

MANUAL OF PHOTOGRAPHY

DEPTH OF FOCUS AND EXPOSURE TABLES. DEVELOPING & PRINTING

FOR SERVICE & CIVILIAN USE.



COMPILED BY
DOUGLAS T. HEDGES.

Colour, Filters,
Formulae,
Moving Objects.
ETC. ETC.

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INTRODUCTION.

THE object of this little booklet is to give facts and figures which will enable everyone possessing a camera to take good, clear pictures. Who, at some time or another, has not experienced the disappointment of blurred and misty snaps, when the opportunity of re-taking may never come again?

The information contained in these pages gives clear and concise guidance from the exposure of the film to the finished photograph.

* * * *

First of all let us examine the various types of cameras. Roll-film cameras can be classified into four main groups.

1. The simple **BOX CAMERA**, which usually has a fixed aperture and shutter speed of about f11 at 1/25 sec. It has a great "depth of focus," and will give fairly sharp pictures at most distances in good light. The disadvantage of this type of camera is that there is no adjustment of aperture and speed to suit the subject you are photographing.

2. The **FOLDING CAMERAS** vary from the cheaper models with the aperture and speed, to those with fast lenses of the type of f2.8 and f3.5 and shutters with many speeds. Some also have a coupled range-finder which enables you to focus accurately on any object.

3. The **MINIATURES**, which usually take 35 mm. film, are the most versatile of all cameras. Usually fully automatic, they have interchangeable lenses for various purposes, built-in range-finders, and sometimes built-in filters and exposure meters.

4. The **REFLEX** cameras usually take $2\frac{1}{4}$ in. by $2\frac{1}{4}$ in. pictures, and are also made with automatic focussing, which is done on a ground glass screen. These cameras are ideal for catching "the right moment" owing to the very large and clear image of the subject visible on the screen.

* * * *

These are the various types of camera. The essentials of every camera are the lens, the shutter, the diaphragm, and the film. It is the combination of these four in the correct manner which produces the good picture.

Camera **LENSES** are made of a number of lenses of different kinds of glass glued together. The light rays coming through the lens produce a sharp image at a distance behind the lens which varies according to its focal length (which is marked on it). The nearer the subject approaches the lens, the further back will the sharp image appear. Therefore, the camera must be focussed correctly or the image on the film will not be sharp.

The **DIAPHRAGM** is made of very fine steel plates mounted in a metal ring. The plates can be moved in or out to give whatever size of hole (or aperture as it is called) is desired

and thus control the amount of light which is let into the camera. The size of the aperture is marked in f numbers, f2, f8, f16, etc.

The SMALLER the f numbers the LARGER the aperture, e.g., f2 is larger than f8.

The SHUTTER is the door which opens and closes and decides how long the light rays are to remain in contact with the sensitive skin or emulsion of the film. The speeds of opening and closing vary from a time exposure of any duration down to about 1/1200 sec. on the more expensive cameras.

The sensitivity to light of the emulsion on the film varies greatly and is marked on the packet in degrees H and D, DIN. or SCHEINER. The latter is the more popular and the higher the Scheiner number the greater the sensitivity and the faster the film, e.g., 30 deg. SCH. is faster than 26 deg. SCH., etc. To convert SCH. to DIN., subtract 10 from SCH., e.g., 30 deg. SCH. = $\frac{20}{10}$ DIN. DIN. is always expressed with denominator of 10. This subject will be discussed more fully later on. The problem is how to get the correct combination of these four essentials to produce the perfect picture. For each f number and distance there is a DEPTH of FOCUS. This means that everything within this depth will be reproduced sharply on the film. This varies for different focal lengths and the tables are set out here to cover nearly all cameras. If your camera has a slightly different focal length to those in the tables it will make hardly any difference. We will take one or two examples from the table for focal length = 10.5 cm.

If the subject is, say, a landscape with a cottage or farmhouse in the foreground, you want everything in the picture to be sharp. You choose \therefore f16 and focus at 50 ft. Everything is sharp from 16 ft. 9 ins. to infinity or f11 at 50 ft., and the picture is sharp from 21 ft. 6 ins. to infinity.

On the other hand, if you are taking a portrait or a group at, say, 12 ft., you do not want the fence or the garage behind to be sharp. Therefore you choose f3.5 at 12 ft., and you are in focus from 10 ft. 10 ins. to 13 ft. 6 ins. This can be repeated for all occasions.

The procedure, then, for taking a picture should be as follows. First of all set the f number and distance from the "Depth of Focus" tables. Then turn to the Exposure Tables and find the correct exposure for the f number chosen.

It has not been found possible to include all the f numbers (or stops as they are called) in the Exposure Tables, so here is a table giving the relative exposure times compared with f8. For instance, if you want to use stop f5.6 you find the correct exposure for f8 and multiply by the number in the second column, which is $\frac{1}{2}$. So for any stop which is on your camera and not in the tables, find the correct exposure for f8 and multiply by the number in the second column.

DEPTH OF FOCUS TABLE FOR $f = 7.5 \text{ cms} = 3 \text{ inches}$

FEET	STOP								
	f2.8	f3.5 f4	f4.5	f5.6	f6.3	f8	f11	f16	f22
3	2' 11 1/2"	2' 11"	2' 10 1/2"	2' 10"	2' 9 1/2"	2' 9 1/4"	2' 9"	2' 8"	2' 7"
	3' 1"	3' 1"	3' 1 1/2"	3' 2"	3' 2"	3' 2 1/2"	3' 3"	3' 5"	3' 7"
4	3' 11"	3' 10"	3' 9 1/2"	3' 9"	3' 8 1/2"	3' 8"	3' 7"	3' 5"	3' 3"
	4' 1"	4' 2"	4' 2 1/2"	4' 3"	4' 3 1/2"	4' 4"	4' 6"	5'	5' 2"
5	4' 10 1/2"	4' 9"	4' 8 1/2"	4' 8"	4' 7"	4' 6"	4' 4"	4' 2"	4'
	5' 2"	5' 3"	5' 4"	5' 6"	5' 6 1/2"	5' 7"	6'	6' 4"	7'
6	5' 9 1/2"	5' 8"	5' 7"	5' 6"	5' 5"	5' 4"	5'	4' 9"	4' 5"
	6' 3"	6' 5"	6' 6"	6' 7"	6' 9"	7'	7' 3"	8'	9'
8	7' 7"	7' 5"	7' 4"	7' 2"	7' 1"	7'	6' 6"	6'	5' 5"
	8' 5"	8' 9"	8' 10"	9'	9' 5"	10'	11'	12'	15'
12	11' 3"	11'	10' 8"	10'	10'	10'	9'	8'	7'
	13'	14'	14' 5"	15'	15' 5"	16'	19'	25'	42'
24	22'	20'	19'	18'	17'	16'	14'	12'	10'
	28'	33'	35'	38'	43'	50'	2.6'	∞	∞
50	38'	35'	33'	28'	26'	23'	18'	15'	13'
	90'	140'	190'	∞	∞	∞	∞	∞	∞
100	58'	47'	43'	36'	34'	29'	23'	18'	15'
	∞	∞	∞	∞	∞	∞	∞	∞	∞
∞	124'	95'	81'	65'	55'	45'	33'	23'	17'
	∞	∞	∞	∞	∞	∞	∞	∞	∞

DEPTH OF FOCUS TABLE FOR $f = \frac{10 \text{ cms}}{1.1} = 4 \frac{1}{8} \text{ inches}$

FEET	STOP								
	f2.8	f3.5 f4	f4.5	f5.6	f6.3	f8	f11	f16	f22
3	2' 11 1/2"	2' 11 1/4"	2' 11"	2' 10 1/2"	2' 10 1/2"	2' 10"	2' 9 1/2"	2' 8 1/4"	2' 7"
	3' 0 1/2"	3' 1"	3' 1"	3' 1 1/2"	3' 1 3/4"	3' 2 1/4"	3' 3"	3' 4 1/2"	3' 7"
4	3' 11"	3' 10 1/2"	3' 10"	3' 9 1/2"	3' 9 1/2"	3' 8 1/2"	3' 7 1/2"	3' 6"	3' 3 1/2"
	4' 1"	4' 1 1/2"	4' 2"	4' 2 1/2"	4' 3"	4' 4"	4' 5 1/2"	4' 8 1/2"	5' 1 1/2"
5	4' 10 1/2"	4' 9 1/2"	4' 9"	4' 8 1/2"	4' 7 3/4"	4' 6 1/2"	4' 5"	4' 2 1/2"	4'
	5' 1 1/2"	5' 2 1/2"	5' 3"	5' 4"	5' 5"	5' 6 1/2"	5' 9"	6' 2 1/2"	6' 10"
6	5' 9 1/2"	5' 8 1/2"	5' 8"	5' 7"	5' 5 1/2"	5' 4 1/2"	5' 2"	4' 10 1/2"	4' 7"
	6' 2 1/2"	6' 4"	6' 5"	6' 6"	6' 7 1/2"	6' 9 1/2"	7' 2"	7' 10"	8' 11"
8	7' 8"	7' 6"	7' 4 1/2"	7' 3"	7' 1 1/4"	6' 11"	6' 7"	6' 2"	5' 7"
	8' 5"	8' 8"	8' 9"	8' 11"	9' 2"	9' 6"	10' 2"	11' 8"	14' 4"
12	11' 2"	10' 10"	10' 7"	10' 5"	10' 2"	9' 9"	9' 1"	8' 2"	7' 3"
	12' 11"	13' 6"	13' 10"	14' 3"	14' 9"	15' 8"	17' 11"	22' 9"	35'
24	21'	19' 8"	19'	18' 4"	17' 5"	16' 4"	14' 6"	12' 3"	10' 4"
	28'	31'	32'	35'	38'	45'	71'	600'	∞
50	38'	34'	32'	31'	28'	26'	21' 6"	16' 9"	13' 4"
	74'	99'	114'	150'	241'	∞	∞	∞	∞
100	62'	51'	47'	43'	39'	34'	27'	21'	15' 4"
	300'	∞	∞	∞	∞	∞	∞	∞	∞
∞	150'	100'	89'	75'	63'	50'	36'	25'	18'
	∞	∞	∞	∞	∞	∞	∞	∞	∞

∞ = Infinity

NOTE.—In compiling these tables, the author has taken into account the degree of sharpness required. The small negatives of the 5 cm. miniature cameras are usually enlarged many times, and require a higher standard of definition than the 10.5 cm. lenses by 3 1/4 in. by 2 1/4 in. negatives, which do not usually require such great enlargement. These tables are therefore accurate and perfectly safe to use with all types of cameras.

DEPTH OF FOCUS TABLE FOR $f = 5 \text{ cms} = 2 \text{ inches}$

FEET	STOP								
	f 1.5	f 2	f 2.5	f 3.5	f 4.5	f 6.3	f 9	f 12.5	f 18
3'6"	3'5"	3'5"	3'4 $\frac{1}{2}$ "	3'4"	3'3 $\frac{1}{2}$ "	3'3"	3'1"	3'0"	2'9"
4'	3'6 $\frac{3}{4}$ "	3'7"	3'7 $\frac{1}{2}$ "	3'8 $\frac{1}{2}$ "	3'9"	3'10"	4'0"	4'3"	4'8 $\frac{1}{2}$ "
	3'11"	3'10 $\frac{1}{2}$ "	3'10"	3'9 $\frac{1}{2}$ "	3'8 $\frac{1}{2}$ "	3'7 $\frac{1}{2}$ "	3'6"	3'4"	3'1"
5'	4'1 $\frac{1}{4}$ "	4'1"	4'2"	4'3"	4'4"	4'5 $\frac{1}{2}$ "	4'8"	5'0"	5'8"
	4'10 $\frac{1}{2}$ "	4'10"	4'9"	4'8"	4'7"	4'5"	4'3"	4'0"	3'8"
6'	5'1 $\frac{1}{2}$ "	5'2"	5'3 $\frac{1}{4}$ "	5'5"	5'6"	5'9"	6'1"	6'8"	7'11"
	5'9 $\frac{1}{2}$ "	5'9"	5'8"	5'6"	5'5"	5'2"	4'11"	4'7"	4'2"
7'	6'2 $\frac{1}{2}$ "	6'3"	6'5"	6'7"	6'9"	7'1"	7'8"	8'8"	10'8"
	6'8 $\frac{3}{4}$ "	6'8"	6'6"	6'4"	6'2"	5'11"	5'7"	5'2"	4'8"
8'	7'3 $\frac{1}{2}$ "	7'5"	7'7"	7'9"	8'0"	8'6"	9'5"	10'10"	14'4"
	7'8"	7'7"	7'5"	7'2"	7'0"	6'7"	6'2"	5'8"	5'0"
9'	8'4 $\frac{1}{2}$ "	8'6"	8'9"	9'0"	9'4"	10'1"	11'4"	13'6"	19'3"
	8'7"	8'5"	8'3"	8'0"	7'9"	7'4"	6'9"	6'2"	5'5"
10'	9'6"	9'8"	9'11"	10'4"	10'9"	11'8"	13'5"	16'7"	26'4"
	9'5 $\frac{3}{4}$ "	9'4"	9'1"	8'9"	8'5"	7'11"	7'4"	6'8"	5'9"
12'	10'7"	10'10"	11'2"	11'8"	12'3"	13'5"	15'9"	20'4"	37'3"
	11'3"	11'0"	10'8"	10'3"	9'10"	9'2"	8'4"	7'5"	6'5"
15'	12'10"	13'2"	13'8"	14'6"	15'5"	17'4"	21'5"	30'9"	98'
	13'10"	13'6"	13'0"	12'4"	11'9"	10'10"	9'8"	8'6"	7'2"
20'	16'5"	16'11"	17'8"	19'1"	20'8"	24'4"	33'3"	63'	00
	18'0"	17'5"	16'8"	15'7"	14'8"	13'3"	11'7"	9'11"	8'1"
30'	22'6"	23'6"	25'1"	28'	31'7"	41'	75'	00	00
	25'8"	24'6"	23'	21'	19'4"	17'	14'4"	11'11"	9'5"
50'	36'1"	38'9"	43'2"	50'	66'	129'	00	00	00
	39'0"	36'4"	33'2"	29'	26'2"	22'	17'8"	14'2"	10'9"
100'	69'7"	80'	102'	00	00	00	00	00	00
	64'0"	58'	50'	41'	35'6"	28'	21'6"	16'5"	12'
00	229'	00	00	00	00	00	00	00	00
	177'	133'	98'	70'	55'	39'	27'	20'	14'
	00	00	00	00	00	00	00	00	00

F NUMBER	COMPARED WITH F 8.	F NUMBER	COMPARED WITH F 8.
f 1	1/64	f 7	3/4
f 1.5	1/32	f 9	1 1/4
f 1.8	1/30	f 10	1 1/2
f 2	1/16	f 12.5	2 1/2
f 2.5	1/10	f 14	3
f 3	1/7	f 22	8
f 4	1/4	f 32	16
f 5.6	1/2	f 64	64

CALCULATION OF LENGTH OF EXPOSURE.

The time of exposure of the film varies according to the following factors:—

1. Whether the film is Ortho-, Chrome-, or Pan-
2. The time of year and the weather

3. The time of day.
4. The aperture to be used.
5. The subject to be photographed.

SUBJECTS can be classified as follows :—

Normal Subjects. Landscapes with trees, castles or other buildings in foreground, well-lit streets.

Outdoor Portraits, close-ups of architecture and dark objects in foreground require four times the exposure of a normal subject.

Snaps taken in woods require about twelve times the exposure for a normal subject.

Bright beach scenes require only a third to a quarter the exposure for a normal subject.

The following tables are calculated for **NORMAL** subjects. When you have found the appropriate month and time for the type of film you are using you can choose your stop, and the exposure is found in the column below. Don't forget to make the adjustment outlined above for any subject other than normal. A is for clear sky, B is cloudy, and C is very dull

MINIMUM EXPOSURE TABLES - ORTHOFILM 24⁰ SCH
ALL TIME RECKONED GREENWICH MEAN

NOVEMBER DECEMBER AND JANUARY TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11AM to 1PM	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2	1/8	1/4	1
10AM to 2PM	1/200	1/100	1/30	1/150	1/75	1/25	1/75	1/30	1/10	1/50	1/25	1/8	1/25	1/10	1/4	1/10	1/5	1/2	1/5	1/3	1
9AM to 3PM	1/100	1/50	—	1/75	1/30	—	1/30	1/15	—	1/25	1/10	—	1/10	1/5	—	1/5	1/3	—	1/3	3/4	—

FEBRUARY AND OCTOBER TIME IN SECONDS.

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11AM to 1PM	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3	1/10	1/5	3/4
10 " 2 "	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2	1/8	1/4	1
9 " 3 "	1/400	1/100	—	1/150	1/75	—	1/75	1/30	—	1/50	1/25	—	1/25	1/10	—	1/10	1/5	—	1/5	1/3	—
8 " 9 "	1/100	1/50	—	1/75	1/30	—	1/30	1/15	—	1/25	1/10	—	1/10	1/5	—	1/5	1/3	—	1/3	3/4	—

MINIMUM EXPOSURE TABLES-ORTHO FILM 24°sch.
MARCH AND APRIL TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10 AM to 2 PM	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
9 ^h 3 ^m	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3	1/10	1/5	1/4
8 ^h 4 ^m	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2	1/8	1/4	1/1
7 ^h 5 ^m	1/150	1/75	-	1/100	1/50	-	1/50	1/25	-	1/30	1/15	-	1/15	1/8	-	1/8	1/4	-	1/4	1/2	-

MAY, JUNE AND JULY TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10 AM to 2 PM	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
9 ^h 3 ^m	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
8 ^h 4 ^m	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3	1/10	1/5	1/4
7 ^h 5 ^m	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2	1/8	1/4	1/1
6 ^h 6 ^m	1/150	1/75	-	1/100	1/50	-	1/50	1/25	-	1/30	1/15	-	1/15	1/8	-	1/8	1/4	-	1/4	1/2	-
5 ^h 7 ^m	1/75	1/30	-	1/50	1/25	-	1/25	1/10	-	1/15	1/8	-	1/8	1/4	-	1/4	1/2	-	1/2	1	-

AUGUST AND SEPTEMBER TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11 AM to 1 PM	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
10 ^h 2 ^m	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
9 ^h 3 ^m	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3	1/10	1/5	1/4
8 ^h 4 ^m	1/150	1/75	-	1/100	1/50	-	1/50	1/25	-	1/30	1/15	-	1/15	1/8	-	1/8	1/4	-	1/4	1/2	-
7 ^h 5 ^m	1/75	1/30	-	1/50	1/25	-	1/25	1/10	-	1/15	1/8	-	1/8	1/4	-	1/4	1/2	-	1/2	1	-

CHROME FILM AND FINE GRAIN PAN 27°sch (Approximately)

ALL TIME RECKONED GREENWICH MEAN
NOVEMBER, DECEMBER AND JANUARY TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11 AM to 1 PM	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
10 ^h 2 ^m	1/400	1/200	-	1/300	1/150	-	1/150	1/75	-	1/100	1/50	-	1/50	1/25	-	1/25	1/10	-	1/10	1/5	-
9 ^h 3 ^m	1/200	1/100	-	1/150	1/75	-	1/75	1/30	-	1/50	1/25	-	1/25	1/10	-	1/10	1/5	-	1/5	1/3	-

CHROME FILM AND FINE GRAIN PAN 27^osch (Approximately)

FEBRUARY AND OCTOBER. ALL TIME IN SECONDS

TIME	STOP																				
	f 2.8			f 3.5			f 4.5			f 6.3			f 8			f 11			f 16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11 AM to 1 PM	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
10 ^o 42"	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
9 ^o 43"	1/400	1/200	—	1/300	1/150	—	1/150	1/75	—	1/100	1/50	—	1/50	1/25	—	1/25	1/10	—	1/10	1/5	—
8 ^o 44"	1/200	1/100	—	1/150	1/75	—	1/75	1/30	—	1/50	1/25	—	1/25	1/10	—	1/10	1/5	—	1/5	1/3	—

MARCH AND APRIL. TIME IN SECONDS

TIME	STOP																				
	f 2.8			f 3.5			f 4.5			f 6.3			f 8			f 11			f 16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10 AM to 2 PM	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
9 ^o 43"	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
8 ^o 44"	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
7 ^o 45"	1/500	1/150	—	1/200	1/100	—	1/100	1/50	—	1/75	1/30	—	1/30	1/15	—	1/15	1/8	—	1/8	1/4	—

MAY, JUNE AND JULY. TIME IN SECONDS

TIME	STOP																				
	f 2.8			f 3.5			f 4.5			f 6.3			f 8			f 11			f 16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10 AM to 2 PM	1/1200	1/800	1/200	1/1200	1/600	1/150	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5
9 ^o 43"	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
8 ^o 44"	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
7 ^o 45"	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4	1/15	1/8	1/2
6 ^o 46"	1/300	1/150	—	1/200	1/100	—	1/100	1/50	—	1/75	1/30	—	1/30	1/15	—	1/15	1/8	—	1/8	1/4	—
5 ^o 47"	1/150	1/75	—	1/100	1/50	—	1/50	1/25	—	1/30	1/15	—	1/15	1/8	—	1/8	1/4	—	1/4	1/2	—

AUGUST AND SEPTEMBER. TIME IN SECONDS

TIME	STOP																				
	f 2.8			f 3.5			f 4.5			f 6.3			f 8			f 11			f 16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11 AM to 1 PM	1/1200	1/800	1/200	1/1200	1/600	1/150	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5
10 ^o 42"	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
9 ^o 43"	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5	1/25	1/10	1/3
8 ^o 44"	1/300	1/150	1/75	1/200	1/100	1/50	1/100	1/50	1/25	1/75	1/30	1/15	1/30	1/15	1/8	1/15	1/8	1/4	1/8	1/4	1/2
7 ^o 45"	1/150	1/75	—	1/100	1/50	—	1/50	1/25	—	1/30	1/15	—	1/15	1/8	—	1/8	1/4	—	1/4	1/2	—

MINIMUM EXPOSURE TABLES-ORTHOFILM 24°sch.
MARCH AND APRIL TIME IN SECONDS

FAST PAN FILM 30°sch. (Approximately)
NOVEMBER, DECEMBER, JANUARY. TIME IN SECONDS
ALL TIME RECKONED GREENWICH MEAN TIME

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11AM to 1PM	1/1200	1/600	1/400	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
10 ^a 2"	1/800	1/400	1/200	1/600	1/300	1/100	1/300	1/150	1/50	1/200	1/100	1/30	1/100	1/50	1/15	1/50	1/25	1/8	1/25	1/10	1/4
9 ^a 3"	1/400	1/200	1/100	1/300	1/150	1/50	1/150	1/75	1/25	1/100	1/50	1/15	1/50	1/25	1/7.5	1/25	1/10	1/5	1/10	1/5	1/2

FEBRUARY AND OCTOBER. TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
11AM to 1PM	1/1200	1/800	1/200	1/1200	1/600	1/150	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5
10 ^a 2"	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
9 ^a 3"	1/800	1/400	1/200	1/600	1/300	1/100	1/300	1/150	1/50	1/200	1/100	1/30	1/100	1/50	1/15	1/50	1/25	1/8	1/25	1/10	1/4
8 ^a 4"	1/400	1/200	1/100	1/300	1/150	1/50	1/150	1/75	1/25	1/100	1/50	1/15	1/50	1/25	1/7.5	1/25	1/10	1/5	1/10	1/5	1/2

MAY, JUNE AND JULY. TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10AM to 2PM	1/1200	1/1200	1/400	1/1200	1/200	1/300	1/200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10
9 ^a 3"	1/1200	1/1200	1/300	1/1200	1/800	1/200	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8
8 ^a 4"	1/1200	1/800	1/200	1/1200	1/600	1/150	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5
7 ^a 5"	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
6 ^a 6"	1/600	1/300	1/100	1/400	1/200	1/75	1/200	1/100	1/30	1/150	1/75	1/25	1/75	1/30	1/10	1/30	1/15	1/5	1/15	1/8	1/3
5 ^a 7"	1/300	1/150	1/100	1/200	1/100	1/50	1/100	1/50	1/25	1/75	1/30	1/15	1/30	1/15	1/7.5	1/15	1/8	1/4	1/8	1/4	1/2

MARCH AND APRIL. TIME IN SECONDS

TIME	STOP																				
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16		
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
10AM to 2PM	1/1200	1/1200	1/300	1/1200	1/800	1/200	1/800	1/400	1/100	1/600	1/300	1/75	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8
9 ^a 3"	1/1200	1/800	1/200	1/1200	1/600	1/150	1/600	1/300	1/75	1/400	1/200	1/50	1/200	1/100	1/25	1/100	1/50	1/10	1/50	1/25	1/5
8 ^a 4"	1/1200	1/600	1/150	1/800	1/400	1/100	1/400	1/200	1/50	1/300	1/150	1/30	1/150	1/75	1/15	1/75	1/30	1/8	1/30	1/15	1/4
7 ^a 5"	1/600	1/300	1/100	1/400	1/200	1/75	1/200	1/100	1/30	1/150	1/75	1/25	1/75	1/30	1/10	1/30	1/15	1/5	1/15	1/8	1/3

FAST PAN FILM 30°SCH (Approximately)

AUGUST AND SEPTEMBER ALL TIME IN SECONDS
ALL TIME GREENWICH MEAN TIME

TIME	STOP																							
	f2.8			f3.5			f4.5			f6.3			f8			f11			f16					
	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C			
Hambleton	1/200	1/200	1/100	1/200	1/200	1/100	1/200	1/150	1/100	1/200	1/150	1/100	1/200	1/100	1/50	1/200	1/100	1/50	1/250	1/100	1/50	1/100	1/50	1/25
10" 12"	1/200	1/200	1/100	1/200	1/150	1/100	1/200	1/100	1/50	1/200	1/75	1/50	1/200	1/50	1/25	1/200	1/25	1/15	1/150	1/75	1/50	1/100	1/50	1/25
9" 13"	1/200	1/150	1/100	1/200	1/100	1/50	1/200	1/75	1/50	1/200	1/50	1/25	1/200	1/25	1/15	1/200	1/15	1/10	1/150	1/10	1/50	1/100	1/50	1/25
8" 14"	1/600	1/300	1/100	1/400	1/200	1/100	1/200	1/100	1/50	1/150	1/75	1/50	1/100	1/50	1/25	1/75	1/30	1/15	1/50	1/15	1/10	1/30	1/15	1/8
7" 15"	1/300	1/150	1/100	1/200	1/100	1/50	1/100	1/50	1/25	1/75	1/30	1/20	1/50	1/15	1/10	1/30	1/15	1/10	1/15	1/8	1/5	1/10	1/5	1/4

Moving Objects. When photographing moving objects the following tables will be found most useful. The most important point is the direction of the motion, whether it is towards or away from the camera, oblique or directly across. The exposure time also depends on the speed of the object, its distance from the camera, and also the focal length of the lens. These Tables are compiled for objects at a distance of 50 ft. from the camera. If the subject is twice the distance away the exposure time must be doubled, if half the distance give half the exposure and so on. If your camera does not possess the faster speeds, the only alternative is to focus on the subject and "swing" the camera in the direction of the motion.

DIRECTION OF MOTION TABLE.

MAXIMUM EXPOSURE TIME IN SECONDS

OBJECT AT 50 FT	↑ ↓	↖ ↗ ↙ ↘	← →
MOVING TREES, RUNNING WATER, ETC.	1/25	1/25	1/25
PEOPLE OR ANIMALS MOVING SLOWLY.	1/25	1/50	1/100
CYCLISTS, STREET TRAFFIC, PEOPLE HURRYING.	1/50	1/100	1/200
CYCLE RACES, GYMNASTS, TROTting HORSE.	1/100	1/200	1/250
FAST CAR, EXPRESS TRAIN, ETC, ETC.	1/200	1/400	1/600

TYPES OF FILM.

There are two types of film, one with orthochromatic emulsion and one with panchromatic. Ortho-film does not give a true rendering of colours. It is not sensitive to red light and red appears black on the picture. Also, blue sky is rendered much too light and comes out almost white, whilst yellow comes out too dark. Almost the only point in its favour is that ortho-emulsion can stand the light of the dark room lantern, which pan-film cannot. It is therefore more convenient for those who do their own developing.

On the other hand, panchromatic film gives a much more faithful rendering of red, yellow, and blue, and produces a well balanced and much more satisfactory negative. Both ortho- and panchromatic films are made in various degrees of sensitivity. Slow films of 23 deg. SCH. and less are the least sensitive and are suitable only for specialists who do very big enlarging work where "grain" is the biggest enemy. The minute grains of silver which make up the picture are coarser on the faster films and give an unpleasant appearance on enlargements. These slow films possess very little latitude and demand great care in exposure and development.

Medium-fast films of about 25 deg.—26 deg. SCH. are fine-grain, have a greater sensitivity and are the finest for all general purposes. They are also suitable for enlargements. Very fast films of 30 deg., 31 deg., and 32 deg. SCH. are not so fine grained and are useful for photographing fast-moving objects and also in bad lighting conditions. It will be seen from the above that the most useful all-round film is a panchromatic of about 26 deg. SCH.

* * * *

Filters. One of the most disappointing aspects of snapshotting is the incorrect rendering of tone and colour, especially by orthochromatic film as outlined above. For example, on ortho-film, snowy-white clouds, blue sky and distant hills all merge into a grey-white mass on the print. The reason is that the rays of blue light, which appear dark to the eye, are rendered light by the ortho-film emulsion.

If a yellow-coloured glass or "filter" as it is called, is placed in front of the lens a much finer picture will be obtained. The yellow filter tones down the blue, makes it a darker shade and brings the clouds out as white. There are also filters for other purposes. Red, Orange, Green and Blue.

A filter, as its name implies, filters the light passing through it and only allows rays of certain colours to pass through the lens. Here is a Table which shows the colours which various filters let pass or absorb.

Filter.	Allows to Pass.	Absorbs.
Red	Red	Green
Green	Green	Red
Blue	Blue	Yellow
Yellow	Yellow	Blue

A red filter can only be used with panchromatic film because ortho-emulsion is not sensitive to red rays. The red and orange filters are used to produce clear pictures of distant snowy mountains and hills, etc., which without a filter would be lost on the snap in mist or haze.

As filters absorb light which would otherwise get through to the film a longer exposure must be given (or a larger aperture).

The longer exposures necessary are for Light Yellow filters, 2 times normal exposure.

Medium yellow and green filters, 3 times normal exposure.

For Orange filters, 6 times normal exposure.

For Red filters, 8 times normal exposure.

Or correspondingly larger apertures.

* * * *

The Lens Hood. Pictures taken with the sun at the photographer's back are usually devoid of light and shadow effect and are rather dull. Most pleasing effects and pictures full of life are obtained by taking photographs against the light, i.e., with sun in front and a little to one side of the camera. This is achieved by using a **lens hood**, a device which clips on to the lens and shields it from the sun. As the hood hides some of the light from the lens, the normal exposure time must be doubled.

* * * *

Pictures at Night. Some very interesting pictures can be obtained at night even by very poor street lighting or even by car headlamps. Railway scenes and flood-lit buildings make excellent subjects, but they are, of course, not available to the photographer to-day. For best results pan-film must be used, but any camera will do because the exposure can be lengthened according to aperture. Using pan-film of approximately 30 deg. SCH. the following are the exposure times for various lighting.

It should be noted that only about half the exposure quoted here should be given if ground is wet or covered in snow.

LIGHTING	STOP					
	f2.5	f3.5	f4.5	f6.3	f8	f11
NORMAL STREET LIGHTING.	Secs 20	Secs 40	Mins 1½	Mins 3	Mins 6½	Mins 13
WELL LIT STREET OR RAILWAY STATION	Secs 10	Secs 20	Secs 40	Mins 1½	Mins 3	Mins 6½
THEATRE AND STREETS WITH ELECTRIC SIGNS	Secs 6	Secs 10	Secs 20	Secs 40	Mins 1½	Mins 3
FLOODLIT BUILDINGS	Secs ¾	Secs 1½	Secs 3	Secs 7	Secs 13	Secs 25

Portraits. The best portraits are secured by capturing the subject unawares. Instead of the conventional "smile please" type, much better portraits are obtained by taking an unsuspecting person in a natural pose.

The following points should be observed.

1. The best close-ups can be obtained with a twin-lens reflex or a miniature.
2. Do not come closer than 10 or 12 ft. with a box camera or you will get distortion. Take a picture at about 15 ft. and enlarge a portion of the negative.
3. See that the background is pleasing and use a filter if it is against the sky.
4. For portraits use 4 times the exposure for a normal subject.
5. Use pan-film for correct tones.
6. A reflector (a sheet of white paper will do) will be found useful especially indoors in daylight.

* * * *

INDOORS.

Any camera can take reasonably good pictures indoors. In daylight the exposure time varies enormously with the amount of light available in the room. Here are some useful hints.

1. With a slow lens (say f11) work near the window and try short time exposures using a stand. (The arm of a chair will do.) With a fast lens up to a $\frac{1}{25}$ sec. or even $\frac{1}{50}$ sec. can be used.
2. Use a reflector of white paper or a mirror for greater effect.
3. Use pan-film.
4. Watch the background. Ugly walls or furniture may spoil the picture.
5. Vary the exposure time according to distance from the window.

Artificial Lighting.

One or two sec. exposures at f3.5 are usually sufficient in ordinary electric light. Longer exposure for smaller stops.

2. Keep close to the light. If the distance from the lamp is doubled, the exposure must be increased 4 times.

3. For best results try one or even two special "Photolamps."

4. Use one lamp on the subject and one for indirect lighting of shadows or background. There are no hard and fast rules, and many interesting experiments can be made.

Colour. There are now 3 types of colour film: Agfacolor, Kodachrome and Dufaycolor. Very beautiful transparencies in brilliant colours can be obtained, but as yet, paper prints are very costly, and not entirely satisfactory. It is not possible as yet for most amateurs to process colour films, and they therefore have to be returned to the makers. However, it is well worth while trying colour. Whether at the seaside, in the garden or of the children, very pleasant results can be obtained. Special films are also made for indoors with electric light.

Here are the points to remember.

1. The speeds are: Agfacolor, 23 deg. SCH.; Kodachrome, 20 deg. SCH.; and Dufaycolor, 17 deg. SCH.

2. Colour film emulsion has very little latitude. Therefore accurate exposure is essential and an exposure meter is recommended. Makers exposure tables are supplied with the film.

3. All other rules as to depth of focus, etc., as for ordinary films.

4. The subject must be taken with the sun **behind** the camera.

5. Leave out blue sky unless clouds are present—it looks artificial.

6. Once started **use up** and have the film developed quickly. Colour deteriorates with age.

7. Do not expose transparencies to the sun for long or they will fade.

DEVELOPING AND PRINTING.

Remember that developing is a skilled process and this skill can only be obtained by experience. Therefore we would recommend that the beginner should have his films developed by an expert at first and then experiment with contact printing, which is easier. When the necessary dark-room experience has been acquired, developing will be found much simpler. Here are the necessary instructions for developing, contact printing, and enlarging.

Developing. Tank developing is most suitable for roll film.

Procedure.

1. Fill tank with developer at 18 deg. C. (64 deg. F.).

2. Open spool (or cassette) in dark-room and remove backing paper. Do **NOT TOUCH** emulsion side of film.

3. Load film into tank and close tank. Light can now be switched on.

4. Gently shake tank every few minutes to guard against air bubbles and uneven development.

5. When development is completed (time required is given by maker) empty from the tank and rinse twice with clean water.

6. Fill tank with hypo solution for fixing for 15 minutes.

7. Pour the fixer away, and run clean water through for 30 minutes.

8. Carefully remove film and wipe off water with chamois leather.

9. Hang up in a dry place which is free from dust.

Contact Printing from Negative. Either work with a yellow dark-room bulb or cover the developer and fixing trays with cardboard and work in a dim light and one's own shadow.

Apparatus required. Printing frame, 100 c.c. measuring jar, 3 dishes, some paper developer, and hypo.

Procedure.

1. Fill the three dishes with 100 c.c. developer (instructions on bottle), clean water and fixer.

2. Put negative in the frame dull side up.

3. Take sheet of gaslight paper and place on dull side of negative.

4. Close the frame, and cover with cardboard.

5. Take over to light, and remove cardboard. Expose the frame to light for 10 seconds by watch.

6. Cover up the frame again and return to dishes. Remove the paper and place in the developer with emulsion side up.

7. Remove any air bubbles from paper and rock to and fro. If not in your own shadow cover with cardboard. Leave for 2 minutes maximum.

8. Rinse in covered water dish, and place in covered fixing bath for 10 minutes.

9. Wash thoroughly in running water, or by continually changing water in dish. Remove water by means of blotting paper, and leave on a blotter overnight to dry.

10. Press in between thick heavy book to flatten.

ENLARGING.

For enlarging you will need a red, or light green filtered light. The green gives a better light, but must be used indirectly, e.g., reflected from a wall or ceiling.

Procedure.

1. Place film in enlarger and switch on light.

2. Lay a sheet of white paper on the board, decide the size of enlargement required and focus accurately to get a sharp image on the paper.

3. Switch off light, and replace ordinary paper by enlarging paper. Fix firmly.

4. Switch on lamp and expose.

Procedure is then exactly as for contact printing as outlined previously.

With regard to the time of exposure, 20 secs. is the normal time, but this may have to be increased, or decreased according to the negative. Only experience will tell the exact time of exposure for the various types of negatives.

Notes on Negatives.

Negatives have various degrees of hardness or gradation. A hard negative is one with great contrast between the lights and shades. A flat or soft negative is one with little contrast. The correct negative midway between these two is normal. Hard and soft negatives can be influenced by methods of development, and are printed on the opposite paper, i.e., soft negatives on hard paper, flat negatives on extra hard, hard negatives on soft, and normal negatives on normal paper.

USEFUL DARK-ROOM HINTS.

Wear old clothes—chemical stains are hard to remove.

Don't keep a developer in a half-filled bottle. The air causes it to deteriorate.

A 5 per cent. solution of hydrochloric acid removes stains and deposits from dishes.

When mixing developer, warm to about 70 deg. F. and then pour in dish, or tank, and allow to cool to 64 deg. F. If you mix at 64 deg. F. it will cool below this temperature when you pour it into a cold bath.

A few drops of acetic acid in the rinsing dish prevents developer from reaching the fixing bath.

"Resistol" removes scratches from negatives.

FORMULÆ.

Normal Tank Developer.

Anhydrous Sodium Sulphite	...	...	1 gm.
" " Carbonate	...	...	1 "
Pyrocatechin	...	...	0.4 "
Water, added to make	...	...	100 c.c.
Developing time 30 to 40 minutes.			

Contrast Developer.

1. Dissolve $2\frac{1}{2}$ gms. caustic stick in water to make	...	...	100 c.c.
2. Hydroquinone	...	...	$2\frac{1}{2}$ gm.
Potassium Bromide	...	...	$2\frac{1}{2}$ "
Anhydrous Sodium Sulphite	...	...	5 "
Add water to make	...	...	100 c.c.

Mix (1) and (2) in equal parts just before use.

Time, 4 minutes maximum. RUBBER GLOVES must be worn.

Soft Developer.

Metol	1.5 gm.
Anhydrous Sodium Sulphite	5.0 "
Potassium Bromide	0.1 "
Anhydrous Sodium Carbonate	5.0 "
Add water to make	100 c.c.

Dilute with twice its own volume for fast film, and four times its own volume for fine grain film.

Kodak Fine Grain Developer D.K.20.

Water at 125 deg. F.	750 c.c.
(a) Elon	5 gm.
(b) Anhydrous Sodium Sulphite	100 "
(c) Kodalk	2 "
(d) Potassium Sulphocyanide (Thiocyanate)	1 "
(e) Potassium Bromide	0.5 "
Cold water to make up to	1,000 c.c.

Dissolve chemicals in alphabetical order. Time 18 minutes at 65 deg. F.

Farmer's Reducer for Dense Negatives.

(1) Potassium Ferricyanide	5 gm.
Water	100 c.c.
(2) Hypo crystals	25 gm.
Water	500 c.c.

Mix immediately before use one volume of (1) to five volumes of (2). Reduction continues in the washing water and negative should be removed from reducer before fully reduced. WASH THOROUGHLY.

Intensifier.

Solution A—

Potassium bichromate	10 gm.
Water	100 c.c.

Make up solution as above, then bleach negatives in one of the following liquids, wash, and then blacken in an ordinary tank developer in strong lighting. USE RUBBER GLOVES.

For Strong Intensification.

Solution A	12.5 c.c.
Concentrated Hydrochloric acid	0.3 "
Water	100 "

For Medium Intensification.

Solution A	12.5 c.c.
Concentrated Hydrochloric acid	1.5 "
Water	100 "

For Slight Intensification.

Solution A	12.5 c.c.
Concentrated Hydrochloric acid	12.5 "
Water	100 "

Fixer.

Hypo crystals	25 gm.
Potassium metabisulphite	2 "
Add water to bring up to	100 c.c.