QUESTIONSHEET 1

Annelida;
hydrostatic;
coelomic;
circular;
longitudinal;
chaetae;
relax;
antagonistic;
contract; **TOTAL 9**

QUESTIONSHEET 2

(a)

	(i)Position	(ii)Elasticity	(iii)Function
Tendon	link between muscle and bone;	not elastic;	transmit pull of muscle to bone causing movement;
Ligament	link bone to bone (across joint);	is elastic;	prevents dislocation;

6

(b) (i) E x 3 = 15 x 28/ E = $\frac{15 \times 28}{3}$;
E = 140 kg; **2**

(ii) tendon from muscle is tightly anchored into bone substance;
(collagen) fibres of tendon are continuous with (Sharpey) fibres of bone matrix;
tendon has very high tensile strength; **max 2**

TOTAL 10

QUESTIONSHEET 3

(a) made of chitin;
will not stretch thus moulting is essential;
has thinner flexible arthrodial/joint membranes to allow movement at joints;
covered with a waterproof cuticle/wax; **4**
(could also allow 'has apodemes for muscle attachment/has sclerites/ always on outside of body)

(b) Any two of

Class;;	Example;;
Insecta	cockroach/bee
Crustacea	lobster /prawn
Arachnida	spider /scorpion
Myriapoda	centipedes/millipedes (allow other correct examples)

4

(c) heavy;
thus body size has to be kept fairly small/can be larger in aquatic forms due to upthrust of water;
smallness means larger surface area to volume ratio;
which means there is a possible dehydration;
thus waterproofing essential; **max 3**

will not stretch;
thus growth is impeded;
thus moulting is essential to allow further growth (before new cuticle hardens);
susceptible to predators during moulting;
susceptible to dehydration during moulting; **max 3**

TOTAL 14

QUESTIONSHEET 4

(a) (i) l. Haversian canal;
2. canaliculi;
3. lacunae;
4. osteocytes (not osteoblasts since found only in young bone);
5. matrix;
6. concentric lamellae; **6**

(ii) l. blood vessels/nerves/lymphatics;
2. tissue fluid/lymph; **2**

(iii) collagen fibres/fibres of Sharpey;
calcium phosphate/calcium hydroxyapatite crystals; **2**

(b) (i) vitamin D/calciferol/ergosterol;
calcitonin/parathormone/oestrogen; **2**

(ii) rickets;
vitamin D/calcium salts; **2**

TOTAL 14

QUESTIONSHEET 5

(a) osteoblasts form the matrix during bone growth/repair;
osteoclasts reabsorb bone matrix/breakdown bone;
both operate in balance to achieve a turnover/replacement of bone; **max 2**

(b) endoskeletons are found inside animals/plants/organisms;
exoskeletons are found on the outside of organisms/animals/plants;
e.g. bones of a mammal and chitinous sclerites of an insect; **max 2**

(c) chitin is the skeletal substance of arthropods/fungi;
lignin is the skeletal substance found in plants;
ref. exoskeleton and xylem/sclerenchyma; **max 2**

(d) smooth muscle made of cells, striated muscle made of sarcomeres/(striated) fibres;
smooth muscle involuntary/autonomically controlled, striated muscle voluntary;
smooth muscle found in viscera, striated muscle attached to skeleton; **max 2**

TOTAL 8

QUESTIONSHEET 6

(a) (i) A = scapula; B = humerus; C = radius; D = ulna; **4**

(ii) X = biceps; Y = triceps; **2**

(iii) diarthrodial/synovial/hinge; **1**

(iv) X contracts to flex the elbow joint;
Y contracts to extend the elbow joint; **2**

(v) one muscle moves a bone to a certain position and the other muscle moves it back; **1**

(b) (i) isotonic: the tone/tension of the muscle stays the same while the muscle shortens;
isometric: the length of the muscle stays the same while the tone/tension increases; **2**

(ii) the shoulder joint is fixed in place/reference to fixator muscles;
shoulder/fixator muscles do this by <u>isometric</u> contraction; **2**

TOTAL 14

QUESTIONSHEET 7

(a) (i) the plant cell contents absorb water osmotically;
and so swell pushing against the (cellulose) cell wall producing turgor pressure; **2**

(ii) turgor pressure makes the parenchyma cells expand so that they push against each other;
but the cells are held in a limited space by other surrounding tissues/epidermis/
sclerenchyma and so their turgidity gives support; **2**

(b) (i) living cells which have extra cellulose/suberin thickening on walls; **1**

(ii) found in stem ridges/petioles where it gives extra support;
possesses plasticity;
which means that it will return to its original size/shape after compression; **max 2**

(c) (i) dead cells thickened heavily with lignin; **1**

(ii) elongate cells with interlocking tapering ends/ref fibres form sheets of supporting tissue;
lignin is elastic and has high tensile strength;
so that it can stretch and return without breaking; **max 2**

(d) stem is subjected to bending forces so that one side is compressed and the other side is stretched;
collenchyma in surface ridges withstands compression (and so maintains shape);
ring of sclerenchyma in cortex/pericycle allows stretching and return (without stem breakage);
ring of vascular bundles each containing xylem and sclerenchyma also allow stretching and return (without breakage);
root is subject to pulling forces trying to dislodge it (from soil);
thus xylem and sclerenchyma arranged in a rod formation/stele up the centre of each root; **max 5**

TOTAL 15

QUESTIONSHEET 8

(a) (i) A = pelvis/hip/ilium (not ileum);
B = sacrum;
C = coccyx;
D = femur; **4**

(ii) universal/flexion + extension + rotation/adduction/abduction; **1**

(b) (i) when the joint is seriously damaged by disease/arthritis; **1**

(ii) by smooth (articular) cartilages covering the contact areas;
lubrication by synovial fluid/ref surfactants in synovial fluid; **2**

(iii) (articular) cartilages are worn away so that actual bone surfaces abrade/rub together;
synovial membranes may be damaged so not enough synovial fluid is produced; **2**
(could also refer to extra spurs of bone growing in joint which limit mobility/cause friction/pain)

(iv) teflon/plastic lining over socket/acetabulum and over new head of femur; **1**

(c) tissues of a natural joint are constantly being renewed/replaced;
thus cartilage/synovial membranes are kept in good repair;
this does not happen with teflon/plastics/stainless steel which will eventually wear out with use; **3**

TOTAL 14

QUESTIONSHEET 9

Table A

Feature	Cartilage	Bone	
Matrix is impermeable to tissue fluid	×	✓	;
Matrix is secreted by chondroblasts	✓	×	;
Contains blood vessels in the tissue	✓	✓	;
Found in intervertebral discs	✓	×	;
Is the main skeletal tissue of dogfish	✓	×	;
Forms the early fetal skull	×	✓	;
Forms the early fetal leg bones	✓	×	; **7**

(Bones of the skull form directly as bone, other bones are preformed as cartilage)

Table B

Feature	Striated muscle	Smooth muscle	
Made of cells	×	✓	;
Controlled by autonomic nervous system	×	✓	;
Joined to bones by ligaments	×	×	;
Contains actin and myosin filaments in a regular arrangement	✓	×	;
Has sustained slow contractions	×	✓	;
May work in antagonistic groups or pairs	✓	✓*	; **6**

* e.g. circular and radial muscles of iris/ circular and longitudinal muscles of gut

TOTAL 13

QUESTIONSHEET 10

(a) (i) A = joint capsule;
B = synovial membrane;
C = (articular) cartilage; **3**

(ii) diarthrodial/synovial/ball and socket; **1**

(iii) A: to hold the bones of the joint together/keep joint intact;
to protect the (delicate) inside structures of the joint; **2**

B: has a large capillary network for producing much lymph/synovial fluid;
secretes mucopolysaccharides/surfactants into (synovial) fluid to enhance lubricating properties; **2**

C: reduces friction/protects bone surfaces (which are involved in joint movement);
(thus) makes joint movement smooth and easy; **2**

(b) (i) increases depth of socket so head of femur is less likely to dislocate; **1**

(ii) holds/anchors head of femur in socket so reduces chance of dislocation; **1**

(c) knee joint is a hinge joint, hip is ball and socket;
knee joint can only flex and extend, hip joint has universal/more movements; 2
(could also have, knee joint has extra cartilages/semilunar cartilages).

TOTAL 14

QUESTIONSHEET 11

(a) bone consists of similar cells, ground substance and formed elements (matrix) which fits the definition of a tissue;
a bone is an organ because it contains several tissues;
such as bone, cartilage, red bone marrow, yellow bone marrow, white fibrous tissue, blood; **3**

(b) the axial skeleton forms the longitudinal/midline supporting axis of the body;
the appendicular skeleton forms the limbs and (limb) girdles;
the axial skeleton is the skull and vertebral column;
the appendicular skeleton consists of the pectoral girdle and forelimb and pelvic girdle and hind limb; **max 3**

(c) arm of human, wing of bat and wing of bird are all modifications of the basic vertebrate/pentadactyl limb;
they are the same bones (eg humerus, radius, ulna) which are modified for the particular needs of the organism, thus they are homologous;
wing of insect is a totally unrelated structure/has no relationship to vertebrate/pentadactyl limb; **3**

TOTAL 9

QUESTIONSHEET 12

(a) 1 = (articular) cartilage;
2 = compact bone;
3 = spongy/cancellous bone;
4 = head/epiphysis;
5 = cartilage/epiphyseal line; **5**

(b) (i) humerus, radius, ulna, metacarpals, digits/phalanges; **1**

(ii) red bone marrow is concerned with blood cell manufacture whereas yellow bone marrow is a fat store/ made of adipose tissue;
red bone marrow found in the epiphyses/heads and yellow bone marrow is found in the shaft/diaphysis; **2**

compact bone is solid and consists of (cylindrical) Haversian systems;
cancellous bone has struts/trabeculae and has lots of spaces containing marrow; **2**

(iii) artery + vein + nerves/lymphatics; **1**

TOTAL 11

QUESTIONSHEET 13

(a) the internal structural component of cytoplasm which supports the cell;
consists of actin microfilaments;
which are contractile and aid cell movements;
also has hollow microtubules;
which are passages for intracellular transport; **max 3**

(b) made of ground substance;
into which chondroblasts secrete chondrin;
flexible/incompressible;
(thus) for example, making a strong flexible joint between ribs and sternum/
cushioning joint between vertebrae as intervertebral discs;
may contain extra collagen or elastic fibres in the matrix to give extra strength;
provides a scaffold/base on which bone may be built/ref (endochondrial) ossification; **max 4**

(c) made of sarcomeres/sarcomeres assembled into fibres;
ref. to actin and myosin/contractile proteins;
arrangement of actin and myosin gives a striated appearance;
ref. to muscle belly, tendons of origin/insertion;
rapid contraction enables locomotion/movements; **max 4**

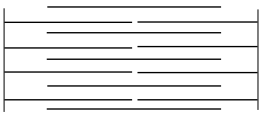
TOTAL 11

QUESTIONSHEET 14

(a) (i) 1 - H line;
2 = isotropic/I disc;
3 = anisotropic/A disc;
4 = Zobie's/Z line; **4**

(ii) X = actin filaments;
Y = myosin filaments; **2**

(iii) drawing with I discs much narrower;
and H line almost non existent; **2**



(b) (i) ATP provides energy for the formation of cross bridges between actin and myosin filaments/provides energy for the change in angle of the cross bridges;
ATP provides energy to pump back calcium ions into sarcoplasmic reticulum/T tubules; **2**

(ii) when calcium ions leak from the endoplasmic reticulum/T tubules they displace tropomyosin from the binding sites allowing cross bridges to form;
when calcium ions are reabsorbed the tropomyosin returns (to cover the binding sites); **2**

(iii) resting muscle produces too much ATP which cannot be stored (as such);
reacts with creatine to form (energy rich) creatine phosphate which can be stored until a sudden surge of energy is needed; **2**

TOTAL 14