SULIT

NAMA :.....

NO K.P. : | | | | | | | - | | | - | | | | |

NO. MAKTAB : ..... KELAS : .....

MAKTAB RENDAH SAINS MARA

# PEPERIKSAAN AKHIR SIJIL PENDIDIKAN MRSM

**FIZIK** **4531/3**

**Ujian Amali**

45 minit

---

**JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERITAHU**

1. *Tulis* **nama, nombor kad pengenalan, nombor maktab** *dan* **kelas** *anda pada ruang yang disediakan.*
2. *Jawapan hendaklah ditulis pada ruang jawapan yang disediakan di dalam kertas peperiksaan ini.*
3. *Kertas peperiksaan ini adalah dalam dwibahasa.*
4. *Jawapan boleh ditulis dalam bahasa Melayu atau bahasa Inggeris.*
5. *Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
6. *Kerja mengira anda mesti ditunjukkan.*
7. *Calon diberi masa lima minit untuk menyemak radas dan bahan yang disediakan sebelum menjalankan ujian amali.*
8. *Kertas peperiksaan ini hendaklah diserahkan kepada pengawas amali pada akhir peperiksaan.*

---

Kertas peperiksaan ini mengandungi **8** halaman bercetak

[Lihat halaman sebelah

 © 2022 Hak Cipta Bahagian Pendidikan Menengah MARA 

## SENARAI SEMAK CALON
## *CANDIDATE CHECK LIST*

**ARAHAN**
Anda dikehendaki menyemak radas dan bahan, membaca soalan dan merancang eksperimen dalam tempoh lima minit yang pertama.
Tandakan (✓) pada ruangan kotak yang disediakan untuk menyemak radas dan bahan yang disediakan.

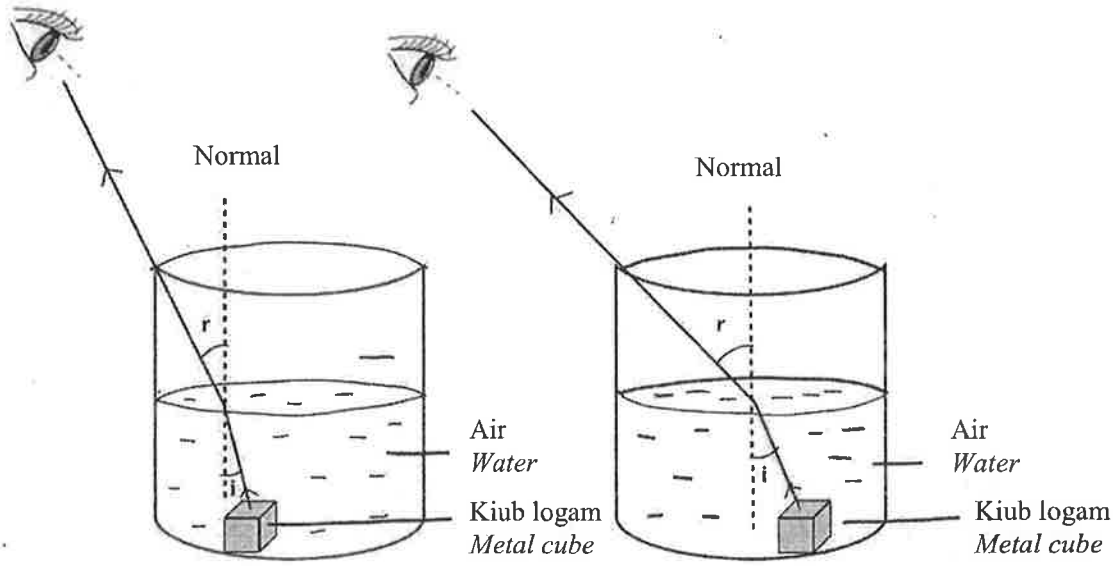
***INSTRUCTION***
*You are required to check the list of apparatus and materials, read the questions and plan the experiment in the first five minutes.*
*Tick (✓) in the box provided to check the apparatus and materials prepared.*

| **Bil.** ***Bil*** | **Radas dan bahan** ***Apparatus and materials*** | **Kuantiti** ***Quantity*** | **Tanda (✓)** ***Tick (✓)*** |
|---|---|---|---|
| 1 | Mentol 6.2 V, 0.5 A<br>*6.2 V, 0.5 A bulb* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 2 | Sel kering 1.5 V<br>1.5 V *Dry cell* | 3 unit per calon per sidang<br>*3 unit per candidate per session* | |
| 3 | Pemegang bateri<br>*Battery holder* | 3 unit per calon per sidang<br>*3 unit per candidate per session* | |
| 4 | Wayar penyambung<br>*Connecting wire* | 2 unit per calon per sidang<br>*2 unit per candidate per session* | |
| 5 | Jangka Sudut<br>*Protractor* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 6 | Pembaris Plastik 15 cm<br>*Plastic ruler 15 cm* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 7 | Blok Kaca (75mm X 50mm X 18mm)<br>*Glass block (75mm X 50mm X 18mm)* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 8 | Kertas Putih A4<br>*A4 White paper* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 9 | Paip silinder (Kotak sinar,<br>h = 5.0 cm, D = 3.0 cm)<br>*Cylinder pipe (Ray box,*<br>*h = 5.0 cm, D = 3.0 cm)* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |
| 10 | Suis buka tutup<br>*Open close switch* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |

| | | | |
|---|---|---|---|
| 11 | Pemegang mentol<br>*Bulb holder* | 1 unit per calon per sidang<br>*1 unit per candidate per session* | |

1 Rajah 1.1. dan Rajah 1.2 menunjukkan alur sinar cahaya dari kiub logam ke mata pemerhati. Kedudukan mata pemerhati berubah apabila kedudukan kiub logam di dalam air berubah.

*Diagram 1.1 and Diagram 1.2 show the path of a light ray from a metal cube to an observer's eye. It is observed that the position of observer's eye changes when the position of the metal cube in the water changed.*




Rajah 1.1
*Diagram* 1.1

Rajah 1.2
*Diagram* 1.2

(*a*) Berdasarkan maklumat dan pemerhatian, nyatakan
*Based on the information and observation, state*

(i) satu inferens yang sesuai.
*one suitable inference.*

.....

[1 markah]
[1 *mark*]

(ii) satu hipotesis yang sesuai.
*one suitable hypothesis.*

.....

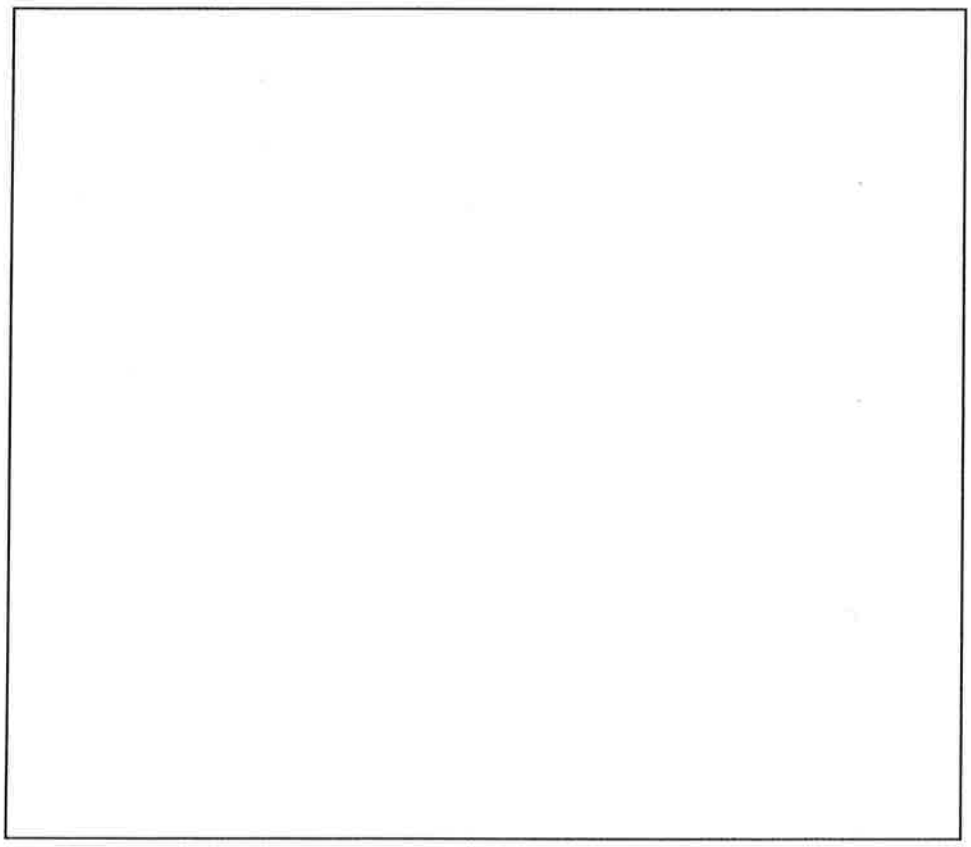
[1 markah]
[1 *mark*]

(*b*) Dengan menggunakan radas yang diberikan, rancang satu eksperimen untuk menyiasat hipotesis yang dinyatakan di 1(*a*).
Penerangan anda hendaklah mengandungi:

- Susunan radas
- Prosedur eksperimen termasuk **satu kaedah** mengawal pemboleh ubah dimanipulasi dan **satu kaedah** mengukur pemboleh ubah bergerak balas.

*With the use of apparatus given, plan an experiment to investigate the hypothesis stated in* 1(*a*).
*Your description should include:*

- *The arrangement of the apparatus*
- *The procedure of the experiment which includes* ***one method*** *of controlling the manipulated variable and* ***one method*** *of measuring the responding variable.*



[1 markah]
[1 *mark*]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3 markah]
[3 *marks*]

(c) Jadualkan data anda pada ruang di bawah.
*Tabulate your data in the space below.*

[4 markah]
[4 *marks*]

(*d*) Analisis data yang diperolehi di 1(*c*) dengan melukis satu graf sin *r* melawan sin *i* pada kertas graf yang disediakan.

*Analyze the data obtained in* 1(c) *by plotting a graph of sin r against sin i in the graph paper provided.*

[3 markah]
[3 *marks*]

(*e*) Berdasarkan graf yang dilukis di 1(*d*), nyatakan hubungan di antara sin r dan sin i.

*Based on the graph in* 1(d)*, state the relationship between sin r and sin i.*

.....

[1 markah]
[1 *mark*]

(*f*) Ramalkan kecerunan graf sekiranya blok kaca digantikan dengan blok perspeks yang mempunyai ketumpatan optik yang lebih rendah?

*Predict what will happen to the gradient of the graph if the glass block is replaced with a perspex block of lower optical density.*

.....

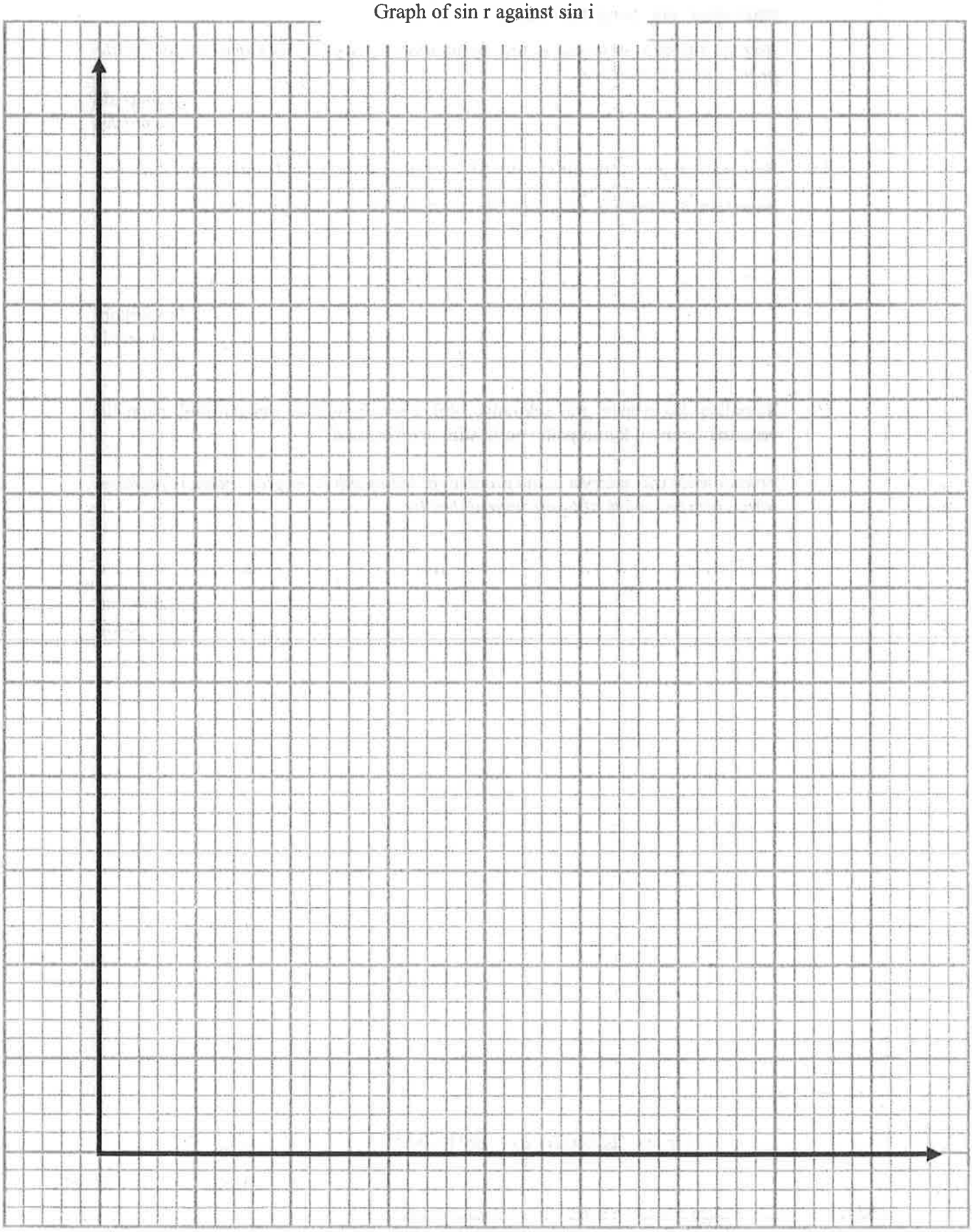
[1 markah]
[1 *mark*]

END OF QUESTION PAPER



4531/3 © 2022 Hak Cipta Bahagian Pendidikan Menengah MARA

Graph of sin r against sin i



# MAKTAB RENDAH SAINS MARA
# SPMRSM
# 2022

---

## FIZIK

**4531/3**

Kertas 3

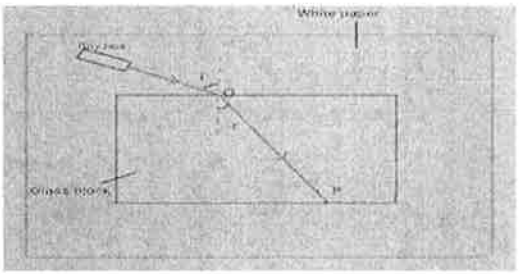
September 2022

Skema Jawapan

Markah maksimum : 15

---

MARKING SCHEME
PHYSICS (PAPER 3)

| NO | ANSWER | MARKS | TOTAL MARK | REMARK |
|---|---|---|---|---|
| 1(a) (i) | **State a suitable inference**<br><br>Angle of refraction affected by angle of incidence | 1 | 1 | |
| (ii) | **State a relevant hypothesis**<br><br>The larger the angle of incidence, i, the larger the angle of refraction, r | 1 | 1 | |
| (b) | **Arrangement of apparatus**<br><br>  <br><br>**Must label : ray box, glass block, angle i and angle r.** | 1<br>(label correctly) | 4 | |
| | **State the method of controlling the manipulated variable**<br><br>1. Trace the outline of the glass block on the white paper and draw a normal line at point *O*. Direct the light ray from the ray box at angle of incidence, ***i*** = **10°** using the protector.<br><br>2. Remove the glass block and draw the refracted ray OP. | 1 | | |
| | **State the method of measuring the responding variable**<br><br>3. Measure the **angle of refraction, r** by using **a protactor** and record the readings. | 1 | | |

**Repeat the experiment at least 4 times**

Put the glass block back in place. Repeat steps 1 to 3 with angle of incidence, **i = 20°, 30°, 40° and 50°.**

1

(c) **Record r, sin i and sin r**

M1 – record the angle of refraction, r, correctly
M2 – calculate sin i correctly
M3 – calculate sin r correctly
M4 – consistency of decimal places

1
1
1
1

4

Can choose any set according to students' answer

**(Set 1)**

| i (°) | r (°) | Sin i | Sin r |
|---|---|---|---|
| 10 | 6 -9 | 0.1736 | 0.1218 |
| 20 | 12-16 | 0.3420 | 0.2079 |
| 30 | 17- 20 | 0.5000 | 0.3090 |
| 40 | 25 – 30 | 0.6427 | 0.4226 |
| 50 | 29 - 34 | 0.7660 | 0.4848 |

**(Set 2)**

| i (°) | r (°) | Sin i | Sin r |
|---|---|---|---|
| 5 | 3 | 0.0872 | 0.0523 |
| 10 | 6 | 0.1737 | 0.1045 |
| 15 | 10 | 0.2588 | 0.1737 |
| 20 | 12 | 0.3420 | 0.2079 |
| 25 | 15 | 0.4226 | 0.2588 |

**Sin i and sin r: 2 d.p to 4 d.p**

(d) **Plot a graph sin i against sin r**

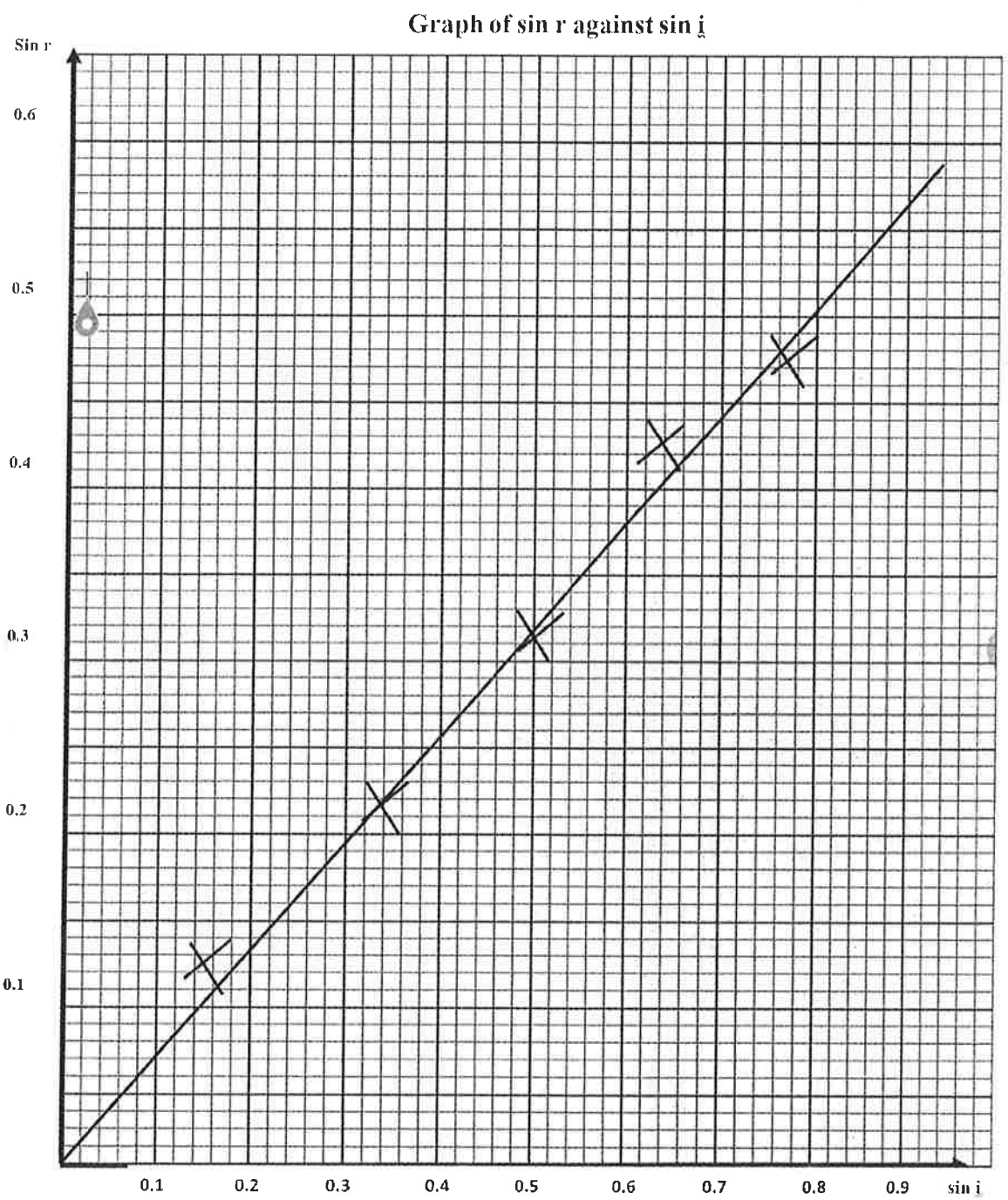
1. ✓1 Label sin r (y-axis) and sin i (x-axis)
2. ✓2 No unit on y-axis and x-axis
3. ✓3 Uniform scale
4. ✓4 3,4 points plotted correctly
5. ✓5 5 points plotted correctly
6. ✓6 Best fit line/ balanced straight line
7. Size graph (> 5 x 5) from origin

Rubrik

| | |
|---|---|
| 6-7 ✓ | 3M |
| 3-5 ✓ | 2M |
| 1-2 ✓ | 1M |

3

| | | | | |
|---|---|---|---|---|
| (e) (i) | **State the correct relationship between sin r and sin i**<br>Sin r directly proportional to sin i<br><br>**accept answer based on student`s plotted graph* | 1 | 1 | |
| (ii) | **Predict the gradient of the graph correctly**<br>Increases | 1 | 1 | |
| | | **TOTAL MARKS** | **15 MARKS** | |


Graph of sin r against sin i
Sin r
0.6
0.5
0.4
0.3
0.2
0.1
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
sin i

(Set 2)

Graph of sin r against sin i