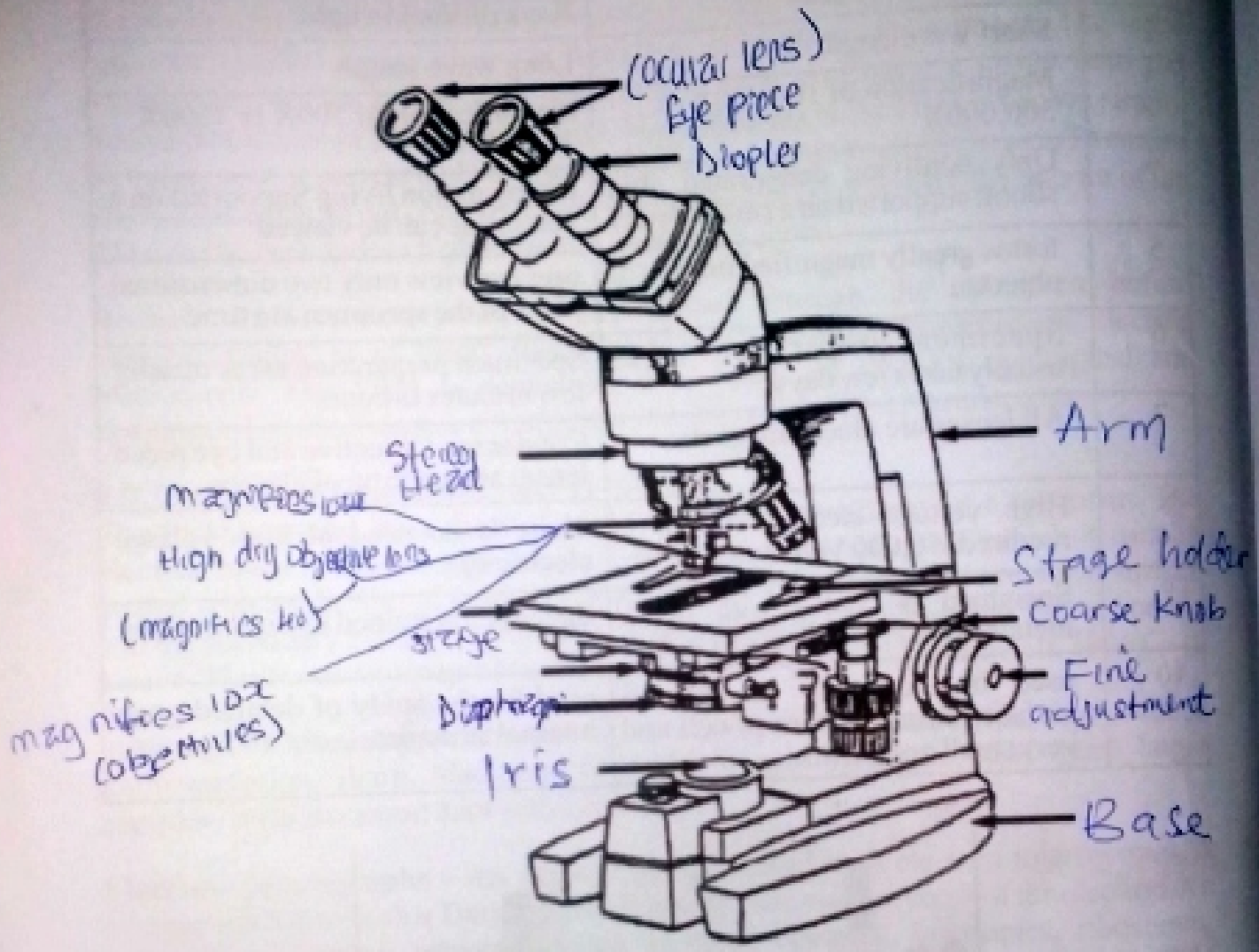
Microscope Quiz Exercise

a. Complete the following diagram. Label the parts of the microscope



b. What are the magnifications of each of the objectives on your microscope? Magnification of the objectives are as follows:
Magnification 10x, magnification 40x, magnification 100x

c. Calculate the total magnification for each ocular/objective combination on your microscope.

Ocular	Objective	Total Magnification
10x	4x	40x
10x	10x	100x
10x	40x	400x
10x	10x	1000x
10x		

d. List the magnification and numerical aperture for each objective on your microscope.

Magnification of Objective	Numerical Aperture (NA)
4X	4.45
10X	1.75
40X	0.65
100X	0.198

e. What is the total magnification that you are using to examine a cell when you are examining it with the 40x objective?

The ocular lens = 10x The total magnification is
objective = 40

f. If 4 plant cells extend across the field of view when the observer is using 10X objective, what is the length of each cell?

10x objective (4 cells across) length of the one cell
2mm = 0.5mm | 10x objective = 2.2mm (1.76)
4 cells = 2mm $\frac{2mm}{4mm}$ = 0.5mm

g. If you were observing a live specimen under the 40x objective lens and it moved out of your field of view, explain how you could find it again quickly and easily. The observing area must be a white plan where you can easily see and detect it. But the observing area was a coloured background it would be difficult to trace or quickly find the specimen.

h. Microscopes that are____ will remain nearly focused after the low-power objective lens is changed to the high-power objective lens. A), monocular. B), parcentered. C), parfocal. D), properly adjusted.

i. At high power, always use which adjustment knob to focus the image?

At high power, always use the coarse Adjustment knob

j. What are the two knobs used in focusing the microscope

Coarse Adjustment knob
Fine Adjustment knob

k. On the microscope stage, what is used to hold the glass slide in place and prevent it from moving. The part used to hold the glass slide in place without moving is called a chip.

Which part of the microscope should you hold when lifting or moving the microscope? The only part one should hold and lift when moving a microscope is the ARM

Transmitted light microscope has a light source below the stage while a reflected microscope has a light source that is located? It is located just beside the objective lens where the auxiliary lenses can be attached

A stereo microscope is used to? Study the surface of solid specimen or to carry out work such as dissection, microsugery, watch making and forensic engineering.

Which part of the microscope contains the shutter that regulates the amount of light entering the lens system? The part which controls or regulates the amount of light is known as the Condenser lens

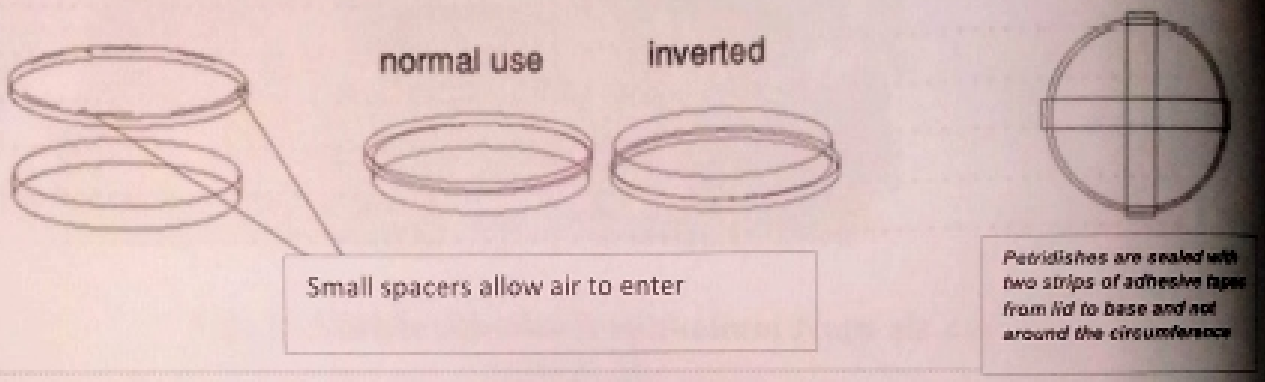
A microscope is set to 10x eyepiece and 40x objective. What is the total magnification? The total magnification of 10x eye piece and 40x Objective is equal to 400

To obtain total magnification, you should ..... the magnification of the eyepiece to the objective lens power: (a) Add (b) Multiply (c) Divide (d) Subtract.

LABORATORY EXERCISE FIVE

MICROBIOLOGICAL TECHNIQUES

It is a known fact that any source of organic food which provides carbon compound for energy of respiration provides a suitable environment for Bacteria to grow. To study the growth of bacteria, two normal media are used and are a clear soup-like liquid nutrient broth, usually in tubes, and nutrient agar, which is set into a jelly by the addition of a seaweed extract called agar. When they are melted they are poured into glass or plastic Petri dishes(known as plates) as shown below.



Petri Dishes

5.1 Microbiological Techniques

These consist of sterilization, aseptic techniques, inoculation, and incubation. The media must be sterilized by heating in an autoclave (like a pressure cooker) at 121°C (pressure 1 bar or 15 lb/sq. in.) for 15 minutes, which kills all living organisms, including spores. All apparatus used from this point onwards must be sterilized by heat (glassware - 160 °C for 2 hrs) or exposure to radiation. Aseptic techniques must be used to reduce the likelihood of bacterial contamination. This usually involves disinfection of working areas, minimizing possible access by bacteria from the air to exposed media, and use of flames to kill bacteria which might enter vessels as they are opened.

Cultures are usually examined after 24 hrs incubation.Liquid media such as broth become cloudy if bacteria are present. This could be the result of only one bacterial cell originally entering the medium, then dividing repeatedly to produce millions. Bacteria on agar "plates" become visible as distinct circular colonies; each colony should represent an individual bacterial cell (or group) which has divided repeatedly but, being kept in one place, the resulting cells have accumulated to form a visible patch.

7. Record your observations in your practical book indicating the stain and organism used. Pay particular attention to the arrangements, shapes and relative sizes of the cells.

5.3 Review Questions

1. Give three reasons why microorganisms are stained
a) To enhance visualization of the cell under a microscope
b) To highlight differences of the micro organisms
c) To enhance or highlight cell components

2. On what type of cells can staining be conducted
Staining can be conducted on fixed or non-living cells

3. Give two examples of stains. Simple staining
Differential staining

4. What is the result of staining with three dyes? It results in seperation into group and visualization of structures

5. Why do we prefer stains with positively charged chromogen? It is preferred because bacterial nucleic acids and certain cell wall components carry a negative charge that strongly attracts and binds to the cationic chromogen

6. Under what magnification do you examine all the stained slides?
HOX

7. What stains are used to show the morphology and arrangement of bacterial cells? Simple stain

LABORATORY EXERCISES SEVEN

ECOLOGICAL TECHNIQUES

7.1 Ecological Terms

i. **Terrestrial organisms** = organisms that live on land.

ii. **Aquatic organisms** = organisms that live in water. e.g fish, crayfish, octopus, etc

iii. **Arboreal organisms** = organisms that live in the trees. e.g. Squirrel, monkey, pangolin, chameleon, etc

iv. **Planktonic organisms** = organisms that float on water surface e.g copepods (and other microcrusteaceans), rotifer, algae, eggs and larvae of aquatic organisms in the water.

v. **Nektonic organisms** = organisms that swim well in water, e.g fish, sea turtle, Blue crab, Octopus, etc

vi. **Benthos / Benthic** organisms = organisms that dwell on sea or river bed (bottom- dwellers of a water body).

vii. **Sessile or sedentary** organisms = live permanently attached to hard substrates (rocks, mangrove, ship-wreck, piers, in water). e.g. Oyster, sponge, barnacle, hydroid, tunicate, bryozoan, etc.

viii. **Semi-sessile** organisms = Slow-moving animals like periwinkles, earthworms, garden snails, millipede, woodlice, etc that can easily be collected or captured.

ix. **Amphibious** = shoreline animals that spend some time in water and on land e.g. crocodile, River Otter, Nile monitor, sea turtle, terrapins, Hippopotamus, Seal, Sea lion, etc.

x. **Fossorial** = Burrowing animals e.g, Ocypod crabs, earthworm, crickets, giant rat (rabbit), etc.

xi. **Cursorial** = ground-running animals like antelopes, duikers, bush-pig, grasscutter, etc.

xii. **Saltorial** = leaping animals e.g kangaroo

xiii. **Authotrophs**= Organisms that carry out the food-manufacturing process of photosynthesis, namely- green plants, algae, seagrass, etc.

xiv. **Herbivores** = animals that feed on plants and plant parts.

xv. **Grazers** = animals (herbivores) specialized in feeding on grass / plants on the ground (e.g. antelopes, sheep, goat, etc

Table 5

Species	Count of Animal Species				
	Stone	Dead wood	Panel	Plastic	Total
A Earthworm	12	0	6	0	18
B Centipede	1	5	2	1	9
C Cricket	2	2	8	0	12
D Termite	0	15	0	0	15
E Ants	10	12	9	6	35
F Spider	0	2	7	1	10
G Millipede	0	2	0	0	2
H Frog	0	0	5	6	11
I Cockroach	7	2	3	1	13
TOTAL	32	40	38	15	125

Transform your data using bar charts:

i. From your result, state the dominant species in each habitat type
Specie A (stone), D (dead wood), C (panel), E and H

ii. Which species are commonly found in all the habitat types?
I, E and B Species

iii. Why do these animals hide in these habitats in dry season?
They hide because hot or dry conditions (extremely) can cause death, so they hide in these habitat for survival

iv. How do they get into these habitats?
Through Migration

v. Make a list of other habitat types you can find on campus, other than these.
Meadows, grasslands, gardens

vi. What is a microhabitat? A small area which differs somehow from the surrounding habitat

7.3 Preparation and Examination of Protozoan/Micro-Invertebrate Algal Culture.

Collect some water from a pond, gutter, or pool fed by bathroom waste water, using a plastic container. Introduce some straw or dry leaves into it and let it stand under a shade for about 5 days. During the period, protozoan, rotifers, nematodes and algae etc in the culture will multiply.

Laboratory Exercise

1. What is a Secchi Disk and what is its use in ecological measurements? A Secchi disc is a metalic disc about 30cm across alternating black and white quadrant used to measure transparency of water body.

2. How are earthworms extracted from soil? Earthworm are extracted by pouring 5ml of 4% formaldehyde into 5ml of water sprinkling over a square meter of grassland, they will be driven out of their burrows.

3. What are the number of methods for extracting ectoparasites from their host?
There are two methods:
1) Brushing and combing methods
2) Detergent washing methods.

4. What are the methods for extracting nematodes, small arthropods from soil and organic debris? Baermann funnel, Tulgren funnel, Berlese methods.

5. Explain the methods for catching small mammals and birds
(A) Long nets with mammal trap is used for catching small mammals like rats.
(B) Mist net is used to trap birds.

6. What are the following used for in ecological studies?
i) Pooler Collecting minute and delicate organisms without destroying them
ii) Pit trap Collecting animals including lizards, myriapods,
iii) Basket trap Capture fishes for studies.

7. List the types of equipment used in collecting soil samples for analysis of microorganisms
Soil Auger
Soil trike
Spade

8. What is the Pour Plate Method? A laboratory technique for isolating and counting the viable microorganisms present in a liquid sample which is added along with or before molten agar medium prior to its solidification.

9. What are the conditions to ensure results that are accurate in the Pour Plate Method? Fixed amount of emenium from a sample is placed in the centre of sterile petridish. Molten, cooled agar is poured into the petridish containing inoculant & are mixed. After solidification, plate is inverted at 32°C for 24-48 hours.

7.7 Preparing the Skeleton of a Small Mammal (e.g. a Giant Rat)

7.7.1 Oxidation Method

(a) Procedure

- Sacrifice the animal humanely by putting it in a desiccator containing cotton wool soaked in chloroform or ether for 15 min.
- Dissect the animal to remove the visceral organs.
- Remove the skin.
- Carefully chop off the major muscles of the body with scissors, making sure no bone is cut or cracked.
- Boil for 2 hrs.
- Put the animal in a transparent cellophane bag and fill it with manure.
- Open the earth and bury the cellophane and its content. Mark the spot with small pegs or caution tape
- Allow it to decay for 1 month.
- At the end of one month, exhume the animal and put it in a basin of water and wash off the soil.
- Immerse it in a detergent solution for 24 hrs to macerate any remaining tissue attached to the bones.
- Rinse
- Soak in 50% Ammonia solution
- Immerse it in container of hydrogen peroxide for 24 hrs.
- Rinse and air dry.

Result: A clean, white, degreased set of skeleton, without any objectionable odours