

**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)  $E \times 3 = 15 \times 28 / E = \frac{15 \times 28}{3}$  ;  
 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 arthrodistal/joint membranes to allow movement at joints;  
 covered with a waterproof cuticle/wax;  
 (could also allow 'has apodemes for muscle attachment/has sclerites/ always on outside of body)

**4**

- (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)	1. Haversian canal; 2. canaliculi; 3. lacunae; 4. osteocytes (not osteoblasts since found only in young bone); 5. matrix; 6. concentric lamellae;	<b>6</b>
(ii)	1. blood vessels/nerves/lymphatics; 2. tissue fluid/lymph;	<b>2</b>
(iii)	collagen fibres/fibres of Sharpey; calcium phosphate/calcium hydroxyapatite crystals;	<b>2</b>
(b) (i)	vitamin D/calciferol/ergosterol; calcitonin/parathormone/oestrogen;	<b>2</b>
(ii)	rickets; vitamin D/calcium salts;	<b>2</b>
		<b>TOTAL 14</b>

**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;	<b>max 2</b>
(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;	<b>max 2</b>
(c)	chitin is the skeletal substance of arthropods/fungi; lignin is the skeletal substance found in plants; ref. exoskeleton and xylem/sclerenchyma;	<b>max 2</b>
(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;	<b>max 2</b>
		<b>TOTAL 8</b>

**QUESTIONSHEET 6**

(a) (i)	A = scapula; B = humerus; C = radius; D = ulna;	<b>4</b>
(ii)	X = biceps; Y = triceps;	<b>2</b>
(iii)	diarthrodial/synovial/hinge;	<b>1</b>
(iv)	X contracts to flex the elbow joint; Y contracts to extend the elbow joint;	<b>2</b>
(v)	one muscle moves a bone to a certain position and the other muscle moves it back;	<b>1</b>
(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;	<b>2</b>
(ii)	the shoulder joint is fixed in place/reference to fixator muscles; shoulder/fixator muscles do this by <u>isometric</u> contraction;	<b>2</b>
		<b>TOTAL 14</b>

**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;  
(could also refer to extra spurs of bone growing in joint which limit mobility/cause friction/pain) 2
- (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	✓	×

(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	✓	✓*

\* 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**