

## AUDIO VISUAL EDUCATION

SCRIPT BOOK

Time: 45 minutes

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Module III

PROJECTED AIDS

Unit 2

Projection Systems  
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1. Projection of slides, filmstrips, motion pictures, transparencies and opaque projections involve many simple, fundamental principles that apply to the use of projection devices.
2. Knowledge of these principles, practice in handling individual pieces of equipment and the aids, is necessary to enable you to operate the equipment and use the aids.
3. If you have the knowledge, with no skills, then your knowledge will only result in mockery before your trainees. It is therefore necessary for you to get skill along with knowledge.
4. Open your WORKBOOK and go through the OBJECTIVES. You know from both module 1 and 2, that we plan the learning experiences from the objectives and test the trainees on the attainment of these objectives. You must pay special attention to these objectives. STOP for 3 minutes and restart.
5. To learn how projectors work, you must understand the basic principles of the projectors. If you consider you have some good audio visual materials that will help you in reaching your goal and you do not know to operate the equipment, you will have to depend on the convenience of some one else.
6. We will present you here, an overview of the basic principles of projection equipment.
7. All projection systems have three common elements. They are:
  - a. a light source
  - b. a lens system
  - c. a surface on which images are projected - i.e. a screen.

M III/2-1/SB.

8. To use the projection equipment, you must have the projection materials or the projectuals- i.e. slides, filmstrips, motion picture, overhead transparencies and opaque materials.
9. Here is a schematic diagram of the most common projection system. You have the projection lamp, the projection and condenser lenses, and the projection screen, duly marked. Please note the relative positions. The image to be projected is between the condenser lenses and projection lens. The lamp is at one end.
10. Note that the image to be projected is in the machine upside down to get a right-side-up position on the screen.
11. You must therefore remember to keep the visual up-side-down like this picture in the
  - a. slide projector
  - b. filmstrip projector
  - c. motion picture projector
12. Open your WORKBOOK, and answer question 1 & 2. STOP FOR 2 minutes.
- \* 13. Question 1:- The three common elements for any projection systems are:
  - a. a light source
  - b. a lens system
  - c. a screen.
- \* 14. Question 2:- The projection material is placed up-side-down in the following projectors:
  - a. slide projector
  - b. filmstrip projector
  - c. motion picture projector
15. With the exception of the opaque projector and overhead projector, all projectors have the same system of projection, namely the direct projector system is used in the slide projector, filmstrip projector and motion picture projector.

16. In the direct projection system, the light passes directly from the projection lamp, through the condenser lenses, the projection material, the objective lens, and onto the screen. A minimum of light is lost by the direct projection method.
17. Indirect projection system is used for the overhead projector. Two mirrors are added to the direct projection system. A higher wattage bulb is used. The mirror (a) placed between the condenser lenses, reflects the light source, and mirror (b) again deflects the light by 90° on to the screen, as the projectual is placed on a platform. As compared to the reflected and direct projection systems, the light lost is negligible. Hence, when we use this system, the projector can be placed in a well lighted room.
18. Projection by reflection is used in the opaque projector. Opaque materials are projected with this system. No condenser lenses are used to spread the light evenly on the projectual. Instead, mirrors (a) are used, to reflect all light on-to the object to be projected. The image reflected by a large mirror (b) above the object, through an objective lens, falls on the screen. The system absorbs a great deal of light, to make it compulsory to darken the projection room for satisfactory results. The equipment also become hot quickly.
19. Objective lens system magnifies the image on to a screen.  
This lens is also called projection lens or magnifying lens. The condenser lens located on one side of the lamp, (except in opaque projection) spread light evenly through the image to be projected. Note the relative position of objective and condenser lenses in all the three projection systems.
20. The projection lamp located at one end, forms the light source and a reflector is used to reflect all light without loss on to the object through condenser lens, except in the case of reflected image system.
21. A heat filter is placed between the condenser lenses to cut down the intensity of heat in most of the systems.
22. Let us go back to the direct projection system, used in slide, filmstrip and motion picture projection. The source of light is the projection lamp. The reflector placed at one end of the system helps to direct all light. The life of most lamps are normally rated between 15 to 25 hours, and the wattage is ordinarily as high as 1000 W for some projectors. The use of higher wattage lamps will sometimes result in burning or scorching of slides, filmstrips or motion picture films.

23. Lamps are expensive and should be treated with care. Lamps should not be allowed to be tilted other than by the tilting device on the projector.
24. Projectors should not be jarred while the projector is hot. If the projector has a fan for cooling, it is advisable to operate the fan for at least 30 seconds after the lamp has been turned off.
25. Proper cooling of the projection lamp prior to storing will help to keep the lamp from burning out pre-maturely.
26. In some cases, projection lamps may develop a dark coating on the inside of the lamp. In such case it is advisable to change the lamp to secure the maximum amount of light.
27. You must clean the reflectors behind the lamp, as often as is required, when it becomes dirty, otherwise it will cause loss of projected light.
28. The filament of the lamp must be positioned parallel to the screen to ensure maximum light emission towards the screen.
29. REFER TO WORKBOOK, and answer questions 3,4,5 & 6. STOP FOR 5 MINUTES AND THEN RESTART.
- \* 30. Question - 3  
The three major projection systems are
  - a. the direct projection system
  - b. the indirect projection system.
  - c. the reflected projection system.
- \* 31. Question - 4  
The direct projection system is applicable to the following types of projectors:
  - a. slide projector
  - b. filmstrip projector
  - c. motion picture projector.

\* 32. Question -5

The indirect projection system is used in the overhead projector. The material being projected, is placed on a horizontal projection surface through which the light passes. Opaque projector is an example of reflected projection system.

33. Question -6

The image to be projected is to be marked between condenser lens and the projection lens, upside down:

34. Several lamp bases are designed to lock the lamp in the socket. Some bases are called the prefocus bases(a) The lamp with the prefocus is fitted into a socket pressed down, turned clockwise and quarter turn and is locked into position. A second type is the bayonet type base (b), largely used for the low wattage projection lamps. It is smooth and cylindrical and has two pins on its sides. It is fitted into socket, depressed, turned 90°, and is locked into place. The third type (c) has special flanges engaged in slot in the receptacle. Some lamps (d) have four pins base with a special key that guarantees correct placement.
35. The fifth one is a high intensity lamp that actually has no base, but with both ends of the lamp resting on electrical contacts.
36. Replacement of lamps is a task that all instructors must face when using projection equipment. It is always wise to have a replacement lamp ready at hand, as a spare lamp.
37. Remember three important points while replacing lamps, (1) the wattage should be same; (2) the filaments must have an identical structure and (3) the base and contact points must be compatible with the socket.
38. PROJECTION LENSES.
39. All projectors are supplied with standard lenses. Selection of projection lenses is determined by
  1. size of the projected material.
  2. the distance from the projector to the screen and
  3. the size of the image required on the screen,
40. The image on the screen can be adjusted changing the projector to screen distance. When the projector is moved towards the screen the image will become smaller and brighter; moving the projector away from the screen produces a larger but less bright image.

41. Some projectors are provided with zoom lens which permits adjusting the picture size to the screen size without changing the projector position.
42. Lenses have two functions. There are generally two sets of lenses in a projector. The first condensing lens system is to gather light from the lamp and direct it through a specifically designed area. The second function is to recreate the image on the screen - objective lens-. The objective lens, as already stated is also called projection or magnifying lens.
43. Condensing lenses spread the light evenly over or through the material to be projected. Usually combinations of condenser lenses are needed to produce desired results. Condenser lenses are located generally nearer the lamp, and designed to withstand high temperature. The lenses must be cleaned with soft cloth or tissue and lens cleaning fluid regularly.
44. The heat filter placed in between most of the condenser lens system, cuts down the intensity of heat passing through the system without appreciably affecting the illumination from the lamp.
45. The projection lens is responsible for providing sharpness and clarity of the image on the screen. This lens, inverts the image, and for that reason, the projection material - slides, films etc.- are placed up-side-down in the projector. The overhead and opaque projectors use mirrors to correct the inversion, so the projection material is placed right-side-up in the projector.
46. We should remember the following important points:
  - a. The projected image becomes larger as the projector is moved away from the screen;
  - b. The projected image becomes smaller as the projector is moved toward the screen;
  - c. The wider the size of the slide or film the wider the screen width.
47. REFER YOUR WORKBOOK and answer questions 7,8,9,10 and 11. STOP FOR 6 MINUTES & THEN RESTART.
- \*48. Question -7  
The reason for positioning the lamp parallel to the screen is to ensure maximum light emission toward the screen.

## \* 49. Question -8

The main points to remember while replacing lamps are:

- a. the wattage specified by the projector manufacturer should be same.
- b. the filament must have an identical structure.
- c. the base and contact points must be compatible with the socket.

## \* 50. Question -9

- The projected image becomes larger as the projector is moved away from the screen.
- The projector image becomes smaller as the projector is moved toward the screen.
- The projected image can be made larger or smaller without moving the projector by using a zoom lens.
- The two functions of lenses are to gather light from the lamp and direct it through the projectual-condenser lens system - and to recreate the image on the screen - objective lens system.
- The projection lens is responsible for providing sharpness and clarity of the image on the screen.

## 51. Question -10.

- The image is inverted upside down in the following projectors:
- a. Slide projector
- b. Filmstrip projector and
- c. Motion picture projector

## 52. Question - 11

- Overhead and Opaque projectors.

The projectual is placed in the correct position-right side-up in the OVERHEAD and OPAQUE projectors, as image is not inverted.

- We use mirrors to correct the inversion of the projectual in the OVERHEAD & OPAQUE projectors.

53. PROJECTION SCREENS are mainly of three types. They are Wall mounted screens that are pulled down for use and put back into the case, when not needed.

Portable stand screens mounted on tripods or detachable legs. They can be located where desired.

Projection wall areas. Wall surfaces are sometimes painted with white paints to serve as screens. These are covered with sliding chalkboards when not in use.

54. Screen size, shape and location are determined by room size, audience size, distance from projector, and type of projector.
55. A rule of thumb suggests that the students be seated no closer to the screen than two times the width of the projected image, and no more than six times the width of the image from the screen.
56. For the entire area of an image to be sharp, the axis of projection must be perpendicular to the screen.
57. If not, the image will be distorted and will look like one of these on the screen.  
This effect is generally called keystone effect.
58. When one side of the projected image is taller than the other, move the projector to the right or left; until the image becomes a rectangular. This is align Horizontally.
59. If the image is wider at the top than at the bottom, tilt the screen forward at the top, or pull it toward the wall at the bottom to correct the distortion. That is align vertically.
60. The keystone effect is not noticeable by viewers if the tilting angle is less than  $6^{\circ}$ . It is slightly noticeable when this angle is between  $6^{\circ}$  and  $9^{\circ}$ . Above  $9^{\circ}$  viewers will notice a distortion of the image, and hence to be corrected.
61. REFER TO WORKBOOK and answer questions 12 to 16.  
STOP FOR 6 MINUTES AND THEN RESTART.

- \* 62. Question -12

The maximum viewing distance for a projected image is 6 times the width of the screen, and the minimum distance is two times the width of the screen.



\* 63. Question -13

The defects in fig.(a) and (b) are called keystone effect.

For defect (a) align the projector horizontally-move the projector i.e. tilt it forward at the top or pull it down.

For (b) align projector vertically i.e. tilt the projector forward at the top or pull down.

\* 64. Question -14.

The figure on the screen has the following parts marked-reflector, lamp, condenser lens, heat filter, the projectual, the projection lens, the screen.

\* 65. Question -15.

Darkening the classroom is not required when using overhead projector.

\* 66. Question -16

Projection screens are mainly of three types, they are

- a. wall mounted screens
- b. Portable stand screens.
- c. projection wall areas.

67. We believe that once you understand projection systems better, you will have less problems with projectors while using in the class room.

68. END.

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Module III

Projected Aids

Unit 2

Projection Systems

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Instructional Objectives:

1. Enumerate three common elements in projection systems used for instructional purposes.
2. Identify and name the parts of projection system viz., lenses, lamps of the following projectors.
  - a) filmstrip projector
  - b) slide projector
  - c) motion picture projector
  - d) overhead projector
  - e) Opaque projector.
3. State the method of placing the projectuals in the following projectors to get the picture without any directional changes:
  - a) filmstrip projector
  - b) slide projector
  - c) motion picture projector
  - d) overhead projector, and
  - e) opaque projector.
4. Classify the projectors according to the system of projection as direct, indirect and reflect projection system.
  - a) filmstrip projector
  - b) slide projector
  - c) motion picture projector
  - d) overhead projector, and
  - e) opaque projector.

5. State the minimum and maximum viewing distance for projected images by slide, filmstrip, motion picture projectors and television.
6. Differentiate the conditions of lighting required when you use slide, filmstrip, overhead, opaque or motion picture projector.
7. Explain how you can correctly position lamp filament with respect to the screen.
8. List three important points to be considered while replacing lamps.
9. Differentiate the various lenses in a projection system based on their explicit functions.
10. Explain how the size of a projected image can be varied while using projectors.
11. Compare the use of zoomlens with ordinary lens.
12. Name the two common projection defects and indicate the method for rectification.
13. Differentiate the types of projection screens.

## AUDIO VISUAL EDUCATION

## WORK BOOK

Module III

Projected Aids

Unit 2

projection Systems

1. Name three common elements, for any projection system.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
2. In which of the following projector, will you place the projection material upside down ? Circle or mark the correct answer(s) from a, b, c, d or e.
  - a. slide projector
  - b. filmstrip projector
  - c. motion picture projector
  - d. opaque projector
  - e. overhead projector
3. Name three major projection systems.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
4. Name three projectors where direct projection system is applicable.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

5. a. Give an example of a projector, of the indirect projection system

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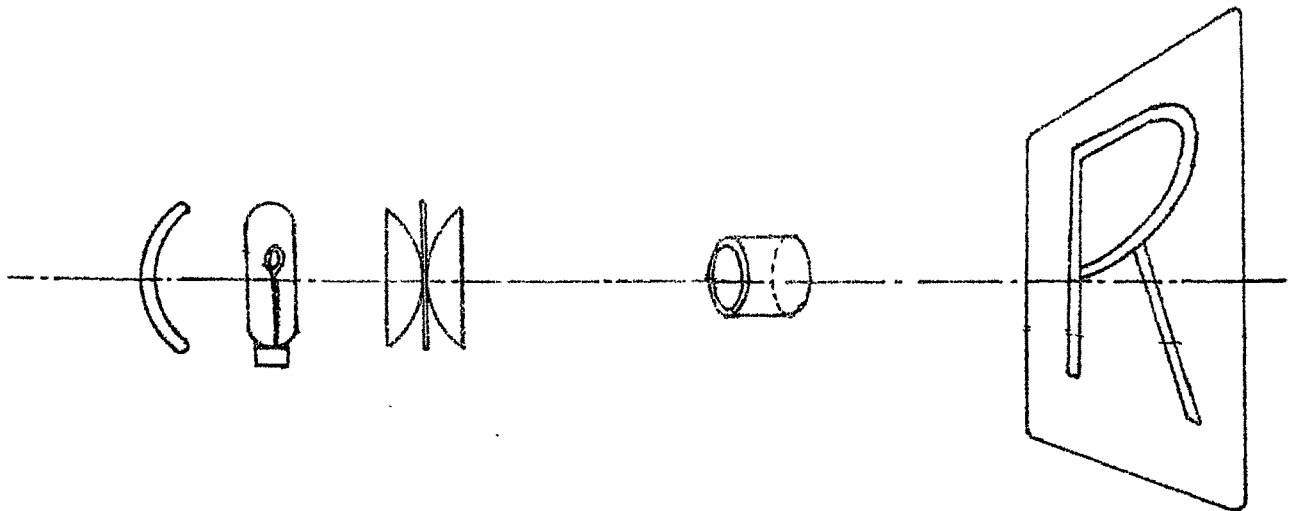
- b. Say where the projection material is to be placed.

.....  
 .....  
 .....

- c. In which projector is the projection by reflected projection system used ?

.....  
 .....

6. Mark in the following sketch, the position of the image to be projected.



7. Why is it necessary to position the lamp parallel to the screen ?

.....  
 .....

8. State three points to be remembered while replacing lamp on the projector ?

.....  
 .....  
 .....

9. Fill up the blanks:

- a. The projected image becomes smaller as the projector is moved \_\_\_\_\_ the screen.
- b. The projected image becomes larger as the projector is moved \_\_\_\_\_ the screen.
- c. The projected image can be made larger or smaller without moving the projector by using a \_\_\_\_\_.
- d. The two functions of lenses are (1) to \_\_\_\_\_ from lamp and direct it through the projectual-condenser lens system and (2) to \_\_\_\_\_ the image on the screen -  
 \_\_\_\_\_ objective lens system.
- e. The \_\_\_\_\_ is responsible for providing sharpness and clarity of the image on the screen.

10. In which of the projectors the image is inverted upside down ? Why is it so ?

.....  
 .....  
 .....  
 .....  
 .....

11. Name the projectors in which you will place the projectual right side up ?

How is the inversion avoided ?

12. Fill up the blanks:

The maximum viewing distance for a projected image is \_\_\_\_\_ times the width of the screen and the minimum viewing distance is \_\_\_\_\_ times the width of the screen.

13. In any projection system the following defects are called \_\_\_\_\_

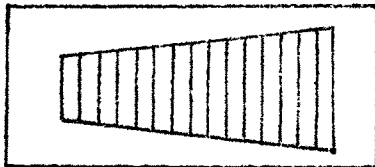


FIG. a

For the defect shown at (a) above, you have to align projector \_\_\_\_\_ly.

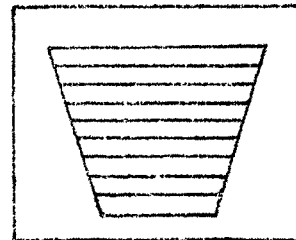


FIG. b.

For the defect shown at (b) above, you have to align projector \_\_\_\_\_ly.

14. Mark the alphabet a,b,c,d,e,f,g of the following parts of the figure given below. You may use more than one alphabet for an item, or need not use an alphabet at all.

reflector

lamp

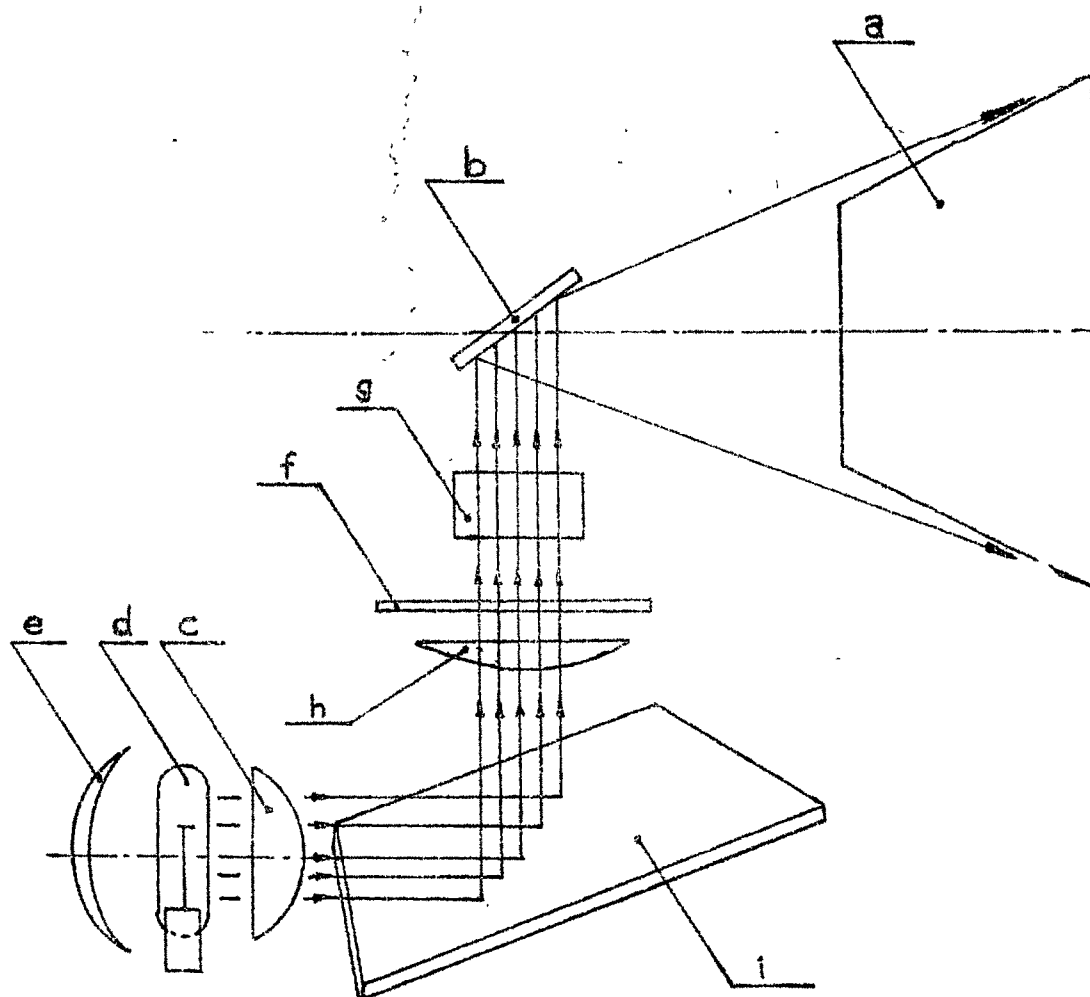
Condenser lens

mirrors

projectuals

objective lens

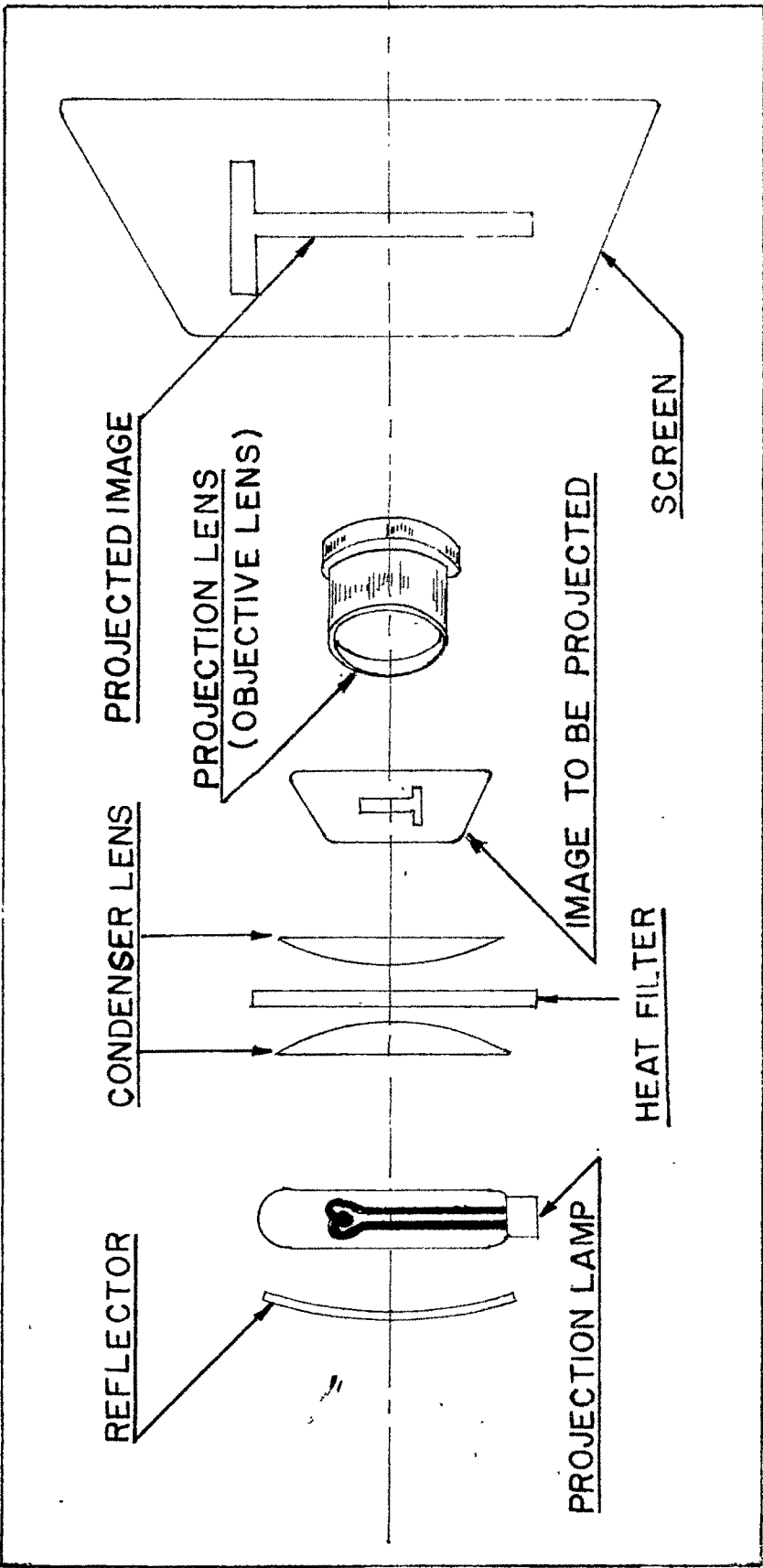
screen





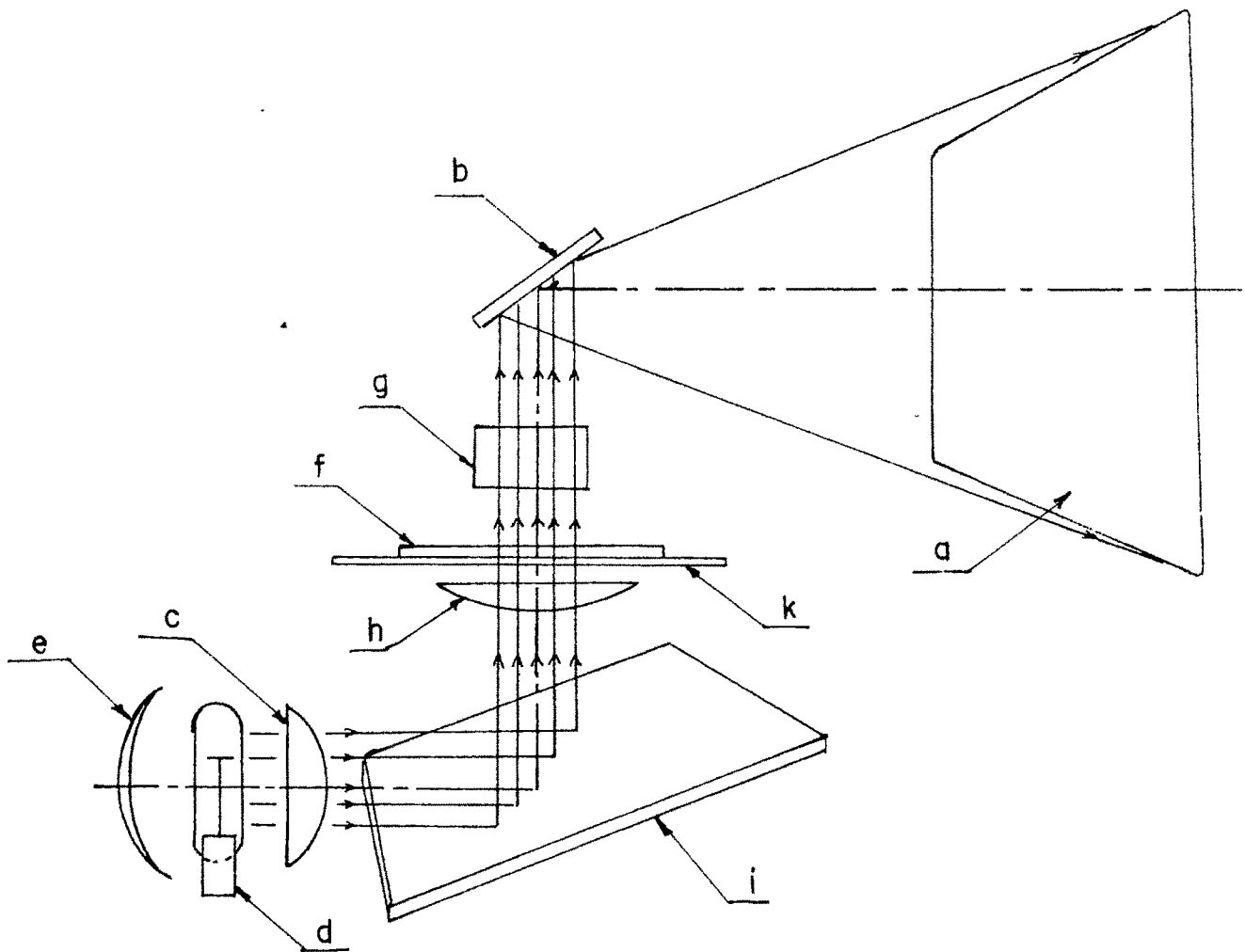
15. In which of the following projectors you need not have to darken the class room ?
- a. Slide projector
  - b. opaque projector
  - c. Overhead projector
  - d. Motion picture projector.
16. Name three types of projection screens available in your institute.
- a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

DIRECT PROJECTION SYSTEM



# INDIRECT PROJECTION SYSTEM

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Reflector \_ \_ \_ \_ a

Projectual \_ \_ \_ \_ \_ f

Lamp \_ \_ \_ \_ \_ d

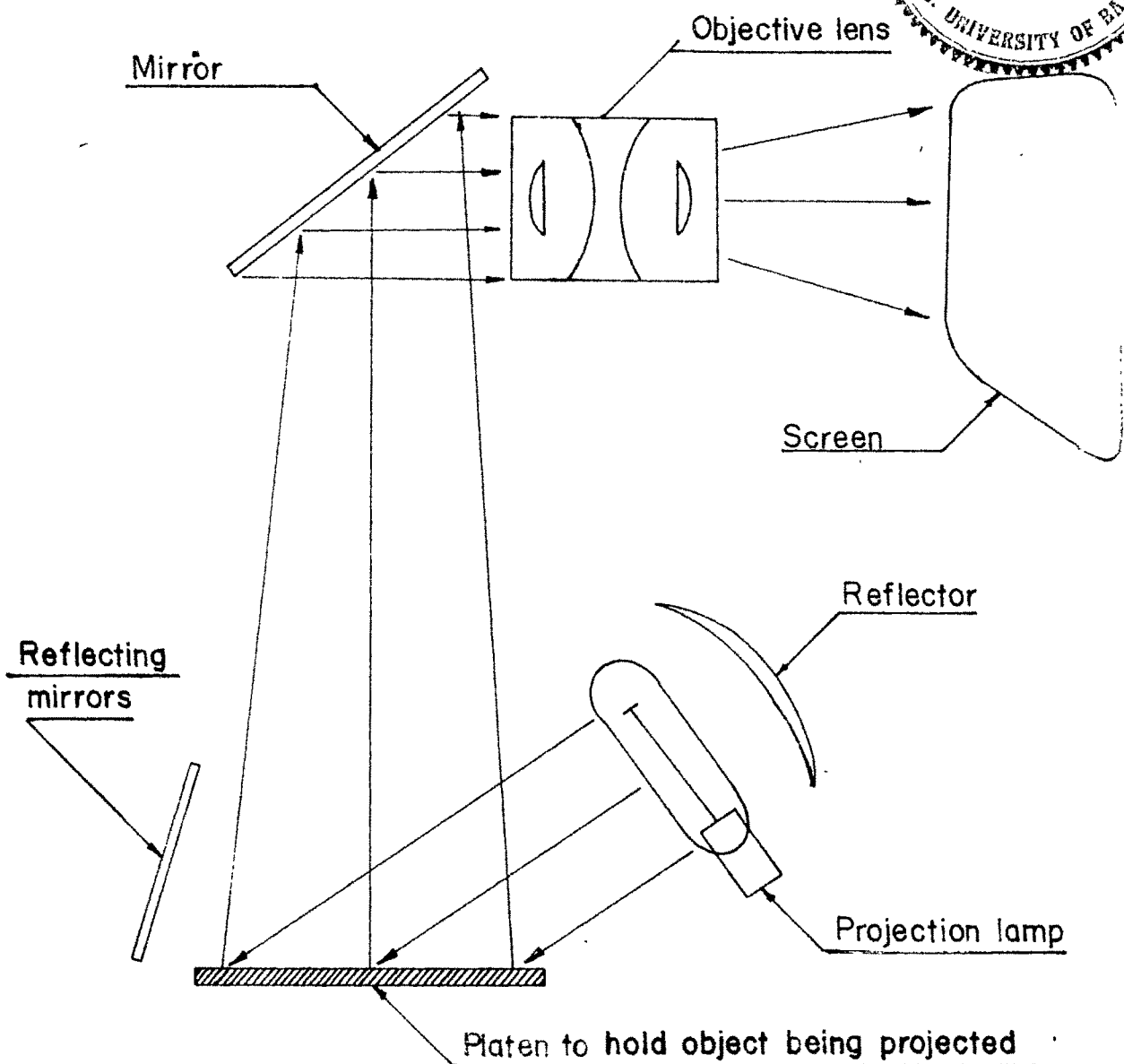
Objective lens \_ \_ \_ \_ g

Condenser lens \_ \_ c, h

Screen \_ \_ \_ \_ \_ a

Mirrors \_ \_ \_ i, b

## REFLECTED PROJECTION SYSTEM



## CRITERION TEST

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Module III

Projected Aides

Unit 2

Projection systems  
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1. Name three most common elements for any projection system.
  - a. -----
  - b. -----
  - c. -----
2. In which of the following projectors, will you place the projection material upside down ? Circle or mark the correct answer(s) from a,b, c,d or e.
  - a. ☒ slide projector
  - b. ☒ filmstrip projector
  - c. ☒ motion picture projector
  - d. ☐ opaque projector
  - e. ☒ overhead projector
3. Name three major projection systems.
  - a. -----
  - b. -----
  - c. -----
4. Name three projectors where direct projection system is applicable.
  - a. -----
  - b. -----
  - c. -----

M III/2-1/CT

5. a. Give an example of a projector, of the indirect projection system.

.....

- b. Say where the projection material is to be placed.

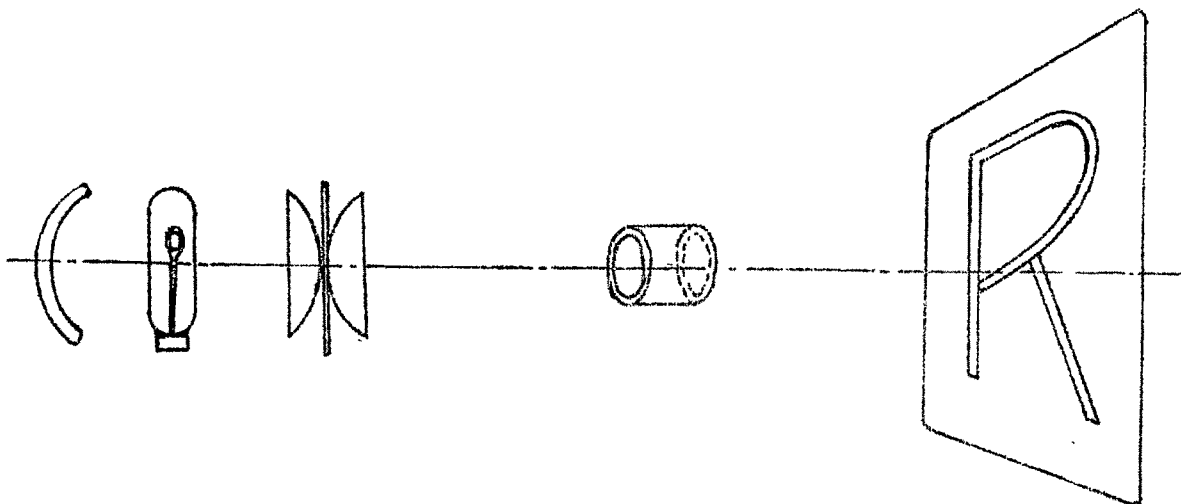
.....

- c. In which projector is the projection by reflected projection system used ?

.....

.....

6. Mark in the following sketch, the position of the image to be projected.



7. Why is it necessary to position the lamp parallel to the screen ?

.....

.....

8. State three points to be remembered while replacing lamp on the projector ?

.....  
 .....  
 .....

9. Fill up the blanks:

- a. The projected image becomes smaller as the projector is moved \_\_\_\_\_ the screen.
- b. The projected image becomes larger as the projector is moved \_\_\_\_\_ the screen.
- c. The projected image can be made larger or smaller without moving the projector by using a \_\_\_\_\_ lens.
- d. The two functions of lenses are (1) to \_\_\_\_\_ from lamp and direct it through the projectual-condenser lens system and (2) to \_\_\_\_\_ the image on the screen-objective lens system.
- e. The \_\_\_\_\_ is responsible for providing sharpness and clarity of the image on the screen.

10. In which of the projectors the image is inverted upside down ? Why is it so ?

.....  
 .....  
 .....  
 .....  
 .....

11. Name the projectors in which you will place the projectual right side up ?

.....  
 .....

How is the inversion avoided ?

.....  
 .....

12. Fill up the blanks:

The maximum viewing distance for a projected image is \_\_\_\_\_ times the width of the screen and the minimum viewing distance is \_\_\_\_\_ times the width of the screen.

13. In any projection system the following defects are called \_\_\_\_\_

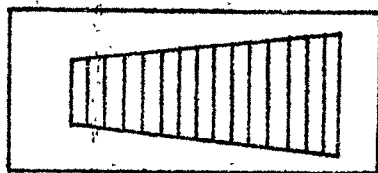


FIG. a

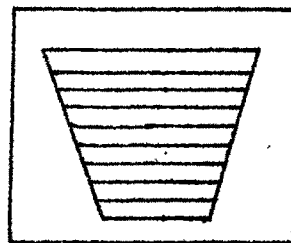


FIG. b

For the defect shown at (a) above, you have to align projector \_\_\_\_\_ ly.

For the defect shown at (b) above, you have to align projector \_\_\_\_\_ ly.



14. Mark the alphabet a,b,c,d,e,f,g of the following parts of the figure given below. You may use more than one alphabet for an item or need not use an alphabet at all.

reflector

lamp

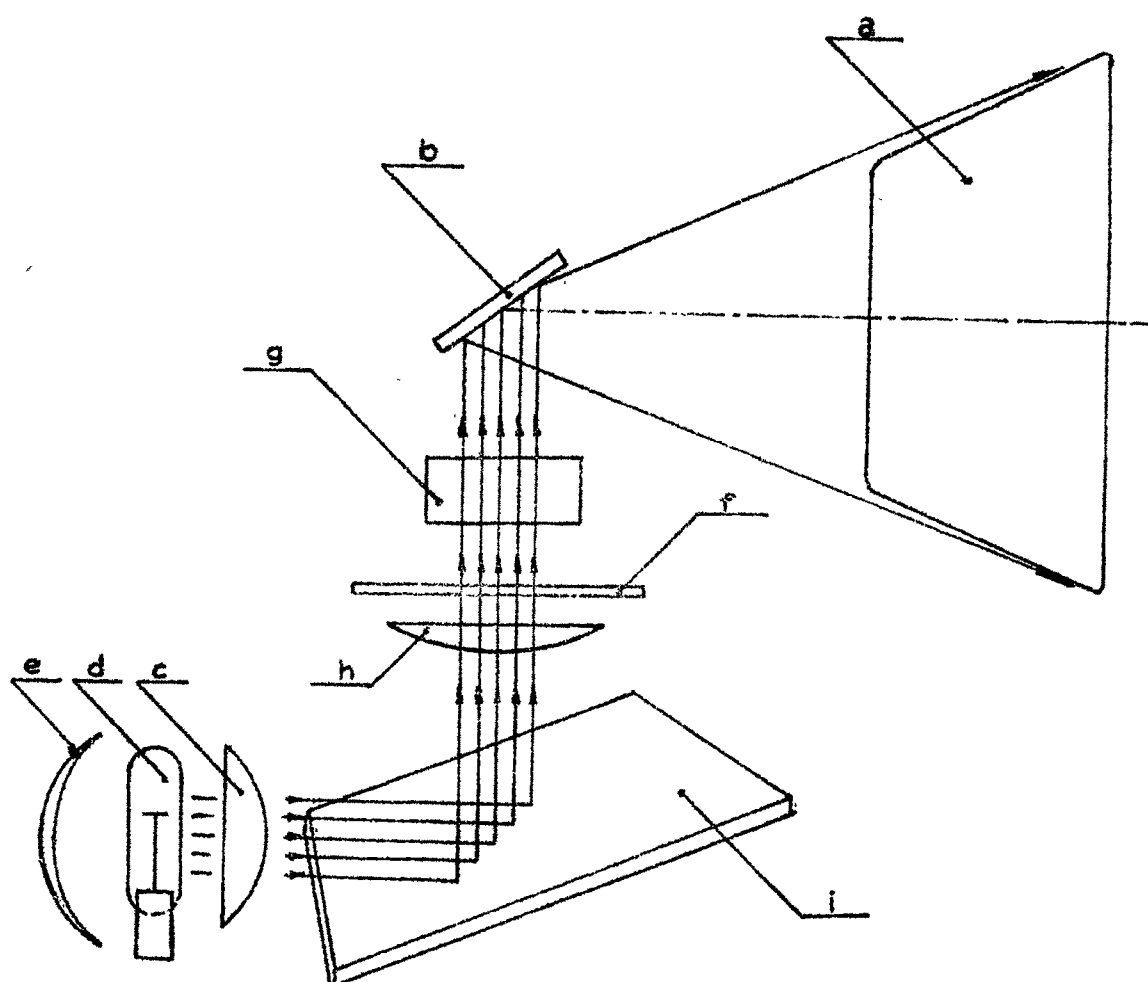
condenser lens

mirrors

Projectual

objective lens

screen



M III/2-5/CT

15. In which of the following projectors you need not have to darken the class room ?
- a. slide projector
  - b. opaque projector
  - c. overhead projector
  - d. motion picture projector
16. Name three types of projection screens available in your Institute.
- a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_

## AUDIO VISUAL EDUCATION

KEY TO  
CRITERION TEST-----  
Module III

Projected Aids

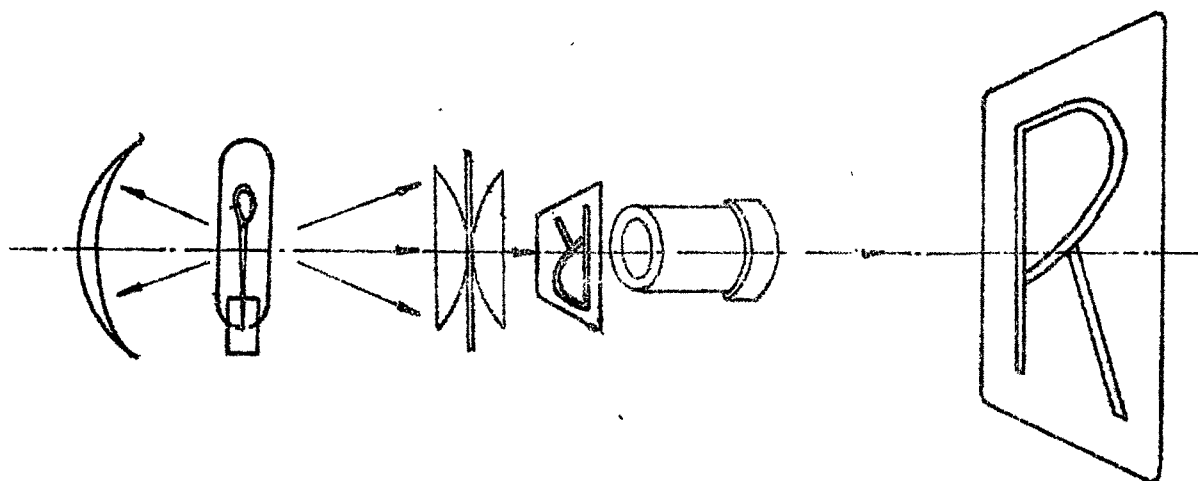
Unit 2

Projection Systems  
-----

1. Name three most common elements for any projection system.
  - a. a light source.
  - b. a lens system.
  - c. a screen.
2. In which of the following projectors, will you place the projection material upside down ?  
Circle or mark the correct answer(s) from a, b, c, d or e.
  - \* a. Slide projector
  - \* b. Filmstrip projector
  - \* c. Motion picture projector
  - d. opaque projector
  - e. Overhead projector
3. Name three major projection systems.
  - a. the direct projection system.
  - b. the indirect projection system.
  - c. the reflected projected system.

M III/2-1/KCT

4. Name three projectors where direct projection system is applicable.
- slide projector.
  - filmstrip projector.
  - motion picture projector.
5. a. Give an example of a projector, of the indirect projection system.
- Overhead projector.
- b. Say where the projection material is to be placed.
- Projection material is placed on a horizontal projection surface called fresnel lens.
- c. In which projector is the projection by reflected projection used ?
- Opaque projector.
6. Mark in the following sketch, the position of the image to be projected.



7. Why is it necessary to position the lamp parallel to the screen ?
- The reason is to ensure maximum light emission towards the screen.

8. State three points to be remembered while replacing lamp on the projector ?
- the wattage specified by the projector manufacturer should be same.
  - the filament must have an identical structure.
  - the base and contact points must be compatible with the socket.
9. Fill up the blanks:
- The projected image becomes smaller as the projector is moved towards the screen.
  - The projected image becomes larger as the projector is moved away from the screen.
  - The projected image can be made larger or smaller without moving the projector, by using a Zoom lens.
  - The two functions of the lenses are (1) to gather light from lamp and direct it through the projectual-condenser lens system- and (2) to recreate the image on the screen-objective lens system.
  - The projection lens is responsible for providing sharpness and clarity of the image on the screen.
10. In which of the projectors the image is inverted upside down ? Why is it so ?
- slide projector
- filmstrip projector
- motion picture projector
- The projectual is placed upside down because the the projection lens, inverts the image.

11. Name the projectors in which you will place the projectual right side up ?

1. Overhead projector
2. Opaque projector

How is the inversion avoided ?

We use mirrors.

12. Fill up the blanks:

The maximum viewing distance for a projected image is six times the width of the screen and the minimum viewing distance is two times the width of the screen.

13. In any projection system the following defects are called keystone effect.

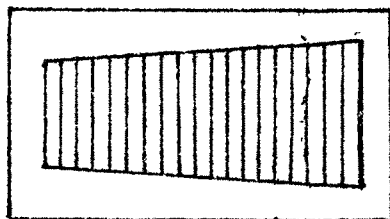


FIG. a

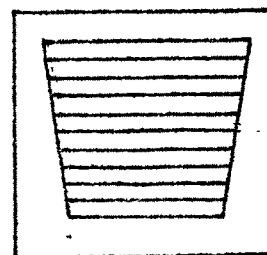


FIG. b

For the defect shown at (a) above, you have to align projector horizontally.

For the defect shown at (b) above, you have to align projector vertically.

14. Mark the alphabet a, b, c, d, e, f, g of the following parts of the figure given below.

reflector \_ \_ \_ \_ \_ e  
 lamp \_ \_ \_ \_ \_ d  
 condenser lens \_ \_ \_ c, h  
 mirrors \_ \_ \_ \_ \_ b, i  
 projectual \_ \_ \_ \_ \_ f  
 objective lens \_ \_ \_ g  
 screen \_ \_ \_ \_ \_ a

15. In which of the following projectors you need not have to darken the class room ?

- a. Slide projector
- b. Opaque projector
- \* c. Overhead projector
- d. Motion picture projector.

16. Name three types of projection screens available in your Institute.

- a. Wall mounted screens
- b. Portable stand screens
- c. Projection wall areas.