GOVERNMENT OF SAMOA

STUDENT EDUCATION NUMBER									

Samoa School Certificate

PHYSICS

2023

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 paper to write your answers, ask the supervisor. Write your SEN on all extra sheets used and clearly number the questions. Attach the extra sheets to the appropriate places in this booklet.
5. **All formulas required are provided on page 21.**

STRANDS		Pages	Time (min)	Weighting
STRAND 1	MEASUREMENTS	2 – 4	20	11
STRAND 2	MECHANICS	5 – 8	41	22
STRAND 3	HEAT	9 – 10	24	13
STRAND 4	MAGNETISM	11 – 13	27	16
STRAND 5	ELECTRICITY	14 – 17	34	19
STRAND 6	WAVES	18 – 20	34	19
TOTAL			**180**	**100**

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 **MEASUREMENTS** **WEIGHTING 11**

1. What is the S.I unit for mass?

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SL 1

2. Define the term vector quantity.

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_____

SL 1

3. The quantity 650 nm (nanometres) expressed in scientific notation with its units in **m** (metres) is:

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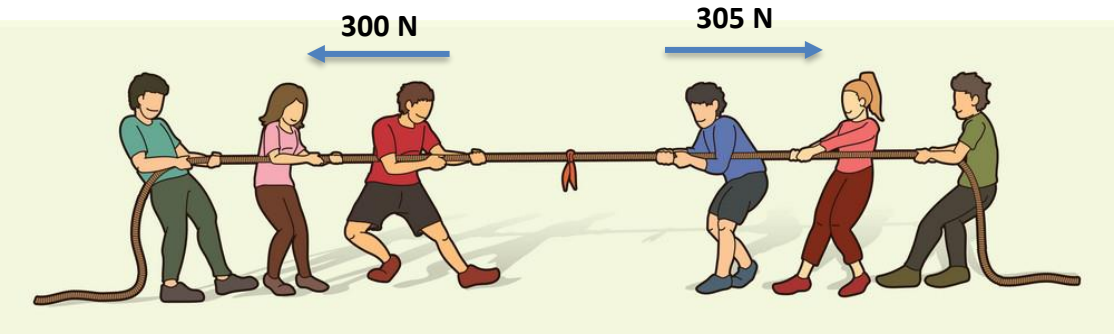
SL 1

4. A cube of mass 300 grams has a volume of 300 cm^3. Calculate the density of the cube in kgm^{-3}

SL 2

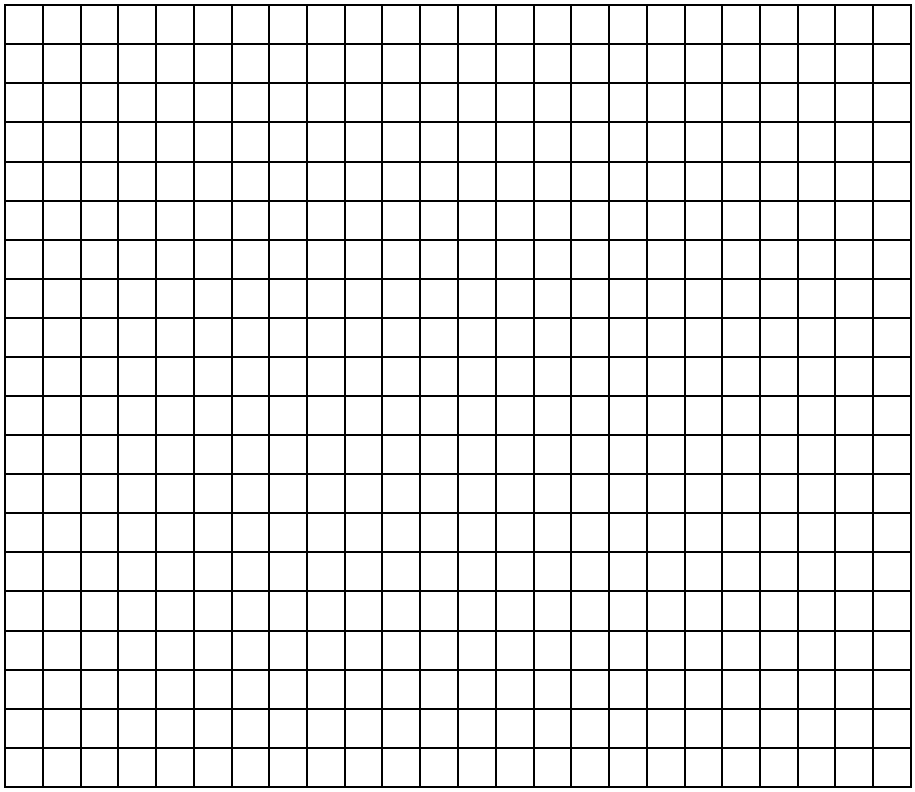
5. Two teams namely Manono (left) and Apolima (right) were competing in the final of a tug of war game during the school's sport day as shown in the diagram below. Which team won the tug of war? Provide the reason why in terms of resultant force.



SL 3

6. Sketch and label a suitable graph using the data in the following table.

Velocity (m/s)	0.0	2.5	5.0	7.5	10.0	10.0	10.0	10.0	10.0	10.0
Time (s)	0.0	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0



SL 3

Define the following terms in Questions 7 to 11.

7. Displacement

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SL 1

8. Velocity

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SL 1

9. Acceleration

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SL 1

10. Efficiency

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SL 1

11. Density

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SL 1

12. A car is moving toward north at a speed of 40 km/hr for 30 minutes. It then turns west and continues at a speed of 30 km/hr for 20 minutes. Determine the average speed of the car.

SL 2

13. Explain with an example how energy can be transformed from one form to another form.

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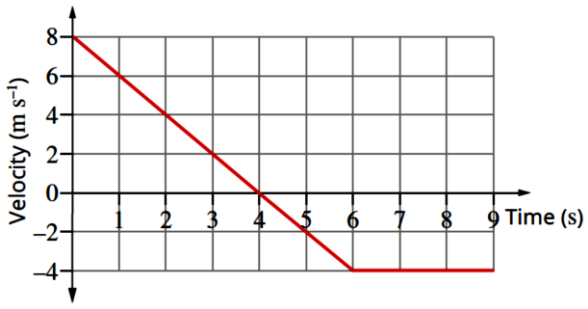
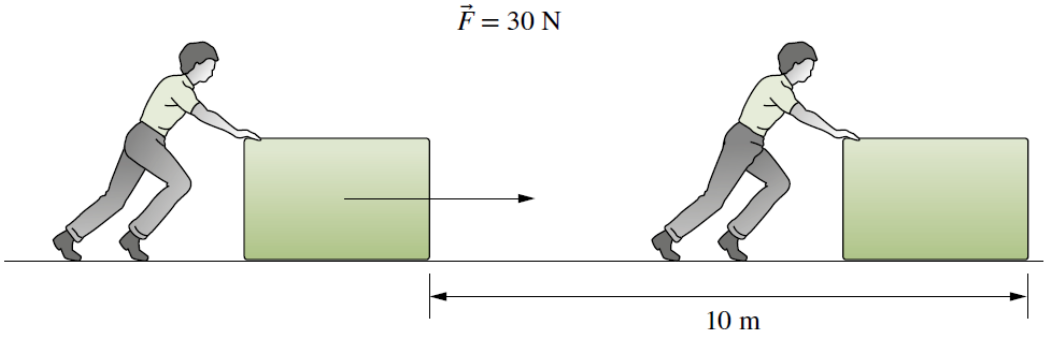
SL 2

14. The motion of a radio-controlled car, initially travelling east in a straight line across a driveway, is represented by the velocity vs time graph below. What is the acceleration of the car during the first 4 seconds?



SL 3

15. Timo is pushing a 50 kg crate at a distance of 10 metres at a force of 30 N. If a force of friction of 5 N is acting in the opposite direction, how much work is done on moving the crate?

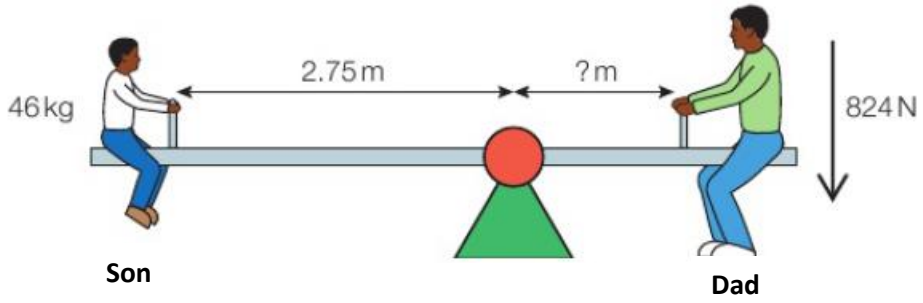


SL 3

16. The height of Mt. Vaea is 0.472 km. Many hikers enjoy the short trail which has about 0.800 km of walking distance. How much gravitational potential energy is gained by a 75 kg hiker when she gets to the top?

SL 3

17. In order to balance the moment on the seesaw in the diagram below, the pivot has to be adjusted so that the dad's distance from the pivot is shorter than the son's distance. Explain why the dad's distance from the pivot must be shorter and calculate the dad's distance from the pivot.



SL 4

18. Convert 200^0C into Kelvin.

SL 1

19. Define Radiation.

SL 1

20. Define Latent Heat.

SL 1

21. Define Heat.

SL 1

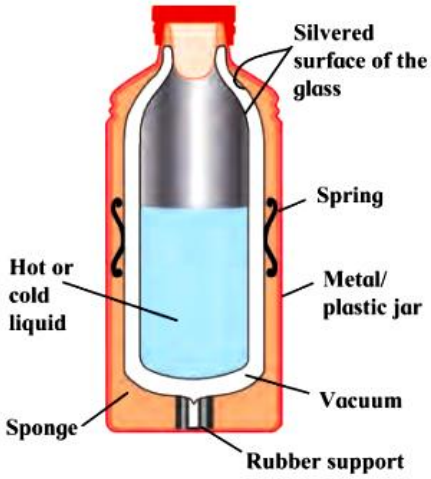
22. Describe the behaviour of particles in the expansion of gases when the temperature is increased.

SL 2

23. Explain application of the differences in specific heat capacity that results in land and sea breeze.

SL 3

24. Discuss how heat transfer by conduction, convection and radiation is reduced in a thermos flask shown below.



Thermos flask

SL 4

25. State the Law of Magnetism.

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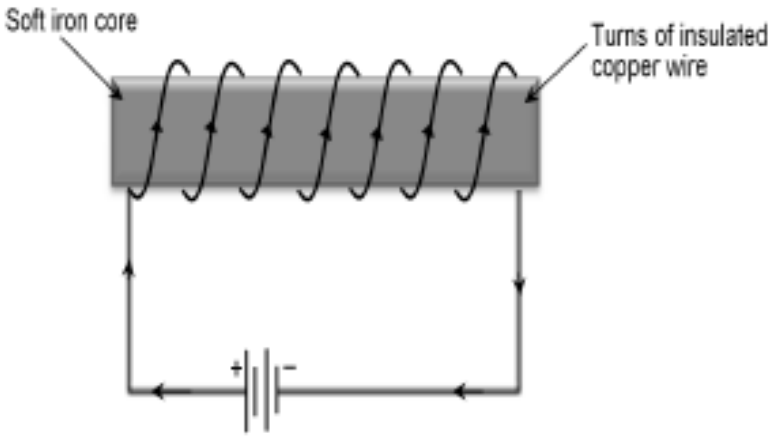
SL 1

26. Clearly label on the diagram the poles of the electromagnet given below.



SL 1

27. State **ONE** way to increase the strength of an electromagnet.

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SL 1

28. Give **ONE** example of an electromagnet.

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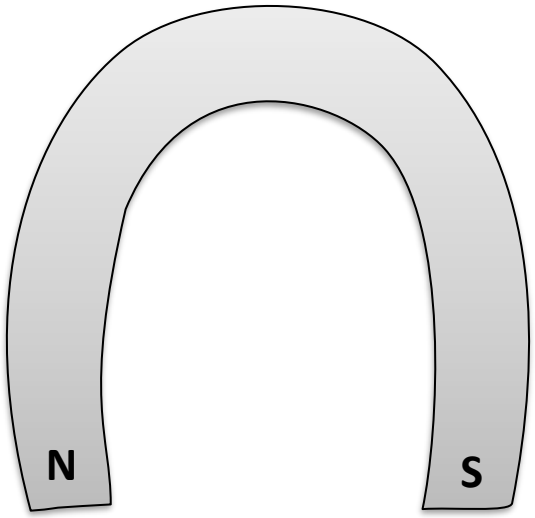
SL 1

29. Draw the magnetic field around the horseshoe magnet given below.



SL 2

30. Describe the magnetic poles of earth and sketch magnetic fields.

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SL 3

31. Explain the shapes of interacting magnetic fields in terms of repulsion and attraction. Feel free to draw relevant diagrams in your answer.

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SL 3

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32. Draw a simple electromagnet. Clearly label the materials you used and list two simple steps you can do with the materials when making an electromagnet.

SL 4

33. Define electrolysis.

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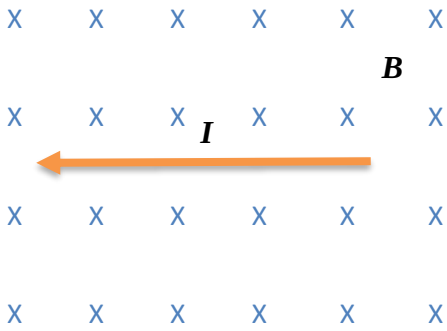
SL 1

34. A magnetic field (***B***) is pointing into the page and a current-carrying wire (***I***) is sitting in the plane of the page carrying current to the left. What is the direction of the force (***F***) on the wire due to the magnetic field? (Circle the correct answer)



UP **DOWN** **LEFT** **RIGHT**

SL 1

35. Define the term **current** including its SI unit.

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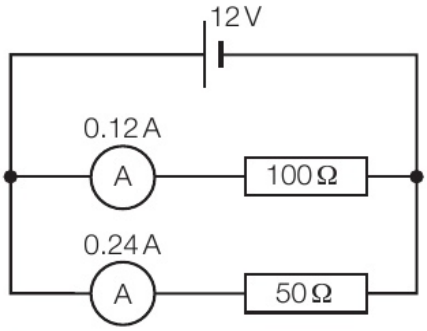
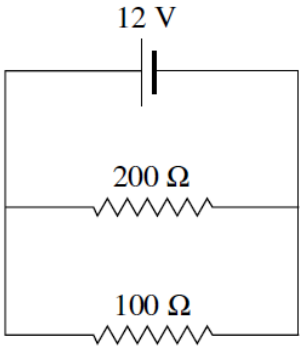
SL 1

36. Calculate the total current in the circuit below.



SL 2

37. Find the equivalent resistance (total resistance) of the circuit below.



SL 3

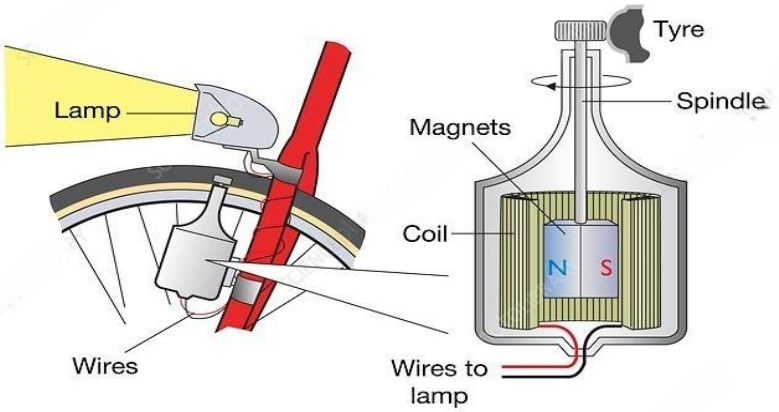
38. A 24.0 Ω resistor is connected across a 12.0 V battery. Calculate the power output delivered by the emf of the battery.

SL 3

39. A circuit consists of a 12 V cell, three resistors, R_1, R_2 and R_3, voltmeter and an ammeter. Draw a circuit of a 12 V cell that is connected in parallel to two resistors and in series with one resistor. Label the resistors in parallel R_1 and R_2. Label the resistor in series R_3. Properly connect an ammeter to R_1 and a voltmeter to R_2 and label them accordingly.

SL 4

40. Explain the practical application and working principles of examples of electromagnetism of a bicycle dynamo.



Source: https://www.sciencephoto.com/media/1156179/view/bicycle-dynamo-illustration

SL 4

41. What part of the ear that is described as a narrow passageway which sound waves pass through after entering from the outer ear?

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SL 1

42. Define a real image.

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SL 1

43. Define the term lateral inversion.

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SL 1

44. List the colours of the rainbow.

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SL 1

45. Give an example of a longitudinal wave.

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SL 1

46. Describe the speed of sound in different mediums such as air and water.

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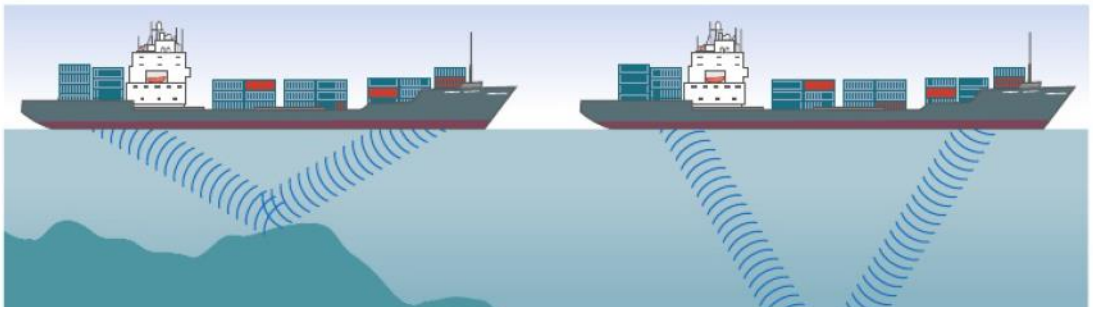
SL 2

47. A real-life application of reflection of sound is used in ships as shown in the diagram. Describe how echo sounding is used in ships to determine the depth of the ocean floor.



SL 2

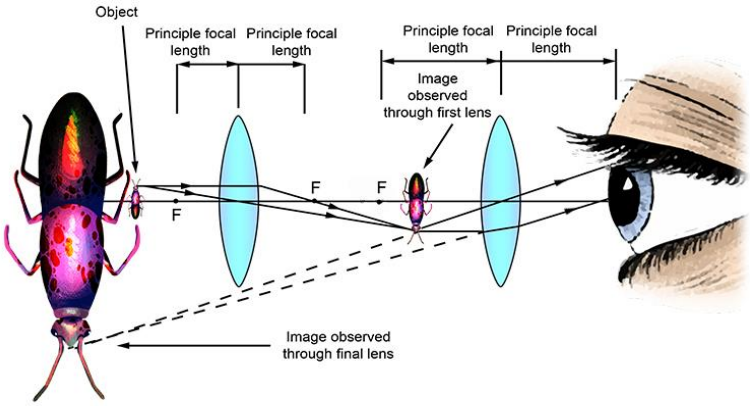
48. Explain how rainbows are formed in terms of dispersion of light by prisms.

SL 3

49. Calculate the speed of a longitudinal wave that has a wavelength of 2.0 m and a frequency of 100 Hz.

SL 3

50. There are many real-life applications of lenses and mirrors. From what you have learnt in your physics class this year, identify the application shown in the figure below and discuss how the final image is formed.



SL 4

PHYSICS EQUATIONS SHEET

Kinematics

$$v = u + at$$

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

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

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

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

Heat, Energy and Mechanics

$$T_K = 273 + T_{\circ C}$$

$$Q = mc\Delta T$$

c is the specific heat capacity

$$F = ma$$

$$W = Fd$$

$$E_p = mgh$$

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

$$E_s = \frac{1}{2}kx^2$$

$$\rho = \frac{m}{V}$$

$$P = \frac{F}{A}$$

Electricity and Magnetism

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

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

$$V = IR$$

$$P = VI$$

$$P = I^2R$$

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

$$F = Bqv$$

$$V = Bvl$$

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

parallel

$$R_T = R_1 + R_2$$

series

Constants

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

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

$$G = 6.67 \times 10^{-11}\ N\ m^2C^2$$

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

$$c_{water} = 4200\ J\ kg^{-1}K^{-1}$$

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									

SSC PHYSICS

2023

(For Scorers only)

STRANDS		Weighting	Scores	Check Scorer	AED check
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**			