

## 4.4 BIOLOGY (231)

### 4.4.1 Biology Paper 1 (231/1)

- 1.(a) Is when the rate of water loss is more than the rate of absorption and the plant droops; 1 mark
- (b) The rate of active transport increases with increase in temperature up to the optimum temperature; 1 mark
- Further increase in temperature slows down the rate of active transport until it stops because it denatures enzymes; 1 mark
- 2.(a) Animal cell; 1 mark
- (b) - Has cell membrane only/has no cell wall;  
- Has numerous small vacuoles;  
- Has central nucleus; Max. 2 marks
- (c) Consists of many similar cells performing the same function; 1 mark
- 3.(a) Have mammary glands; have external ears/pinna;  
Body covered with fur/hair; Max. 2 marks
- (b) Class; 1 mark
- 4.(a) Lubrication; Protection; 2 marks
- (b) Young people are more active; requiring more energy;/  
Older people are less active; requiring less energy; 2 marks
5. As the cell gains water by osmosis; the sap/cell vacuole enlarges; pushing the cytoplasm outwards; exerting pressure on the cell wall; Any 3 3 marks
6. ~~6000(μm)~~  
55 (cells) ; 109μm; 2 marks
- 7.(a) Water molecules cling to each other maintaining a continuous column of water/preventing the break of water column; 1 mark
- (b) Water molecules cling to the sides of the xylem vessel walls; 1 mark
8. 1(a) - Leaf with serrated margin -- go to 2;  
(b) - Leaf with smooth margin -- go to --; 2 marks
9. Presence of myelin sheath for insulation/increases transmission; Axon for transmission of impulses;  
Large cell body controls activities of cell; Nerve endings/dendrites receive impulses from

receptors cells;

Node of Ranvier speeds up impulse transmission.

- (b) Inner membrane highly folded/cristae to increase S A for attachment of (respiratory) enzymes. 4 marks
10. Cells loosely arranged; to facilitate air circulation;  
Cells have moist surfaces; to dissolve respiratory gases; 2 marks
11. Can receive blood from any donor/ universal recipient; 1 mark
12. (a) (i) Arachnida; 1 mark  
(ii) Spider/scorpion/tick/mite; 1 mark
- (b) Protoctista/protista; 1 mark
13. Autotrophic nutrition; show alternation of generation;  
Limited movement;  
Limited excretory products/unspecialized respiratory structures;  
Localised growth; 2 marks
14. Alcohol/ethanol; Carbon (IV) oxide; Energy/Adenosine Triphosphate; 3 marks
15. - To increase supply of oxygen to the tissues;  
- The oxygen is used to oxidize lactic acid (to carbon (IV) oxide, water and energy); 2 marks
16. Protogyny; protandry; Dioecious; Dichogamy;  
Self sterility/incompatibility; Heterostyly;  
Presence of structures/substances to attract agents of pollination; Max. 3 marks
17. Ovary /Anther; 1 mark
18. - Acrosome/Lysosome contain enzyme to digest membrane of the ovum;  
- Numerous mitochondria to provide energy for movement;  
- Long tail for faster movement; Max. 2 marks
19. - Embryo not fully developed;  
- Chemical inhibitors/presence of abscisic acid;  
- Hard/impermeable testa/seed coat;  
- Low hormones/low enzymes concentration; Max. 3 marks
20. Genetically acquired beneficial characteristics which occur spontaneously; are  
perpetuated through reproduction; 2 marks
- 21.(a) Continents existed as one large Landmass/Pangea/Laurasian and Gondwana Land;  
Present continents drifted from it leading to isolation of organisms; organisms in each  
continent  
evolved along different lines hence emergence of new species; 3 marks



- (b) Emergence of new life/species/organisms from pre-existing simple forms, gradually over a long period of time, to present complex forms; 1 mark
- 22.(a) Thigmotropism/Haptotropism; 1 mark
- (b) Part of the tendril in contact with support causes migration of auxins to the opposite side; leading to faster cell division/growth on the side not in contact with the support; This causes the tendril to curl around the support; 3 marks
23. Use of biconcave/concave lens/divergent lens; to diverge the rays and make image be focussed on the retina; 2 marks
24. - Contains antibodies that defend the body from foreign antigens;  
- Has white blood cells that produce antibodies/while blood cells engulf antigens;  
- Has platelets that initiate blood clotting to prevent excessive bleeding at an open wound/ prevent entry of pathogens; 3 marks
25. - Thin and long to allow for capillarity;  
- Walls lignified to strengthen the stem/to prevent collapse of vessels;  
- Have bordered pits to allow for exchange of materials; Max. 2 marks
- 26.(a) Genes inherited along with the sex chromosomes; 1 mark
- (b) Haemophilia; hairy ears/pinna/nose; colour blindness/red green; blue-green colour blindness; Muscular diastrophy; baldness 2 marks
- 27.(a) Complete metamorphosis - eggs hatch into larvae while in incomplete metamorphosis hatch into nymphs which resemble the adult;  
  
Complete metamorphosis has four stages; egg, larvae, pupa and adult while an incomplete metamorphosis has three stages; egg, nymph and adult. 2 marks
- (b) To allow for growth of the insect; 1 mark
28. (a) Ligaments; synovial fluid; synovial membrane; articular cartilage; synovial capsule; a bone with rounded head fitting into a cavity of another bone; Max. 2 marks
- (b) (i) Atlas; (ii) Axis allows movement in all planes; 2 marks
29. - Form joints with the legs to make walking possible; 1 mark  
- Provide large surface area for attachment of muscles; 1 mark  
- Offers support (to the body weight)
30. Absorption of water; support;  
Opening and closing of stomata;  
Feeding in insectivorous/plants; 2 marks

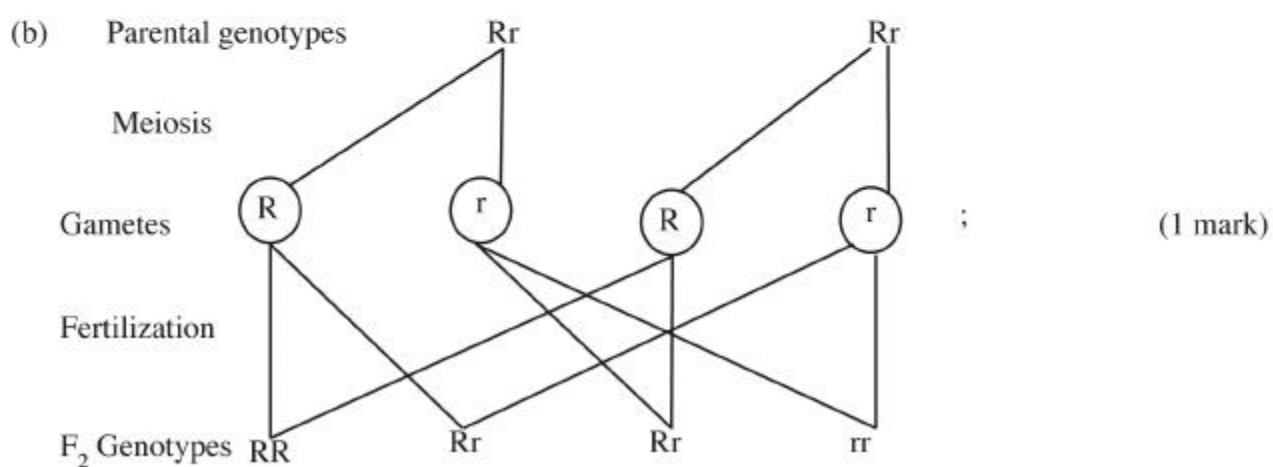
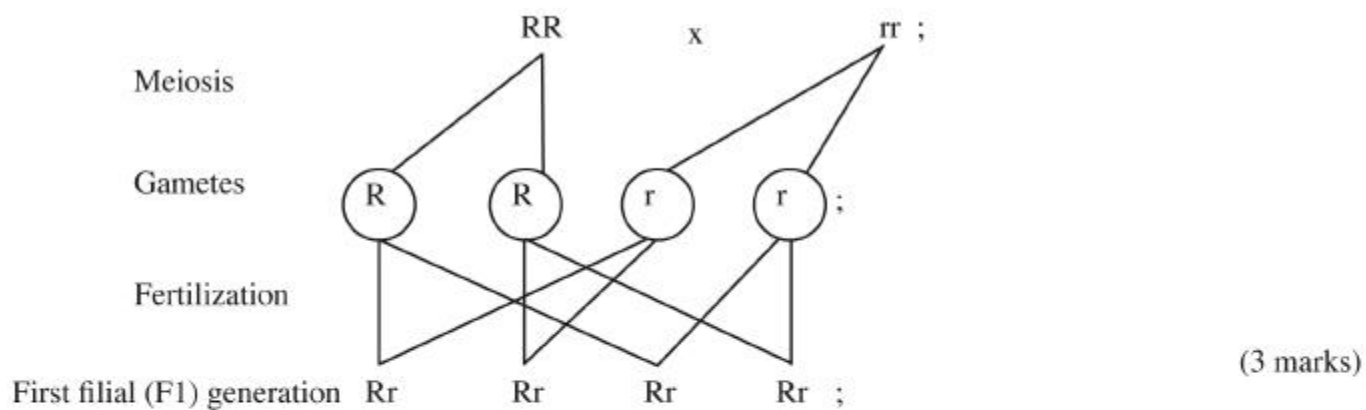


#### 4.4.2 Biology Paper 2 (231/2)

1. (a) (i) **B** Seta/stalk; 1 mark  
**D** Rhizoid; 1 mark  
(ii) **A** Production of spores/sporulation; 1 mark  
**C** Photosynthesis; 1 mark  
(b) (i) Arthropoda; 1 mark  
(ii) - Segmented body;  
- Jointed appendages;  
- Presence of exoskeleton 3 marks
2. (a) **E** Semi circular canals;  
**F** Oval window/Fenestra ovalis/Fenestra vestibuli;  
**G** Cochlea; 3 marks  
(b) (i) Lined with hair/secretion of wax/(has glands that secrete wax) to trap foreign bodies;  
Hollow/tubular/tube; to direct sound waves to the ear drum/tympanum/tympanic membrane;  
(max) (2 marks)  
(ii) Small/form a lever system/solid; to amplify (sound) vibrations; (2 marks)  
(c) Deafness/ absence of pinna/ vertigo/tinnitus; (max) (1 mark)
3. (a) (i) Provides energy needed to split water molecules into oxygen and hydrogen/ photolysis;  
Provides energy for formation of ATP molecules (which is used in dark stage) (1 mark)  
(ii) Combines with hydrogen ions to make glucose; (1 mark)  
(iii) Used to trap light energy; (1 mark)  
(b) (i) Starch;  
(ii) Protein; (2 marks)  
(c) (i) Lack of vitamin B1/thiamine; (1 mark)  
(ii) - Stunted growth;  
- Paralysis of legs/arms/limbs/damage to peripheral nerves;  
- Heart failure  
- Swelling of feet/oedema  
- Gastrointestinal disturbances/loss of appetite/constipation/diarrhoea/vomiting;  
- Weight loss/muscle wasting  
- Pale skin (2 marks)



4. (a) Parental phenotypes Smooth Wrinkled



(i) Genotypic ratio 1 : 2 : 1 ; (1 mark)

(ii) Phenotypic ratio 3 smooth coats : 1 wrinkled coat; (1 mark)

(c) The total number of wrinkled seeds.

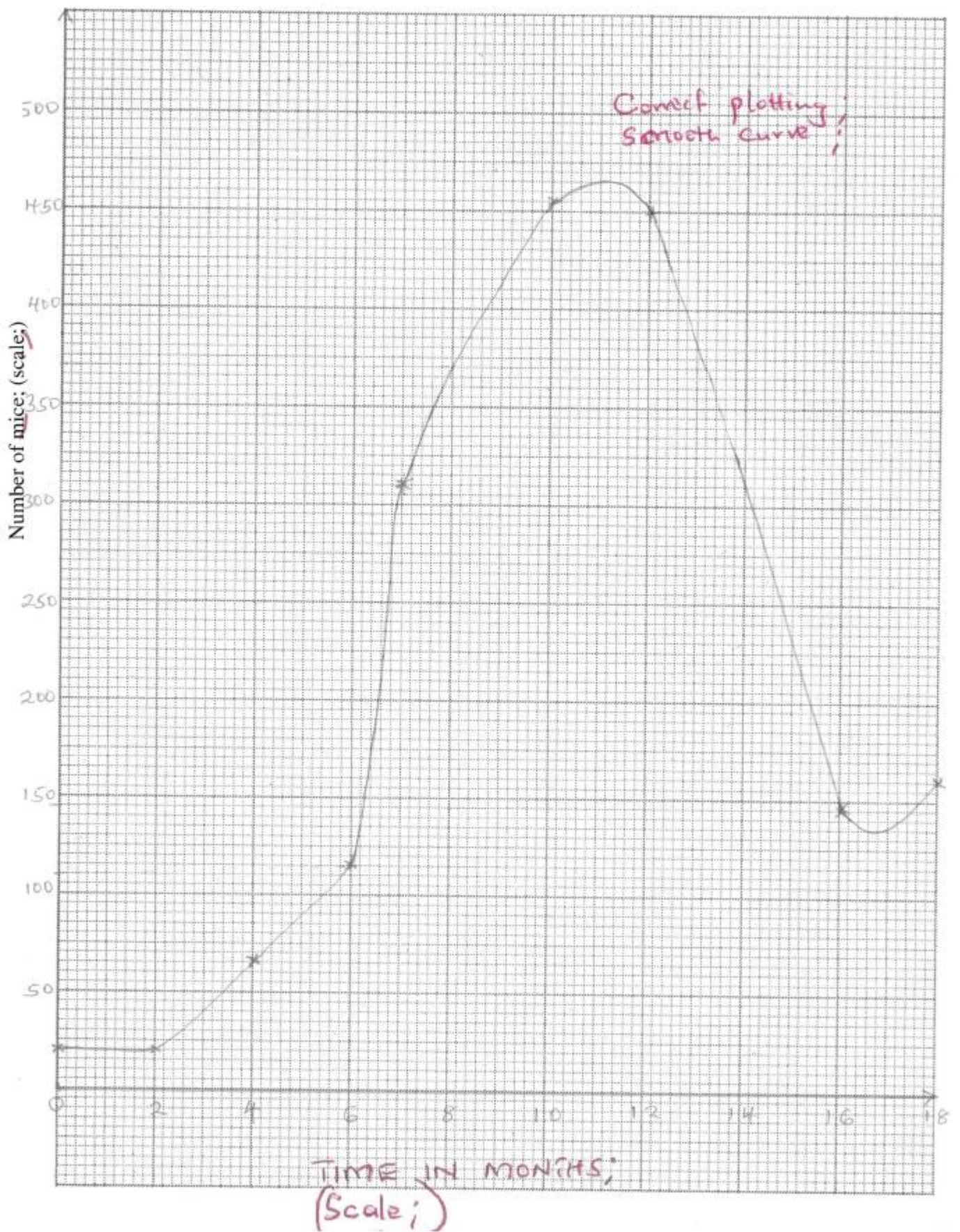
$\frac{1}{4} \times 14,640 = 3660$  ; (2 marks)





5. (a) (i) **H** - It is long/wide/broad/flat; to provide a large surface area for attachment of muscles;  
 - Has facets; for articulation with sacrum; (2 marks)
- (ii) **J** Has flexible cartilage; which allows for widening of the (female) pelvic girdle when giving birth/to absorb shock. (2 marks)
- (b) Allows passage of blood vessels/nerves/ and muscles; (1 mark)
- (c) (i) Femur; 1 mark  
 (ii) Ball and socket; 1 mark
- (d) Coccyx; 1 mark
6. (a) See graph on page 5.
- (b) (i) No change in population/population is constant; mice still maturing/have not given birth; (2 marks)
- (ii) Slow/gradual population growth; few mice have reached sexual maturity; (2 marks)
- (iii) Faster/rapid rate of population growth/exponential;  
 Many mice sexually matured/reproducing/enough food/space/no competition/  
 birth rate higher than death/no diseases: (2 marks)
- (iv) Population decline;  
 Competition is high / food is limiting / space is limiting/accumulation of toxic  
 waste/disease (outbreak) deathrate higher than birth rate. (2 marks)
- (c) (i) 6 and 8 ; (1 mark)
- (ii)  $310 - 115 = 195$  mice per month; (2 marks)
- (d) Population would increase; (1 marks)
- (e) Food; space ; cage size; water; 342

(max) (2 marks)





7. (a) When a blood vessel is cut/injured platelets/thrombocytes/damaged tissue/wound is exposed to the air; they release thrombokinase/thromboplastin ; an enzyme that activates the conversion of prothrombin; to thrombin; in the presence of calcium ions; vitamin K/ phyloquinone ; is needed for the formation of prothrombin; Thrombin converts (soluble blood protein) fibrinogen ; into (the fibrous form) fibrin; which forms a mesh / network across the wound; The clot so formed prevents excessive bleeding; and entry of disease agents/pathogens/micro-organisms/microbes;  
Max 10 marks
- (b) Many to provide a large surface area; across which large amounts of gases diffuse; moist surfaces; to dissolve respiratory gases; so as to diffuse. Made of a thin membrane/epithelium/one cell thick wall ; to reduce diffusion distance; Highly vascularized; to carry away oxygen; and bring in carbon (IV) oxide; creating a steep diffusion gradients.  
(10 marks)
8. (a) Regulation of blood sugar ; when blood sugar is below normal/90 mg/100 cm<sup>3</sup> glucagon ; triggers the conversion of glycogen to glucose in the liver ; the glucose is released into the blood stream. When blood sugar is in excess above normal/10 mg/100 cm<sup>3</sup>, insulin; causes the liver to convert glucose excess to glycogen ; which is stored.  
Production of heat energy ; by increasing the rate of metabolic activities;  
Excretion of bile pigments ; produced due to breakdown of worn out red blood cells;  
Deamination/removal of amino group of excess amino acids to form urea; and detoxication/poisonous/toxic substances;  
(Max 10 marks)
- (b) Sweat glands excrete urea; excess water; and salts; hence maintaining salt & water balance in the blood. Evaporation of sweat; cools the body due to loss of latent heat of vaporization; when the body temperature rises ; blood vessels in the skin vasodilate; allowing more blood to flow near the skin surface; thus heat is lost to the environment by radiation/convection. The erector pili muscle relaxes hair flattens ; in a hot environment reducing insulation; hence heat is lost from the body by radiation/convection; to the environment.  
(max 10 marks)



#### 4.4.3 Biology Paper 3 (231/3)

1. (a) (i) Sternum; (1 mark)
- (ii) The internal intercostal muscles relax; pulling the ribs upwards; and outwards;  
This increases the volume of the rib cage while pressure decreases;  
Forcing air into the lungs; (5 marks)
- (b) (i) Anterior/dorsal view; (1 mark)
- (ii) Name - Neural canal; (1 mark)
- Function - Passage of the spinal cord. (1 mark)
- (iii) **V**: It is thick and solid; for bearing the weight of the body (back) (2 marks)
- S**: It is long; to provide a large surface area for attachment of muscles; (2 marks)
- (c) (i) Image width = 9.8 cm;
- (ii) Magnification =  $\frac{\text{Image length / width}}{\text{Actual length / width}}$  ;
- =  $\frac{9.8 \pm 0.1}{4.6 \pm 0.1}$
- Mg =  $\times 2.13$  ;
- (iii) Actual length AB =  $\frac{10.4 \pm 0.1}{2.13}$  ;
- = 4.8826 cm ; (5 marks)



**3.**

1. (a) Simple leaves ..... go to 2;  
 (b) Compound leaves ..... go to 4;
2. (a) Leaves net-veined/reticulate ..... go to 3;  
 (b) Leaves parallel veined ..... *Commelinaceae*,
3. (a) Leaves with serrated margins ..... *Malvaceae*,  
 (b) Leaves with smooth (entire) margins ..... *Nyctaginaceae*,
4. (a) Leaves opposite ..... go to 5;  
 (b) Leaves alternate ..... *Bignoniaceae*,
5. (a) Leaves pinnate ..... *Papilionaceae*,  
 (b) Leaves trifoliate ..... *Compositae*,

(10 marks)

Food Substance Tested	Procedure	Observation	Conclusion
1. Reducing sugars	<ul style="list-style-type: none"> <li>Put 2 cm<sup>3</sup> of C in a test tube;</li> <li>Add equal volume of Benedict's Solution.</li> <li>Put in a hot water bath/heat/warm/boil;</li> </ul>	No colour change/ blue colour remains/ colour of Benedict's solution remains/ persists;	Reducing sugars absent;
2. Reducing sugar	<ul style="list-style-type: none"> <li>Put 2 cm<sup>3</sup> of C in a test tube;</li> <li>Add a few drops of dilute hydrochloric acid.</li> <li>Place the test tube in a hot water bath for 3 minutes;</li> <li>Remove the test tube and cool in cold water.</li> <li>Add (NaH)<sub>2</sub>CO<sub>3</sub> drop by drop until fizzing stops</li> <li>Add 2 cm<sup>3</sup> of Benedict's Solution.</li> <li>Place the test tube in a hot water bath/heat/warm/boil;</li> </ul>	Colour changes to green / yellow / orange / brown;	Reducing sugars present;
3. Proteins	<ul style="list-style-type: none"> <li>Put 2 cm<sup>3</sup> of C in a test tube;</li> <li>Add an equal amount of sodium hydroxide solution and shake.</li> <li>Add copper sulphate drop by drop, shaking well after each addition;</li> </ul>	Colour changes to purple/violet/mauve;	Proteins present;