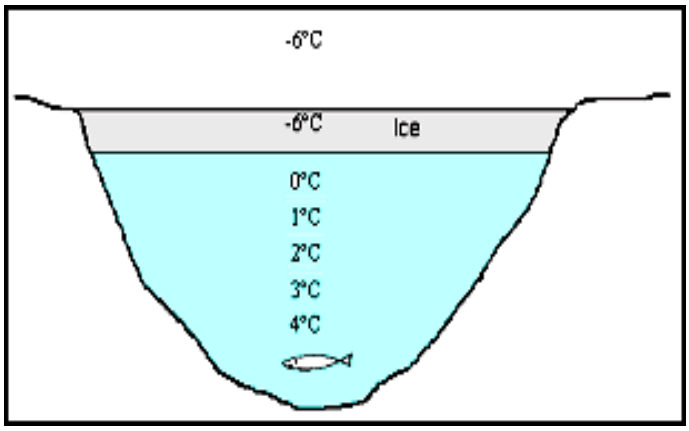
21. Describe the behaviour of water molecules as the water temperature is increased from 0^0C to 11^0C.

	SL 2

Use the following information to answer Question 22.

The variation of water density from 0^0C to 4^0C helps support the marine life during winter.





22. Use the diagrams on page 9 to explain how this behaviour helps sustain marine life during cold seasons.

SL 3

23. Define **latent heat of fusion**.

SL 1

24. Define **radiation**.

SL 1

25. Convert $15.5^{o}C$ into K.

SL 1

26. Describe how a magnet is demagnetized.

SL 2

27. Describe how a permanent magnet is made from the electrical method/electromagnetic method.

SL 2

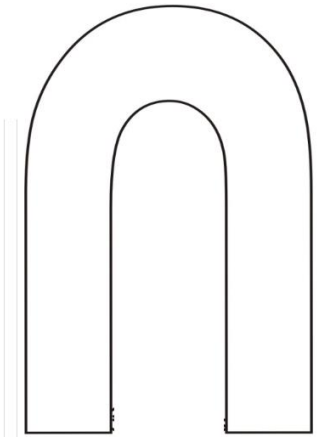
28 The concept of “unlike poles attract” in magnetism can be illustrated with iron fillings or plotting compasses. Illustrate this concept by drawing the field lines between the two magnetic poles.

SL 2

S N

29. Label the poles (N, S) of the horseshoe magnet and draw in the magnetic field lines.

SL 2



30. Explain the magnetic induction that occurs when a magnet is placed near a magnetic material. (Use a diagram to illustrate your answer).

SL 3

31. Discuss the earth's magnetic fields and its interaction with a freely suspended magnet. *(Draw a diagram/picture to illustrate your answer).*

SL 4

32. State ONE way that you can do in order to increase the strength of an electromagnet.

SL 1

33. Demonstrate with diagrams/illustrations how an electroscope is charged with using the induction method.

SL 4

34. Explain how a capacitor is used to support an electric circuit.

SL 3

35. Three resistors, 100 Ω, 1000 Ω and 350 Ω are connected in series with a 12 V battery. Calculate the electric current that is flowing in the circuit.

SL 3

36. List the steps you might carry out in an experiment that is used to determine the factors which affect the resistance of a resistor. *(You may use a diagram to illustrate your answer).*

SL 2

37. Describe the magnetic field lines around a single loop coil when an electric current is passed through it. *(Use a diagram to illustrate your answer).*

SL 2

38. Define **electric field**.

SL 1

39. Define potential difference in relation to electricity.

	SL 1

40. State the formula that is used to calculate the total resistance of the circuit if the resistors are connected in parallel with the power supply.

	SL 1

41. Describe how a transformer works. *(You may use a diagram to illustrate your answer).*

	SL 2

42. One of your friends who does not study physics asks you to show her an experiment which proves that light travels in straight lines. Explain a simple experiment that you can do to show her. *(You may use a diagram to illustrate your answer)*.

SL 4

43. An object of 20 cm in height is placed 10 cm in front of a concave mirror, which has a focal length of 20 cm. Use only the ray diagram *(and not the formulae)* to determine the location, size and the nature of the image.

SL 3

44. Discuss how refraction occurs in the human eye. *(You may use a diagram to illustrate your answer).*

SL 3

45. Draw a diagram to show how a ray of light is refracted in a glass block.

SL 3

46. Describe how the speed of sound changes when it moves from air to water.

SL 2

47. Define **virtual image**.

SL 1

48. Define **lateral inversion**.

SL 1

49. An object with a height of 1 m is placed in front of a spherical mirror. The height of its image is one third of the object height. What is the height of the real object?

SL 1

50. State the changes of light wave when moving from water to air in terms of speed, wavelength and the time period.

SL 1

PHYSICS EQUATIONS SHEET

Kinematics

$$D = m/V$$

$$v = u + at$$

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

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

$$v = \Delta d/\Delta t$$

$$F = ma$$

Waves

$$v = f\lambda$$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$S_o S_i = f^2$$

Constant: C_{water} = 4,200 J/kg ^oC or 4.2 J/g ^oC

Electricity and Magnetism

$$P = W/t$$

$$I = Q/t$$

$$V = IR$$

$$P = VI$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots$$

$$R_T = R_1 + R_2 + \cdots$$

Heat

$$Q = mC\Delta T$$

$$Q = mL$$

$$T_k = T_c + 273$$

Energy and Mechanics

$$W = Fd$$

$$E_p = mgh$$

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

$$\epsilon\ \% = \frac{Useful\ work}{Energy\ input} = \frac{power\ output}{power\ input}$$

STUDENT EDUCATION NUMBER									

PHYSICS

2020

(For Scorers only)

STRANDS	Weighting	Scores	Chief Scorer	Double Entry (AED)
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**			