Samoa School Certificate

PHYSICS

2015

QUESTION and ANSWER BOOKLET

Time allowed: 3 Hours and 10 Minutes

INSTRUCTIONS:

1. You have 10 minutes to read **before** you start writing.
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 for answers, 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.

STRANDS	Page number	Time (minutes)	Weighting
STRAND 1: MEASUREMENTS	2	27	15
STRAND 2: MECHANICS	5	36	20
STRAND 3: HEAT	12	27	15
STRAND 4: MAGNETISM	16	27	15
STRAND 5: ELECTRICITY	20	36	20
STRAND 6: WAVES	25	27	15
TOTAL		**180**	**100**

Check that this booklet contains pages 2–31 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

STRAND 1   **MEASUREMENTS**   **WEIGHTING 15**

Instructions: Write **ALL** your answers in the spaces provided.

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

    _____

    _____

Skill Level 1	
1	
0	
NR	

2. The quantity 650 nm (nanometres) expressed in scientific notation is:

    _____

    _____

    _____

    _____

Skill Level 1	
1	
0	
NR	

3. Define the term *vector quantity*.

    _____

    _____

    _____

    _____

Skill Level 1	
1	
0	
NR	

4. A cube of mass 300 grams has a volume of 3 cm^3.

   Calculate the density of the cube in kgm^{-3}.

   _____

   _____

   _____

   _____

   _____

   _____

   _____

   _____

Skill Level 2	
2	
1	
0	
NR	

5. Define the term *displacement*.

   _____

   _____

   _____

   _____

Skill Level 1	
1	
0	
NR	

6.   *Sione went hiking on a remote island. He started from the coast line and walked 20 km north then decided to walk 6 km east and rest for a little while then continued to walk 12 km south.*

Determine Sione's total distance covered and his displacement at the end.
Use the grid below to draw vectors of his course and label it.
(Scale: side length of one square = 2 km).

N

E
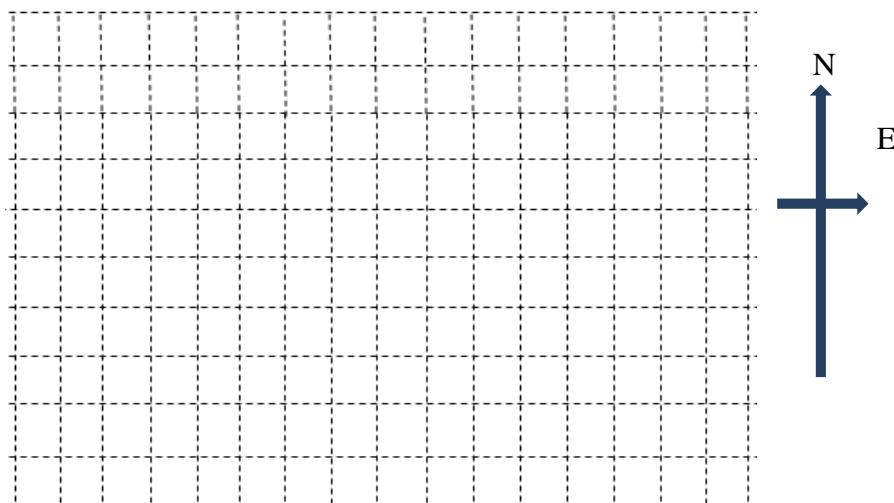
Total distance:

_____

_____

_____

Skill Level 3	
3	
2	
1	
0	
NR	

Total displacement:

_____

_____

_____

_____

_____

**STRAND 2:**   **MECHANICS**   **WEIGHTING 20**

7.   A man rowed across a river at a velocity 4 kmhr $^{-1}$ as shown below.
      The river was flowing downstream at a velocity of 3 kmhr $^{-1}$.
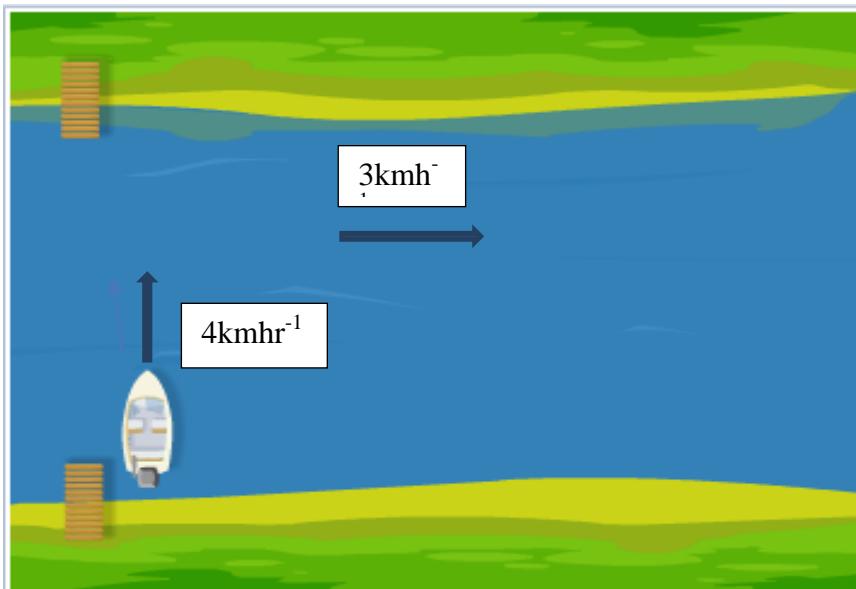
      Calculate the man's resultant velocity in kmhr $^{-1}$.

_____

_____

_____

_____

_____

_____

_____

Skill Level 3	
3	
2	
1	
0	
NR	

_____

_____

8.   The ratio of the total distance an object travels regardless of
      direction to the amount of time taken is referred to as the
      _____ of an object. What is the missing word?

      _____

9.   Describe how a steel ship floats using Archimedes' principle of
      floatation.

      _____

      _____

      _____

      _____

      _____

      _____

10. *Felix takes a ride on his bicycle to drop off his little sister's lunch at school. The distance-time graph below shows his trip.*

Distance/time graph
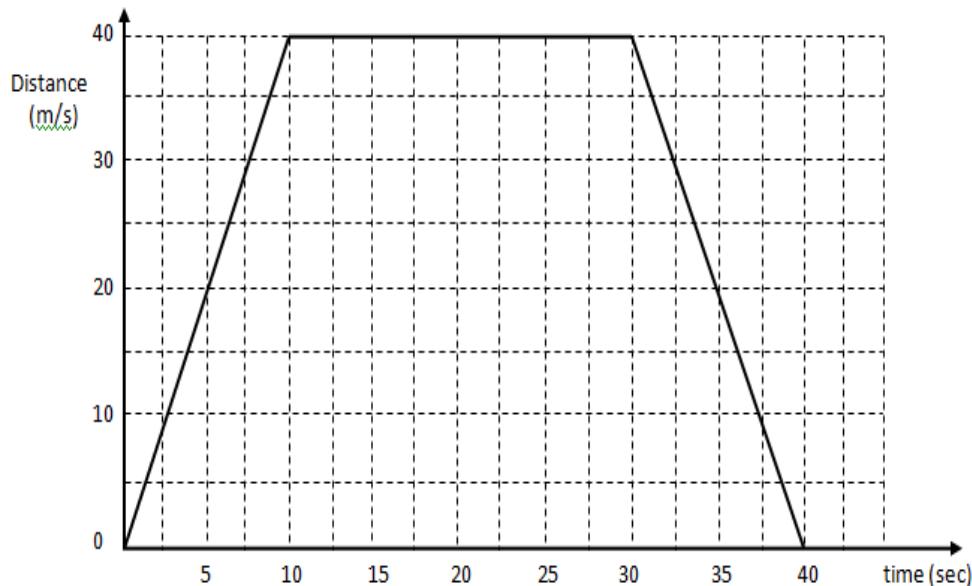
On the grid provided below, sketch the corresponding velocity-time graph of his trip.
Label all the axes.

Skill Level 3	
3	
2	
1	
0	
NR	

7
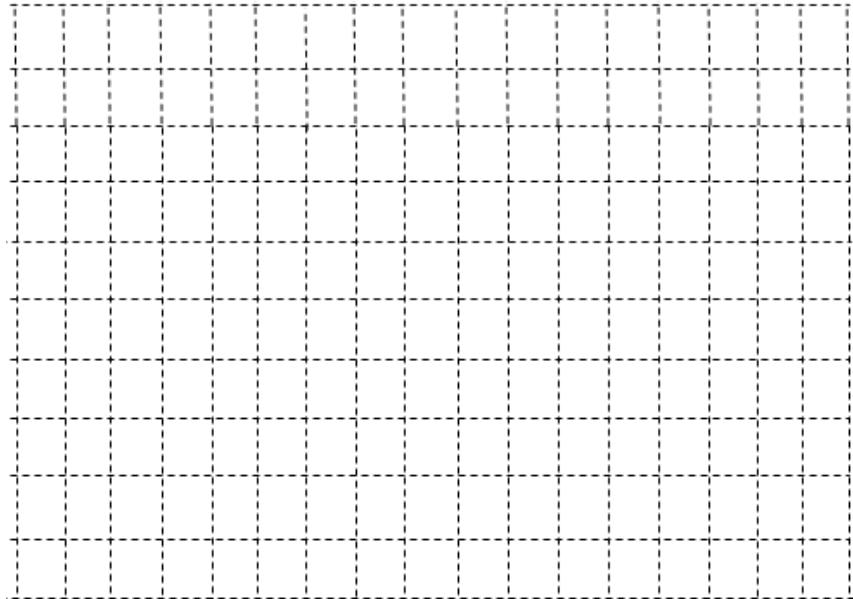
Information for Number 11 & 12

Shown below is a velocity-time graph of a car at certain time tervals.
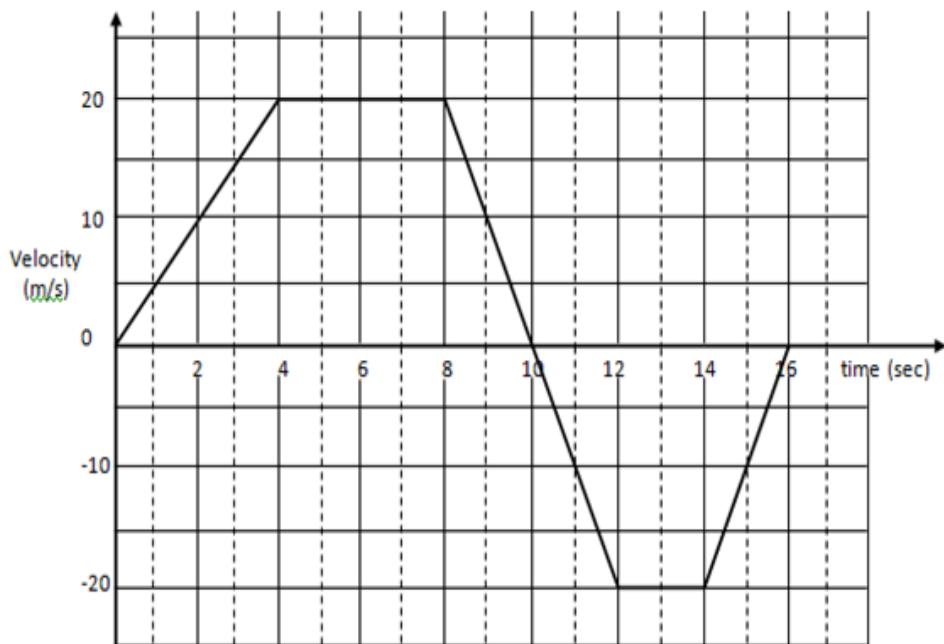
11. Fully explain the motion of the car in the sections below:

0 up to 4 seconds:

_____

_____

4 up to 8 seconds:

_____

_____

8 up to 12 seconds:

_____

_____

Skill Level 3	
3	
2	
1	
0	
NR	

12. Determine the _average velocity_ of the car, and relate this figure back to the motion of the car.

_____

_____

_____

_____

_____

_____

_____

Skill Level 4	
4	
3	
2	
1	
0	
NR	

13. State an example of _gravitational force._

_____

_____

Skill Level 1	
1	
0	
NR	

14. _Situation 1. Pushing a wooden block on an oily surface._
    Situation 2. Pushing a wooden block on a rough surface.

    Which of the above situations demonstrates an example of frictional force?

_____

_____

Skill Level 1	
1	
0	
NR	

15. Define the term _pressure._

10

_____

_____

Skill Level 1	
1	
0	
NR	

_____

_____

16. Define the term *density*.

_____

_____

Skill Level 1	
1	
0	
NR	

_____

_____

17. Define the term *Kinetic Energy*.

_____

_____

Skill Level 1	
1	
0	
NR	

_____

18. State ONE factor that will affect the amount of potential energy of a falling object.

_____

_____

Skill Level 1	
1	
0	
NR	

_____

19. State the principle of energy conservation

_____

_____

Skill Level 1	
1	
0	
NR	

_____

20. Describe how the potential energy of an object can be converted into kinetic energy.

_____

_____

Skill Level 2	
2	
1	
0	
NR	

_____

_____

STRAND 3:   **HEAT TRANSFER**   **WEIGHTING 15**

21.   Define *conduction.*

_____

_____

_____

Skill Level 1	
1	
0	
NR	

22.   Give the definition of *radiation.*

_____

_____

_____

Skill Level 1	
1	
0	
NR	

23.   Give the definition of *heat*

_____

_____

_____

_____

Skill Level 1	
1	
0	
NR	

24.   Define *latent heat.*

_____

_____

_____

Skill Level 1	
1	
0	
NR	

25.   Describe the behaviour of particles in a solid when it is expanding.

_____

_____

_____

_____

_____

_____

_____

_____

Skill Level 2	
2	
1	
0	
NR	

26. Below is a heating curve of water.
Interpret the information given below in terms of latent heat and
changes of state.
Interpret the information given below in terms of latent heat and
changes of state.
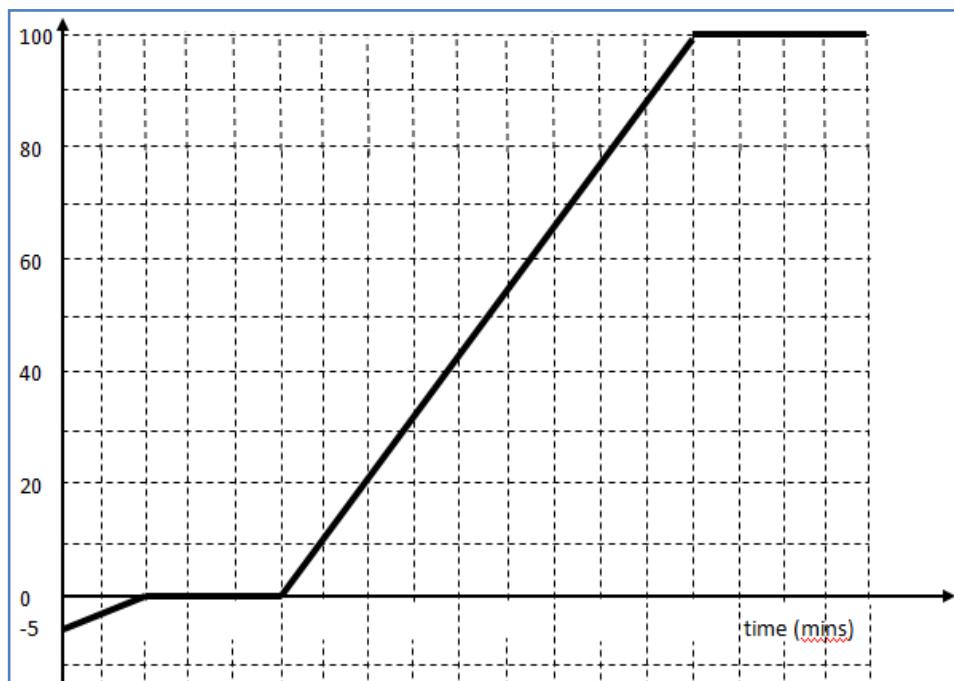
Skill Level 3	
3	
2	
1	
0	
NR	

_____

_____

_____

_____

_____

_____

_____

_____

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

double glass bottle

vacuum

liquid

silvering

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
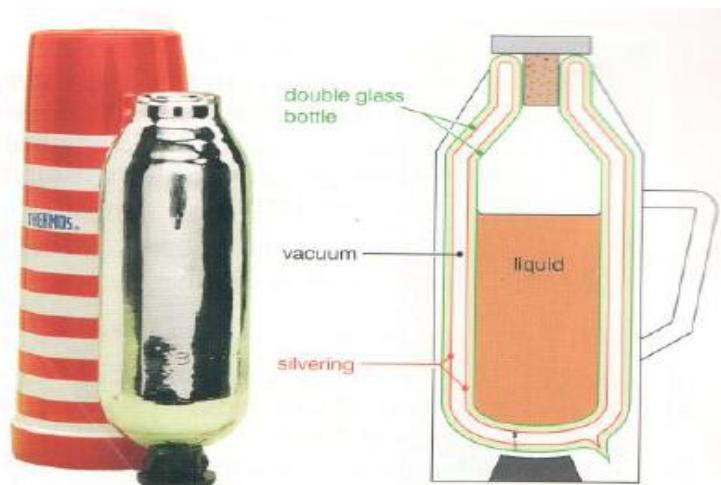
Skill Level 4	
4	
3	
2	
1	
0	
NR	

STRAND 4:   **MAGNETISM**   **WEIGHTING 15**

28. State the law of magnetism.

Skill Level 1	
1	
0	
NR	

_____

_____

_____

29. State ONE way to demagnetise a permanent magnet.

_____

_____

_____

Skill Level 1	
1	
0	
NR	

_____

_____

_____

30. *The diagram below shows a north pole of the coil induced by the current carrying wire.*
Use arrows to show the direction of the current flowing through the wire.
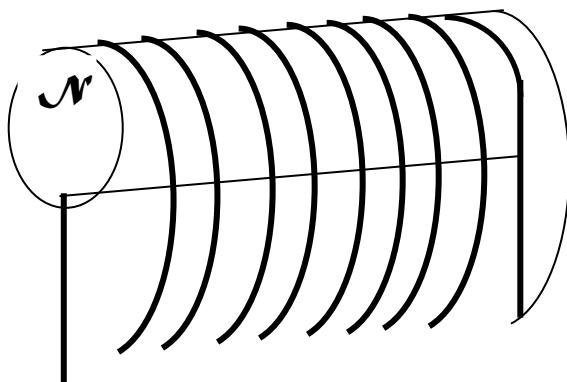
Skill Level 1	
1	
0	
NR	

31. Give an example of where electromagnets are used.

_____

_____

_____

Skill Level 1	
1	
0	
NR	

32. *The stroking method is often used to make a permanent magnet.*
Describe how this is done.

_____

_____

_____

_____

Skill Level 2	
2	
1	
0	
NR	

_____

_____

33. Describe how the earth acts as a magnet.

_____

_____

_____

Skill Level 2	
2	
1	
0	
NR	

_____

_____

34. Draw and label a diagram of the magnetic field around the bar magnet shown below.

Skill Level 3	
3	
2	
1	
0	
NR	

N   S

35. Discuss, with descriptions and specific examples, how to make an electromagnet.

_____

_____

_____

Skill Level 4	
4	
3	
2	
1	
0	
NR	

_____

_____

_____

_____

_____

_____

_____

STRAND 5:   **ELECTRICITY**   **WEIGHTING 20**

36. Define the term *resistance*.

_____

_____

Skill Level 1	
1	
0	
NR	

_____

_____

37. State ONE factor that affects resistance.

_____

_____

Skill Level 1	
1	
0	
NR	

38. What circuit component does the symbol given below stand for?

_____
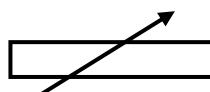
Skill Level 1	
1	
0	
NR	

39. State the formula for calculating the resistance of THREE resistors in parallel.

Skill Level 1	
1	
0	
NR	

_____

_____

40. State the formula for calculating the electrical power in terms of current and resistance

Skill Level 1	
1	
0	
NR	

_____

_____

41. Describe the magnetic field around the current carrying wire shown below.

current carrying wire
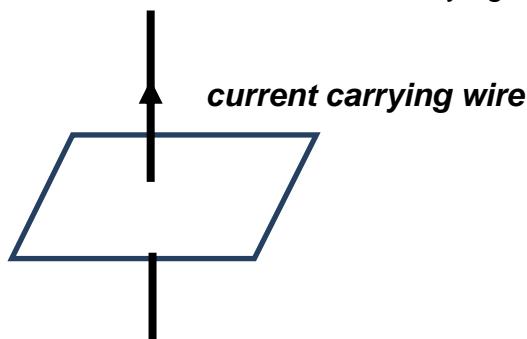
Skill Level 2	
2	
1	
0	
NR	

_____

_____

_____

_____

_____

42. Describe how a transformer works.

_____

Skill Level 2	
2	
1	
0	
NR	

_____

_____

_____

_____

43. Shown below is a combination circuit. Calculate the current through each resistor.

Ammete   12 V

3Ω

R₁ = 2Ω

R₂ = 6Ω

R₃ =

_____

_____
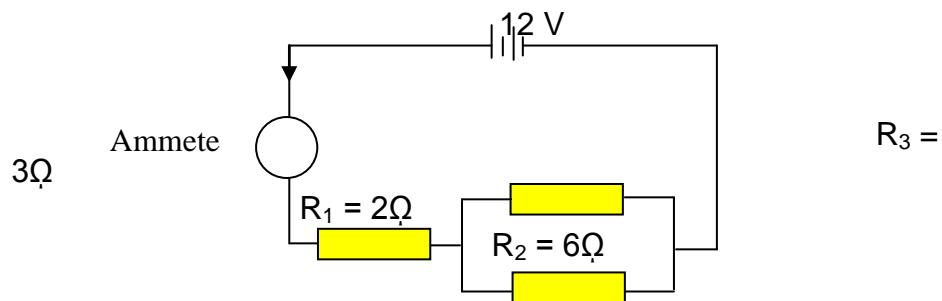
Skill Level 3	
3	
2	
1	
0	
NR	

_____

_____

_____

R₁ = _____   R₂ = _____   R₃ = _____

23

44. Calculate the power through each resistor.

_____

_____

_____

Skill Level 3	
3	
2	
1	
0	
NR	

_____

_____

_____

_____

_____

_____

_____

_____

$P_{R1} =$ _____ $P_{R2} =$ _____ $P_{R3} =$ _____

45. Explain the practical application and working principles of electromagnetism in the bicycle dynamo.

coil on soft-iron core

magnet

N   S

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
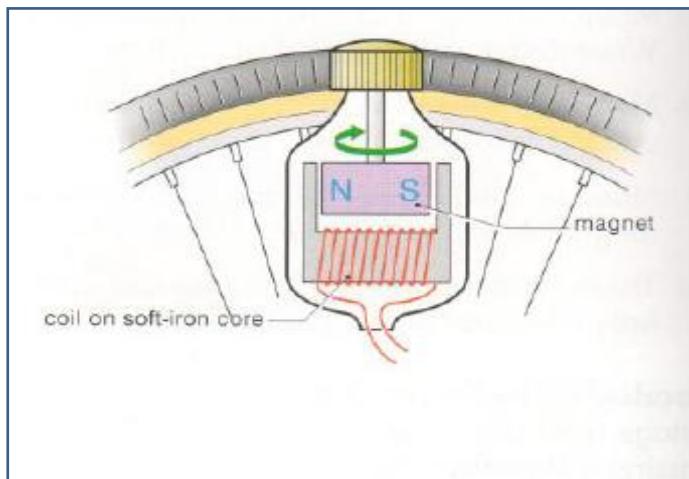
Skill Level 4	
4	
3	
2	
1	
0	
NR	

STRAND 6:   **WAVES**   **WEIGHTING 15**

46. Define the term *rectilinear propagation*.

_____

_____

_____

Skill Level 1	
1	
0	
NR	

47. Define *real images* in a convex lens.

_____

_____

_____

Skill Level 1	
1	
0	
NR	

48. Define *virtual images* in mirrors

_____

_____

_____

Skill Level 1	
1	
0	
NR	

49. State a defect that long-sighted person has in his or her eyesight.

_____

_____

Skill Level 1	
1	
0	
NR	

50. What is the name of the process through which light is split into colours?

_____

_____

_____

Skill Level 1	
1	
0	
NR	

51. Describe what happens to the speed, wavelength and frequency of waves as they enter shallow waters from deep waters.

_____

_____

_____

_____

_____

_____

Skill Level 2	
2	
1	
0	
NR	

52. Describe the speed of sound in vacuum.

_____

_____

_____

| Skill Level 2	
2	
1	
0	
NR	

_____

_____

_____

53. Construct TWO rays in the given diagram to locate the image of the object O after reflection in the concave mirror. Give the nature of the image.
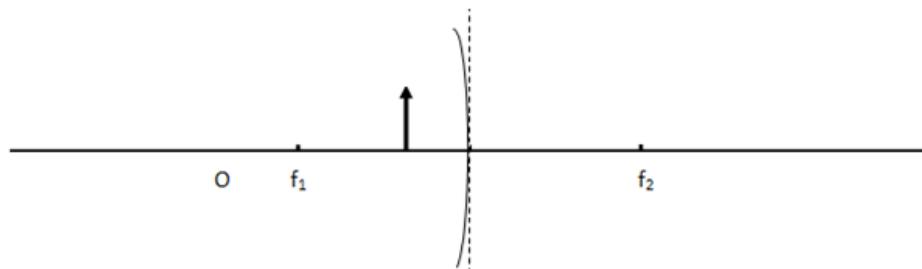
Skill Level 3	
3	
2	
1	
0	
NR	

Nature of the image:

_____

_____

54. Show how the incident light ray is refracted through a glass block.

incident light ray

glass block
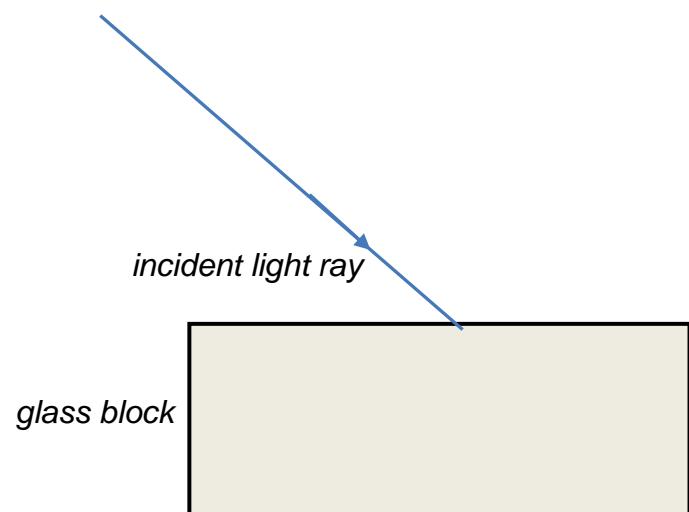
Skill Level 3	
3	
2	
1	
0	
NR	

55. Report on how the dispersion of light by prism can be observed through a practical activity.

_____

_____

_____

_____

_____

_____

Skill Level 4	
4	
3	
2	
1	
0	
NR	

_____

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_____

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_____

_____

_____

FORMULAE

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

$$v = u + at$$

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

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

$$F = ma$$

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

$$W = Fd$$

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

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

$$M = \left|\frac{H_i}{H_o}\right|$$

$$Q_{heat} = mC\Delta t$$

$$V = IR$$

$$P = VI$$

$$v = f\lambda$$

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

$$M = \frac{v}{u}$$

$$W = mg$$

$$D = \frac{m}{v}$$

$$M = \left|\frac{D_i}{D_o}\right|$$

Constants

Density of water = 1 g/cm^3

Speed of sound = 330 m/s

Acceleration due to gravity = 10 m/s

Boiling point of water = 100°C

Freezing point of water = 0°C

1 litre = 1 kg

Specific heat capacity of water = 4,200 J/kgK

Student Education Number

PHYSICS

2015

(For Markers only)

STRANDS	Weighting	Marker	Check Marker	Final Weighting
1. MEASUREMENTS	15			
2. MECHANICS	20			
3. HEAT	15			
4. MAGNETISM	15			
5. ELECTRICITY	20			
6. WAVES	15			
TOTAL	100			