LAMPIRAN 1
ActionScript yang Digunakan dalam Media

Berikut ini adalah ActionScript yang digunakan dalam Media Pembelajaran Bilingual "LISREAD" Berbasis Komputer pada Sub Pokok Bahasan Difraksi Fraunhofer.

a. Pada tampilan utama (tampilan depan)

- ActionScript pada frame 1

```
fscommand("fullscreen",true);
```

- ActionScript pada frame 134

```
stop();
```

- ActionScript pada tiap button
  - Pada button HOME

```
on (release) {
    gotoAndPlay("home");
}
```

  - Pada button TOPICS

```
on (release) {
    gotoAndPlay("topics");
}
```

  - Pada button EXERCISE

```
on (release) {
    gotoAndPlay(159);
}
```

  - Pada button VIDEO

```
on (release) {
    gotoAndPlay("video");
}
```

  - Pada button CLOSE

```
on (release) {
    gotoAndPlay("close");
```

```
}
```

- Pada button How to use this media

```
on (release){
    gotoAndPlay("bagaimana");
}
```

- Pada button amplop

```
on (release){
    gotoAndPlay("close")
}
```

- Pada button rumah

```
on (release) {
    gotoAndPlay("home");
}
```

- Pada buton silang

```
on (press) {
    gotoAndPlay(1213);
}
```

b. Pada bagian TOPICS

- ActionScript pada frame 158

```
stop();
```

- ActionScript pada frame 254

```
stop();
```

- ActionScript pada frame 280

```
stop();
```

- ActionScript pada frame 305

```
stop();
```

- ActionScript pada frame 329

  stop();

- ActionScript pada frame 354

  stop();

- ActionScript pada frame 379

  stop();

- ActionScript pada frame 401

  stop();

- ActionScript pada frame 427

  stop();

- ActionScript pada frame 453

  stop();

- ActionScript pada frame 477

  stop();

- ActionScript pada frame 503

  stop();

- ActionScript pada frame 527

  stop();

- ActionScript pada frame 553

stop();

- ActionScript pada frame 577

  stop();

- ActionScript pada frame 602

  stop();

- ActionScript pada frame 627

  stop();

- ActionScript pada frame 652

  stop();

- ActionScript pada frame 677

  stop();

- ActionScript pada frame 702

  stop();

- ActionScript pada frame 727

  stop();

- ActionScript pada frame 752

  stop();

- ActionScript pada frame 777

  stop();

- ActionScript pada frame 802

stop();

- ActionScript pada frame 827

  stop();

- ActionScript pada frame 852
  stop();
- ActionScript pada frame 877

  stop();

- ActionScript pada frame 903

  stop();

- ActionScript pada frame 927
  stop();
- ActionScript pada frame 952

  stop();

- ActionScript pada frame 977
  stop();
- ActionScript pada frame 1002

  stop();

- ActionScript pada frame 1027

  stop();

- ActionScript pada frame 1052

  stop();

- ActionScript pada frame 1078

```
stop();
```

- ActionScript pada tiap button
  - Pada button Diffraction of the single slit

```
on (release){
    gotoAndPlay("single slit");
}
```

  - Pada button Intensity in the Single Slit Pattern

```
on (release){
    gotoAndPlay("intensity ss1");
}
```

  - Pada button The Maxiam in the Single Slit Pattern

```
on (release){
    gotoAndPlay("maxima ss1");
}
```

  - Pada button Width of the Single Slit Pattern

```
on (release) {
    gotoAndPlay("width");
}
```

  - Pada button Diffraction from a Two Slit

```
on (release){
    gotoAndPlay("two slits");
}
```

  - Pada button The Diffraction Grating

```
on (release){
    gotoAndPlay("grating");
}
```

  - Pada button  (*simple dictionary*)

```
on (press) {
    if(ing=="diffraction"){
            ind="difraksi"
            }
                    if (ing=="wave") {
                            ind="gelombang"}
```

```
if (ing=="diffracted") {
                ind="difraksi"}

if (ing=="is") {
                                ind="adalah"}


if (ing=="and") {
                                ind="dan"}

if (ing=="as") {
                                ind="sebagai"}

if (ing=="because") {
                                ind="karena"}

if (ing=="can") {
                                ind="dapat"}

if (ing=="called") {
                                ind="memanggil"}

if (ing=="difference") {
                                ind="selisih"}

if (ing=="equal") {
                                ind="sama"}
if (ing=="distorting") {
                                ind="pembelokan"}
if (ing=="because") {
                                ind="karena"}
if (ing=="through") {
                                ind="melewati"}
if (ing=="a") {
                                ind="sebuah"}
if (ing=="an") {
```

```
                                        ind="sebuah"}
if (ing=="slit") {
                                        ind="celah"}
if (ing=="each") {
                                        ind="setiap"}
if (ing=="infinitesimal") {
                                        ind="sangat kecil"}
if (ing=="part") {
                                        ind="bagian"}
if (ing=="aperture") {
                                        ind="celah"}
if (ing=="act") {
                                        ind="bertindak"}
if (ing=="source") {
                                        ind="sumber"}
if (ing=="result") {
                                        ind="hasil"}
if (ing=="pattern") {
                                        ind="pola"}
if (ing=="dark") {
                                        ind="gelap"}
if (ing=="interference") {
                                        ind="interferensi"}
if (ing=="among") {
                                        ind="diantara"}
if (ing=="emanating") {
                                        ind="keluar"}
if (ing=="new") {
                                        ind="baru"}
if (ing=="analyze") {
                                        ind="analisis"}
if (ing=="by") {
                                        ind="dengan"}
if (ing=="use") {
                                        ind="menggunakan"}
if (ing=="principal") {
```

```
                                        ind="prinsip"}
if (ing=="every") {
                                        ind="setiap"}
if (ing=="point") {
                                        ind="poin"}
if (ing=="front") {
                                        ind="depan"}
if (ing=="consider") {
                                        ind="menganggap"}
if (ing=="propagation") {
                                        ind="menyebar"}
if (ing=="if") {
                                        ind="jika"}
if (ing=="from") {
                                        ind="dari"}
if (ing=="obstacle") {
                                        ind="celah"}
if (ing=="screen") {
                                        ind="layar"}
if (ing=="far") {
                                        ind="jauh"}
if (ing=="enough") {
                                        ind="cukup"}
if (ing=="all") {
                                        ind="semua"}
if (ing=="line") {
                                        ind="garis"}
if (ing=="parallel") {
                                        ind="sejajar"}
if (ing=="phenomenon") {
                                        ind="fenomena"}
if (ing=="field") {
                                        ind="medan"}
if (ing=="according") {
                                        ind="menurut"}
if (ing=="geometric") {
```

```
                                        ind="geometris"}
if (ing=="optics") {
                                        ind="optika"}
if (ing=="transmit") {
                                        ind="transmisi"}
if (ing=="beam") {
                                        ind="sinar"}
if (ing=="should") {
                                        ind="seharusnya"}
if (ing=="have") {
                                        ind="mempunyai"}
if (ing=="same") {
                                        ind="sama"}
if (ing=="section") {
                                        ind="bagian"}
if (ing=="figure") {
                                        ind="gambar"}
if (ing=="what") {
                                        ind="apa"}
if (ing=="actually") {
                                        ind="kenyataannya"}
if (ing=="observe") {
                                        ind="mengamati"}
if (ing=="observed") {
                                        ind="diamati"}
if (ing=="show") {
                                        ind="menunjukkan"}
if (ing=="shown") {
                                        ind="ditunjukkan"}
if (ing=="spread") {
                                        ind="menyebar"}
if (ing=="out") {
                                        ind="keluar"}
if (ing=="vertical") {
                                        ind="vertikal"}
if (ing=="after") {
```

```
                                        ind="setelah"}
if (ing=="consist") {
                                        ind="terdiri"}
if (ing=="central") {
                                        ind="pusat"}
if (ing=="bright") {
                                        ind="terang"}
if (ing=="band") {
                                        ind="pita"}
if (ing=="may") {
                                        ind="mungkin"}
if (ing=="broader") {
                                        ind="lebih lebar"}
if (ing=="width") {
                                        ind="lebar"}
if (ing=="bordered") {
                                        ind="dibatasi"}
if (ing=="alternating") {
                                        ind="bergantian"}
if (ing=="with") {
                                        ind="dengan"}
if (ing=="rapidly") {
                                        ind="dengan cepat"}
if (ing=="dcreasing") {
                                        ind="berkurang"}
if (ing=="decrease") {
                                        ind="berkurang"}
if (ing=="increasing") {
                                        ind="meningkat"}
if (ing=="increase") {
                                        ind="meningkat"}
if (ing=="intensity") {
                                        ind="intensitas"}
if (ing=="view") {
                                        ind="pandangan"}
if (ing=="setup") {
```

```
                                        ind="susunan eksperimen"}
if (ing=="long") {
                                        ind="panjang"}
if (ing=="slide") {
                                        ind="sisi"}
if (ing=="perpendicular") {
                                        ind="tegak lurus"}
if (ing=="plane") {
                                        ind="bidang"}
if (ing=="incident") {
                                        ind="memasuki"}
if (ing=="left") {
                                        ind="kiri"}
if (ing=="element") {
                                        ind="elemen"}
if (ing=="area") {
                                        ind="kawasan"}
if (ing=="opening") {
                                        ind="bukaan"}
if (ing=="secondary") {
                                        ind="sekunder"}
if (ing=="imagine") {
                                        ind="membayangkan"}
if (ing=="dividing") {
                                        ind="membagi"}
if (ing=="devide") {
                                        ind="membagi"}
if (ing=="into") {
                                        ind="menjadi"}
if (ing=="several") {
                                        ind="beberapa"}
if (ing=="narrow") {
                                        ind="sempit"}
if (ing=="strip") {
                                        ind="pita"}
if (ing=="equal") {
```

```
                                        ind="sama"}
if (ing=="edge") {
                                        ind="tepi"}
if (ing=="page") {
                                        ind="halaman"}
if (ing=="placed") {
                                        ind="ditempatkan"}
if (ing=="right") {
                                        ind="kanan"}
if (ing=="resultant") {
                                        ind="resultan"}
if (ing=="calculate") {
                                        ind="menghitung"}
if (ing=="add") {
                                        ind="menambah"}
if (ing=="adding") {
                                        ind="menambah"}
if (ing=="contribution") {
                                        ind="kontribusi"}
if (ing=="individual") {
                                        ind="individu"}
if (ing=="wavelength") {
                                        ind="panjang gelombang"}
if (ing=="wavelet") {
                                        ind="gelombang kecil"}
if (ing=="account") {
                                        ind="memperhitungkan"}
if (ing=="phase") {
                                        ind="fase"}
if (ing=="amplitude") {
                                        ind="amplitudo"}
if (ing=="assume") {
                                        ind="menganggap"}
if (ing=="ray") {
                                        ind="sinar"}
if (ing=="equivalent") {
```

```
                                        ind="sama"}
if (ing=="situation") {
                                        ind="situasi"}
if (ing=="lens") {
                                        ind="lensa"}
if (ing=="form") {
                                        ind="bentuk"}
if (ing=="reduced") {
                                        ind="tereduksi"}
if (ing=="light") {
                                        ind="cahaya"}
if (ing=="path") {
                                        ind="lintasan"}
if (ing=="introduce") {
                                        ind="mengalami"}
if (ing=="shift") {
                                        ind="pergeseran"}
if (ing=="additional") {
                                        ind="tambahan"}
if (ing=="problem") {
                                        ind="masalah"}
if (ing=="first") {
                                        ind="pertama"}
if (ing=="consider") {
                                        ind="tinjau"}
if (ing=="ray") {
                                        ind="sinar"}
if (ing=="just") {
                                        ind="hanya"}
if (ing=="below") {
                                        ind="dibawah"}
if (ing=="top") {
                                        ind="atas"}
if (ing=="drawing") {
                                        ind="gambar"}
if (ing=="difference") {
```

```
                                        ind="berbeda"}
if (ing=="length") {
                                        ind="panjang"}
if (ing=="angle") {
                                        ind="sudut"}
if (ing=="between") {
                                        ind="diantara"}
if (ing=="suppose") {
                                        ind="misal"}
if (ing=="hapens") {
                                        ind="terjadi"}
if (ing=="arrives") {
                                        ind="datang"}
if (ing=="half") {
                                        ind="setengah"}
if (ing=="cancellation") {
                                        ind="meniadakan"}
if (ing=="two") {
                                        ind="dua"}
if (ing=="immediately") {
                                        ind="langsung"}
if (ing=="every") {
                                        ind="setiap"}
if (ing=="fact") {
                                        ind="kennyataan"}
if (ing=="cancels") {
                                        ind="meniadakan"}
if (ing=="corresponding") {
                                        ind="bersangkutan"}
if (ing=="bottom") {
                                        ind="bawah"}
if (ing=="complete") {
                                        ind="lengkap"}
if (ing=="for") {
                                        ind="untuk"}
if (ing=="combined") {
```

```
                                        ind="digabungkan"}
if (ing=="entire") {
                                        ind="seluruh"}
if (ing=="giving") {
                                        ind="memberikan"}
if (ing=="fringe") {
                                        ind="frinji"}
if (ing=="whenever") {
                                        ind="bilamana"}
if (ing=="occur") {
                                        ind="terjadi"}
if (ing=="from") {
                                        ind="dari"}
if (ing=="plus") {
                                        ind="tambah"}
if (ing=="minus") {
                                        ind="kurang"}
if (ing=="sign") {
                                        ind="dalam"}
if (ing=="equation") {
                                        ind="persamaan"}
if (ing=="says") {
                                        ind="berkata"}
if (ing=="symmetrical") {
                                        ind="simetris"}
if (ing=="above") {
                                        ind="diatas"}
if (ing=="travels") {
                                        ind="menjalani"}
if (ing=="farther") {
                                        ind="lebih jauh"}
if (ing=="right") {
                                        ind="kanan"}
if (ing=="left") {
                                        ind="kiri"}
if (ing=="divided") {
```

```
                                        ind="dibagi"}
if (ing=="quarter") {
                                        ind="empat"}
if (ing=="sixth") {
                                        ind="enam"}
if (ing=="so on") {
                                        ind="sebagainya"}
if (ing=="use") {
                                        ind="menggunakan"}
if (ing=="argument") {
                                        ind="pernyataan"}
if (ing=="condition") {
                                        ind="syarat"}
if (ing=="thus") {
                                        ind="jadi"}
if (ing=="order") {
                                        ind="berorde"}
if (ing=="often") {
                                        ind="sering"}
if (ing=="small") {
                                        ind="kecil"}
if (ing=="typical") {
                                        ind="khusus"}
if (ing=="approximation") {
                                        ind="pendekatan"}
if (ing=="approximate") {
                                        ind="pendekatan"}
if (ing=="ray") {
                                        ind="sinar"}
if (ing=="case") {
                                        ind="kasus"}
if (ing=="distance") {
                                        ind="jarak"}
if (ing=="center") {
                                        ind="pusat"}
if (ing=="vertical") {
```

```
                                    ind="vertikal"}
if (ing=="distribution") {
                                    ind="distribusi"}
if (ing=="single") {
                                    ind="tunggal"}
if (ing=="phasor") {
                                    ind="fasor"}
if (ing=="addition") {
                                    ind="penambahan"}
if (ing=="method") {
                                    ind="metode"}
if (ing=="derived") {
                                    ind="diturunkan"}
if (ing=="represent") {
                                    ind="menyatakan"}
if (ing=="sinusoidally") {
                                    ind="sinusoidal"}
if (ing=="magnitude") {
                                    ind="besaran"}
if (ing=="vector") {
                                    ind="vektor"}
if (ing=="sum") {
                                    ind="jumlah"}
if (ing=="proportional") {
                                    ind="sebanding"}
if (ing=="negligible") {
                                    ind="diabaikan"}
if (ing=="essentially") {
                                    ind="pada dasarnnya"}
if (ing=="denote") {
                                    ind="dinyatakan"}
if (ing=="illustration") {
                                    ind="lustrasi"}
if (ing=="now") {
                                    ind="sekarang"}
if (ing=="different") {
```

```
                                    ind="berbeda"}
if (ing=="corresponding") {
                                    ind="bersangkutan"}
if (ing=="adjacent") {
                                    ind="berdekatan"}
if (ing=="diagram") {
                                    ind="diagram"}
if (ing=="some") {
                                    ind="beberapa"}
if (ing=="perimeter") {
                                    ind="garis keliling"}
if (ing=="many") {
                                    ind="banyak"}
if (ing=="sided") {
                                    ind="sisi"}
if (ing=="side") {
                                    ind="sisi"}
if (ing=="polygon") {
                                    ind="poligon"}
if (ing=="electric") {
                                    ind="listrik"}
if (ing=="chord") {
                                    ind="tali busur"}
if (ing=="total") {
                                    ind="jumlah"}
if (ing=="many") {
                                    ind="banyak"}
if (ing=="narrow") {
                                    ind="sempit"}
if (ing=="narrower") {
                                    ind="sempit"}
if (ing=="curved") {
                                    ind="melengkung"}
if (ing=="trail") {
                                    ind="jejak"}
if (ing=="arc") {
```

```
                                        ind="busur"}
if (ing=="circle") {
                                        ind="lingkaran"}
if (ing=="found") {
                                        ind="ditemukan"}
if (ing=="constructing") {
                                        ind="membangun"}
if (ing=="relationship") {
                                        ind="berhubungan"}
if (ing=="among") {
                                        ind="diantara"}
if (ing=="infinite") {
                                        ind="tak berhingga"}
if (ing=="number") {
                                        ind="jumlah"}
if (ing=="infinitesimally") {
                                        ind="sangat kecil"}
if (ing=="square") {
                                        ind="persegi"}
if (ing=="give") {
                                        ind="memberi"}
if (ing=="given") {
                                        ind="diberikan"}
if (ing=="straight-ahead") {
                                        ind="lurus ke depan"}
if (ing=="express") {
                                        ind="menyatakan"}
if (ing=="quantities") {
                                        ind="kuantitas"}
if (ing=="middle") {
                                        ind="tengah"}
if (ing=="twice") {
                                        ind="kedua"}
if (ing=="plotted") {
                                        ind="digambarkan"}
if (ing=="photograph") {
```

```
                                        ind="potret"}
if (ing=="note") {
                                        ind="catatan"}
if (ing=="peak") {
                                        ind="puncak"}
if (ing=="numerator") {
                                        ind="pembilang"}
if (ing=="zero") {
                                        ind="nol"}
if (ing=="agrees") {
                                        ind="sesuai"}
if (ing=="previous") {
                                        ind="sebelumnya"}
if (ing=="again") {
                                        ind="lagi"}
if (ing=="minimum") {
                                        ind="minimum"}
if (ing=="maximum") {
                                        ind="maksimum"}
if (ing=="maxima") {
                                        ind="maksimum"}
if (ing=="rule") {
                                        ind="aturan"}
if (ing=="position") {
                                        ind="posisi"}
if (ing=="sine") {
                                        ind="sinus"}
if (ing=="function") {
                                        ind="fungsi"}
if (ing=="reaches") {
                                        ind="mencapai"}
if (ing=="general") {
                                        ind="umum"}
if (ing=="or") {
                                        ind="atau"}
if (ing=="correct") {
```

```
                                        ind="benar"}
if (ing=="factor") {
                                        ind="faktor"}
if (ing=="denominator") {
                                        ind="penyebut"}
if (ing=="precise") {
                                        ind="tepat"}
if (ing=="derivative") {
                                        ind="turunan"}
if (ing=="find") {
                                        ind="menemukan"}
if (ing=="minima") {
                                        ind="minimal"}
if (ing=="solved") {
                                        ind="diselesaikan"}
if (ing=="near") {
                                        ind="dekat"}
if (ing=="actual") {
                                        ind="nyata"}
if (ing=="actually") {
                                        ind="kenyataannya"}
if (ing=="error") {
                                        ind="kesalahan"}
if (ing=="vanishes") {
                                        ind="lenyap"}
if (ing=="substitute") {
                                        ind="mensubstitusikan"}
if (ing=="less") {
                                        ind="kurang"}
if (ing=="ratio") {
                                        ind="rasio"}
if (ing=="graphs") {
                                        ind="grafik"}
if (ing=="beside") {
                                        ind="disamping"}
if (ing=="realistic") {
```

```
                                    ind="realistis"}
if (ing=="finite") {
                                    ind="berhingga"}
if (ing=="comparison") {
                                    ind="membandingkan"}
if (ing=="lebeled") {
                                    ind="ditandai"}
if (ing=="integer") {
                                    ind="bilangan bulat"}
if (ing=="great") {
                                    ind="besar"}
if (ing=="widen") {
                                    ind="melebarkan"}
if (ing=="separated") {
                                    ind="terpisah"}
if (ing=="missing") {
                                    ind="hilang"}
if (ing=="coincide") {
                                    ind="bertepatan"}
if (ing=="seen") {
                                    ind="terlihat"}
if (ing=="produce") {
                                    ind="menghasilakan"}
if (ing=="produced") {
                                    ind="dihasilkan"}
if (ing=="constructive") {
                                    ind="konstruktif"}
if (ing=="means") {
                                    ind="berarti"}
if (ing=="reinforcement") {
                                    ind="penguatan"}
if (ing=="resemble") {
                                    ind="menyerupai"}
if (ing=="pair") {
                                    ind="pasangan"}
if (ing=="height") {
```

```
                                    ind="tinggi"}
if (ing=="grating") {
                                    ind="kisi"}
if (ing=="transmission") {
                                    ind="transmisi"}
if (ing=="perpendicular") {
                                    ind="tegak lurus"}
if (ing=="contain") {
                                    ind="terdiri dari"}
if (ing=="illuminated") {
                                    ind="disinari"}
if (ing=="monochromatic") {
                                    ind="monokromatik"}
if (ing=="sharp") {
                                    ind="sederet"}
if (ing=="continuous") {
                                    ind="kontinu"}
if (ing=="spectrum") {
                                    ind="spektrum"}
                                    }
```

- Pada button  (*pronunciation of simple dictionary*)

```
on (press) {
    if (ing=="diffracted") {
            diffracted.gotoAndPlay("play");
    }
    if(ing=="diffraction"){
            diffraction.gotoAndPlay("play");
    }
                if (ing=="wave") {
                        wave.gotoAndPlay("play");
    }
```

```
if (ing=="is") {
                                        is.gotoAndPlay("play");
    }
if (ing=="and") {
    and1.gotoAndPlay("play");
    }
if (ing=="as") {
                                        as.gotoAndPlay("play");
    }
if (ing=="because") {
                                        because.gotoAndPlay("play");
    }
if (ing=="can") {
                                        can.gotoAndPlay("play");
    }
if (ing=="called") {
                                        called.gotoAndPlay("play");
    }
if (ing=="difference") {

    difference.gotoAndPlay("play");
    }
if (ing=="equal") {
                                        equal.gotoAndPlay("play");
    }
if (ing=="distorting") {

    distorting.gotoAndPlay("play");
    }
if (ing=="because") {
                                        because.gotoAndPlay("play");
    }
if (ing=="through") {
                                        through.gotoAndPlay("play");
    }
if (ing=="a") {
```

```
                                    a.gotoAndPlay("play");
        }
if (ing=="an") {
                                    an.gotoAndPlay("play");
        }
if (ing=="slit") {
                                    slit.gotoAndPlay("play");
        }
if (ing=="each") {
                                    each.gotoAndPlay("play");
        }
if (ing=="infinitesimal") {

        infinitesimal.gotoAndPlay("play");
        }
if (ing=="part") {
                                    part.gotoAndPlay("play");
        }
if (ing=="aperture") {
                                    aperture.gotoAndPlay("play");
        }
if (ing=="act") {
                                    act.gotoAndPlay("play");
        }
if (ing=="source") {
                                    source1.gotoAndPlay("play");
        }
if (ing=="result") {
                                    result1.gotoAndPlay("play");
        }
if (ing=="pattern") {
                                    pattern.gotoAndPlay("play");
        }
if (ing=="dark") {
                                    dark.gotoAndPlay("play");
        }
```

```
if (ing=="interference") {

      interference.gotoAndPlay("play");
      }
if (ing=="among") {
                                    among.gotoAndPlay("play");
      }
if (ing=="emanating") {

      emanating.gotoAndPlay("play");
      }
if (ing=="new") {
                                    new1.gotoAndPlay("play");
      }
if (ing=="analyze") {
                                    analyze.gotoAndPlay("play");
      }
if (ing=="by") {
                                    by.gotoAndPlay("play");
      }
if (ing=="use") {
                                    use.gotoAndPlay("play");
      }
if (ing=="principal") {
                                    principal.gotoAndPlay("play");
      }
if (ing=="every") {
                                    every.gotoAndPlay("play");
      }
if (ing=="point") {
                                    point.gotoAndPlay("play");
      }
if (ing=="front") {
                                    front.gotoAndPlay("play");
      }
if (ing=="consider") {
```

```
                                        consider.gotoAndPlay("play");
        }
if (ing=="propagation") {

        propagation.gotoAndPlay("play");
        }
if (ing=="if") {
                                        if1.gotoAndPlay("play");
        }
if (ing=="from") {
                                        from.gotoAndPlay("play");
        }
if (ing=="obstacle") {
                                        obstacle.gotoAndPlay("play");
        }
if (ing=="screen") {
                                        screen.gotoAndPlay("play");
        }
if (ing=="far") {
                                        far.gotoAndPlay("play");
        }
if (ing=="enough") {
                                        enough.gotoAndPlay("play");
        }
if (ing=="all") {
                                        all.gotoAndPlay("play");
        }
if (ing=="line") {
                                        line.gotoAndPlay("play");
        }
if (ing=="parallel") {
                                        parallel.gotoAndPlay("play");
        }
if (ing=="phenomenon") {

        phenomenon.gotoAndPlay("play");
```

```
        }
if (ing=="field") {
                                        field.gotoAndPlay("play");
        }
if (ing=="according") {

        according.gotoAndPlay("play");
        }
if (ing=="geometric") {

        geometric.gotoAndPlay("play");
        }
if (ing=="optics") {
                                        optics.gotoAndPlay("play");
        }
if (ing=="transmit") {
                                        transmit.gotoAndPlay("play");
        }
if (ing=="beam") {
                                        beam.gotoAndPlay("play");
        }
if (ing=="should") {
                                        should.gotoAndPlay("play");
        }
if (ing=="have") {
                                        have.gotoAndPlay("play");
        }
```

```
if (ing=="same") {
                                same.gotoAndPlay("play");
    }
if (ing=="section") {
                                section.gotoAndPlay("play");
    }
if (ing=="figure") {
                                figure.gotoAndPlay("play");
    }
if (ing=="what") {
                                what.gotoAndPlay("play");
    }
if (ing=="actually") {
                                actually.gotoAndPlay("play");
    }
if (ing=="observe") {
                                observe.gotoAndPlay("play");
    }
if (ing=="observed") {

    observed.gotoAndPlay("play");
    }
if (ing=="show") {
                                show1.gotoAndPlay("play");
    }
if (ing=="shown") {
                                shown.gotoAndPlay("play");
```

```
        }
if (ing=="spread") {
                                        spread.gotoAndPlay("play");
        }
if (ing=="out") {
                                        out.gotoAndPlay("play");
        }
if (ing=="vertical") {
                                        vertical.gotoAndPlay("play");
        }
if (ing=="after") {
                                        aftter.gotoAndPlay("play");
        }
if (ing=="consist") {
                                        consist.gotoAndPlay("play");
        }
if (ing=="central") {
                                        central.gotoAndPlay("play");
        }
if (ing=="bright") {
                                        bright.gotoAndPlay("play");
        }
if (ing=="band") {
                                        band.gotoAndPlay("play");
        }
if (ing=="may") {
                                        may.gotoAndPlay("play");
```

```
        }
if (ing=="broader") {
                                broader.gotoAndPlay("play");
        }
if (ing=="width") {
                                width1.gotoAndPlay("play");
        }
if (ing=="bordered") {
                                bordered.gotoAndPlay("play");
        }
if (ing=="alternating") {

        alternating.gotoAndPlay("play");
        }
if (ing=="with") {
                                with1.gotoAndPlay("play");
        }
if (ing=="rapidly") {
                                rapidly.gotoAndPlay("play");
        }
if (ing=="decreasing") {

        decreasing.gotoAndPlay("play");
        }
if (ing=="decrease") {
                                decrease.gotoAndPlay("play");
        }
```

```
if (ing=="increasing") {

    increasing.gotoAndPlay("play");
    }
if (ing=="increase") {
                                increase.gotoAndPlay("play");
    }
if (ing=="intensity") {
                                intensity.gotoAndPlay("play");
    }
if (ing=="view") {
                                view.gotoAndPlay("play");
    }
if (ing=="setup") {
                                setup.gotoAndPlay("play");
    }
if (ing=="long") {
                                long.gotoAndPlay("play");
    }
if (ing=="slide") {
                                slide.gotoAndPlay("play");
    }
if (ing=="perpendicular") {

    perpendicular.gotoAndPlay("play");
    }
if (ing=="plane") {
```

```
                                    plane.gotoAndPlay("play");
        }
if (ing=="incident") {
                                    incident.gotoAndPlay("play");
        }
if (ing=="left") {
                                    left.gotoAndPlay("play");
        }
if (ing=="element") {
                                    element.gotoAndPlay("play");
        }
if (ing=="area") {
                                    area.gotoAndPlay("play");
        }
if (ing=="opening") {
                                    opening.gotoAndPlay("play");
        }
if (ing=="secondary") {

        secondary.gotoAndPlay("play");
        }
if (ing=="imagine") {
                                    imagine.gotoAndPlay("play");
        }
if (ing=="dividing") {
                                    dividing.gotoAndPlay("play");
        }
```

```
if (ing=="devide") {
                    divide.gotoAndPlay("play");
    }
if (ing=="into") {
                    into.gotoAndPlay("play");
    }
if (ing=="several") {
                    several.gotoAndPlay("play");
    }
if (ing=="narrow") {
                    narrow.gotoAndPlay("play");
    }
if (ing=="strip") {
                    strip.gotoAndPlay("play");
    }
if (ing=="equal") {
                    equal.gotoAndPlay("play");
    }
if (ing=="edge") {
                    edge.gotoAndPlay("play");
    }
if (ing=="page") {
                    page.gotoAndPlay("play");
    }
if (ing=="placed") {
                    placed.gotoAndPlay("play");
    }
```

```
if (ing=="right") {
                                    right.gotoAndPlay("play");
    }
if (ing=="resultant") {
                                    resultant.gotoAndPlay("play");
    }
if (ing=="calculate") {
                                    calculate.gotoAndPlay("play");
    }
if (ing=="add") {
                                    add1.gotoAndPlay("play");
    }
if (ing=="adding") {
                                    adding.gotoAndPlay("play");
    }
if (ing=="contribution") {

    contribution.gotoAndPlay("play");
    }
if (ing=="individual") {

    individual.gotoAndPlay("play");
    }
if (ing=="wavelength") {

    wavelength.gotoAndPlay("play");
    }
```

```
if (ing=="wavelet") {
                                    wavelet.gotoAndPlay("play");
    }
if (ing=="account") {
                                    account.gotoAndPlay("play");
    }
if (ing=="phase") {
                                    phase.gotoAndPlay("play");
    }
if (ing=="amplitude") {

    amplitude.gotoAndPlay("play");
    }
if (ing=="assume") {
                                    assume.gotoAndPlay("play");
    }
if (ing=="ray") {
                                    ray.gotoAndPlay("play");
    }
if (ing=="equivalent") {

    equivalent.gotoAndPlay("play");
    }
if (ing=="situation") {
                                    situation.gotoAndPlay("play");
    }
if (ing=="lens") {
```

```
                                    lens.gotoAndPlay("play");
        }
if (ing=="form") {
                                    form.gotoAndPlay("play");
        }
if (ing=="reduced") {
                                    reduced.gotoAndPlay("play");
        }
if (ing=="light") {
                                    light.gotoAndPlay("play");
        }
if (ing=="path") {
                                    path.gotoAndPlay("play");
        }
if (ing=="introduce") {

        introduce.gotoAndPlay("play");
        }
if (ing=="shift") {
                                    shift.gotoAndPlay("play");
        }
if (ing=="additional") {

        additional.gotoAndPlay("play");
        }
if (ing=="problem") {
                                    problem.gotoAndPlay("play");
```

```
        }
if (ing=="first") {
                                        first1.gotoAndPlay("play");
        }
if (ing=="consider") {
                                        condider.gotoAndPlay("play");
        }
if (ing=="ray") {
                                        ray.gotoAndPlay("play");
        }
if (ing=="just") {
                                        just.gotoAndPlay("play");
        }
if (ing=="below") {
                                        below.gotoAndPlay("play");
        }
if (ing=="top") {
                                        top.gotoAndPlay("play");
        }
if (ing=="drawing") {
                                        drawing.gotoAndPlay("play");
        }
if (ing=="difference") {

        difference.gotoAndPlay("play");
        }
if (ing=="length") {
```

```
                                    length.gotoAndPlay("play");
        }
if (ing=="angle") {
                                    angle.gotoAndPlay("play");
        }
if (ing=="between") {
                                    between.gotoAndPlay("play");
        }
if (ing=="suppose") {
                                    suppose.gotoAndPlay("play");
        }
if (ing=="hapens") {
                                    hapens.gotoAndPlay("play");
        }
if (ing=="arrives") {
                                    arrives.gotoAndPlay("play");
        }
if (ing=="half") {
                                    half.gotoAndPlay("play");
        }
if (ing=="cancellation") {

        cancellation.gotoAndPlay("play");
        }
if (ing=="two") {
                                    two.gotoAndPlay("play");
        }
```

```
if (ing=="immediately") {

    immadiately.gotoAndPlay("play");
    }
if (ing=="every") {
                                every.gotoAndPlay("play");
    }
if (ing=="fact") {
                                fact.gotoAndPlay("play");
    }
if (ing=="cancels") {
                                cancels.gotoAndPlay("play");
    }
if (ing=="corresponding") {

    corresponding.gotoAndPlay("play");
    }
if (ing=="bottom") {
                                bottom.gotoAndPlay("play");
    }
if (ing=="complete") {

    complete1.gotoAndPlay("play");
    }
if (ing=="for") {
                                for1.gotoAndPlay("play");
    }
```

```
if (ing=="combined") {

    combined.gotoAndPlay("play");
    }
if (ing=="entire") {
                                    entire.gotoAndPlay("play");
    }
if (ing=="giving") {
                                    giving.gotoAndPlay("play");
    }
if (ing=="fringe") {
                                    fringe.gotoAndPlay("play");
    }
if (ing=="whenever") {

    whenever.gotoAndPlay("play");
    }
if (ing=="occur") {
                                    occur.gotoAndPlay("play");
    }
if (ing=="from") {
                                    from.gotoAndPlay("play");
    }
if (ing=="plus") {
                                    plus.gotoAndPlay("play");
    }
if (ing=="minus") {
```

```
                                    minus.gotoAndPlay("play");
        }
if (ing=="sign") {
                                    sign.gotoAndPlay("play");
        }
if (ing=="equation") {
                                    equation.gotoAndPlay("play");
        }
if (ing=="says") {
                                    says.gotoAndPlay("play");
        }
if (ing=="symmetrical") {

        symmetrical.gotoAndPlay("play");
        }
if (ing=="above") {
                                    above.gotoAndPlay("play");
        }
if (ing=="travels") {
                                    travels.gotoAndPlay("play");
        }
if (ing=="farther") {
                                    farther.gotoAndPlay("play");
        }
if (ing=="right") {
                                    right.gotoAndPlay("play");
        }
```

```
if (ing=="left") {
                                    left.gotoAndPlay("play");
    }
if (ing=="divided") {
                                    divided.gotoAndPlay("play");
    }
if (ing=="quarter") {
                                    quarter.gotoAndPlay("play");
    }
if (ing=="sixth") {
                                    sixth.gotoAndPlay("play");

    }
if (ing=="use") {
                                    use.gotoAndPlay("play");
    }
if (ing=="argument") {

    argument.gotoAndPlay("play");
    }
if (ing=="condition") {

    condition.gotoAndPlay("play");
    }
if (ing=="thus") {
                                    thus.gotoAndPlay("play");
    }
```

```
if (ing=="order") {
                                    order.gotoAndPlay("play");
    }
if (ing=="often") {
                                    often.gotoAndPlay("play");
    }
if (ing=="small") {
                                    small.gotoAndPlay("play");
    }
if (ing=="typical") {
                                    typical.gotoAndPlay("play");
    }
if (ing=="approximation") {

    approximation.gotoAndPlay("play");
    }
if (ing=="approximate") {

    approximate.gotoAndPlay("play");
    }
if (ing=="ray") {
                                    ray.gotoAndPlay("play");
    }
if (ing=="case") {
                                    case1.gotoAndPlay("play");
    }
if (ing=="distance") {
```

```
                                    distance.gotoAndPlay("play");
        }
if (ing=="center") {
                                    center.gotoAndPlay("play");
        }
if (ing=="vertical") {
                                    vertical.gotoAndPlay("play");
        }
if (ing=="distribution") {

        distribution.gotoAndPlay("play");
        }
if (ing=="single") {
                                    single.gotoAndPlay("play");
        }
if (ing=="phasor") {
                                    phasor.gotoAndPlay("play");
        }
if (ing=="addition") {
                                    addition.gotoAndPlay("play");
        }
if (ing=="method") {
                                    method.gotoAndPlay("play");
        }
if (ing=="derived") {
                                    derived.gotoAndPlay("play");
        }
```

```
if (ing=="represent") {

    represent.gotoAndPlay("play");
    }
if (ing=="sinusoidally") {

    sinusoidally.gotoAndPlay("play");
    }
if (ing=="magnitude") {

    magnitude.gotoAndPlay("play");
    }
if (ing=="vector") {
                                vector.gotoAndPlay("play");
    }
if (ing=="sum") {
                                sum.gotoAndPlay("play");
    }
if (ing=="proportional") {

    proportional.gotoAndPlay("play");
    }
if (ing=="negligible") {

    negligible.gotoAndPlay("play");
    }
if (ing=="essentially") {

    essentially.gotoAndPlay("play");
    }
if (ing=="denote") {
                                denote.gotoAndPlay("play");
    }
if (ing=="illustration") {

    illustration.gotoAndPlay("play");
```

```
        }
if (ing=="now") {
                                        now.gotoAndPlay("play");
        }
if (ing=="different") {
                                        different.gotoAndPlay("play");
        }
if (ing=="corresponding") {

        corresponding.gotoAndPlay("play");
        }
if (ing=="adjacent") {
                                        adjacent.gotoAndPlay("play");
        }
if (ing=="diagram") {
                                        diagram.gotoAndPlay("play");
        }
if (ing=="some") {
                                        some.gotoAndPlay("play");
        }
if (ing=="perimeter") {

        perimeter.gotoAndPlay("play");
        }
if (ing=="many") {
                                        many.gotoAndPlay("play");
        }
if (ing=="sided") {
                                        sided.gotoAndPlay("play");
        }
if (ing=="side") {
                                        side.gotoAndPlay("play");
        }
if (ing=="polygon") {
                                        polygon.gotoAndPlay("play");
        }
```

```
if (ing=="electric") {
                                        electric.gotoAndPlay("play");
      }
if (ing=="chord") {
                                        chord.gotoAndPlay("play");
      }
if (ing=="total") {
                                        total.gotoAndPlay("play");
      }
if (ing=="many") {
                                        many.gotoAndPlay("play");
      }
if (ing=="narrow") {
                                        narrow.gotoAndPlay("play");
      }
if (ing=="narrower") {

      narrower.gotoAndPlay("play");
      }
if (ing=="curved") {
                                        curved.gotoAndPlay("play");
      }
if (ing=="trail") {
                                        trail.gotoAndPlay("play");
      }
if (ing=="arc") {
                                        arc.gotoAndPlay("play");
      }
if (ing=="circle") {
                                        circle.gotoAndPlay("play");
      }
if (ing=="found") {
                                        found.gotoAndPlay("play");
      }
if (ing=="constructing") {
```

```
	constructing.gotoAndPlay("play");
	}
if (ing=="relationship") {

	relationship.gotoAndPlay("play");
	}
if (ing=="among") {
					among.gotoAndPlay("play");
	}
if (ing=="infinite") {
					infinite.gotoAndPlay("play");
	}
if (ing=="number") {
					number.gotoAndPlay("play");
	}
if (ing=="infinitesimally") {

	infinitesimally.gotoAndPlay("play");
	}
if (ing=="square") {
					square.gotoAndPlay("play");
	}
if (ing=="give") {
					give.gotoAndPlay("play");
	}
if (ing=="given") {
					given.gotoAndPlay("play");
	}
if (ing=="straight-ahead") {
					straight-
ahead.gotoAndPlay("play");
	}
if (ing=="express") {
					express.gotoAndPlay("play");
	}
```

```
if (ing=="quantities") {

    quantities.gotoAndPlay("play");
    }
if (ing=="middle") {
                                middle.gotoAndPlay("play");
    }
if (ing=="twice") {
                                twice.gotoAndPlay("play");
    }
if (ing=="plotted") {
                                plotted.gotoAndPlay("play");
    }
if (ing=="photograph") {

    photograph.gotoAndPlay("play");
    }
if (ing=="note") {
                                note.gotoAndPlay("play");
    }
if (ing=="peak") {
                                peak.gotoAndPlay("play");
    }
if (ing=="numerator") {

    numerator.gotoAndPlay("play");
    }
if (ing=="zero") {
                                zero.gotoAndPlay("play");
    }
if (ing=="agrees") {
                                agrees.gotoAndPlay("play");
    }
if (ing=="previous") {

    previous1.gotoAndPlay("play");
```

```
        }
if (ing=="again") {
                                again.gotoAndPlay("play");
        }
if (ing=="minimum") {

        minimum1.gotoAndPlay("play");
        }
if (ing=="maximum") {

        maximum1.gotoAndPlay("play");
        }
if (ing=="maxima") {
                                maxima.gotoAndPlay("play");
        }
if (ing=="rule") {
                                rule.gotoAndPlay("play");
        }
if (ing=="position") {
                                position.gotoAndPlay("play");
        }
if (ing=="sine") {
                                sine.gotoAndPlay("play");
        }
if (ing=="function") {

        function1.gotoAndPlay("play");
        }
if (ing=="reaches") {
                                reaches.gotoAndPlay("play");
        }
if (ing=="general") {
                                general.gotoAndPlay("play");
        }
if (ing=="or") {
                                or1.gotoAndPlay("play");
```

```
        }
if (ing=="correct") {
                                        correct.gotoAndPlay("play");
        }
if (ing=="factor") {
                                        factor.gotoAndPlay("play");
        }
if (ing=="denominator") {

        denominator.gotoAndPlay("play");
        }
if (ing=="precise") {
                                        precise.gotoAndPlay("play");
        }
if (ing=="derivative") {

        derivative.gotoAndPlay("play");
        }
if (ing=="find") {
                                        find.gotoAndPlay("play");
        }
if (ing=="minima") {
                                        minima.gotoAndPlay("play");
        }
if (ing=="solved") {
                                        solved.gotoAndPlay("play");
        }
if (ing=="near") {
                                        near.gotoAndPlay("play");
        }
if (ing=="actual") {
                                        actual.gotoAndPlay("play");
        }
if (ing=="actually") {
                                        actually.gotoAndPlay("play");
        }
```

```
if (ing=="error") {
                                        error.gotoAndPlay("play");
      }
if (ing=="vanishes") {
                                        vanishes.gotoAndPlay("play");
      }
if (ing=="substitute") {

      substitute.gotoAndPlay("play");
      }
if (ing=="less") {
                                        less.gotoAndPlay("play");
      }
if (ing=="ratio") {
                                        ratio.gotoAndPlay("play");
      }
if (ing=="graphs") {
                                        graphs.gotoAndPlay("play");
      }
if (ing=="beside") {
                                        beside.gotoAndPlay("play");
      }
if (ing=="realistic") {
                                        realistic.gotoAndPlay("play");
      }
if (ing=="finite") {
                                        finite.gotoAndPlay("play");
      }
if (ing=="comparison") {

      comparison.gotoAndPlay("play");
      }
if (ing=="lebeled") {
                                        labeled.gotoAndPlay("play");
      }
if (ing=="integer") {
```

```
                                    integer.gotoAndPlay("play");
        }
if (ing=="great") {
                                    great.gotoAndPlay("play");
        }
if (ing=="widen") {
                                    widen.gotoAndPlay("play");
        }
if (ing=="separated") {

        separated.gotoAndPlay("play");
        }
if (ing=="missing") {
                                    missing.gotoAndPlay("play");
        }
if (ing=="coincide") {
                                    coincide.gotoAndPlay("play");
        }
if (ing=="seen") {
                                    seen.gotoAndPlay("play");
        }
if (ing=="produce") {
                                    produce.gotoAndPlay("play");
        }
if (ing=="produced") {

        produced.gotoAndPlay("play");
        }
if (ing=="constructive") {

        constructive.gotoAndPlay("play");
        }
if (ing=="means") {
                                    means.gotoAndPlay("play");
        }
if (ing=="reinforcement") {
```

```
        reinforcement.gotoAndPlay("play");
        }
if (ing=="resemble") {

        resemble.gotoAndPlay("play");
        }
if (ing=="pair") {
                                        pair.gotoAndPlay("play");
        }
if (ing=="height") {
                                        height1.gotoAndPlay("play");
        }
if (ing=="grating") {
                                        grating.gotoAndPlay("play");
        }
if (ing=="transmission") {

        transmission.gotoAndPlay("play");
        }
if (ing=="perpendicular") {

        perpendicular.gotoAndPlay("play");
        }
if (ing=="contain") {
                                        contain.gotoAndPlay("play");
        }
if (ing=="illuminated") {

        illuminated.gotoAndPlay("play");
        }
if (ing=="monochromatic") {

        monochromatic.gotoAndPlay("play");
        }
if (ing=="sharp") {
```

```
                                        sharp.gotoAndPlay("play");
        }
    if (ing=="continuous") {
                                        ind="kontinu"}
    if (ing=="spectrum") {

        spectrum.gotoAndPlay("play");
        }
                                        }
```

- Pada button ▶ (*Pronunciation*)

```
on (press){
        fraunhoferdiffraction.gotoAndStop("main");
    }
```

- Pada button ■

```
on (press){
    fraunhoferdiffraction.stop()
    stopAllSounds()
}
```

a. Pada bagian EXERCISE
   - ActionScript pada frame 182
     stop();
   - ActionScript pada frame 1079
     stop();
   - ActionScript pada frame 1080
     stop();
   - ActionScript pada frame 1095
     stop();
   - ActionScript pada frame 1096
     stop();
   - ActionScript pada frame 1097
     stop();
   - ActionScript pada frame 1113
     stop();

- ActionScript pada frame 1114
  stop();
- ActionScript pada frame 1115
  stop();
- ActionScript pada frame 1130
  stop();
- ActionScript pada frame 1131
  stop();
- ActionScript pada frame 1132
  stop();
- ActionScript pada frame 1147
  stop();
- ActionScript pada frame 1148
  stop();
- ActionScript pada frame 1149
  stop();
- ActionScript pada frame 1164
  stop();
- ActionScript pada frame 1165
  stop();
- ActionScript pada frame 1166
  stop();
- ActionScript pada frame 1181
  stop();
- ActionScript pada frame 1182
  stop();
- ActionScript pada frame 1183
  stop();
- ActionScript pada frame 1198
  stop();
- ActionScript pada frame 1199
  stop();
- ActionScript pada frame 1120
  stop();
- ActionScript setiap button
  - Pada button Indonesian

```
on (release){
    gotoAndPlay("indonesia 1");
}
```

- Pada button Done

```
on (press) {
    aku._visible = 0
    exf._visible = 1
    if(ans_1=="0.24"){
            komen="good job!"
            nilai =12.5
                }
    else {
            komen="incorrect"
            nilai =0
            }
}
```

- Pada button Solution

```
on (release){
    gotoAndPlay("solution 1");
}
```

- Pada button NEXT

```
on (release){
    gotoAndPlay("exercise2");
}
```

- Pada button petunjuk pengerjaan soal

```
on (release){
    gotoAndPlay(1203)
}
```

b. Pada bagian VIDEO

- ActionScript frame 206

```
stop();
```

- ActionScript pada masing-masing button
  - Pada button awal 1

```
on (release) {
    loadMovieNum("awal1.swf",1);
```

```
}
```

- Pada button Single Slit 1

```
on (release){
    loadMovieNum("singleslit1.swf",1);
}
```

- Pada button Single Slit 2

```
on (release){
    loadMovieNum("singleslit2.swf",1);
}
```

- Pada button Double Slit 1

```
on (release){
    loadMovieNum("doubleslit1.swf",1);
}
```

- Pada button Double Slit 2

```
on (release){
    loadMovieNum("doubleslit2.swf",1);
}
```

- Pada button Grating

```
on (release){
    loadMovieNum("grating.swf",1);
}
```

- Pada button Data Analyzes

```
on (release){
    gotoAndPlay("analisisss1")
        unloadMovieNum(1);
}
```

- Pada button HOME

```
on (release) {
    gotoAndPlay("home");
unloadMovieNum(1);
}
```

- Pada button TOPICS

```
on (release) {
    gotoAndPlay("topics");
unloadMovieNum(1);
}
```

- Pada button EXERCISE

```
on (release) {
    gotoAndPlay(159);
unloadMovieNum(1);
}
```

- Pada button VIDEO

```
on (release) {
    gotoAndPlay("video");
unloadMovieNum(1);
}
```

- Pada button CLOSE

```
on (release) {
    gotoAndPlay("close");
unloadMovieNum(1);
}
```

c. Pada bagian CLOSE

- ActionScript frame 230

```
stop();
```

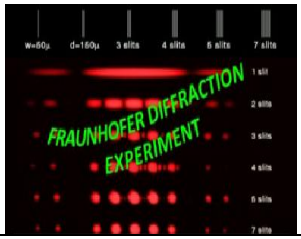
- ActionScript pada masing-masing button
  - Pada button YES

```
on (release){
fscommand("quit",true)
}
```

  - Pada button NO

```
on (release){
gotoAndPlay(99)
}
```

LAMPIRAN 2
Script Video Awal

No.	Visualisasi	Narasi
1	**CU.** CAPTION & PICTURE 	Q1. MUSIK
2	**MS.** PRESENTER ZOOM IN (TULISAN LABORATORIUM OPTIKA DAN FISIKA MODERN)	Q2. Hi, good morning How are you today? I hope you are all great Do you still remember about Fraunhofer diffraction's theory? Oke, Now we are in front of Optic and Modern Physic Laboratory Q3. Let's go!
3	**MS.** PRESENTER	Q4. Now, we are in modern physic and optic laboratory. Are you ready to do this experiment? Let's begin!
4	**MS.** PRESENTER	Q5. Some experiment that we will do are First, Single Slit Difraction Second, Double Slit Diffraction And third, grating diffraction.
5	**MS.** PRESENTER	Q6. First, we will do Single Slit of Fraunhofer diffraction experiment.
6	**MS.** PRESENTER	Q7. The purpose of this experiment are to determine the width of the slit and the wavelength of the laser which use in this experiment

7	**MS.** PRESENTER ZOOM IN: CAPTION A LASER	Q8. The apparatus that we will use are Q9. A laser
8	**CU. CAPTION** SINGLE SLIT	Q10. Single Slit
9	**CU. CAPTION** DOUBLE SLIT	Q11. Double slit
10	**CU. CAPTION** GRATING	Q12. Grating
11	**CU. CAPTION** POSITIVE LENS	Q13. Positive Lens
12	**CU. CAPTION** GAUGE	Q14. Gauge
13	**CU. CAPTION** AND OPTIC BENCH	Q15. And Optic bench

LAMPIRAN 3

Script Video Praktikum Single Slit 1

No.	Visualisasi	Narasi
1	**MS.** PRESENTER	Q1. MUSIK Q2. Now, we are already knew all about the stuff. Let we start to do experiment.
2	**CU.** CAPTION FIRST OF ALL TO DETERMINE THE WIDTH OF THE SLIT.	Q3. First of all to determine the width of the slit.
3	**MS.** PRESENTER **PAN RIGHT**. PRESENTER TO SCREEN **CU.** CAPTION STRING UP APPARATUS ON THE TABLE	Q4. String up apparatus on the table.
4	**MS.** PRESENTER **CU.** CAPTION TURN OFF THIS LAMP IN LABORATORY	Q5. Turn off this lamp in laboratory.
5	**CU.** CAPTION TURN ON THE LASER (PRAKTIKAN MENYALAKAN LASER)	Q6. Turn on the laser
6	**CU.** CAPTION POSITION THE LASER SO THAT THE LASER BEAM IS CENTERED ON THE SINGLE SLIT (PRAKTIKAN MEMPOSISIKAN LASER)	Q7. Position the laser so that the laser beam is centered on the single slit.
7	**PAN RIGHT.** LASER TO SCREEN	Q8. MUSIK
8	**CU. CAPTION** SINGLE SLIT PATTERN **ZOOM IN.** SINGLE SLIT PATTERN	Q9. MUSIK

9	**CU. CAPTION** MEASURE THE DISTANCE FROM THE SLIT TO THE SCREEN (L) **PAN RIGHT.** SLIT RO THE SCREEN	Q10. Measure the distance from the slit to the screen which is L
10	**CU. CAPTION** L = 190 CM	Q11.MUSIK
11	**CU. CAPTION** MEASURE LENGTH OF THE CENTER BRIGHT BAND (D) (PRAKTIKAN MEMBERI TANDA PADA TERANG PUSAT)	Q12. Measure length of the center bright band which is D
12	**CU. CAPTION** D = 3.7 CM	Q13. MUSIK
13	**CU. CAPTION** REPEAT THIS STEP AGAIN WITH 5 DIFFERENT DISTANCES BETWEEN THE SLIT AND THE SCREEN	Q14. Repeat this step again with 5 different distances between the slit and the screen.

LAMPIRAN 4

Script Video Praktikum Single Slit 2

No.	Visualisasi	Narasi
1	**MS.** PRESENTER **ZOOM IN.** LASER **CU.** CAPTION SINGLE SLIT DIFFRACTION	Q1. MUSIK Q2. Now we will determine the wavelength of this laser.
2	**CU.** CAPTION TURN ON THE LASER (PRAKTIKAN MENYALAKAN LASER)	Q3. Turn on the laser
3	**PAN RIGHT.** LASER TO SCREEN	Q4. MUSIK
4	**CU. CAPTION** SINGLE SLIT PATTERN **ZOOM IN.** SINGLE SLIT PATTERN	Q5. MUSIK
5	**CU. CAPTION** MEASURE LENGTH OF THE CENTER BRIGHT BAND (D) (PRAKTIKAN MEMBERI TANDA PADA TERANG PUSAT)	Q6. Measure length of the center bright band which is D
6	**CU. CAPTION** D = 4.4 CM	Q7. MUSIK
7	**CU. CAPTION** MEASURE THE DISTANCE FROM THE SLIT TO THE SCREEN (L) **PAN RIGHT.** SLIT RO THE SCREEN	Q8. Measure the distance from the slit to the screen which is L
8	**ZOOM IN.** THE GAUGE **CU. CAPTION** L = 210 CM	Q9.MUSIK

9	**CU. CAPTION** REPEAT THIS STEP AGAIN WITH 5 DIFFERENT DISTANCE BETWEEN THE SLIT AND THE SCREEN	Q10. Repeat this step again with 5 different distances between the slit and the screen.

LAMPIRAN 5

Script Video Praktikum Double Slit 1

No.	Visualisasi	Narasi
1	**CU.** CAPTION DOUBLE SLIT DIFFRACTION	Q1. MUSIK
2	**CU.** CAPTION FIRST STEP IS TURN ON THE LASER (PRAKTIKAN MENYALAKAN LASER)	Q2. First step is turn on the laser
3	**CU.** CAPTION POSITION THE LASER SO THAT THE LASER BEAM IS CENTERED ON THE DOUBLE SLIT (PRAKTIKAN MEMPOSISIKAN LASER)	Q3. Position the laser so that the laser beam is centered on the double slit.
4	**PAN RIGHT.** LASER TO SCREEN	Q4. MUSIK
5	**CU. CAPTION** DOUBLE SLIT PATTERN **ZOOM IN.** DOUBLE SLIT PATTERN	Q5. MUSIK
6	**CU. CAPTION** MEASURE LENGTH OF THE CENTER BRIGHT BAND (D) (PRAKTIKAN MEMBERI TANDA PADA TERANG PUSAT)	Q6. Measure length of the center bright band which is D
7	**CU. CAPTION** D = 6.8 CM	Q7. MUSIK
8	**CU. CAPTION** MEASURE THE DISTANCE FROM THE SLIT TO THE SCREEN (L) **PAN RIGHT.** SLIT RO THE SCREEN	Q8. Measure the distance from the slit to the screen which is L

9	**CU. CAPTION** L = 200 CM	Q9.MUSIK
10	**CU. CAPTION** REPEAT THIS STEP AGAIN WITH 5 DIFFERENT DISTANCES BETWEEN THE SLIT AND THE SCREEN	Q10. Repeat this step again with 5 different distances between the slit and the screen.

LAMPIRAN 6

Script Video Praktikum Double Slit 2

No.	Visualisasi	Narasi
1	**MS.** PRESENTER **CU.** CAPTION DOUBLE SLIT DIFFRACTION	Q1. MUSIK Q2. Now we will determine the wavelength of this laser.
2	**CU.** CAPTION TURN ON THE LASER (PRAKTIKAN MENYALAKAN LASER)	Q3. Turn on the laser
3	**PAN RIGHT.** LASER TO SCREEN	Q4. MUSIK
4	**CU. CAPTION** DOUBLE SLIT PATTERN **ZOOM IN.** DOUBLE SLIT PATTERN	Q5. MUSIK
4	**CU. CAPTION** MEASURE LENGTH OF THE CENTER BRIGHT BAND (D) (PRAKTIKAN MEMBERI TANDA PADA TERANG PUSAT)	Q6. Measure length of the center bright band which is D
5	**CU. CAPTION** D = 8.8 CM	Q7. MUSIK
6	**CU. CAPTION** MEASURE THE DISTANCE FROM THE SLIT TO THE SCREEN (L) **PAN RIGHT.** SLIT RO THE SCREEN	Q8. Measure the distance from the slit to the screen which is L
7	**ZOOM IN.** THE GAUGE **CU. CAPTION** L = 205 CM	Q9.MUSIK

8	**CU. CAPTION** REPEAT THIS STEP AGAIN WITH 5 DIFFERENT DISTANCES BETWEEN THE SLIT AND THE SCREEN	Q10. Repeat this step again with 5 different distances between the slit and the screen.

LAMPIRAN 7
Script Video Praktikum Grating

No.	Visualisasi	Narasi
1	**CU.** CAPTION GRATING DIFFRACTION	Q1. MUSIK
2	**CU.** CAPTION THE PURPOSE OF THIS EXPERIMENT IS TO DETERMINE THE WAVELENGTH OF LASER	Q2. The purpose of this experiment is to determine the wavelength of laser.
3	**CU.** CAPTION FIRST STEP IS TURN ON THE LASER (PRAKTIKAN MENYALAKAN LASER)	Q3. First step is turn on the laser
4	**CU. CAPTION** MEASURE THE DISTANCE BETWEEN FIRST BRIGHT BAND AND CENTER BRIGHT BAND (Y_1) (PRAKTIKAN MENGUKUR JARAK PITA TERANG PERTAMA KE PITA TERANG PUSAT)	Q4. Measure the distance between first bright band and center bright band (y_1)
5	**PAN RIGHT.** FIRST BRIGHT BAND TO CENTER BRIGHT BAND. **CU. CAPTION** Y_1 = 57.2 CM	Q5. MUSIK
6	**CU. CAPTION** MEASURE THE DISTANCE FROM THE SCREEN TO THE GRATING (L)	Q6. Measure the distance from the screen to the grating which is L

7	**CU. CAPTION** L = 300 CM	Q7.MUSIK
8	**CU. CAPTION** REPEAT THIS STEP AGAIN WITH 5 DIFFERENT DISTANCES BETWEEN THE GRATING AND THE SCREEN	Q8. Repeat this step again with 5 different distances between the slit and the screen.
9	**MS.** PRESENTER	Q9. Ok. We have done experiment about Fraunhofer Diffraction. We can continue to make data analysis.

LAMPIRAN 8
Angket Mahasiswa
Pengembangan Media Pembelajaran Bilingual Berbasis Komputer pada Sub Pokok Bahasan Difraksi Fraunhofer

Angket untuk mahasiswa

No.	Pernyataan	Skala				
		SS	S	R	TS	STS
1	Tidak ada kesulitan membuka program					
2	Tampilan program cukup menarik					
3	Tidak ada kesulitan mengoperasikan program					
4	Animasi gambar pada media dapat menambah pemahaman.					
5	Eksperimen yang ditampilkan video mudah dimengerti					
6	Mudah memahami istilah-istilah dalam bahasa Inggris pada materi Difraksi Fraunhofer.					
7	Mudah mengerti isi materi dalam bahasa Inggris					
8	Mempermudah *listening*					
9	Mempermudah belajar *pronunciation*					
10	Mudah memahami *reading*					

Keterangan:

SS : Sangat Setuju
S : Setuju
R : Ragu
TS : Tidak Setuju
STS : Sangat Tidak Setuju

LAMPIRAN 9

Angket Siswa

Pengembangan Media Pembelajaran Bilingual Berbasis Komputer pada Sub Pokok Bahasan Difraksi Fraunhofer

Angket untuk siswa

No.	Pernyataan	Skala				
		SS	S	R	TS	STS
1	Tidak ada kesulitan membuka program					
2	Tampilan program cukup menarik					
3	Tidak ada kesulitan mengoperasikan program					
4	Animasi gambar pada media dapat menambah pemahaman.					
5	Eksperimen yang ditampilkan video mudah dimengerti					
6	Mudah memahami istilah-istilah dalam bahasa Inggris pada materi Difraksi Fraunhofer.					
7	Mudah mengerti isi materi dalam bahasa Inggris					
8	Mempermudah *listening*					
9	Mempermudah belajar *pronunciation*					
10	Mudah memahami *reading*					

Keterangan:

SS : Sangat Setuju
S : Setuju
R : Ragu
TS : Tidak Setuju
STS : Sangat Tidak Setuju

LAMPIRAN 10

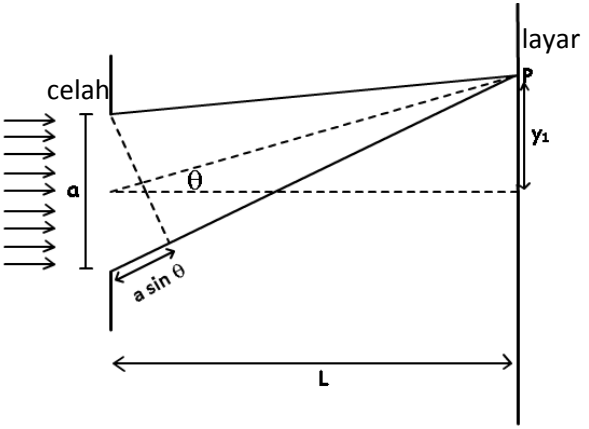
Laporan Praktikum Difraksi Fraunhofer

1. Difraksi Fraunhofer Celah Tunggal

a. Tujuan

- Menentukan lebar celah
- Menentukan panjang gelombang cahaya monokromatik (laser merah)

b. Skema Gambar Praktikum Difraksi Fraunhofer Celah Tunggal



c. Alat-Alat yang digunakan dalam Percobaan

- Laser (λ= 630 nm)
- Laser mainan
- Celah Tunggal
- Bangku Optik
- Meteran
- Mistar
- Lensa Positif

d. Pelaksanaan Percobaan

A. Menentukan Lebar Celah

1) Merangkai alat-alat seperti pada skema pada gambar praktikum Difraksi Fraunhofer dengan menggunakan laser yang telah diketahui panjang gelombangnya (λ = 630 nm).
2) Mengatur posisi laser sehingga di dapatkan pola difraksi yang jelas.
3) Mengukur jarak celah ke layar (L)
4) Mengukur panjang pita terang pusat (D)
5) Mengulangi percobaan sebanyak 5 kali dengan jarak antara celah dan layar (L) yang berbeda.

B. Menentukan Panjang Gelombang laser mainan

1) Merangkai alat-alat seperti pada skema pada gambar praktikum Difraksi Fraunhofer dengan mengganti laser mainan (laser yang tidak diketahui panjang gelombangnya)
2) Mengatur posisi laser sehingga di dapatkan pola difraksi yang jelas.
3) Mengukur jarak celah ke layar (L)
4) Mengukur panjang pita terang pusat (D)
5) Mengulangi percobaan sebanyak 5 kali dengan jarak antara celah dan layar (L) yang berbeda.

e. Data Percobaan

1) Menentukan lebar celah

$\lambda = 630$ nm

No.	D (m)	L (m)
1	0,037	1,900
2	0,033	1,969
3	0,032	1,815
4	0,032	1,762
5	0,028	1,582

2) Mentukan panjang gelombang

$a = 6{,}98925 \times 10^{-5}$ m

No.	D (m)	L (m)
1	0,044	2,1
2	0,04	2,025
3	0,039	1,967
4	0,041	2,059
5	0,047	1,982

f. Analisis Data

1) Menentukan lebar celah tunggal

λ = 630 nm

ΔL = 0.001 x 0,5 = 0,0005

ΔD = 0.0001 x 0,5 = 0,00005

Contoh Perhitungan data 1

y = D/2 = 0,037/2 = 0,0185 m

$$a = \frac{\lambda\, L}{y} = \frac{630 \cdot 10^{-7} \cdot 1{,}9}{0{,}0185} = 6{,}47 \cdot 10^{-5}\, m$$

$$\left|\frac{\partial a}{\partial L}\right| = \left|\frac{\lambda}{y}\right| = \left|\frac{630 \cdot 10^{-7}}{0{,}0185}\right| = 3{,}405 \cdot 10^{-5}$$

$$\left|\frac{\partial a}{\partial y}\right| = \left|-\frac{\lambda L}{y^2}\right| = \left|\frac{630 \cdot 10^{-7} \cdot 1{,}9}{0{,}0185^2}\right| = 0{,}003497$$

$$\text{Kesalahan mutlak} = \left|\frac{\partial a}{\partial L}\right| \cdot \Delta L + \left|\frac{\partial a}{\partial y}\right| \cdot \Delta D$$

$$= (3{,}405 \cdot 10^{-5} \cdot 0{,}0005) + (0{,}003497 \cdot 0{,}00005)$$

$$= 1{,}91899 \times 10^{-7} m$$

$$\text{Kesalahan Relatif} = \frac{Kesalahan\ mutlak}{a} \times 100\%$$

$$= \frac{1{,}91899 \times 10^{-7}}{6{,}47 \cdot 10^{-5}} \times 100\%$$

$$= 0{,}29658606\ \%$$

$$\text{Keseksamaan} = 100\% - Kesalahan\ relatif$$

$$= 100\% - 0{,}29658606$$

$$= 99{,}70341394\%$$

$$\text{Angka Berarti} = 1 - \log \frac{Kesalahan\ mutlak}{a}$$

$$= 1 - \log\left(\frac{1{,}91899 \times 10^{-7}}{6{,}47 \cdot 10^{-5}}\right)$$

$$= 3{,}527849266 \approx 3\ AB$$

Hasil perhitungan untuk kelima data percobaan

D	y	L	a	$\left\|\frac{\partial a}{\partial L}\right\|$
0,037	0,0185	1,9	6,47027E-05	3,40541E-05
0,033	0,0165	1,969	0,00007518	3,81818E-05
0,032	0,016	1,815	7,14656E-05	0,000039375
0,032	0,016	1,762	6,93788E-05	0,000039375
0,029	0,0145	1,582	6,87352E-05	4,34483E-05
			$\bar{a} = 6{,}98925$E-05	

2) Menentukan panjang gelombang laser mainan

a = 6,98925 x 10^{-5} m

ΔL = 0,001 x 0,5 = 0,0005

ΔD = 0,0001 x 0,5 = 0,00005

Contoh Perhitungan data 1

y = D/2 = 0,037/2 = 0,022 m

$$\lambda = \frac{a\ y}{L} = \frac{6{,}98925 \cdot 10^{-5} \cdot 0{,}022}{2{,}1} = 7{,}32207 \cdot 10^{-7}\ m$$

$$\left|\frac{\partial \lambda}{\partial L}\right| = \left|-\frac{a\ y}{L^2}\right| = \left|\frac{6{,}98925 \cdot 10^{-5} \cdot 0{,}022}{2{,}1^2}\right| = 1{,}5846 \cdot 10^{-5}$$

$$\left|\frac{\partial \lambda}{\partial y}\right| = \left|-\frac{a}{L}\right| = \left|-\frac{6{,}98925 \cdot 10^{-5}}{2{,}1}\right| = 3{,}32821 \cdot 10^{-5}$$

$$\text{Kesalahan mutlak} = \left|\frac{\partial\lambda}{\partial L}\right| \cdot \Delta L + \left|\frac{\partial\lambda}{\partial y}\right| \cdot \Delta D$$

$$= (1{,}5846 \cdot 10^{-5} \cdot 0{,}0005) + (3{,}32821 \cdot 10^{-5} \cdot 0{,}00005)$$

$$= 9{,}58842 \times 10^{-9} m$$

$$\text{Kesalahan Relatif} = \frac{Kesalahan\ mutlak}{\lambda} \times 100\%$$

$$= \frac{9{,}58842 \times 10^{-9}}{7{,}32207 \cdot 10^{-7}} \times 100\%$$

$$= 1{,}30952381\ \%$$

$$\text{Keseksamaan} = 100\% - Kesalahan\ relatif$$

$$= 100\% - 1{,}30952381\ \%$$

$$= 98{,}69047619\%$$

$$\text{Angka Berarti} = 1 - \log \frac{Kesalahan\ mutlak}{\lambda}$$

$$= 1 - \log\left(\frac{9{,}58842 \times 10^{-9}}{7{,}32207 \cdot 10^{-7}}\right)$$

$$= 2{,}882886601 \approx 3\ AB$$

D	y	L	λ	$\left\|\frac{\partial\lambda}{\partial L}\right\|$
0,044	0,022	2,1	7,32207E-07	1,58486E-05
0,04	0,02	2,025	6,90296E-07	1,70443E-05
0,039	0,0195	1,967	6,92884E-07	1,80643E-05
0,041	0,0205	2,059	6,95869E-07	1,64861E-05
0,047	0,0235	1,982	8,28695E-07	1,77919E-05
			$\bar{\lambda}$ =7,2799E-07	

$\left\lvert\frac{\partial\lambda}{\partial y}\right\rvert$	Kesalahan Mutlak ($\Delta\lambda$)	Kesalahan Relatif (%)	Keseksamaan (%)	AB
3,32821E-05	9,58842E-09	1,30952381	98,69047619	2,882886601
3,45148E-05	1,02479E-08	1,484567901	98,5154321	2,828399934
3,55325E-05	1,08088E-08	1,559970279	98,44002972	2,806883676
3,39449E-05	9,94029E-09	1,428469894	98,57153011	2,845128908
3,52636E-05	1,06591E-08	1,286257166	98,71374283	2,890672193
	$\overline{\Delta\lambda}$ =1,02489E-08			

g. Kesimpulan

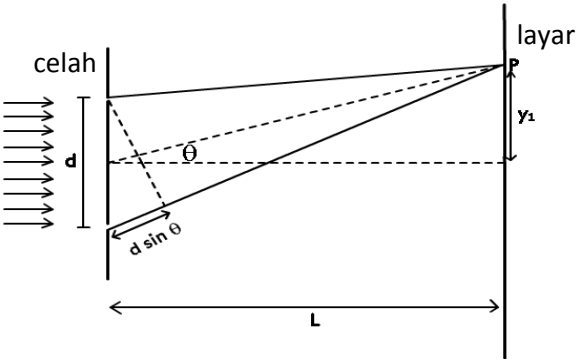
Dari perhitungan data percobaan Difraksi Fraunhofer Celah Tunggal didapatkan lebar celah rata-rata sebesar (6,99 ± 0,01) x 10^{-5} m dan panjang gelombang dari laser mainan sebesar (7,28 ± 0,10) x 10^{-7} m

2. Difraksi Fraunhofer Celah Ganda

a. Tujuan

- Menentukan jarak antara dua celah
- Menentukan panjang gelombang cahaya monokromatik (laser mainan warna merah)

b. Skema Gambar Praktikum Difraksi Fraunhofer Celah Tunggal



c. Alat-Alat yang digunakan dalam Percobaan

- Laser (λ= 630 nm)
- Laser mainan
- Celah Ganda
- Bangku Optik
- Meteran
- Mistar
- Lensa Positif

d. Pelaksanaan Percobaan

A. Menentukan Lebar Celah

1) Merangkai alat-alat seperti pada skema pada gambar praktikum Difraksi Fraunhofer dengan menggunakan laser yang telah diketahui panjang gelombangnya (λ = 630 nm).
2) Mengatur posisi laser sehingga di dapatkan pola difraksi yang jelas.
3) Mengukur jarak celah ke layar (L)

4) Mengukur panjang pita terang pusat (D)
5) Mengulangi percobaan sebanyak 5 kali dengan jarak antara celah dan layar (L) yang berbeda.

C. Menentukan Panjang Gelombang laser mainan

1) Merangkai alat-alat seperti pada skema pada gambar praktikum Difraksi Fraunhofer dengan mengganti laser mainan (laser yang tidak diketahui panjang gelombangnya)
2) Mengatur posisi laser sehingga di dapatkan pola difraksi yang jelas.
3) Mengukur jarak celah ke layar (L)
4) Mengukur panjang pita terang pusat (D)
5) Mengulangi percobaan sebanyak 5 kali dengan jarak antara celah dan layar (L) yang berbeda.

e. Data Percobaan

1) Menentukan jarak antara dua celah

$\lambda = 630$ nm

D	y	L
0,068	0,034	2
0,069	0,0345	1,96
0,065	0,0325	2,13
0,067	0,0335	2,05
0,065	0,0325	1,956

2) Menentukan panjang gelombang laser mainan

D	y	L
0,088	0,044	2,05
0,083	0,0415	2,087
0,09	0,045	2,012
0,084	0,042	2,059
0,089	0,0445	1,982

f. Analisis Data

1) Menetukan jarak antara dua celah

λ = 630 nm

ΔL = 0,001 x 0,5 = 0,0005

ΔD = 0,0001 x 0,5 = 0,00005

Contoh Perhitungan data 1

y = D/2 = 0,037/2 = 0,034 m

$$d = \frac{\lambda\, L}{y} = \frac{630 \cdot 10^{-7} \cdot 2}{0{,}034} = 3{,}70588 \cdot 10^{-5}\, m$$

$$\left|\frac{\partial d}{\partial L}\right| = \left|\frac{\lambda}{y}\right| = \left|\frac{630 \cdot 10^{-7}}{0{,}034}\right| = 1{,}85294 \cdot 10^{-5}$$

$$\left|\frac{\partial d}{\partial y}\right| = \left|-\frac{\lambda L}{y^2}\right| = \left|\frac{630 \cdot 10^{-7} \cdot 2}{0{,}034^2}\right| = 0{,}001089965$$

$$\text{Kesalahan mutlak} = \left|\frac{\partial d}{\partial L}\right| \cdot \Delta\text{L} + \left|\frac{\partial d}{\partial y}\right| \cdot \Delta\text{D}$$

$$= (1{,}85294 \cdot 10^{-5} \cdot 0{,}0005) + (0{,}001089965 \cdot 0{,}00005)$$

$$= 6{,}3763 \times 10^{-8}\, m$$

$$\text{Kesalahan Relatif} = \frac{Kesalahan\ mutlak}{d} \times 100\%$$

$$= \frac{6{,}3763 \times 10^{-8}}{3{,}70588 \cdot 10^{-5}} \times 100\%$$

$$= 0{,}17205882\%$$

$$\text{Keseksamaan} = 100\% - Kesalahan\ relatif$$
$$= 100\% - 0{,}17205882\%$$
$$= 99.82794118\%$$

$$\text{Angka Berarti} = 1 - \log \frac{Kesalahan\ mutlak}{a}$$
$$= 1 - \log\left(\frac{6{,}3763 \times 10^{-8}}{3{,}70588 \cdot 10^{-5}}\right)$$
$$= 3{,}76432305 \approx 4\ AB$$

Hasil perhitungan untuk kelima data percobaan

D	y	L	d	$\left\|\frac{\partial d}{\partial L}\right\|$
0,068	0,034	2	3,70588E-05	1,85294E-05
0,069	0,0345	1,96	3,57913E-05	1,82609E-05
0,065	0,0325	2,13	4,12892E-05	1,93846E-05
0,067	0,0335	2,05	3,85522E-05	1,8806E-05
0,065	0,0325	1,956	3,79163E-05	1,93846E-05
			$\bar{d}$ =3.81216E-05	

$\left\|\frac{\partial d}{\partial y}\right\|$	Kesalahan Mutlak (Δd)	Kesalahan Relatif (%)	Keseksamaan (%)	AB
0,001089965	6,3763E-08	0,172058824	99,82794118	3,764323
0,001037429	6,10019E-08	0,17043774	99,82956226	3,768434
0,001270438	7,32142E-08	0,177320332	99,82267967	3,751241
0,001150813	6,69436E-08	0,173643975	99,82635602	3,76034
0,001166656	6,80251E-08	0,179408526	99,82059147	3,746157
	$\overline{\Delta d}$ =6,65896E-08			

2) Menentukan panjang gelombang laser mainan

d = 3,81216 x 10^{-5} m

ΔL = 0,001 x 0,5 = 0,0005

ΔD = 0,0001 x 0,5 = 0,00005

Contoh Perhitungan data 1

y = D/2 = 0,037/2 = 0,044 m

$$\lambda = \frac{d\,y}{L} = \frac{3{,}81216 \cdot 10^{-5} \cdot 0{,}044}{2{,}05} = 8{,}18219 \cdot 10^{-7}\ m$$

$$\left|\frac{\partial \lambda}{\partial L}\right| = \left|-\frac{d\,y}{L^2}\right| = \left|\frac{3{,}81216 \cdot 10^{-5} \cdot 0{,}044}{2{,}05^2}\right| = 9{,}17117 \cdot 10^{-6}$$

$$\left|\frac{\partial \lambda}{\partial y}\right| = \left|-\frac{d}{L}\right| = \left|-\frac{3{,}81216 \cdot 10^{-5}}{2{,}05}\right| = 1{,}85959 \cdot 10^{-5}$$

$$\text{Kesalahan mutlak} = \left|\frac{\partial \lambda}{\partial L}\right| \cdot \Delta L + \left|\frac{\partial \lambda}{\partial y}\right| \cdot \Delta D$$

$$= (9{,}17117 \cdot 10^{-6} \cdot 0{,}0005) + (1{,}85959 \cdot 10^{-5} \cdot 0{,}00005)$$

$$= 5{,}46538 \times 10^{-9} m$$

$$\text{Kesalahan Relatif} = \frac{Kesalahan\ mutlak}{\lambda} \times 100\%$$

$$= \frac{5{,}46538 \times 10^{-9}}{8{,}18219 \cdot 10^{-7}} \times 100\%$$

$$= 0{,}667960089\ \%$$

$$\text{Keseksamaan} = 100\% - Kesalahan\ relatif$$
$$= 100\% - 0{,}667960089\ \%$$
$$= 99{,}33203991\%$$

$$\text{Angka Berarti} = 1 - \log\frac{Kesalahan\ mutlak}{\lambda}$$
$$= 1 - \log\left(\frac{5{,}46538 \times 10^{-9}}{8{,}18219 \cdot 10^{-7}}\right)$$
$$= 3{,}175249 \approx 3\ AB$$

Hasil perhitungan untuk kelima data percobaan

D	y	L	λ	$\left\|\frac{\partial\lambda}{\partial L}\right\|$
0,088	0,044	2,05	8,18219E-07	9,07117E-06
0,083	0,0415	2,087	7,58048E-07	8,75238E-06
0,09	0,045	2,012	8,5262E-07	9,41705E-06
0,084	0,042	2,059	7,77614E-07	8,99204E-06
0,089	0,0445	1,982	8,55908E-07	9,70429E-06
			$\bar{\lambda}$ =8,12482E-07	

$\left\|\frac{\partial\lambda}{\partial y}\right\|$	Kesalahan Mutlak ($\Delta\lambda$)	Kesalahan relatif (%)	Keseksamaan (%)	AB
1,85959E-05	5,46538E-09	0,667960089	99,33203991	3,175249
1,82662E-05	5,2895E-09	0,697779138	99,30222086	3,156282
1,89471E-05	5,65588E-09	0,663353214	99,33664679	3,178255
1,85146E-05	5,42175E-09	0,697229353	99,30277065	3,156624
1,92339E-05	5,81384E-09	0,679259402	99,3207406	3,167964
	$\overline{\Delta\lambda}$ =5,52927E-09			

g. Kesimpulan

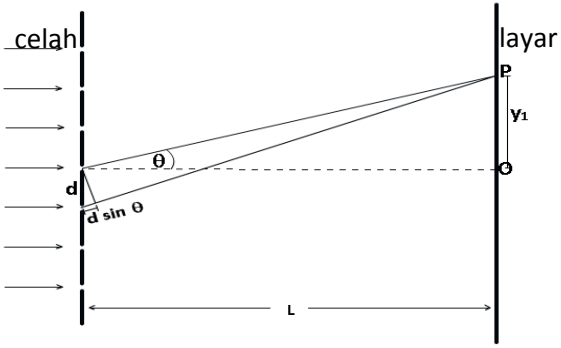
Dari perhitungan data percobaan Difraksi Fraunhofer Celah Ganda didapatkan lebar celah rata-rata sebesar $(6.99 \pm 0{,}01) \times 10^{-5}$

m dan panjang gelombang dari laser mainan sebesar (7,28 ± 0,10) x 10^{-7} m

3. Kisi Difraksi

a. Tujuan
- Menentukan jarak antara dua celah yang berdekatan

b. Skema Gambar Praktikum Kisi Difraksi



c. Alat-Alat yang digunakan dalam Percobaan
- Laser (λ= 630 nm)
- Kisi
- Bangku Optik
- Meteran
- Mistar

d. Pelaksanaan Percobaan
1) Merangkai alat-alat seperti pada skema pada gambar praktikum Difraksi Fraunhofer dengan menggunakan laser yang telah diketahui panjang gelombangnya (λ = 630 nm).
6) Mengatur posisi laser sehingga di dapatkan pola difraksi yang jelas.
7) Mengukur jarak celah ke layar (L)
8) Mengukur jarak pita terang pusat ke pita terang pertama (y_1)
9) Mengulangi percobaan sebanyak 5 kali dengan jarak antara celah dan layar (L) yang berbeda.

e. Data Percobaan
1) Menentukan jarak antara dua celah

λ = 630 nm

y	L
0,573	3
0,561	3,1
0,582	2,98
0,55	3,4
0,53	3,65

f. Analisis Data

λ = 630 nm

ΔL = 0,001 x 0,5 = 0,0005

ΔD = 0,0001 x 0,5 = 0,00005

Contoh Perhitungan data 1

$$d = \frac{\lambda L}{y} = \frac{630 \cdot 10^{-7} \cdot 2}{0{,}573} = 3{,}29843 \cdot 10^{-6}\ m$$

$$\left|\frac{\partial d}{\partial L}\right| = \left|\frac{\lambda}{y}\right| = \left|\frac{630 \cdot 10^{-7}}{0{,}573}\right| = 1{,}09948 \cdot 10^{-6}$$

$$\left|\frac{\partial d}{\partial y}\right| = \left|-\frac{\lambda L}{y^2}\right| = \left|\frac{630 \cdot 10^{-7} \cdot 3}{0{,}573^2}\right| = 5{,}75642 \cdot 10^{-6}$$

$$\text{Kesalahan mutlak} = \left|\frac{\partial d}{\partial L}\right| \cdot \Delta\text{L} + \left|\frac{\partial d}{\partial y}\right| \cdot \Delta\text{D}$$

$$= (1{,}09948 \cdot 10^{-6} \cdot 0{,}0005) + (5{,}75642 \cdot 10^{-6} \cdot 0{,}00005)$$

$$= 8{,}37559 \times 10^{-10}\ m$$

$$\text{Kesalahan Relatif} = \frac{Kesalahan\ mutlak}{d} \times 100\%$$

$$= \frac{8{,}37559 \times 10^{-10}}{3{,}29843 \cdot 10^{-6}} \times 100\%$$

$$= 0{,}02539267\%$$

$$\text{Keseksamaan} = 100\% - Kesalahan\ relatif$$

$$= 100\% - 0{,}02539267\%$$

$$= 99.97460733\%$$

$$\text{Angka Berarti} = 1 - \log \frac{Kesalahan\ mutlak}{a}$$

$$= 1 - \log\left(\frac{8{,}37559 \times 10^{-10}}{3{,}29843 \cdot 10^{-6}}\right)$$
$$= 4{,}595 \approx 5AB$$

Hasil perhitungan untuk kelima data percobaan

y	L	d	$\left\|\frac{\partial d}{\partial L}\right\|$	$\left\|\frac{\partial d}{\partial y}\right\|$
0,573	3	3,29843E-06	1,09948E-06	5,75642E-06
0,561	3,1	3,48128E-06	1,12299E-06	6,2055E-06
0,582	2,98	3,22577E-06	1,08247E-06	5,54257E-06
0,55	3,4	3,89455E-06	1,14545E-06	7,08099E-06
0,53	3,65	4,33868E-06	1,18868E-06	8,18619E-06
		$\bar{d}$ =3,64774E-06		

Kesalahan Mutlak	Kesalahan Relatif (%)	Keseksamaan	AB
8,37559E-10	0,02539267	99,97460733	4,595291629
8,71772E-10	0,025041688	99,97495831	4,601336396
8,18365E-10	0,025369589	99,97463041	4,595686572
9,26777E-10	0,023796791	99,97620321	4,623481596
1,00365E-09	0,023132592	99,97686741	4,635775694
$\overline{\Delta d}$ =8,91625E-10			

g. Kesimpulan

Dari perhitungan data percobaan Kisi Difraksi didapatkan lebar antar celah rata-rata sebesar (3,6477 ± 0,0009) x 10^{-6} m.

LAMPIRAN 11
Soal Latihan dan Penyelesaian

1. You pass 633 nm laser light through a narrow slit and observe the diffraction pattern on a screen 6.0 m away. You find that the distance on the screen between the centers of the first minima outside the central bright fringe is 32 mm. How wide is in the slit?

   Solution

   Hint: $\lambda = 633 \times 10^{-9}$ m

   $x = 6.0$ m

   $n = 1$

   $y = 32 \times 10^{-3}$ m

   Question: a

   Answer:

$$a \sin\theta = n\lambda$$

$$a\frac{y}{x} = n\lambda$$

$$a = \frac{n\,x\,\lambda}{y}$$

$$a = \frac{1 \cdot 6 \cdot 633 \cdot 10^{-9}}{(32 \cdot 10^{-3})/2} = 0.24\ mm$$

2. In a single-slit diffraction pattern, what is the intensity at a point where the total phase difference between wavelets from the top and bottom of the slit is 66 rad?

   Solution

   Hint: $\beta = 66$ rad

   Question: I

Answer:

$\beta = 66\, rad$

$\frac{\beta}{2} = 33\, rad$

$I = \left(\frac{sin\ (33\ rad)}{33\ rad}\right)^2 = 0.00092\ I_0$

3. You pass 633 nm laser light through a narrow slit and observe the diffraction pattern on a screen 6.0 m away. If the width of the slit is 0.24 mm, what is the intensity at a point on the screen 3.0 mm from the center of the pattern? The intensity at the center of the pattern is I_0

Solution

Hint: $\lambda = 633 \times 10^{-9}$ m

$x = 6.0$ m

$y = 3.0 \times 10^{-3}$ m

Question: I

Answer:

$$sin\ \theta = \frac{y}{x}$$

$$\frac{\pi a\ sin\ \theta}{\lambda} = \frac{\pi(2.4 \cdot 10^{-4})(5.0 \cdot 10^{-4})}{6.33 \cdot 10^{-7}} = 0.60$$

$$I = I_0 \left(\frac{sin\ 0.60}{0.60}\right)^2 = 0.89\ I_0$$

4. The wavelengths of the visible spectrum are approximately 400 nm (violet) to 700 nm (red). Find the angular width of the first-order visible spectrum produced by a plane grating with 600 slits per millimeter when light falls normally on the grating !

   Solution

   Hint: N = 600 slits/mm

   $\lambda_v = 400 \times 10^{-9}\ m$

   $\lambda_r = 700 \times 10^{-9}$

   Question: The angular width of the first order visible spectrum

   Answer:

   $d = \frac{1}{N} = \frac{1}{600\ slits/mm} = 1.67 \times 10^{-6}\ m$

   with m = 1, the angular deviation θ_v of the violet light (400 nm) is

   $sin\ \theta_V = \frac{\lambda_v}{d} = \frac{400 \times 10^{-9}}{1.67 \times 10^{-6}} = 0.240$

   $\theta_V = 13.9^o$

   with m = 1, the angular deviation θ_r of the red light (700 nm) is

   $sin\ \theta_r = \frac{\lambda_r}{d} = \frac{700 \times 10^{-9}}{1.67 \times 10^{-6}} = 0.419$

   $\theta_V = 24.8^o$

   So the angular width of the first order visible spectrum is

   $24.8^o - 13.9^o = 10.9^o$

5. Monochromatic light from a distance source is incident on a slit 0.750 mm wide. On a screen 2.00 m away, the distance from the central maximum of the diffraction pattern to the first minimum is measured to be 1.35 mm. Calculate the wavelength of the light!

Solution

Hint: $y = 1.35 \times 10^{-3}$ m

$x = 2.0$ m

$a = 0.750 \times 10^{-3}$ m

$n = 1$

Question: λ

Answer:

$$a \sin\theta = n\lambda$$

$$a\frac{y}{x} = n\lambda$$

$$\lambda = \frac{a\,y}{x}$$

$$\lambda = \frac{0.75 \cdot 10^{-3} \cdot 1.35 \cdot 10^{-3}}{2} = 5060 \text{ Å}$$

6. Light of wavelength 633 nm from a distance source is incident on a slit 0.750 mm wide, and a resulting diffraction pattern is observed on a screen 3.50 m away. What is the distance between the two dark fringes on either side of the central bright fringe?

Solution

Hint: $\lambda = 633 \times 10^{-9}$ m

$x = 3.5$ m

$a = 0.750 \times 10^{-3}$ m

n = 1

Question: 2y

Answer:

$$a \sin \theta = n\lambda$$

$$a\frac{y}{x} = n\lambda$$

$$y = \frac{n\, x\, \lambda}{a}$$

$$y = \frac{1 \cdot 3.5 \cdot 633 \cdot 10^{-9}}{(0.75 \cdot 10^{-3})} = 2.954\ mm$$

2y = 2 (2.954) = 5.908 mm

7. Monochromatic light of wavelength λ= 620 nm from a distant source passes through a single slit 0.450 mm wide. The diffraction pattern is observed on a screen 3.00 m from the slit. In terms of the intensity I_0 at the peak of the central maximum, what is the intensity of the light at the screen the following distance from the center of the central maximum is 1.00 mm?

Solution

Hint: $\lambda = 620 \times 10^{-9}$ m

$a = 0.450 \times 10^{-3}$ m

x = 3.0 m

$y = 1.0 \times 10^{-3}$ m

n = 1

Question: I

Answer:

$$\frac{\pi a \sin\theta}{\lambda} = \frac{\pi(0.450 \cdot 10^{-3})(10^{-3})}{6.20 \cdot 10^{-7} \cdot 3} = 0.76$$

$$I = I_0 \left(\frac{sin\ 0.76}{0.76}\right)^2 = 0.8217\ I_0$$

8. An interference pattern is produced by light of wavelength 580 nm from a distant source incident on two identical parallel slit separated by a distance (between centers) of 0.530 mm. If the slits are very narrow, what would be angular positions of the first-order?

Solution

Hint: $\lambda = 580 \text{ x } 10^{-9}$ m

d = $0.530 \text{ x } 10^{-3}$ m

Question: θ

Answer:

$d \sin\theta = m\lambda$

$$\sin\theta = \frac{1 \times 580 \times 10^{-9}}{0.530 \times 10^{-3}} = 0.001$$

$\theta = 0.001^o$