

231 / 1
BIOLOGY
PAPER 1
(THEORY)
MARCH, 2015
2 HOURS

MARKING SCHEME.

- 1 (i) (Animals that) feed on flesh only;
(ii) Dog / Lion / Leopard / Hyena;
- 2 (a) Panthera;
(b) They belong to different species; OTWTE
(c) Bryophyta;
- 3 (a) Photosynthesis;
(b) (i) Chloroplast;
(ii) Trap light energy;
- 4 (a) Resolution;
(b) Electron microscope;
- 5 (a) From solution A to solution B;
(b) Osmosis - Movement of solvent from a lowly concentrated solution to a highly concentrated solution across a semi-permanent membrane / Movement of water molecules from their region of high concentration to their region of low concentration across a semi-permeable membrane;
- 6 (i) Log phase; Log / Exponential phase;
(ii) Growth rate slows down;

- 7 (a) Protoctista;
(b) Eukaryotic
- Many organelles include mitochondria
 - Microscopic (Unicellular, colonial or filamentous)
 - Have means of movement (Pseudopodia, cilia & flagella)
- } reproduce sexually
} Any two
- 8 (a) Respiration;
(b) Respiration is a metabolic reaction within a cell; / Breakdown of substrate to release energy
Gaseous exchange is diffusion of respiratory gases across a respiratory surface;
- 9 (a) Protection
Regulation of body temperature
Excretion
Storage of fat
Sensory organ
Synthesis of Vitamin D.
(Any two)
- 10 (a) Energy losses at succeeding trophic levels; means fewer numbers can be supported up the trophic levels;
(b) One plant being fed on by many insects.
- 11 (a) $\text{Mag} = \frac{\text{Image length}}{\text{Object length}} = \frac{2}{1} = \times 2$
(b) Objective lens and eye piece;
- 12 (a) Apex (shoot / root); cambium;
(b) Meristematic (cells);
13. First stage
- 14 (a) Copulation / Deposition of sperms in vagina;
(b) Anthers;

- 15 (a) Substances that cause mutation.
(b) Gamma rays
X-rays
Colchicine
Mastard gas (Any two)
- 16 (a) One of a gene pair that controls a trait;
(b) Homozygote - an individual with identical Allelic Genes;
Heterozygote - An individual with differing Allelic genes;
- 17 (a) Aerenchyma tissue
(b) Broad leaves with more stomata upper side
Reduced root system
- 18 (a) Two gametes form new individuals:
New individual arises from parts of the old.
(b) Flower
- 19 Sofia - Due to ravenousness of oxygen increased Red blood cells as an adaptation;
20. Insert a glowing splint in test tube containing oxygen gas; - glowing splint will be ignited;
- 21 (a) - Replacement of lost water
- Transportation of mineral salts
- Cooling the plant
(b) Transpiration pull / Cohesion and Adhesion / Capillarity / Root pressure;
- 22 (a) Earthworm; and frog;
(b) Plants convert toxic waste into non toxic form and store them on leaves which later fall off the wastes are excreted;
- 23 (a) Entomology
(b) (i) Arthropoda
(ii) - Jointed legs

- Exoskeleton
- Segmented body

24. Vitamin C is for general body health
Vitamin A improves night vision.
- 25 (a) Insulin from pancreas does not use the duct; hence by diffusion it will still reach the blood stream to the liver and regulate sugar;
(b) Digestion
26. In Aerobic respiration the substrate is completely broken down; while in Anaerobic the substrate is partially broken down to release energy;
- 27 (i) Blood oozing from all body openings;
(ii) Virus;
- 28 (i) For increased oxygen supply to tissue for the ongoing respiratory reaction;
(ii) Lactic acid
29. Energy is used in Active transport and not in the others;
30. Wilting - Flabby leaves as a result of flaccid cells.
Crenation - Shrunken animal cell as a result of losing water by osmosis.
- 31 (i) Prevent corrosion by HCl to the stomach walls
Provide lubrication for smooth food movement
(ii) Large intestines.

FORM FOUR PRE-MOCK LAINAKU EXAM
MARKING SCHEME

1. a) i) Anaphase I, accept ; anaphase of meiosis I
Reject; anaphase alone

ii) centromere of bivalent pair not split.
Accept – sister chromatids not split or separated.
Homologous chromosomes separate, moving towards (opposite) poles of the cell.

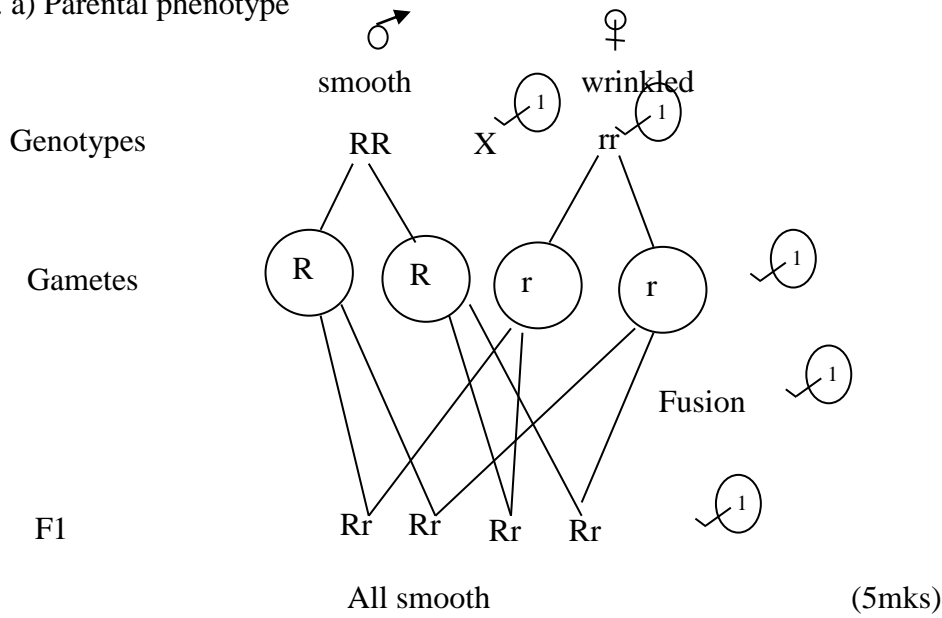
b) spindle fibre.
Reject; fibres

c) - offsprings can inherit undesirable characteristics from the parents
- sexual reproduction takes a long time
- involves two separate sexes; which must mate together
(award any two correct ones)

c)

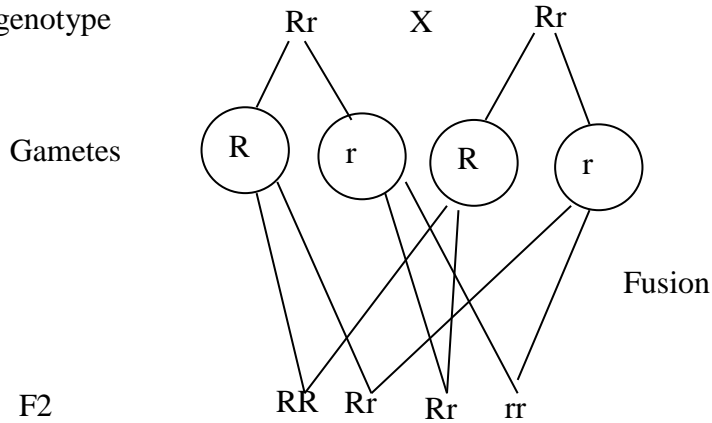
Mitosis	Meiosis
1. Occur in the general body cell resulting in growth	Occur during formation of sex cells (gametes)
2. Occur as one cell division process	Occur as two division processes ie meiosis I & II
3. Crossing over do not take place	Crossing over takes place
4. Homologous chromosomes do not separate	Homologous chromosomes separate.
5. Results in two daughter cells	Results in four daughter cells
6. Daughter cells have the same number of chromosomes as parents	Daughter cells have half the number of chromosomes present in the parent cells.

2. a) Parental phenotype



b)

parental genotype



i) Genotypic ratio, 1RR:2Rr:1rr (1mk)

ii) Phenotypic ratio; 3 smooth: 1 wrinkled. (1mk)

iii) The total number of wrinkled seeds

$\frac{1}{4} \times 7324 = 1831$

Q3. a) i) enzymes work well in specific pH, the wrong pH denatures or inactivates enzymes.

- ii) Papain is not affected by any pH ranges.
Pepsin work best at PH2; it prefers acidic conditions not alkaline
Trypsin work best at PH 8; it prefers alkaline conditions not acidic
- iii) Papain is the best meat tenderizer because it is not denatured by acidic or alkaline media and hence suitable for any type of meat.
- iv) Rennin curdles milk;acc;coagulates milk or converts milk caseinogens into casein (OWTTE)

- b) i) platelets
- ii) calcium ions rej; Ca^{2+} /Ca
- iii) Fibrin
- iv) Formation of prothrombin in the liver
- v) - Reduces loss of blood/nutrients and water
- protects entry of pathogens
- protects injured tissues

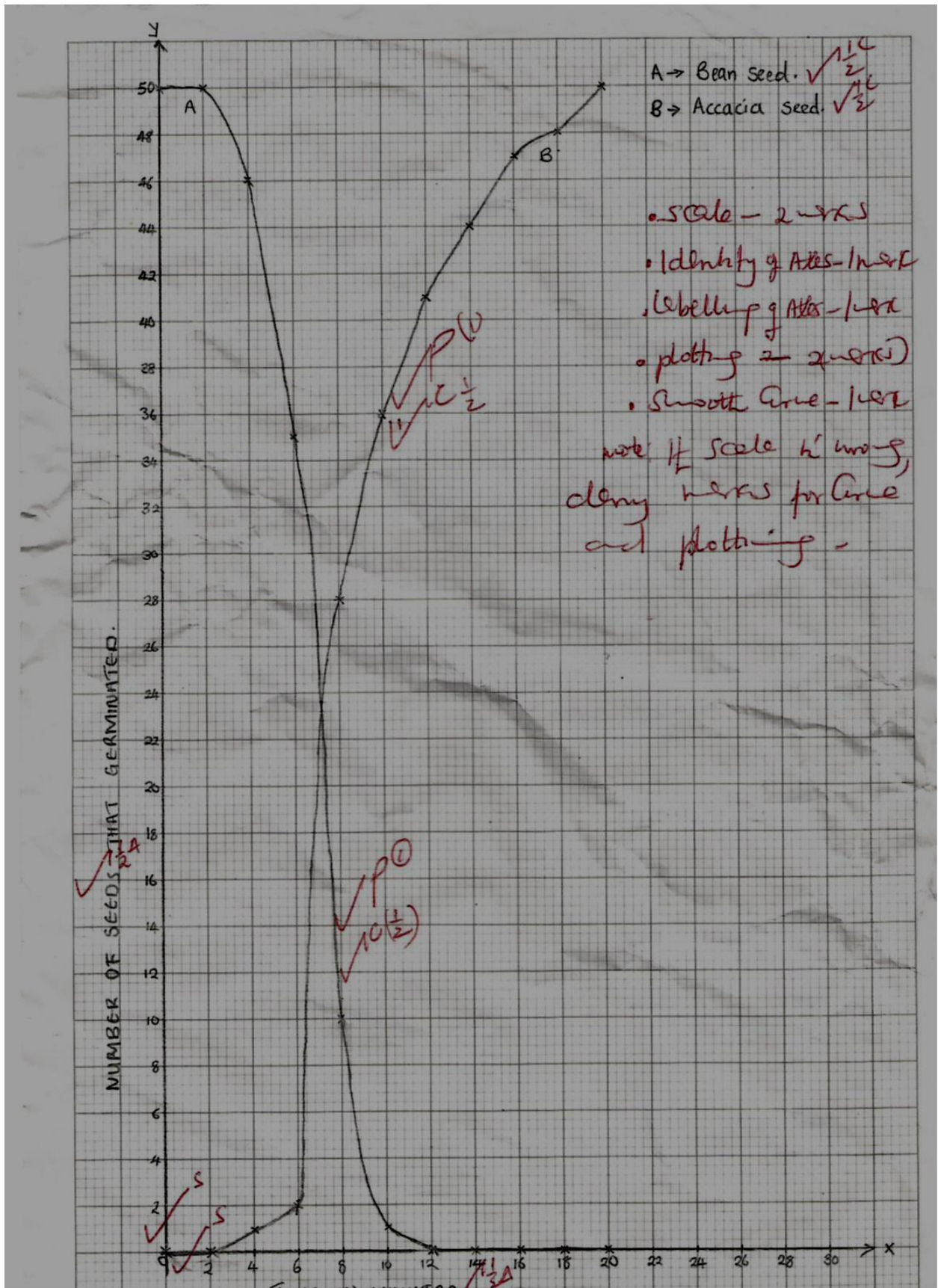
Award any two.

- 4. a) 1. Intermittent growth curve
2. sigmoid growth curve;
Accep;t normal growth curve

- b) ecdysone
accept; moulting hormone

- 5. a) during this period, the person was allowed to adjust (equilibrate) with his surroundings.
- b) there is a direct relationship between these two variables where the rate of sweating is controlled by activity of the hypothalamus.
- c) As the evaporation rate falls due to the action of the hypothalamus in response to ingestion of iced water, latent heat of vaporization is not being lost from the skin and this accounts for the observed rise in skin temperature.(OWTTE)

6. a)



b) i) 7-8 minutes – accept any value within the range.

ii) 11-12 minutes – accept any value within 11-12

c) i) Bean seeds

ii) More seeds are germinating on exposure to hot water for a short time. (OWTTE)

d) i) Destruction of the embryo by heat.

- enzymes are denatured by heat.

ii) Acacia seeds were dormant – heat broke the dormancy – hence the more the heat, the better the effect.

e) i) 100⁰c

- (comparatively)/fewer/no bean seeds will germinate

- but more/all acacia seeds will germinate

ii) 5⁰c

v) No acacia seeds will germinate

vi) Comparatively all/most bean seeds will germinate

Reject; more or high

Accept 100% germination in bean seeds

Very many beans or large proportion of bean seeds germinated.

7. a) i) - Gradual developmental change of species of organisms from simple forms of life into complex ones over a long period of time.

-Or Emerging of new forms of life from pre-existing ones gradually, over a long period of time.

ii) - Homologous structures – structures of common/similar embryonic origin but modified to perform different functions.

- Analogous structures- structures of different embryonic origin modified to perform similar functions.

b) **Fossil/paleontological evidence**

- these are remains of organisms preserved in naturally occurring material like sedimentary rocks for many years.

- They show morphological changes of organism over a long period of time eg skull of man and leg of horse.

Comparative anatomy/taxonomy

- Members of a given phylum/group show similarities

- Such organisms have similar structures or organs performing the same functions eg digestive system, urinary system and nervous system.

- Homologous structures have the same embryological origin but perform different functions eg the pentadactyl limb.

- Analogous structures have different embryological origin but perform same function eg wings of bird and those of insects.
- Vestigial structures or organs which are greatly reduced and non-functional structures but have been well-developed and perform normal functions in the ancestors eg appendix and coccyx of man.

Comparative embryology

- Vertebrates embryos in their early stages of development are morphologically similar suggesting that the vertebrates have a common ancestral origin.

Geographical distribution

- Present continents are thought to have been one large land mass.
- The continents slowly drifted apart over millions of years.
- As a result of continental drift, isolation occurred bringing about different patterns of evolution, examples kangaroo and duck-billed platypus are only naturally found in Australia; jaguar and ilama found in South America resemble lions and camels found in Africa.

Comparative serology/physiology

Antigen-antibody reactions, Rhesus factor, blood groups and haemoglobin structure reveal some phylogenetic relationship among organisms suggesting common ancestry.

Comparative cell biology and biochemistry

Cells of most organisms contain common organelles, eg mitochondria and ribosomes as well as biological chemicals like ATP and DNA.

-Naming evidence;1mark;every statement ;1mark;total marks;18 but max;16

8. a) Two functions of the placenta

- serves for the exchange of materials between the mother and the foetus.
- Serves as endocrine organ- forms source of progesterone hormone which is important in female reproduction.

b) The role of hormones in the human menstrual cycle

- the menstrual cycle begins on the very first day of the menstrual flow.
- pituitary gland starts to secrete follicle stimulating hormone (FSH)
- The FSH causes development of a Graafian follicle in the ovary. It also stimulates the walls of the follicle/tissues of the ovary to start secreting oestrogen.
- Oestrogen causes repair and healing of the uterine wall. It also stimulates the pituitary gland to secrete the lutenising hormone (LH)
- LH stimulates the final maturation of the Graafian follicle and ovulation.
- Following ovulation, LH causes remains of the Graafina follicle to re-organize into a corpus luteum.
- LH stimulates the corpus luteum to secrete the hormone progesterone.
- Progesterone causes the lining of the uterus to get thickened, folded and invaded by blood vessels in readiness for implantation.
- Progesterone and oestrogen also inhibit production of FSH which in turn prevents the development of another follicle and oestrogen production falls.
- In the next two weeks after ovulation, progesterone level rises and inhibits production of LH from the pituitary gland. The corpus luteum stops secretion of progesterone. The sudden drop in the level of progesterone causes menstruation

to occur and the pituitary gland starts secreting FSH again.min;9 points;2 marks each.

LAINAKU JOINT EVALUATION 2015

BIOLOGY 231/3

PRACTICAL PAPERS

MARKING SCHEME

- a. (i) strips in solution P
Firm/hard/turgid/stiff √(1mk)
Strips in solution Q;
Soft / flexible /tender/limp/flabby√ (1mk)
- (ii) Solution more concentrated / hypertonic than the cell sap√ cell lose water by osmosis to become soft /flexible/ flabby √ (2mk)
- (iii) dilute/less concentrated/hypotonic √ (1mk)
- (iv) strips remained firm/turgid/stiff/hard√(1mk)
- (v) control experiment (1mk)
- b. (i) 2- 3mm (1mk);N/B,Each school to use their value based on microscope used;
(ii) 1mm = 1000 um √ (1mk)
 $2 \times 1000 = 2000 \text{ um}$ or (1mk)
 $3 \times 1000 = 3000 \text{ um}$
- c. (i) 10 – 15 cells (1mk);customize the school value;
(ii) $\frac{\text{Diameter of field of view in b (ii)}}{10-15}$ cells √1mk
i.e $\frac{2000 \text{ um}}{10} = 2000 \text{ um} \sqrt{\text{or}} \frac{3000 \text{ um}}{10} = 300 \text{ um}$

or $\frac{2000 \text{ um}}{11} = 181.81 \text{ um}$ or $\frac{3000 \text{ um}}{11} = 272.72 \text{ mm}$

or $\frac{2000 \text{ um}}{12} = 166.66 \text{ um}$ or $\frac{3000 \text{ um}}{12} = 250 \text{ um}$

or $\frac{153.84 \text{ um}}{13} = 153.84 \text{ um}$ or $\frac{3000 \text{ um}}{13} = 230.76 \text{ um}$
or $\frac{2000 \text{ um}}{14} = 142.85 \text{ um}$ or $\frac{3000 \text{ um}}{14} = 214.28 \text{ um}$
or $\frac{2000 \text{ um}}{15} = 133.33 \text{ um}$ or $\frac{3000 \text{ um}}{15} = 2000 \text{ um}$
- c. (iii) to make different parts of the cell distinct (1mk)

Question 2

- a. (i) chordata (1mk)

- (ii) pisces (1mk)
- (iii) presence of operculum/gills cover/gills/fins (1mk)
- b. Streamlined body for easy movement / minimize friction (1mk)
 - Presence of fins for swimming/balance (1mk)
 - Presence of gills for gas exchange in water (1mk)
 - Presence of operculum/gill cover to allow water to pass out (1mk)
- c.

Food Substance	Procedure	Observation S	Conclusion
Proteins ✓	To extract add dilute NaoH solution Add CUSO ₄ (aq) with shaking ✓	Purple/violet colour✓	Proteins present ✓
Reducing sugar✓	To the extract add Benedict's solution Boil /heat/warm✓	Colour of benedicts remains/blue colour persists✓	Reducing sugar absent ✓

Question 3

A – Liver ✓

B- stomach ✓

C – Pancreas ✓

D – small intestine(s)/ileum ✓

b E rectum - stores undigested/ indigestible materials ✓

Not a Must to Identify

F - caecum - contains/ harbours/has bacteria that produce cellulase enzymes which digest cellulase to produce glucose ✓

C (i) male (1mk)

(ii) presence of prostate gland (1mk)

D (i) 8.5 cm ± 0.2 ✓ (1mk)

(ii) magnification = $\frac{\text{length of tool in the photograph}}{\text{actual length of the tool}}$

$$= \frac{8.5\text{cm}}{11.5\text{ cm}} = \times 0.739$$

$$\text{or } \frac{8.6\text{cm}}{11.5\text{ cm}} = \times 0.747$$

$$\text{or } \frac{8.7\text{cm}}{11.5\text{ cm}} = \times 0.756$$

$$\text{or } \frac{8.3\text{cm}}{11.5\text{ cm}} = \times 0.721$$

LAINANKU FORM FOUR PRE- MOCK EVALUATION

MARCH /APRIL 2015 SERIES.

BIOLOGY PRACTICAL 231/3

Each candidate will require the following apparatus and specimens

1. 1/2 onion bulb labeled specimen K
2. Distilled water labeled solution P.
3. Saturated Sodium Chloride labeled solution Q
4. One surgical blade .
5. Pair of forceps
6. A plastic ruler (30cm)
7. 3 Petri dishes / 50ml beaker
8. One piece of label
9. Access to means of timing
10. Access to a light microscopic
11. (preferably 1 to be shared by 4)
12. Microscope slide and cover ship
13. Access to iodine solution
14. Blotting paper / tissue paper.
15. 4 pieces of omena labeled M(NB) the specimen should have all the features;N/B;Soak overnight;.
16. Hand lens
17. Boiling tube
18. Test tube holder
19. 10ml measuring cylinder
20. Access to source of heat
21. Dilute sodium hydroxide
22. 1% copper sulphate solution
23. Benedict 's solution

N/B photograph on question 3 should be coloured.

END;