GOVERNMENT OF SAMOA

STUDENT EDUCATION NUMBER									

Samoa National Junior Secondary Certificate

PHYSICS

2024

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 the formulas required are provided on the last page.**

STRANDS		Pages	Time (min)	Weighting
STRAND 1	ENERGY (WAVES)	2-6	45	25
STRAND 2	ELECTRICITY	7-10	45	25
STRAND 3	MAGNETISM	11-15	45	25
STRAND 4	FORCES AND MOTION	16-19	45	25
TOTAL			**180**	**100**

Check that this booklet contains pages 2 - 21 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 **ENERGY (WAVES)** **WEIGHTING 25**

For Questions 1 to 3, choose and write the LETTER of the correct answer in the box provided.

1. _____ is the transfer of heat through a solid material by direct contact of its particles.

   A. Conduction
   B. Convection
   C. Radiation
   D. Transportation

	SL 1

2. If a wave has a frequency of 10 Hertz, what is its period?

   A. 100 seconds.
   B. 10 seconds.
   C. 0.10 seconds.
   D. 0.01 seconds.

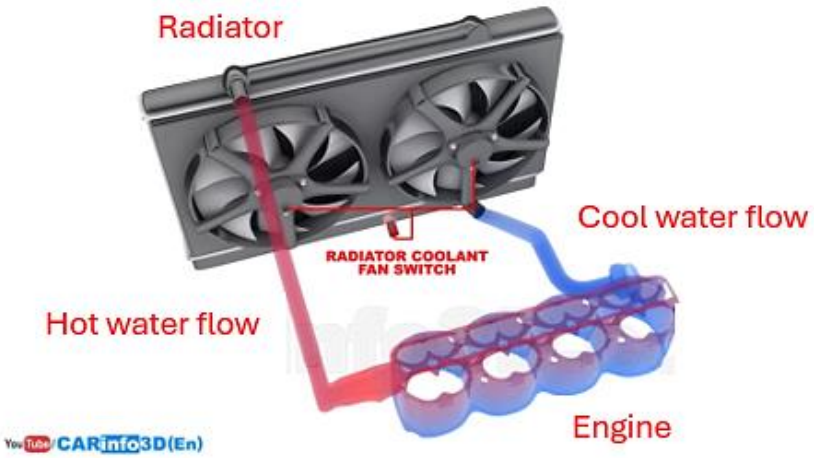
	SL 1

3. The loudness of sound is determined by the intensity, or amount of energy, in sound waves. What is the unit of sound intensity?

   A. Hertz
   B. Equalizer
   C. Ampere
   D. Decibel

	SL 1

The diagram below is a 3D diagram of a car engine cooling system.



https://www.youtube.com/watch?app=desktop&v=k0ovUHEOtyE

4. Explain how the heat transfer process through convection occurs in a car engine cooling system in the diagram above.

SL 3

5. Describe how temperature difference affects the rate of heat transfer.

SL 2

The table below shows the change in size of the two metals after boiling in water for 2 hours.

Metals	Length (cm)		Change in Length (ΔL) (cm) $\Delta L = L_f - L_i$	Coefficient of linear expansion ($°C^{-1}$)
	Initial length (L_i)	Final length (L_f)		
Aluminum	5.2	5.9		23×10^{-6}
Copper	5.6	5.9		17×10^{-6}

6. Use the formula given to calculate and fill in the column (change in length (ΔL)) of the table above. Comment on the difference between the values you calculated with reference to the coefficient of linear expansion of each metal.

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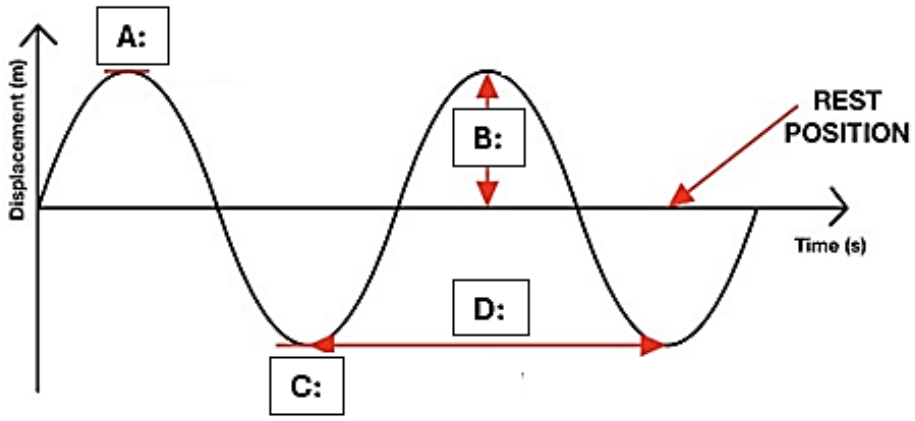
SL 4

7. Name parts A and B of a transverse wave shown in the diagram below.



SL 2

A. _____

B. _____

8. Draw a longitudinal wave pattern from a slinky spring wave experiment.
Show in your diagram the **wavelength, rarefaction region** and **compression region**.

SL 4

9. Calculate the speed of a wave that has a wavelength of 0.5 m and a period of 0.05 seconds.

SL 3

10. State the function of cochlea in relation to the human hearing system.

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SL 2

11. Briefly explain what happens to the speed of a sound wave when it travels from air into water.

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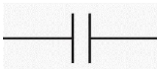
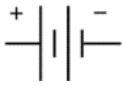
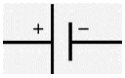
SL 2

For Questions 12 to 14, choose and write the LETTER of the correct answer in the box provided.

12. Which of the following is the symbol for the battery component?

A. 

B. 

C. 

D. 

	SL 1

13. Which of the following is **NOT** a Conductor?

A. Rubber band
B. Ionized Water
C. Aluminum
D. Copper

	SL 1

14. _____ is the measure in Volts of electric potential difference between two points in a circuit.

A. Voltage
B. Current
C. Energy
D. Resistance

	SL 1

15. Explain the difference between closed circuit and open circuit. You can use diagrams if needed.

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SL 2

16. Explain why all metals are good conductors of electric current.

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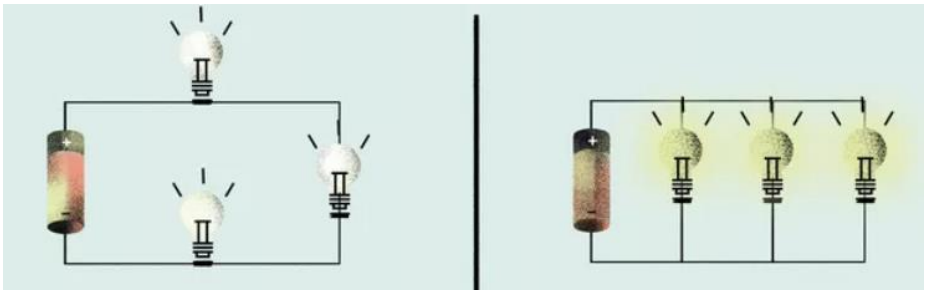
SL 3

Use the diagram below to answer Questions 17 to 19.

The total Current in both circuits is 3 Amperes, and all bulbs are identical having resistance of 1 ohm.



Circuit A

Circuit B

17. Name the two-circuit diagrams above and compare their advantages.

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SL 2

18. If the total current flow in both circuits is 3 Amperes, and each bulb has 1-ohm (1 Ω) resistor. What will be the current passed across each bulb in Circuit B? Explain your answer.

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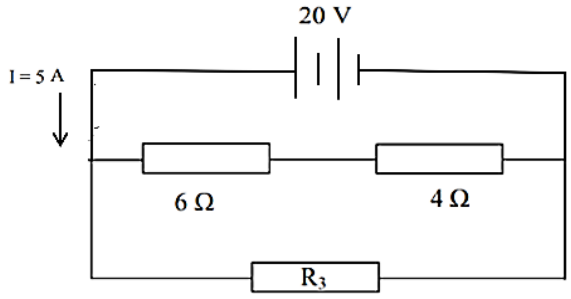
SL 3

19. Calculate the total voltage supply by the battery in Circuit A.

SL 2

20. What is the value of the third resistor connected in parallel across 6 ohms and 4 ohms to give a current supply from the source of 5 A? Show working.



SL 4

21. Explain the application of storage and transfer of energy of a lead-acid cell for a vehicle.

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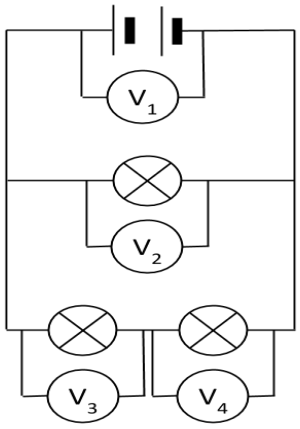
SL 3

22. Write a mathematical expression to clearly demonstrate the relationship of V_1, V_2, V_3, and V_4 in the circuit below.

SL 3



For Questions 23 to 25, write the letter of your BEST answer in the box provided.

23. Which of the following statements is **TRUE** about the Law of Magnets?

A. South Pole repels North Pole.
B. North Pole repels South Pole.
C. Like poles repel, unlike poles attract.
D. Like poles attract, unlike poles repel.

SL 1

24. A magnet generated from electricity (electric field) is also known as:

A. Magnetic field.
B. Permanent Magnet.
C. Temporary Magnet.
D. Electromagnet.

SL 1

25. Which method is used in making a strong magnet?

A. Electrical method
B. Stroking method
C. Hammering method
D. Heating method

SL 1

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

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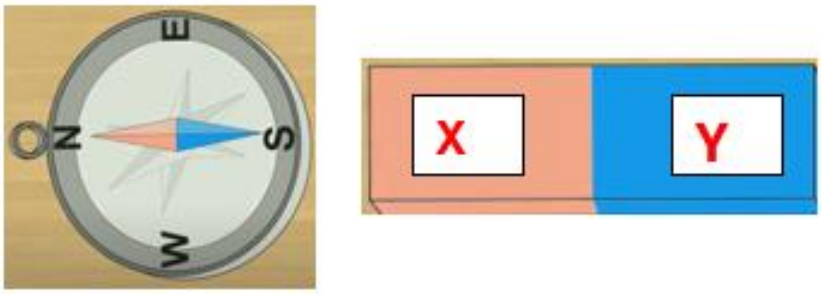
SL 3

Use the diagram below of a compass position closed to one end of a bar magnet to answer Question 27.



27. Name the poles label X and Y on the Bar magnet and state reason for your answer.

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SL 2

28. State any two methods of destroying magnetism.

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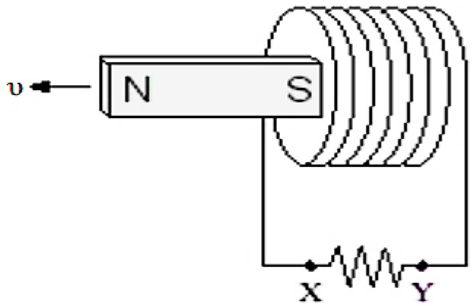
SL 2

A bar magnet is moved away from a coil as shown.



29. Describe how the speed of the bar magnet and the **number of turns** in the coil affect the current through the resistor.

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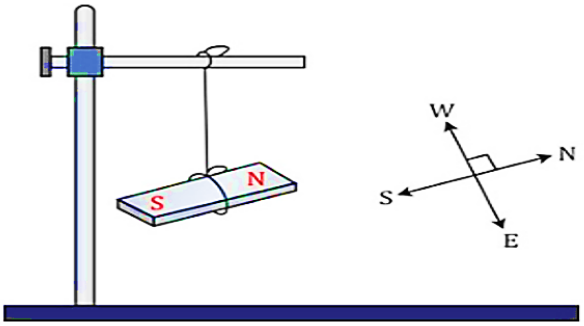
SL 3

The diagram below shows a freely suspended bar magnet. Use this information to answer Question 30.



30. Briefly explain why a freely suspended magnet always rests at the geographic (or earth) north-south direction.

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SL 2

31. List at least three uses of permanent magnets in everyday life.

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SL 3

Use the information below to answer Questions 32 and 33.

Tulia from RLSS did an experiment on creating a permanent magnet. He used an iron nail, a 12 V power supply, a long piece of insulated copper wire and some iron paper pins.

Below are the steps or procedures which are not in order for doing his experiment.

Procedures:

A. For electric current to flow through the copper wire plug in the power supply, adjust the volts to 6 V and turn it on.

B. Test the electromagnet by positioning the tip of the nail to some paper clips.

C. Coil/wrap the copper wire tightly around the iron nail.

D. Connect the ends of the wire to the power supply using the DC terminals.

32. Arrange the list of procedures/steps above for Tulia to carry his experiment successfully. (Step #4 is done for you).

Step 1: _____

Step 2: _____

Step 3: _____

Step 4: **B**

SL 3

Tulia increased the volts to 12V and again tested the experiment.

33. Write an observation and conclusion of this experiment when Tulia successfully carries out his experiment.

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SL 4

For Questions 34 to 36, write the letter of your BEST answer in the box provided.

34. Which of the following is **NOT** a Vector quantity?

A. Mass
B. Displacement
C. Weight
D. Velocity

	SL 1

35. What is the correct SI unit for speed?

A. m/s
B. ms^1
C. ms^2
D. m/s^2

	SL 1

36. The known density of water is:

A. $1.00\ kg/m^3$
B. $10.00\ kg/m^3$
C. $100.00 kg/m^3$
D. $1000.00\ kg/m^3$

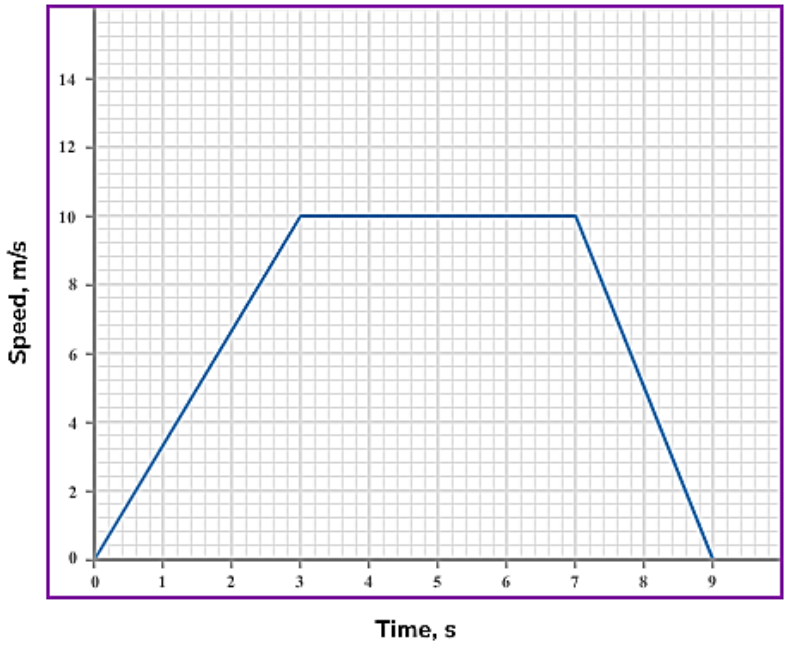
	SL 1

37. Sketch and label a vector diagram to represent the vector information given below.

A tennis ball is moving at 5 m/s above horizontal at an angle of 25° (North of East).

SL 2

USE the figure below to answer Questions 38 and 39.



38. Calculate the lowest and the highest accelerations experienced by the moving object.

SL 3

39. What is the total distance travelled by the object during the first 7 seconds?

SL 3

40. Differentiate with examples contact and non-contact forces.

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SL 2

41. Describe what inertia is in relation to mass and force.

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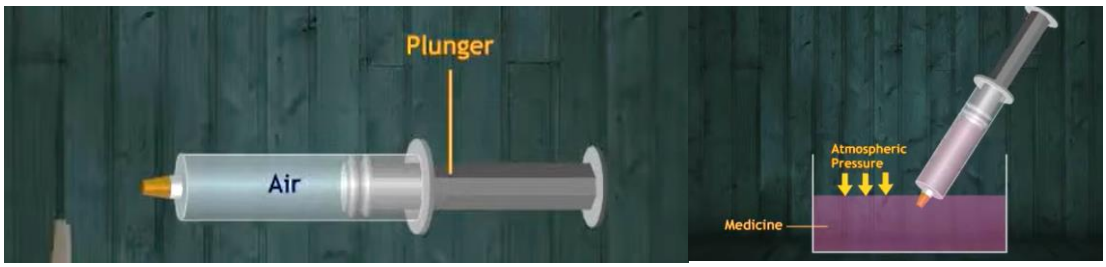
SL 2

Use the diagrams below to answer Question 42.



42. Explain how the atmospheric pressure works in a syringe used by doctors.

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SL 4

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43. What is the density of a copper material if its mass is 0.12 kg and has a volume of 14 cm? Give your answer in g/cm^3.

SL 2

44. A body of mass 5 kg displaces 1000 cm^3 of water when fully immersed in water. Calculate the volume of the body and the apparent weight of the body in water. (Take density of water 1000 kgm^{-3})

SL 4

FORMULAS

Wave (Energy)

$Q = mc\Delta T$

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

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

$v = f\lambda$

Electricity

$V = IR$

$R_T = R_1 + R_2 + R_n$

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

Forces and Motion

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

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

$v = u + at$

$v^2 = u^2 + 2as$

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

$s = \left(\frac{v+u}{2}\right)t$

$F = ma$

$Pressure = F/A$

$Density = m/V$

$Weight = mg$

$F_b = \rho gV$

Constants

$c_w = 4200\, J/kg^0C$

$g = 10\, ms^{-2}$

STUDENT EDUCATION NUMBER									

SNJSC PHYSICS

2024

(For Scorers only)

STRANDS		Weighting	Scores	Check Scorer	AED check
STRAND 1	ENERGY (WAVES)	25			
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STRAND 3	MAGNETISM	25			
STRAND 4	FORCES AND MOTION	25			
TOTAL		**100**			