केन्द्रीय माध्यमिक शिक्षा बोर्ड, दिल्ली
माध्यमिक स्कूल परीक्षा (कक्षा दसवीं)
परीक्षार्थी प्रवेश–पत्र के अनुसार भरें

विषय Subject : SCIENCE

विषय कोड Subject Code : 086

परीक्षा का दिन एवं तिथि
Day & Date of the Examination : 03.03.2015, Tuesday

उत्तर देने का माध्यम
Medium of answering the paper : ENGLISH

प्रश्न पत्र के ऊपर लिखे कोड को दर्शाएं : Write code No. as written on the top of the question paper :	Code Number	Set Number
	31/2	① ● ③ ④

अतिरिक्त उत्तर–पुस्तिका (ओं) की संख्या **No . of supplementary answer -book(s) used**	–
विकलांग व्यक्ति : Person with Disabilities : हाँ / नहीं **Yes / No**	No

किसी शारीरिक अक्षमता से प्रभावित हो तो संबंधित वर्ग में ✓ का निशान लगाऐं।
If physically challenged, tick the category

B	D	H	S	C	A

B = दृष्टिहीन, D = मूक व बधिर, H = शारीरिक रूप से विकलांग, S = स्पास्टिक
C = डिस्लेक्सिक, A = ऑटिस्टिक
B = Visually Impaired, D = Hearing Impaired, H = Physically Challanged
S = Spastic, C = Dyslexic, A = Autistic

क्या लेखन – लिपिक उपलब्ध करवाया गया : हाँ / नहीं **Whether writer provided : Yes / No**	
यदि दृष्टिहीन हैं तो उपयोग में लाए गये सोफ्टवेयर का नाम : If Visually challenged, name of software used :	

*एक खाने में एक अक्षर लिखें। नाम के प्रत्येक भाग के बीच एक खाना रिक्त छोड़ दें। यदि परीक्षार्थी का नाम 24 अक्षरों से अधिक है, तो केवल नाम के प्रथम 24 अक्षर ही लिखें।
Each letter be written in one box and one box be left blank between each part of the name. In case Candidate's Name exceeds 24 letters, write first 24 letters.

कार्यालय उपयोग के लिए
Space for office use

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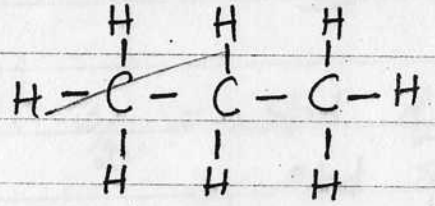
Section-A

1.) 

No. of covalent bonds = 10

2.) The DNA is found in the nucleus of a cell.

3.) Green plants are considered to be producers of food. They convert simple inorganic raw materials to complex organic substances (sugar & starch) in the presence of sunlight and chlorophyll. Hence, the green plants (capable of synthesizing their own food) are placed in the first trophic level.

4.) $n_g = \frac{4}{3} = \frac{\text{Spd of light in vacuum}}{\text{Spd of light in glass}}$

$\frac{4}{3} \times 2 \times 10^8 =$ Spd of light in vacuum

i) 2.67×10^8 = speed of light in ... vacuum

$$3\overline{)8}\ (2.66$$
$$-6$$
$$20$$
$$-18$$
$$20$$

ii) $n_w = \frac{3}{2} = \frac{\text{Spd of light in vacuum}}{\text{Spd of light in water}}$

$$9\overline{)16}\ (1.77$$
$$-9$$
$$70$$
$$-63$$
$$70$$
$$63$$

$\text{Spd of light in vacuum} \times \frac{2}{3} = \text{Spd of light in water}$

$\frac{8}{3} \times 10^8 \times \frac{2}{3} =$ Spd of light in water.

$\therefore$ Spd of light in water $= 1.78 \times 10^8$ m/s.

5.) • Encourage the use of composting (or) vermi-composting.
• Spreading awareness about the diseases spread due to improper disposal of wastes and breeding of mosquitoes.
• Holding staged shows to demonstrate safer ways of disposal and discussing about the health problems (malaria, dengue, jaundice) etc which may arise if harmful pathogens enter our body.

- Organising clubs and campaigns to clean the neighbourhood every week.
- Encourage the Rs - Recycle, Reuse, Reduce to protect the environment.
- Segregating bio-degradable & non-biodegrable wastes.
- Bio-degradable wastes can be disposed by composting & incinerating.
- Non-bio-degradable wastes can be recycled, reused.
- Proper Sewage Treatment.

6.)
- To Water doesn't evaporate.
- To recharge ground water level & nearby-wells
- To provide moisture for the vegetation cover.
- There is no breeding of mosquitoes unlike stagnant water collected in ponds (or) lakes.

- Water is protected from contamination by the humans.

7.) A series of compounds in which the same functional group substitutes for hydrogen in a carbon-chain is called a homologous series of carbon compounds.

Alkynes C_nH_{2n-2}		Alkenes C_nH_{2n}	
Propyne	C_3H_4	C_3H_6	Propene
Butyne	C_4H_6	C_4H_8	Butene
Pentyne	C_5H_8	C_5H_{10}	Pentene

8.) Reaction with carbonates / hydrogencarbonates:

Alcohol (Ethanol) doesn't react with carbonates/ hydrogencarbonates.

(Ethanol) $(H_3CH_2OH + NaHCO_3 \rightarrow$ No reaction.

Ethanoic acid (carboxylic acid) reacts with carbonates

/ hydrogencarbonates to form a Sodium salt (sodium ethanoate / acetate), CO_2 and H_2O.

$CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$

(Ethanoic acid) (Sodium acetate / ethanoate)

$2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + CO_2 + H_2O$

The CO_2 gas evolved is passed through lime water & it turns lime water milky. This shows it is carbon-di-oxide

II Reaction with an alkali:

Ethanol (alcohol) doesn't react with a base. (Ethanol) $CH_3CH_2OH + NaOH \rightarrow$ No reaction

(Ethanol).

Ethanoic acid (carboxylic acid) reacts with a base (NaOH - Sodium hydroxide) to form salt and water.

$CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$.

(Acetic acid) (Sodium ethanoate).

III Reaction with metal.

Ethanol reacts with metal (Na) to form sodium ethoxide & evolution of hydrogen.

$$2Na + 2CH_3CH_2OH \longrightarrow 2CH_3CH_2O^-Na^+ + H_2$$

Ethanoic acid reacts with metal to form Sodium ethanoate. & H_2

$$2Na + 2CH_3COOH \longrightarrow 2CH_3COONa + H_2$$

9) a) Electronic configuation.

		K	L	M	N
Be	$\Rightarrow Z = 4$	2,	2.		
Mg	$\Rightarrow Z = 12$	2,	8,	2	
Ca	$\Rightarrow Z = 20$	2,	8,	8,	2

They should be in the II nd group because they have 2 electrons each in their valence shell.

b) Beryllium is the least reactive because as you go down the group the metallic property increases (electropositive) and they tend to lose electrons easily.

c) Calcium has the largest atomic size because it has 4 shells (K, L, M, N) and the atomic size increases as you go down a group due to addition of new shells.

10) $Z = 16$ Electronic configuration $\overset{K}{2}, \overset{L}{8}, \overset{M}{6}$

The element is ~~Silicon~~ Sulphur.

→ It lies in the third period because it has 3 shells (K, L, M). [Each occupied shell marks a new period].

→ It lies in the 16th group (10 + 6). The no. of valence electrons helps us find its group. There are 6 valence electrons, so it belongs to 10 + 6 = 16th group

The valence electrons are 6. So, in order to attain noble gas configuration, it must gain 2 electrons. So the valency of sulphur is 2.
$(8-6) = 2 \Rightarrow$ valency.

It is a non-metal because it must gain electrons to attain noble gas configuration.

When the no. of valence electrons are 5 and above, to find out the valency subtract the no. of valence electrons from 8.

8 − (no. of valence electrons).

11.)

Asexual Reproduction.	Sexual Reproduction
1.) It doesn't involve gamete formation.	It involves gamete formation.
2.) It involves only one parent.	It involves two parents.
3.) The offspring is almost identical to the parent.	The offspring resembles both parents (50% each)
Less variations.	More variations.

4.) Mitosis - type of cell division

Meiosis - (Gametes)
Mitosis - (Somatic cells).

5.) Less chances of evolution.

More chances of evolution.

12.) → To avoid the transmission of STDs (sexually transmitted diseases) like AIDs, syphillis, warts etc.
→ To avoid unnecessary pregnancies.
→ To control the population of the Society.
→ Controlled population size leads to equitable distribution of resources.
→ Increase in standard of living.

⇒ Incentives for small family norms have lead to control in the popolulation explosion.

⇒ The sex Ratio has become more balanced in our country because prenatal sex determination has been prohibited & & illegal sex-selective abortion has been banned.

⇒ Spread of awareness about STDs & usage of contraceptives (Barriers - condoms) have prevented many unwanted pregnancies & has lowered the spread of STDs (AIDs, syphillis etc). This was possible mainly due to sex-education.

13) Each gene set is present not as a single long thread of DNA but as separate independent pieces, called chromosomes. Each cell has 2 pairs of chromosomes for each characteristic / gene - one from male & other from

female parents. During gamete formation only one chromosome enters the gamete (either of maternal (or) paternal origin).

⇒ The no° of chromosomes are halved by meiosis. (the amount of DNA) -

⇒ The Gametes which are haploid in nature combine during fertilisation to form the zygote (diploid in nature).

Thus, the no. of chromosomes & DNA material are restored in the organism ensuring the stability of DNA in the species.

14.) P_1 BB (blue) × WW (white)

G_1 (B) (B) (W) (W)

F_1

		W	W
B		Bw	Bw
B		Bw	Bw

Phenotype: Blue : white

Bw (Blue)

a.) All F_1 plants will have blue flowers. (Blue - dominant trait, white - recessive trait).

Law of Dominance

P_2/F_1 Bw (Blue) × Bw (Blue)

G_2 (B) (W) (B) (W)

F_2

		B	W
B		BB (Blue)	Bw (Blue)
W		Bw (Blue)	WW (white)

Phenotypic ratio : Blue : white = 3 : 1.

Genotypic ratio : BB : Bw : WW = 1 : 2 : 1.

b.) Percentage of white flowers = 25%.

c.) Phenotype ratio : Blue : white = 3 : 1

Genotype ratio : BB : Bw = 1 : 2

15.) a) Speciation is the process of formation of new species from pre-existing species.

It depends on → Natural Selection
→ Geographic isolation
→ Genetic Drift
→ Onset of reproductive isolations

The beetles feeding on the bushes are spread over a mountain range. There are many sub-populations in the neighbourhood & they mostly reproduce within these sub-populations. They are isolated by a large river.

→ The Genetic drift & natural selection operate on these isolated groups separately.

→ Eventually they become incapable of reproducing with each other even if (incapable) they happen to meet. 2 New species are formed.

b) Natural selection: For example: A group of red beetles are living in a mountain range among green bushes. There is a variation, a green beetle is born which passes on the green colour to its progeny. Green beetles are not spotted by crows easily & mostly red beetles are eaten.
→ Natural selection changes the frequency of a certain gene in a population.
→ It enables the organism to adapt better to its environment.
→ It directs evolution. Organisms which are fitter survive better.

16) The particles in the (colloidal) environment scatter light and the path of the beam is visible. Colloidal particles are large enough to scatter light. This phenomenon is called Tyndall effect.

The sky appears blue.

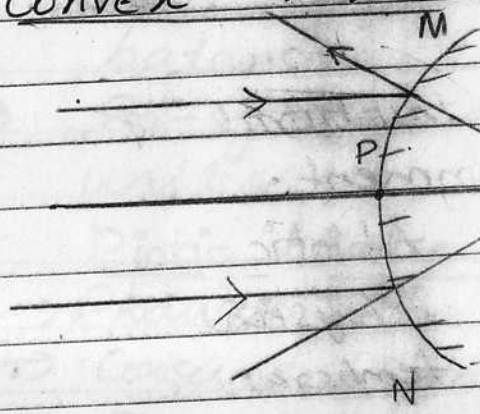
The atmosphere contains small particles like dust, smoke, mist and molecules of air that are smaller than the wavelength of visible light. Hence, they scatter light of shorter wavelengths at blue end. This scattered blue light enters our eye & the sky appears blue.

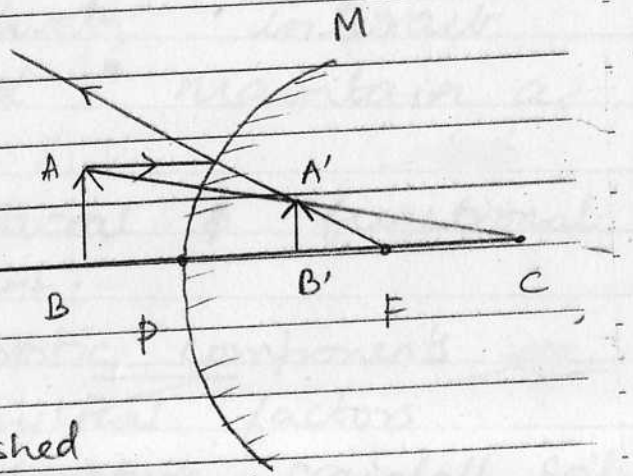
Reddish appearance of Sun at sunrise

When the Sun is at the horizon, the sunlight has to pass through thick layers of atmosphere & large distances to reach the surface of Earth. Meanwhile, the smaller particles in the atmosphere scatter away lights of shorter wavelength (blue & violet). Hence, only the lights of longer

wavelength (red) reaches our eyes. (The blue light is scattered & eliminated away).

17.) Convex mirror





Erect
Diminished

We use it generally in rear-view mirrors of cars to enable the driver to see the traffic behind him / her and to facilitate safe driving. A convex mirror is used because it always gives → erect
→ virtual
→ diminished images.

It gives a wider field of view so that a larger area can be viewed. This is because the convex mirror is curved outwards.

18) → An eco-system ~~const~~ consists of humans, plants, animals, micro-organisms and non-living things that interact with each other and maintain a balance in nature.

→ Eco-system is the structural & functional unit of an environment.

Biotic components
→ Producers
→ Consumers
→ Decomposers.

Abiotic components
Physical factors
→ temperature, rainfall, soil, minerals, wind.

Natural eco-systems (ponds / lakes) have self-sustainability. They have decomposers in them unlike aquariums which are artificial eco-systems.

Decomposers they convert organic substances into v inorganic materials which are taken (Simple) up by plants once again.

They feed on dead remains & waste

products of plants and animals. Eg:
Bacteria, Fungi, Saprophytes.

19.) Fossils are preserved traces of living organisms. Eg: If a dead insect gets trapped in hot mud, it doesn't decompose easily. Eventually the mud will harden and retain the impressions of the body parts of the insect.

Thus, the insect is fossilised into rocks.

Excavating This is a relative method.
As we dig into the soil, the fossils we find in the deeper layers are more recent than the fossils we find closer to the surface.

Radio-Carbon Dating - the ratio of different isotopes of the same element present in the fossil can tell us how old the fossil is.

(∧- detecting)

Fossils give the palentological evidence for evolution. For eg: Dinosaur fossils reveal that they had feathers millions of years ago; to protect them from cold. These feathers have now been adapted by birds for flight. This suggests that dinosaurs birds were closely related. Fossils thus help us in tracing evolutionary relationships and origins.

(Grep & -files)

20) a) Testis, testosterone (hormone) - 1

→ It regulates the formation of sperms

→ It controls the appearance of the boys seen at the time of puberty.

b) i) Oviduct (fallopian tube)

ii) Uterine wall. - 1

The embryo gets its nourishment from its mother through the placenta. Placenta is a disc-like structure that is embedded in the uterine wall.

embryo's
The ~~mother's~~ side of the placenta has villi-like structures.
The mother's side of the placenta has blood-spaces which surround the villi.
The villi like structures increase the surface area for absorption of materials like glucose & (exchange) oxygen from the mother's blood to the embryo.
The embryo also generates wastes which are transported to the mother's blood via the placenta.

21.) The degree of convergence (or) divergence achieved by a lens is called the power of a lens. SI unit — Dioptre
1 Dioptre is the power of a lens whose focal length is 1 metre.
$1\ D = 1\ m^{-1}$.

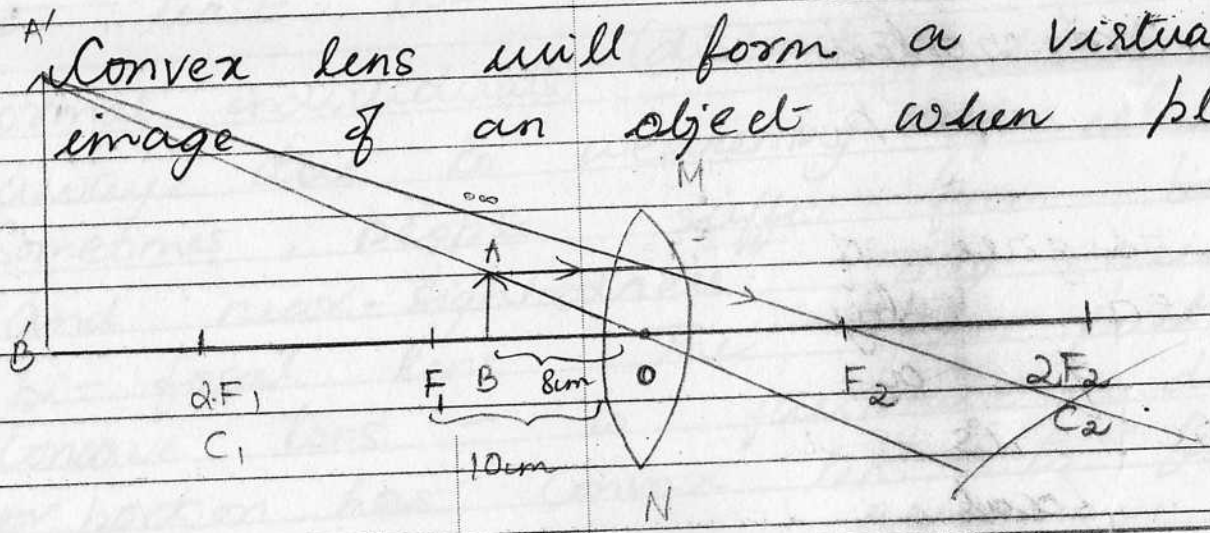
A. $f = +10\,cm$ Convex lens.

$$P = \frac{100\ cm}{f\ cm} = \frac{10\emptyset}{1\emptyset} = +10D$$

B $f = -10\,cm$ Concave lens.

$$P = \frac{100}{f\,cm} = \frac{10\emptyset}{-1\emptyset} = -10D.$$

Convex lens will form a virtual, magnified image of an object when placed at 8 cm.



22) Ciliary muscles control the thickness of the lens. If the muscles are relaxed, the lens becomes thin & the focal length increases to help seeing distant objects.
If the muscles contract, the lens become thick & the focal length decreases to help seeing nearby objects.

Presbyopia: Convex lens.

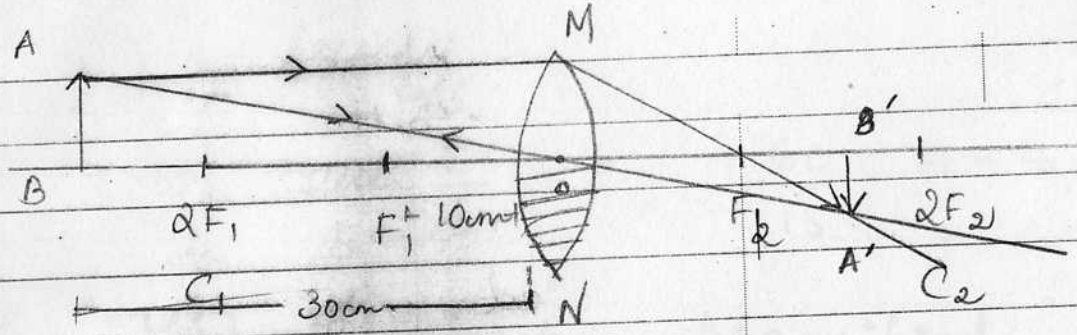
The least point of vision which is 25cm in normal individuals (distinct) gradually recedes away due to weakening of ciliary muscles. Sometimes, people suffer from both distant sightedness and near-sightedness. They need to use bi-focal lens. The upper portion has Concave lens - to facilitate - distant vision. lower portion has convex lens - to facilitate near vision.

a.) Myopia, Concave lens.

b.) Teacher and Salman :-
Kind, thoughtful, helpful.
Teacher wants Akshay to learn properly.
and Salman wants his classmate to read comfaxtably.
The teacher called in Akshay's parents. This shows the concern of the teacher.

c.) Akshay can study properly, be obedient in class and gratify his teacher.
He can help Salman in his studies (or) other problems which he may face.

23.) Yes, the lens can produce an image because the light can still pass through the optical centre.



Convex Lens.

$h = 4cm$ $f = 20cm$ $u = -15cm$

$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ $\frac{1}{20} = \frac{1}{v} - \frac{1}{-15}$

5 | 15, 20
3, 4.

$\frac{1}{20} - \frac{1}{15} = \frac{1}{v}$

$\frac{3-4}{60} = \frac{1}{v}$ $\frac{-1}{60} = v$ $-60cm = v$

Image is formed 60cm on the LHS of the lens.

$\frac{h'}{h} = \frac{v}{u}$ $\frac{h'}{4} = \frac{+60}{-15}$

$h' = \frac{60}{15} \times 4 = 16cm$

$h' = 16$ cm.

$$m = \frac{v}{u} = \frac{+60}{+15} = +4$$

Virtual, Erect, Magnified.

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24) Soap :- Sodium (or) Potassium salts of long chain carboxylic acids.

Detergents :- Ammonium (or) Sulphonate salts of long chain carboxylic acids.

The soap v have two ends with differing (molecules) properties.

Hydrophyllic - dissolves in water.

Hydrophobic - dissolves in hydrocarbons.

Dirt is oily in nature and doesn't dissolve in water. In water, the

(clusters of molecules)

Soap molecules form special structures called miscelles that keep the hydrocarbon portion out of water. The ionic end which is soluble in water faces the surface of the cluster. The hydrocarbon portion faces the interior of the cluster towards the oil droplet. Soap in the form of a miscelle is able to clean, since the oily dirt is collected in the centre of the miscelle. Miscelles stay in a solution as a colloid & do not come together because of ion-ion repulsion. Thus, the dirt is easily cleansed away.

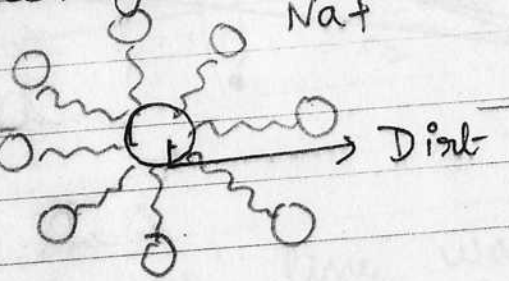
→ Soaps reacts with magnesium (or) calcium ions ions in hard water to form scum (an insoluble substance). So it doesn't form lather.

→ Detergents are made from synthetic materials which may be harmful to our skin and even clothes. They prove to

Ionic end ← ~ → Hydrophobic end.

be harsh on our skin.

→ They are non-biodegrable unlike soaps which are mostly made of glycerol.



25) B) Radish, Carrot

26) C) III, IV & V.

27) B.)

28) D.) $\angle i = \angle e > \angle r$.

29) B.) MS.

30) D.)

31) A.) P & Q.

32) A.)

33) D.)

34.) $h = 4\text{ cm}$ $u = -12$

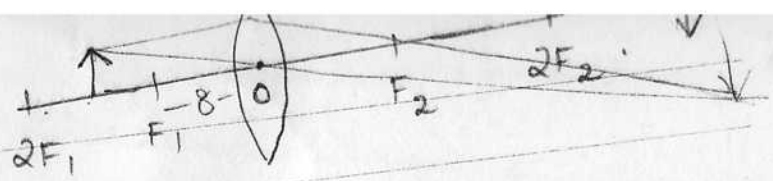
$v = 24$.

Convex lens.

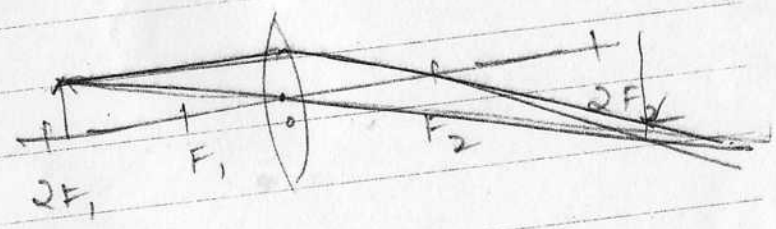
$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{24} - \frac{1}{-12} = \frac{1}{24} + \frac{1}{12}$

$= \frac{1+2}{24} = \frac{3}{24}$

$$f = \frac{24}{3} = 8\,cm.$$



Move the screen towards the lens.



Magnification reduces.

35.) CO_2 (carbon-di-oxide). → Pass the gas through lime water ($Ca(OH)_2$).
→ Lime water turns milky.

36.) a) Fine adjustment screw

b)