

# GELOMBANG

## PANDUAN PENSKORAN

### PERCUBAAN NEGERI: KEDAH

| NO SOALAN | CADANGAN PEMARKAHAN | MARKAH | JUMLAH MARKAH |
|-----------|---------------------|--------|---------------|
| 2         | (a)                 | 1      | 1             |

|               |  |   |          |
|---------------|--|---|----------|
| (b)           |  |   |          |
| (i)           | <p>Arah perambatan gelombang menunjukkan gelombang air <u>menumpu di tanjung/ mencapah di teluk</u></p> <p><i>The direction of propagation of wave shows water wave converge at cape / diverge at bay</i></p>  | 1 | 2        |
| (ii)          | <p>Muka gelombang <u>mengikut bentuk pantai</u> dengan <u>panjang gelombang yang lebih kecil</u> berbanding panjang gelombang di laut dalam</p> <p><i>Wavefront follow the shape of the beach with smaller wavelength compared to the wavelength in the deep sea</i></p> | 1 | 1        |
| (c)           | <p><math>\lambda = \frac{5}{4} // \frac{4}{\lambda} = \frac{9}{5} // \frac{4}{1.8}</math></p> <p>2.2222 m (minimum 2 tp)</p>   | 1 | 2        |
| <b>JUMLAH</b> |  |   | <b>5</b> |

$$v = f\lambda$$

$$f_1 = \frac{v_1}{\lambda_1}$$

$$\frac{v_1}{\lambda_1} = \frac{v_2}{\lambda_2}$$

$$v_d = f\lambda_d$$

$$f = \frac{v_d}{\lambda_d} = \frac{9}{5} = 1.8 \text{ Hz}$$

$$v_c = f\lambda_c$$

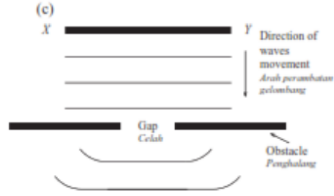
$$\lambda_c = \frac{4}{1.8} \sqrt{1}$$

$$= 2.22 \text{ m} \sqrt{2}$$

## PERCUBAAN NEGERI: MELAKA

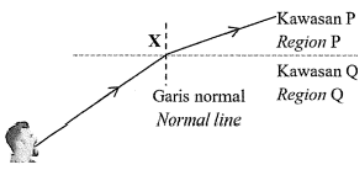
| NO SOALAN     | SKEMA JAWAPAN  | MARKAH         |
|---------------|--|----------------|
| 1. (a)        | Berserenjang / <i>perpendicularly</i>  | 1              |
| (b)           | (i) Sinar gama / <i>Gamma ray</i>  | 1              |
|               | (ii) Sinaran inframerah / <i>Infrared radiation</i>  | 1              |
| (c)           | <ul style="list-style-type: none"> <li>• merupakan gelombang melintang / <i>are transverse waves</i></li> <li>• tidak memerlukan medium perambatan / <i>do not need medium for propagation</i></li> <li>• boleh merambat melalui vakum / <i>can propagate through vacuum</i></li> <li>• Laju dalam vakum, <math>c = 3.00 \times 10^8 \text{ m s}^{-1}</math>, dan bergerak dengan laju yang lebih kecil di dalam medium. <i>Have speed in vacuum, <math>c = 3.00 \times 10^8 \text{ m s}^{-1}</math>, and move with lower speed in any medium</i></li> <li>• Menunjukkan fenomena pantulan, pembiasan, pembelauan dan interferens <i>Show phenomena of reflection, refraction, diffraction and interference</i></li> </ul> | 1<br><br>Max 1 |
| <b>JUMLAH</b> |  | <b>4</b>       |

## PERCUBAAN NEGERI : PULAU PINANG

|              |  |   |          |
|--------------|--|---|----------|
| 5. (a)       | Pembelauan//diffraction  | 1 |          |
| b(i)         | Panjang gelombang kekal sama// the wavelength remains the same   | 1 |          |
|              | (ii) Diagram 5.1 > diagram 5.2   | 1 |          |
|              | (iii) Diagram 5.1 less obvious than diagram 5.2  | 1 |          |
|              | (iv) Lengkungan bertambah apabila saiz celah berkurang daripada Panjang gelombang // the curvature increases when the size of gaps decreases | 1 |          |
| (c)          |   | 2 |          |
| (d)          | $v = f\lambda$<br>$= 15 \times 0.5 = 7.5 \text{ cm s}^{-1}$  | 2 |          |
| <b>Total</b> |  |   | <b>9</b> |

## PERCUBAAN NEGERI : SBP

| Soalan | Panduan Pemarkahan   | Markah | Jumlah Markah | Kesalahan Umum Murid / Catatan |
|--------|--|--------|---------------|--------------------------------|
| a      | <p>Perubahan/Pembengkokan arah perambatan gelombang disebabkan oleh perubahan halaju/laju gelombang apabila gelombang merambat melalui dua medium yang berbeza ketumpatan.</p> <p><i>The change/bending of the direction of the waves propagation caused by the change in the velocity/speed of the waves when the waves propagate through two mediums of different density.</i></p> | 1      | 1             |                                |
| b      | (i) Panjang gelombang bagi gelombang bunyi di Kawasan P > Kawasan Q<br><br><i>Wavelength of sound waves at Region P &gt; Region Q</i>  | 1      | 1             |                                |
|        | (ii) Suhu udara di Kawasan P > Kawasan Q<br><i>Air temperature at Region P &gt; Region Q</i>   | 1      | 1             |                                |
|        | (iii) Laju gelombang bunyi di Kawasan P > Kawasan Q<br><i>Speed of sound waves at Region P &gt; Region Q</i>   | 1      | 1             |                                |

|        |      |   |   |   |  |
|--------|------|---|---|---|--|
| c      | (i)  | Suhu udara bertambah, panjang gelombang bunyi bertambah<br><i>Air temperature increases, the wavelength of sound waves increases.</i>   | 1 | 1 |  |
|        | (ii) | Suhu udara bertambah, laju gelombang bunyi bertambah<br><i>Air temperature increase, the speed of sound waves increases.</i>  | 1 |   |  |
| d      | M1   | Gantian // Substitution<br>$\frac{340}{500}$  | 1 |   |  |
|        | M2   | Jawapan dengan unit yang betul // <i>Answer with correct unit</i><br>0.68 m   | 1 | 2 |  |
| e      |      |  <p>* Arah perambatan gelombang membengkok menjauhi garis normal<br/><i>The direction of wave propagation bend away from the normal line</i></p> | 1 | 1 |  |
| Jumlah |      |   |   | 9 |  |

### PERCUBAAN NEGERI : TERENGGANU

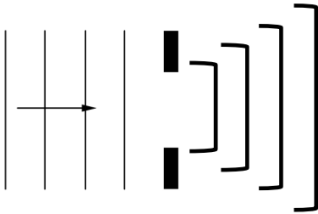
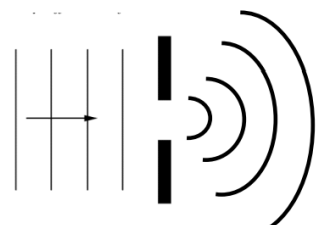
| SOALAN        | JAWAPAN   | MARKAH      | NOTA                 |
|---------------|---|-------------|----------------------|
| 4             |   |             |                      |
| (a)           | Gelombang yang mempunyai frekuensi sama, fasa sama<br><i>Wave which has same frequency, same phase</i>  | 1           |                      |
| (b)           | Kedudukan P dan R<br><i>Point P and R</i>   | 1           | <b>Maks 3 markah</b> |
|               | <ul style="list-style-type: none"> <li>- Puncak gelombang superposisi dengan puncak gelombang / lembangan superposisi dengan lembangan.<br/><i>Superposition crest with crest / superposition trough with trough.</i></li> <li>- Interferens membina terhasil<br/><i>Constructive interference occurs.</i></li> </ul> | 1           |                      |
| (c) (i)       | Kedudukan Q dan S<br><i>Point Q and S</i>   | 1           | Maks 3 M             |
|               | <ul style="list-style-type: none"> <li>- Puncak gelombang superposisi dengan lembangan<br/><i>Superposition between crest and trough</i></li> <li>- Interferens memusnah terhasil<br/><i>Destructive interference occurs.</i></li> </ul>  | 1           |                      |
| (c) (ii)      | $V = f\lambda$<br>$\lambda = \frac{330}{1000}$<br>$\lambda = 0.33 \text{ m}$ (Jawapan berserta unit)  | 1<br>1      |                      |
| (c) (ii)      | $\lambda = \frac{dx}{D}$<br>$x = \frac{0.33(0.8)}{0.75}$<br>$x = 0.352$<br>$PS = 1.5(0.352) = 0.528 \text{ m} = 52.8 \text{ cm}$ (jawapan + unit)   | 1<br>1<br>1 |                      |
| <b>JUMLAH</b> |   | <b>9</b>    |                      |

### PERCUBAAN NEGERI : KELANTAN

|   |     |  |             |   |
|---|-----|--|-------------|---|
| 7 | (a) | Pantulan gelombang<br><i>Wave reflection</i>   | 1           | 1 |
|   | (b) | $d = vt / 2$<br>( formula ditulis )<br>( <i>Written formula</i> )<br><br>$= 1500 ( 130 \times 10^{-3} ) / 2$<br>$= 97.5 \text{ m}$ | 1<br>1<br>1 | 3 |

|               |   |        |          |
|---------------|---|--------|----------|
| (c)(i)        | Gelombang ultrasonik<br><i>Ultrasonic wave</i><br>- Frekuensi tinggi // Tenaga tinggi // Kuasa tinggi // Panjang gelombang pendek // Bergerak dengan jarak lebih jauh<br>- <i>High frequency // High energy // High power // Short wavelength // Moves longer distances</i> | 1<br>1 | 2        |
| (ii)          | Pendek<br><i>Short</i><br>- Mengurangkan kehilangan tenaga<br>- Tidak mudah terbelau // Mudah dipantulkan<br>- <i>Reduces energy loss</i><br>- <i>Not easy to scatter // Easy to reflect</i>  | 1<br>1 | 2        |
| (iii)         | Q   | 1      | 1        |
| <b>JUMLAH</b> |   |        | <b>9</b> |

### PERCUBAAN NEGERI : SMKA & SABK

| SOALAN  | JAWAPAN  | MARKAH | NOTA |
|---------|--|--------|------|
| 9       |  |        |      |
| (a)     | Pembelauan ialah penyebaran gelombang apabila melalui satu celah atau tepi suatu penghalang<br><i>Diffraction is the propagation of waves when passing through a gap or edge of a barrier</i>                | 1      |      |
| (b)(i)  |  <p style="text-align: center;">Rajah 9.1 / Diagram 9.1</p>   |        |      |
|         |  <p style="text-align: center;">Rajah 9.2 / Diagram 9.2</p>   |        |      |
|         | M1 : Corak gelombang kedua-dua rajah betul<br><i>The waveforms of both diagrams are correct</i>  | 1      |      |
|         | M2 : Panjang gelombang yang sama sebelum pembelauan dan selepas pembelauan<br><i>The same wavelength before diffraction and after diffraction</i>  | 1      |      |
| (b)(ii) | Rajah 9.2 // Diagram 9.2<br>Gelombang lebih dibelaukan // pembelauan lebih ketara // lebih banyak gelombang terbelau<br><i>More diffracted waves // more pronounced diffraction // more diffracted waves</i> | 1<br>1 |      |

|               |   |  |           |  |
|---------------|---|--|-----------|--|
| (c)           | <p><b>Ciri-ciri Characteristics</b></p> <p>Lokasi :<br/>Location :<br/>Teluk<br/>Bay</p>  | <p><b>Penerangan Explanation</b></p> <p>Ombak/ Gelombang lebih tenang // Amplitud gelombang lebih kecil/ berkurang // Ketinggian ombak berkurang<br/>Waves more calm // Amplitude of waves smaller//lower // Height of wave reduce</p> | 1,2       |  |
|               | <p>Rekabentuk benteng :<br/>Design retaining wall:<br/>Lebar dibahagian bawah<br/>Width at the base</p>   | <p>Dapat menahan tekanan air yang lebih tinggi di bahagian bawah<br/>Can withstand higher water pressure at the bottom</p>   | 3,4       |  |
|               | <p>Ketinggian benteng :<br/>Height of retaining wall :<br/>Tinggi<br/>Higher</p>  | <p>Menahan ombak / gelombang yang tinggi<br/>Withstand high wave</p>   | 5,6       |  |
|               | <p>Saiz celah :<br/>Size of gap :<br/>Lebih kecil<br/>Smaller</p>   | <p>Mengurangkan amplitud / tenaga // kesan pembelauan lebih ketara // lebih dibelaukan<br/>Reduce the amplitude / energy // effect of diffraction more obvious // more diffracted</p>  | 7,8       |  |
|               | <p>Reka bentuk S dipilih // Design S is choosen</p> <p>Lokasi di teluk, rekabentuk benteng lebar dibahagian dasar, ketinggian benteng tinggi dan saiz celah lebih kecil</p> <p>The location in the bay, the design of the retaining wall is width at the base, the height of the retaining wall is high and the size of the gap is smaller.</p> |  | 9,10      |  |
| (d)(i)        | $v = f\lambda$<br><br>$f = \frac{1500}{120\ 000}$ //<br><br>$v = 0.0125\ \text{m s}^{-1}$   | 1<br><br>1   |           |  |
| (d)(ii)       | $2d = vt$<br><br>$d = \frac{0.0125 (50 \times 10^{-3})}{2}$<br><br>$= 3.125 \times 10^{-3}\ \text{m}$   | 1<br><br>1   |           |  |
| <b>JUMLAH</b> |   |  | <b>20</b> |  |

### PERCUBAAN NEGERI : SELANGOR (SET 1)

|     |  |   |
|-----|--|---|
| (a) | <p>Pantulan gelombang<br/>Reflection of wave</p> | 1 |
|-----|--|---|

|     |   |   |
|-----|---|---|
| (b) | <p>M1 transduser memancarkan gelombang ultrasonik dan ditujukan ke dasar laut<br/><i>the transducer emits ultrasonic waves and is directed to the seabed</i></p> <p>M2 gelombang ultrasonik dipantulkan di dasar laut<br/><i>ultrasonic waves are reflected on the seabed</i></p> <p>M3 gelombang ultrasonik yang terpantul diterima/dikesan oleh penerima<br/><i>the reflected ultrasonic wave is received/detected by the receiver</i></p> <p>M4 kedalaman dasar laut ditentukan berdasarkan rumus <math>d = vt/2</math> di mana <math>t</math> adalah masa pantulan gelombang<br/><i>the depth of the seabed is determined based on the formula <math>d = vt/2</math> where <math>t</math> is the wave reflection time</i></p> | 4 |
| (c) | (i) <p>M1 Gantikan nilai yang betul<br/><math>1500 = (5 \times 10^4) \lambda</math></p> <p>M2 Jawapan dengan unit yang betul<br/>0.03 m</p>   | 2 |
|     | (ii) <p>M1 Penukaran unit masa yang betul<br/><math>2500 \times 10^{-3} \text{ s}</math></p> <p>M2 Gantikan nilai yang betul<br/><math>d = \frac{1500 \times 2500 \times 10^{-3}}{2} // d = \frac{1500 \times 2500}{2}</math></p> <p>M3 Jawapan dengan unit yang betul<br/>1875 m</p>   | 3 |

| (d)                                     | <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Ciri</th> <th style="width: 50%;">Sebab</th> </tr> </thead> <tbody> <tr> <td><b>M1</b><br/>Lokasi tembok penahan : Teluk<br/><i>Location of retaining wall : Bay</i></td> <td><b>M2</b><br/>Gelombang lebih tenang<br/><i>The wave is calmer</i></td> </tr> <tr> <td><b>M3</b><br/>Struktur tembok penahan : bercerun<br/><i>Structure of retaining wall : sloping</i></td> <td><b>M4</b><br/>Mengurangkan kelajuan ombak apabila kedalaman berkurang<br/><i>Reduce the speed of wave as depth decreases</i></td> </tr> <tr> <td><b>M5</b><br/>Permukaan tembok tidak rata<br/><i>Uneven surface of the wall</i></td> <td><b>M6</b><br/>Gelombang air terpantul pelbagai arah maka tenaga gelombang air berkurang<br/><i>Water waves are reflected in various directions, so the energy of water waves is reduced</i></td> </tr> <tr> <td><b>M7</b><br/>Ketinggian tembok penahan : tinggi<br/><i>The height of retaining wall : high</i></td> <td><b>M8</b><br/>Menahan gelombang tinggi<br/><i>Withstand high waves</i></td> </tr> <tr> <td><b>M9</b><br/>Pilih : P<br/><i>Choose</i></td> <td><b>M10</b><br/>(1,3,5,7)</td> </tr> </tbody> </table> |   | Ciri | Sebab | <b>M1</b><br>Lokasi tembok penahan : Teluk<br><i>Location of retaining wall : Bay</i> | <b>M2</b><br>Gelombang lebih tenang<br><i>The wave is calmer</i> | <b>M3</b><br>Struktur tembok penahan : bercerun<br><i>Structure of retaining wall : sloping</i> | <b>M4</b><br>Mengurangkan kelajuan ombak apabila kedalaman berkurang<br><i>Reduce the speed of wave as depth decreases</i> | <b>M5</b><br>Permukaan tembok tidak rata<br><i>Uneven surface of the wall</i> | <b>M6</b><br>Gelombang air terpantul pelbagai arah maka tenaga gelombang air berkurang<br><i>Water waves are reflected in various directions, so the energy of water waves is reduced</i> | <b>M7</b><br>Ketinggian tembok penahan : tinggi<br><i>The height of retaining wall : high</i> | <b>M8</b><br>Menahan gelombang tinggi<br><i>Withstand high waves</i> | <b>M9</b><br>Pilih : P<br><i>Choose</i> | <b>M10</b><br>(1,3,5,7) | 10 |
|---|---|---|------|-------|---|--|---|--|---|---|---|--|---|-------------------------|----|
|   | Ciri  | Sebab   |      |       |   |  |   |  |   |   |   |  |   |                         |    |
|   | <b>M1</b><br>Lokasi tembok penahan : Teluk<br><i>Location of retaining wall : Bay</i>   | <b>M2</b><br>Gelombang lebih tenang<br><i>The wave is calmer</i>  |      |       |   |  |   |  |   |   |   |  |   |                         |    |
|   | <b>M3</b><br>Struktur tembok penahan : bercerun<br><i>Structure of retaining wall : sloping</i>   | <b>M4</b><br>Mengurangkan kelajuan ombak apabila kedalaman berkurang<br><i>Reduce the speed of wave as depth decreases</i>  |      |       |   |  |   |  |   |   |   |  |   |                         |    |
|   | <b>M5</b><br>Permukaan tembok tidak rata<br><i>Uneven surface of the wall</i>   | <b>M6</b><br>Gelombang air terpantul pelbagai arah maka tenaga gelombang air berkurang<br><i>Water waves are reflected in various directions, so the energy of water waves is reduced</i> |      |       |   |  |   |  |   |   |   |  |   |                         |    |
|   | <b>M7</b><br>Ketinggian tembok penahan : tinggi<br><i>The height of retaining wall : high</i>   | <b>M8</b><br>Menahan gelombang tinggi<br><i>Withstand high waves</i>  |      |       |   |  |   |  |   |   |   |  |   |                         |    |
| <b>M9</b><br>Pilih : P<br><i>Choose</i> | <b>M10</b><br>(1,3,5,7)   |   |      |       |   |  |   |  |   |   |   |  |   |                         |    |
| <b>Jumlah</b>                           |   | <b>20</b>   |      |       |   |  |   |  |   |   |   |  |   |                         |    |

### PERCUBAAN NEGERI : KEDAH

|    |     |  |        |   |
|----|-----|--|--------|---|
| 10 | (a) | <p><u>Pembelauan</u> <span style="color: red;">X dibelaukan</span><br/><i>Diffraction</i> <span style="color: red;">X belauan</span></p>   | 1      | 1 |
|    | (b) | (i) <p>M1 <u>Amplitud berkurang</u><br/><i>Amplitude decreases</i></p> <p>M2 Laju tidak berubah <span style="color: red;"><math>v = f \lambda</math></span><br/><i>Speed does not change</i></p> | 1<br>1 | 4 |

|     |      |   |                                      |   |
|-----|------|---|--------------------------------------|---|
|     | (ii) | M3 Tenaga berkurang<br><i>Energy decrease</i><br>M4 Kedalaman tidak berubah<br><i>Depth unchanged</i><br><i>sama jenis gelombang</i>  | 1<br>1                               |   |
| (c) | (i)  | M1 Gelombang mikro<br><i>Microwave</i><br>M2 Frekuensi tinggi // Tenaga tinggi // <i>bergerak lebih jauh</i><br>Kuasa penembusan tinggi // <i>panjang gelombang pendek // kuasa di belakakan</i><br><i>power. power</i><br><i>High frequency // High energy // high penetrating</i><br>M3 Bina di atas bukit<br><i>Built on hilltops</i><br>M4 Bebas daripada halangan // <i>tiada halangan</i><br><i>Free from blockage or obstacles // no obstacle</i><br>M5 Bina (lebih) banyak menara geganti<br><i>Built more relay towers</i><br>M6 Mengurangkan kehilangan isyarat melalui jarak yang jauh // <i>gelombang</i><br><i>To reduce loss of signal over a long distance</i><br><i>meurangkan pelenyapan</i><br>M7 Gelombang berfrekuensi tinggi<br><i>High frequency wave</i><br>M8 Tenaga tinggi<br><i>High energy</i><br><i>kuasa penembusan tinggi</i> | 1<br>1<br>1<br>1<br>1<br>1<br>1<br>1 | 8 |

|               |      |  |             |   |
|---------------|------|--|-------------|---|
|               | (ii) | M9 V dipilih<br><i>Choose V</i><br>M10 terima 4 aspek yang betul atau 4 alasan yang betul atau<br><i>accept 4 correct aspects or 4 correct reasons or</i><br><i>V = fλ</i> | 1<br>1      | 2 |
| (d)           | (i)  | $f = \frac{1500}{0.032}$ ✓ 1<br>$= 46\ 875\ \text{Hz}$ ✓ 2<br>$= 4.7 \times 10^4\ \text{Hz}$ ✓ 2<br>$f = \frac{1500}{3.2}$ ✓ 1<br>$= 468.75$ ✓ 2                           | 1<br>1      | 5 |
|               | (ii) | $d = \frac{v\ t}{2}$ ✓ 1<br>$= \frac{(1500 \times 0.073)}{2}$ ✓ 2<br>$= 54.75\ \text{m}$ ✓ 3   | 1<br>1<br>1 |   |
| <b>JUMLAH</b> |      |  | <b>20</b>   |   |

**PERCUBAAN NEGERI : SELANGOR (SET 2)**

| Soalan   | Panduan Pemarkahan  | Jumlah Markah |       |  |  |  |
|--|---|---------------|-------|--|--|--|
| (a)  | Gelombang mikro<br><i>Microwave</i>   | 1             |       |  |  |  |
| (b)  | <table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 50%;">Ciri</th> <th style="width: 50%;">Sebab</th> </tr> </thead> <tbody> <tr> <td><b>M1</b><br/>Frekuensi gelombang : tinggi<br/><i>Frequency of wave : high</i></td> <td><b>M2</b><br/>Tenaga tinggi dan kuasa penembusan tinggi // maka isyarat gelombang boleh merambat jauh<br/><i>High energy and high penetrating power // the wave signal can propagate further</i></td> </tr> </tbody> </table> | Ciri          | Sebab | <b>M1</b><br>Frekuensi gelombang : tinggi<br><i>Frequency of wave : high</i> | <b>M2</b><br>Tenaga tinggi dan kuasa penembusan tinggi // maka isyarat gelombang boleh merambat jauh<br><i>High energy and high penetrating power // the wave signal can propagate further</i> |  |
| Ciri   | Sebab   |               |       |  |  |  |
| <b>M1</b><br>Frekuensi gelombang : tinggi<br><i>Frequency of wave : high</i> | <b>M2</b><br>Tenaga tinggi dan kuasa penembusan tinggi // maka isyarat gelombang boleh merambat jauh<br><i>High energy and high penetrating power // the wave signal can propagate further</i>  |               |       |  |  |  |

|  |  |   |    |
|--|--|---|----|
|  | <p><b>M3</b><br/>Jarak antara penerima isyarat dan piring parabola :<br/>Sama dengan panjang focus<br/><i>Distance between signal receiver and parabolic disc : Same as focal length</i></p> | <p><b>M4</b><br/>Isyarat gelombang ditumpukan ke penerima di titik fokus<br/><i>The wave signal is focused to the receiver at the focal point</i></p> | 10 |
|  | <p><b>M5</b><br/>Diameter piring parabola : besar<br/><i>Parabolic disc diameter : large</i></p>   | <p><b>M6</b><br/>Terima banyak isyarat gelombang<br/><i>Receive multiple wave signals</i></p>   |    |
|  | <p><b>M7</b><br/>Ketinggian piring parabola : tinggi<br/><i>Height of the parabolic disc : high</i></p>  | <p><b>M8</b><br/>Elak halangan<br/><i>Avoid obstacles</i></p>   |    |
|  | <p><b>M9</b><br/>Pilihan : K</p>   | <p><b>M10</b><br/>(Gabungan ciri M1,M3,M5,M7)</p>   |    |

|        |       |  |    |
|--------|-------|--|----|
| (c)    | (i)   | <p>M1 radar memancarkan isyarat gelombang dan ditujukan ke kapal terbang<br/><i>the radar emits wave signals and is directed to the airplane</i></p> <p>M2 isyarat gelombang dipantulkan di kapal terbang<br/><i>Wave signals are reflected on the airplane</i></p> <p>M3 isyarat gelombang yang terpantul diterima/dikesan oleh penerima di radar<br/><i>the reflected wave signals is received/detected by the receiver on the radar</i></p> <p>M4 jarak antara kapal terbang dan radar ditentukan berdasarkan rumus <math>d = vt/2</math> di mana <math>t</math> adalah masa pantulan isyarat gelombang<br/><i>the distance between the airplane and the radar is determined using formula of <math>d = vt/2</math> where <math>t</math> is the time of wave reflection</i></p> | 4  |
|        | (ii)  | <p>M1 Gantian nilai yang betul<br/><math>3.0 \times 10^8 = 1.5 \times 10^9 \lambda</math></p> <p>M2 Jawapan dengan unit yang betul<br/><math>\lambda = 0.2 \text{ m}</math></p>  | 2  |
|        | (iii) | <p>M1 Gantian nilai yang betul<br/><math>d_R = \frac{300\,000\,000 \times 0.0006}{2}</math></p> <p>M2 menentukan jarak antara kapal terbang R dan radar dengan betul<br/><math>d_R = 90000 \text{ m}</math>,</p> <p>M3 menentukan jarak antara R dan S dengan betul<br/><math>d_R - d_S = 90000 - 52500 = 37500 \text{ m}</math></p>   | 3  |
| Jumlah |       |  | 20 |

### PERCUBAAN NEGERI : PERAK

|   |     |   |   |   |
|---|-----|---|---|---|
| 9 | (a) | <p>Gelombang electromagnet ialah gelombang yang terdiri daripada medan elektrik dan medan magnet yang berayun secara serenjang antara satu sama lain.<br/><i>Electromagnetic waves are the waves made up of an electric field and a magnetic field that oscillate perpendicularly to one another.</i></p> | 1 | 1 |
|---|-----|---|---|---|



|     |   |   |   |
|-----|---|---|---|
| (b) | M1<br>Sinaran elektromagnet kerana menunjukkan ciri-ciri gelombang seperti pembelauan<br><i>Electromagnetic waves have wave properties because it exhibits the phenomena of diffraction</i> | 1 | 4 |
|     | M2<br>dan interferens<br><i>and interference</i>  | 1 |   |
|     | M3<br>Sinaran elektromagnet menunjukkan ciri-ciri zarah kerana memiliki momentum.<br><i>Electromagnetic waves have particle properties because they possess momentum</i>                    | 1 |   |
|     | M4<br>dan tenaga kinetik<br><i>and kinetic energy</i>   | 1 |   |

|  |  |        |  |
|--|--|--------|--|
|  | M5<br>serta boleh berlanggar antara satu sama lain.<br><i>can collide with each other.</i> | 1      |  |
|  |  | Maks:4 |  |

| (c)  | <table border="1"> <thead> <tr> <th>Ciri-ciri<br/><i>Characteristics</i></th> <th>Sebab<br/><i>reasons</i></th> </tr> </thead> <tbody> <tr> <td>Gelombang mikro<br/><i>Microwaves</i></td> <td>Frekuensi tinggi // tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br/><i>High frequency// high energy// high penetrating power // travel further distance// easily reflected</i></td> </tr> <tr> <td>Kedudukan tinggi<br/><i>High position</i></td> <td>Mengurangkan halangan<br/><i>Reduce blockage</i></td> </tr> <tr> <td>Frekuensi tinggi<br/><i>High frequency</i></td> <td>Tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br/><i>High energy// high penetrating power // travel further distance// easily reflected</i></td> </tr> <tr> <td>Diameter cakera parabola besar<br/><i>Bigger diameter of parabolic dish</i></td> <td>Menerima lebih banyak gelombang// memantulkan lebih banyak isyarat<br/><i>Receive more waves// reflect more signals</i></td> </tr> </tbody> </table> | Ciri-ciri<br><i>Characteristics</i>   | Sebab<br><i>reasons</i> | Gelombang mikro<br><i>Microwaves</i> | Frekuensi tinggi // tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br><i>High frequency// high energy// high penetrating power // travel further distance// easily reflected</i> | Kedudukan tinggi<br><i>High position</i> | Mengurangkan halangan<br><i>Reduce blockage</i> | Frekuensi tinggi<br><i>High frequency</i> | Tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br><i>High energy// high penetrating power // travel further distance// easily reflected</i> | Diameter cakera parabola besar<br><i>Bigger diameter of parabolic dish</i> | Menerima lebih banyak gelombang// memantulkan lebih banyak isyarat<br><i>Receive more waves// reflect more signals</i> | 1,1 | 10 |
|--|---|---|-------------------------|--------------------------------------|---|--|---|---|--|--|--|-----|----|
|  | Ciri-ciri<br><i>Characteristics</i>   | Sebab<br><i>reasons</i>   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  | Gelombang mikro<br><i>Microwaves</i>  | Frekuensi tinggi // tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br><i>High frequency// high energy// high penetrating power // travel further distance// easily reflected</i> |                         |                                      |   |  |   |   |  |  |  |     |    |
|  | Kedudukan tinggi<br><i>High position</i>  | Mengurangkan halangan<br><i>Reduce blockage</i>   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  | Frekuensi tinggi<br><i>High frequency</i>   | Tenaga tinggi// kuasa penembusan tinggi// bergerak lebih jauh// mudah dipantulkan<br><i>High energy// high penetrating power // travel further distance// easily reflected</i>                                      |                         |                                      |   |  |   |   |  |  |  |     |    |
| Diameter cakera parabola besar<br><i>Bigger diameter of parabolic dish</i> | Menerima lebih banyak gelombang// memantulkan lebih banyak isyarat<br><i>Receive more waves// reflect more signals</i>  |   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  |   | 1,1   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  |   | 1,1   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  |   | 1,1   |                         |                                      |   |  |   |   |  |  |  |     |    |
|  | X dipilih kerana jenis gelombang mikro, kedudukan pemancar tinggi, frekuensi tinggi dan diameter cakera parabola besar.<br><i>X is chosen because it transmits microwaves, high position of transmitter, high frequency of waves and bigger diameter of parabolic dish.</i>   | 1,1   |                         |                                      |   |  |   |   |  |  |  |     |    |

|         |  |   |  |
|---------|--|---|--|
| (d) (i) | $f = 1.0 \times 10^4 \text{ cm} = 1.0 \times 10^2 \text{ m}$ | 1 |  |
|         | $f = \frac{3 \times 10^8}{1 \times 10^2}$                    | 1 |  |
|         | $= 3 \times 10^6 \text{ m}$                                  | 1 |  |

|      |  |   |           |
|------|--|---|-----------|
| (ii) | $1.333 = \frac{3 \times 10^8}{v}$      | 1 | 5         |
|      | $v = 2.25 \times 10^8 \text{ ms}^{-1}$ | 1 |           |
|      | <b>Jumlah</b>                          |   | <b>20</b> |

## PERCUBAAN NEGERI : PAHANG

| 11   | (a)   | Bilangan ayunan lengkap dalam 1 saat/ Bilangan gelombang lengkap dalam 1 saat.<br><i>The number of complete oscillations in 1 second/ The number of complete wave in 1 second.</i>  | 1                 |                        |  |   |                                      |   |  |   |   |
|--|---|---|-------------------|------------------------|--|---|--------------------------------------|---|--|---|---|
|  | (b)   | - Amplitud gelombang dalam Rajah 11.1 = Rajah 11.2<br><i>The amplitude of wave in Diagram 11.1 = Diagram 11.2</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Bilangan gelombang lengkap dalam Rajah 11.1 > Rajah 11.2<br><i>The number of complete waves in Diagram 11.1 &gt; Diagram 11.2</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Tempoh ayunan gelombang dalam Rajah 11.2 > Rajah 11.1<br><i>The period of oscillation of wave in Diagram 11.2 &gt; Diagram 11.1</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - semakin bertambah tempoh ayunan gelombang, semakin berkurang bilangan gelombang lengkap/ Tempoh ayunan gelombang berkadar songsang dengan bilangan gelombang lengkap<br><i>The higher the period of waves, the lower the number of complete waves/ The period of wave is inversely proportional to the number of complete waves.</i>  | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Semakin bertambah frekuensi gelombang, semakin bertambah bilangan gelombang lengkap/ Frekuensi gelombang berkadar terus dengan bilangan gelombang lengkap.<br><i>The higher the frequency of wave, the higher the number of complete waves/ The frequency of wave is directly proportional to the number of complete waves.</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  | (c)   | - Kon kertas pembesar suara bergetar.<br><i>Speaker paper cone vibrates.</i>  | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Gelombang bunyi memerlukan medium untuk merambat.<br><i>Sound waves need medium to propagate.</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Getaran kon kertas pembesar suara menghasilkan siri mampatan dan regangan zarah-zarah udara.<br><i>The vibration of the speaker paper cone produces a series compression and rarefaction of air particles.</i>  | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Zarah-zarah udara bergetar selari dengan arah perambatan gelombang bunyi.<br><i>Air particles vibrate parallel to the direction of propagation of the sound wave.</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   | - Tenaga dipindahkan (ke gegendang telinga) dan bergetar.<br><i>Energy is transferred (to the ear drum) and vibrates.</i>   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   |   | <b>Maks 4</b>     |                        |  |   |                                      |   |  |   |   |
|  | (d)   | <table border="1"> <thead> <tr> <th>Cadangan Proposal</th> <th>Penerangan Explanation</th> </tr> </thead> <tbody> <tr> <td>Dipasang pada aras kedudukan tinggi dari lantai.<br/><i>Install at a high-level position from the ground.</i></td> <td>Isyarat tidak dihalang/ Isyarat gelombang boleh dihantar ke kawasan yang lebih luas/Boleh menghantar lebih banyak isyarat/<br/><i>The signal is not blocked/ The wave signal can be sent to a wider area/ Can send more signals/</i></td> </tr> <tr> <td>Gelombang radio<br/><i>Radio wave</i></td> <td>Mudah dibelaukan/ Isyarat gelombang boleh dipindahkan ke kawasan yang luas.<br/><br/><i>Easy to diffract/ Wave signals can be transferred over a wide area.</i></td> </tr> <tr> <td>Berfrekuensi tinggi<br/><i>High frequency</i></td> <td>Kuasa penembusan tinggi/ Boleh memindahkan lebih banyak isyarat dalam satu masa.<br/><br/><i>High penetration power/ Can transfer more signals at one time.</i></td> </tr> </tbody> </table> | Cadangan Proposal | Penerangan Explanation | Dipasang pada aras kedudukan tinggi dari lantai.<br><i>Install at a high-level position from the ground.</i> | Isyarat tidak dihalang/ Isyarat gelombang boleh dihantar ke kawasan yang lebih luas/Boleh menghantar lebih banyak isyarat/<br><i>The signal is not blocked/ The wave signal can be sent to a wider area/ Can send more signals/</i> | Gelombang radio<br><i>Radio wave</i> | Mudah dibelaukan/ Isyarat gelombang boleh dipindahkan ke kawasan yang luas.<br><br><i>Easy to diffract/ Wave signals can be transferred over a wide area.</i> | Berfrekuensi tinggi<br><i>High frequency</i> | Kuasa penembusan tinggi/ Boleh memindahkan lebih banyak isyarat dalam satu masa.<br><br><i>High penetration power/ Can transfer more signals at one time.</i> | 1 |
| Cadangan Proposal  | Penerangan Explanation  |   |                   |                        |  |   |                                      |   |  |   |   |
| Dipasang pada aras kedudukan tinggi dari lantai.<br><i>Install at a high-level position from the ground.</i> | Isyarat tidak dihalang/ Isyarat gelombang boleh dihantar ke kawasan yang lebih luas/Boleh menghantar lebih banyak isyarat/<br><i>The signal is not blocked/ The wave signal can be sent to a wider area/ Can send more signals/</i> |   |                   |                        |  |   |                                      |   |  |   |   |
| Gelombang radio<br><i>Radio wave</i>   | Mudah dibelaukan/ Isyarat gelombang boleh dipindahkan ke kawasan yang luas.<br><br><i>Easy to diffract/ Wave signals can be transferred over a wide area.</i>   |   |                   |                        |  |   |                                      |   |  |   |   |
| Berfrekuensi tinggi<br><i>High frequency</i>   | Kuasa penembusan tinggi/ Boleh memindahkan lebih banyak isyarat dalam satu masa.<br><br><i>High penetration power/ Can transfer more signals at one time.</i>   |   |                   |                        |  |   |                                      |   |  |   |   |
|  |   |   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   |   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   |   | 1                 |                        |  |   |                                      |   |  |   |   |
|  |   |   | 1                 |                        |  |   |                                      |   |  |   |   |

|   |  |           |
|---|--|-----------|
| Berfrekuensi tinggi<br><i>High frequency</i>                    | Kuasa penembusan tinggi/<br>Boleh memindahkan lebih<br>banyak isyarat dalam satu<br>masa.<br><br><i>High penetration power/<br/>Can transfer more signals at<br/>one time.</i>               | 1<br>1    |
| Bahan berketumpatan<br>rendah<br><i>Low density of material</i> | Mudah dialihkan/ ringan<br><i>Portable/light</i>   | 1<br>1    |
| Banyak antenna<br><i>Multiple antennas</i>                      | Kuatkan isyarat/ Menghantar<br>lebih banyak isyarat/ Meliputi<br>kawasan isyarat yang lebih luas<br><i>Strengthen the signal/ Transmit<br/>more signal/ Covered wider<br/>area of signal</i> | 1<br>1    |
| <b>JUMLAH</b>   |  | <b>20</b> |

**SELAMAT MAJU JAYA**

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