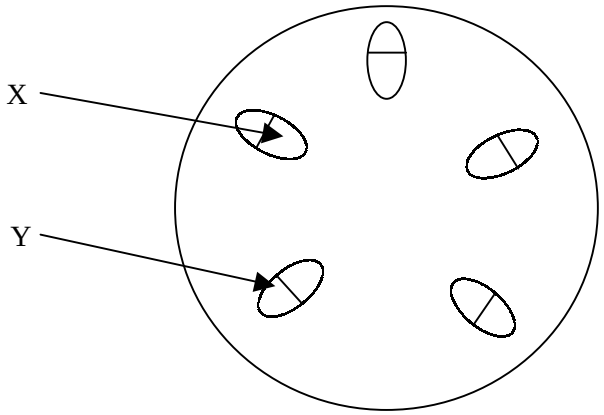
ANSWERS & MARK SCHEMES

QUESTIONSHEET 1

(a) (i) X = xylem/protoxylem (not 'metaxylem');
Y = phloem;
Z = parenchyma; **3**

(ii) X = transport of <u>water</u> and <u>salts</u> <u>up</u> the plant;
mechanical/strengthening tissue;
Y = transport of organic solutes/sugars/amino acids throughout plant; **3**

(b)



<u>5</u> vascular bundles clearly drawn;
in cortex/near outside of stem/under epidermis;
xylem clearly shown and labelled;
phloem clearly shown and labelled;
award one mark for good drawing quality (ie. lines joined up, sharp,clear lines, bundles spaced evenly on radii of stem); **5**

(c) (i) xylem being peripheral/around circumference withstands lateral forces of stretching/compression (due to wind/insects);
lignified thickening gives high tensile strength(prevents breaking when pulled)/elasticity /plasticity(ability to return to the original shape after compression); **2**

(ii) central rod of xylem withstands pulling/tugging strains from aerial parts;
high tensile strength of lignin means xylem will not snap when pulled; **2**

TOTAL 15

QUESTIONSHEET 2

(a) A = cuticle;
B = palisade mesophyll;
C = spongy mesophyll;
D = guard cells (reject 'stoma'); **4**

(b) A: made of cutin/waxy material;
impermeable to water so reduces water loss;
prevents entry of fungal spores/infectious agents;
transparant so lets light through for photosynthesis; **max 3**

B: many chloroplasts to enable much photosynthesis;
cylindrical shape of cells accommodates many chloroplasts;
huge surface area of chlorophyll for light absorption;
thin cellulose walls allow efficient gas exchange/transmission of turgor pressure(for support); **max 3**

C: thin/wet cell walls to allow efficient gas exchange/dissolving oxygen/carbon dioxide;
many air spaces between cells to enable gas flow within leaf;
contain chloroplasts for photosynthesis; **3**

D: contain chloroplasts for photosynthesis;
enables sugar synthesis in light which promotes water uptake/turgidity;
unevenly thickened walls cause opening of stoma in light/when turgid; **3**

TOTAL 16

QUESTIONSHEET 3

(a) (i) piliferous layer (reject 'epidermis'); **1**

(ii) cellulose;
calcium/magnesium pectate; **2**

(b) (i) absorption of water;
absorption of salts/prevent entry of pathogens; **2**

(ii) A = apoplastic/cell wall pathway;
B = symplastic or cytoplasmic pathway;
C = vacuolar pathway; **3**

(iii) increased/large surface area for absorption;
cell membranes/plasma membrane/tonoplast have carrier molecules for active uptake of salts; **2**

TOTAL 10

QUESTIONSHEET 4

(a) (i) phloem; **1**

(ii) A = companion (cell);
B = sieve tube (element/cell); **2**

(iii) sieve plate; **1**

(b) (i) transport of organic solutes/sugars/amino acids/other correct eg;
up and down the plant/from leaves to sinks/from sinks to flower buds/equivalent correct statements; **2**

(ii) has many pores from one side to the other;
through which plasmodesmata/cytoplasmic strands run;
enabling rapid transport/passage of solutes (through); **3**

(iii) pores become blocked/closed with callose; **1**

(c) cell A has a nucleus, cell B does not;
cell A has dense cytoplasm/no vacuole, cell B has peripheral cytoplasm/has a vacuole;
cell A has no sieve plates, cell B has sieve plates; **max 2**

TOTAL 12

QUESTIONSHEET 5

(a) (i) xylem; **1**

(ii) transport of water/salts (up the plant);
support/mechanical tissue; **2**

(iii) lignin; **1**

(iv) impermeable to water;
thus water can only escape through pores/holes/open ends;
has elasticity/high tensile strength/plasticity;
can be stretched without breaking/compressed without breaking/returns to its original shape/good mechanical tissue;
max 3

(b) B and C; **1**

lignin is not continuous/ref spiral/annular thickening;
this enables vessels to stretch as stem/roots elongate;
in A the lignin is continuous and so stretching could not occur; **max 2**

TOTAL 10

QUESTIONSHEET 6

(a) (i) in a simple epithelium <u>all</u> the cells touch the basement membrane;
in a compound epithelium <u>only the lower layer</u> of cells touch the basement membrane;
or for 1 mark max only: simple epithelium has one layer of cells/compound epithelium has more than one layer; **2**

(ii) very thin layer/flattened cells/ref to moistened with tissue/serous fluid (reject 'mucus');
enables efficient gas transfer/diffusion of oxygen and carbon dioxide/gases dissolve in fluid; **2**

very thin layer/flattened cells to reduce diffusion/ultrafiltration distance/improve diffusion;
cells modified into podocytes/foot cells/raised off basement membrane by protoplasmic projections;
improves permeability of membranes to small (molecular weight) solutes; **max 2**

(b) (i) cells in the germinative layer divide continuously;
by mitosis;
to replace cells shed from the surface; **max 2**

(ii) cells (eventually) become keratinised/cornified/covered in keratin;
keratin is impermeable to water;
forms a hard layer/shield which cannot be penetrated by pathogens; **3**

(iii) germinative layer responds (to increased friction/pressure/compression) by increasing mitotic rate/rate of cell division;
increased friction results in increased keratinisation;
thus epidermis becomes thicker/harder; **3**

TOTAL 14

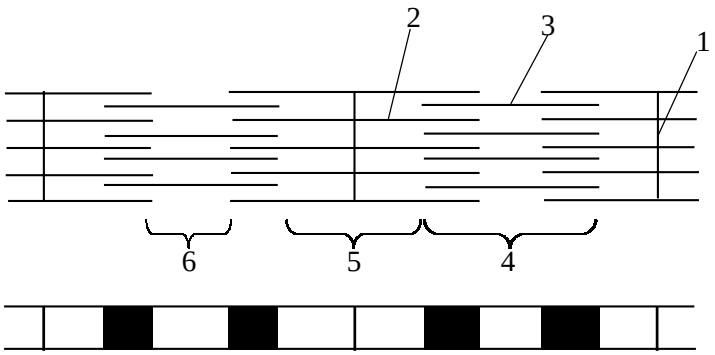
QUESTIONSHEET 7

(a)

Statement	Skeletal muscle	Cardiac muscle
Nuclei are centrally placed in the fibres	✗	✓
Fibres are branched	✗	✓
Found in the diaphragm	✓	✗
Cells attach to each other by intercalated discs	✗	✓
Not easily fatigued	✗	✓

5

(b) (i)



Z lines/lines 1 aligned with electron micrograph;
A and I discs/light and dark discs aligned with electron micrograph; **2**

(ii) 1 = Z line/Zobie's line;
2 = actin/thin filaments;
3 = myosin/thick filaments;
4 = A/anisotropic zone/disc;
5 = I/isotropic zone/disc;
6 = H zone; **6**

TOTAL 13

QUESTIONSHEET 8

(a) (i) A = dendrites;
B = Schwann cell (sheath);
C = myelin (sheath/block);
D = axon; (reject 'fibre' - the fibre is the axon plus its sheaths)
E = node (of Ranvier);
F = motor end plate; **6**

(ii) A: a relay neurone;
B: skeletal/striated/voluntary muscle; **2**

(iii) B: secretes/produces myelin;
C: speeds up the impulse/causes saltatory conduction/insulation; **2**

(b) (i) (in a sensory neurone) the cell body is situated on the side of the fibre rather than on the end; **1**

(ii) (a grey matter relay neurone) is non-myelinated; **1**

(iii) (an autonomic motor neurone) is non-myelinated; **1**

TOTAL 13

QUESTIONSHEET 9

(a) (i) contain haemoglobin as respiratory pigment (which can carry oxygen and carbon dioxide);
contains carbonic anhydrase (to aid carbon dioxide transport);
flattened disc shape which gives large surface area (for exchange of gases);
thin cell membrane/envelope (which does not hinder diffusion); **max 3**

(ii) cells show shrunken/crinkled/crenated appearance;
due to water loss (to external solution);
which must be more concentrated than red cell cytoplasm/hypertonic to cytoplasm/have a lower water potential than cytoplasm; **3**

(The IOB Recommendations suggest that in animals the terms 'isotonic', 'hypotonic' and 'hypertonic' remain in use and that 'water potential' terms are restricted to plants. However, at present, Examination Boards will accept 'water potential' type answers in animals, providing the biological context is correct).

(b) (i) neutrophil has a lobed nucleus/three nuclear lobes; lymphocyte has a rounded nucleus/no lobes;
neutrophil has many granules/lysozyme containing vesicles in the cytoplasm; lymphocyte has not/has clear cytoplasm;
neutrophil has more cytoplasm/a lot of cytoplasm; lymphocyte has little/less cytoplasm; **6**

(ii) measured length along line in X = 11mm (allow 10.5 – 11.5)
measured length along line on neutrophil = 24 mm (allow 23.5 – 24.5);

diameter of neutrophil $= \frac{7.1 \times 24}{11}$;

= 15.5 μm ; (units essential) **3**

TOTAL 15

QUESTIONSHEET 10

xylem; lignin; vessels; tracheids; annular/spiral; mechanical/supporting; phloem; sieve tube; companion cell; organic solutes/sugars/amino acids; sieve plates; callose; sclerenchyma/fibres; lignin;

TOTAL 14

QUESTIONSHEET 11

(a) (i) leaf epidermis is one cell thick, mammalian epidermis is many cells thick;
leaf epidermis is covered with cuticle, mammalian epidermis is covered with keratin
mature leaf epidermis does not undergo mitosis, mammalian epidermis always has cells undergoing mitosis;
leaf epidermis may have unicellular hairs, mammalian epidermis has multicellular hairs;
leaf epidermis does not have sweat glands, mammalian epidermis (often) does; **max 3**

(ii) prevent/reduce water loss;
prevent entry of pathogenic/disease causing organisms; **2**

(b) (i) secrete mucus/a glycoprotein;
which coats the stomach wall preventing attack/damage by the acid (in the gastric juice); **2**

(Note spellings: 'mucus' is a noun – the actual substance. 'mucous' is an adjective – describes the cells producing mucus).

(ii) microvilli increase the surface area of the epithelial cell membranes (facing the duodenal contents);
enhancing absorption of the products of digestion; **2**
(do not credit answers which confuse villi and microvilli)

(iii) dust particles/bacteria/spores become trapped in the mucus (produced by the goblet cells);
beating of cilia move this trapped material up to the glottis/pharynx where it is swallowed;
reference to keeping airways clean/bacteria killed in stomach acid/protects against infection; **3**

TOTAL 12

TISSUES

ANSWERS & MARK SCHEMES

QUESTIONSHEET 12

Tissue/cell	Living or dead	Wall materials if plant	Cell shape	Main function
Xylem vessel	Dead	Lignin	Elongated/ tubular	Transport of water and salts/ support/mechanical ;
Parenchyma	Living	Cellulose	Round/polygonal/ iso-diametric	Packing/starch storage/gas exchange/ transport through apoplast/symplast ;
Epidermis of plant	Living	Cellulose + cutin	Rectangular /flattened	Prevent water loss/ entry of infective agents ;
Sieve tube	Living	Cellulose	Elongated/ tubular	Transport of organic solutes/ sugars/amino acids ;
Sclerenchyma (fibres)	Dead	Lignin	Elongated/ + tapering ends	Support/mechanical ;
Collenchyma	Living	Extra cellulose	Polygonal/ elongated	Support/mechanical ;
Red blood cell	Living		Disc shaped	Oxygen and carbon dioxide transport ;
Lymphocyte	Living		Round/ spherical	Immune response/ antibody production ;
Neutrophil	Living		Amoeboid/ irregular	Phagocytosis ;
Smooth muscle cell	Living		Spindle shaped	Slow sustained contractions in viscera/peristalsis ;
Mucous goblet cell	Living		Columnar/ pillar shaped	Secretion of mucus for lubrication /protection against acids/bacteria ;

TOTAL 11