School of Anatomy & Human Biology

SEMESTER 2, 2009 EXAMINATIONS

ANHB2213
Human Functional Anatomy 213

FAMILY NAME: _________________________  GIVEN NAMES: ___________________

STUDENT ID: [redacted] SIGNATURE: _________________

This Paper Contains: 21 pages (including title page)
Time allowed: 2 hours 10 minutes

This paper contains two (2) sections:
Section A: 40 Multiple Choice Questions.
Section B: 12 Short Answer Questions.
See instructions at the beginning of each section.

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Examiners' use only

Section A. (15% of the TOTAL unit mark)

Section B. Short answer section Total marks 202 – 25% of the TOTAL unit mark.

<table>
<thead>
<tr>
<th>Q</th>
<th>1</th>
<th>2</th>
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<tr>
<td>Mark</td>
<td>14</td>
<td>16</td>
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<td>14</td>
<td>19</td>
<td>23</td>
<td>14</td>
<td>213</td>
</tr>
</tbody>
</table>
Section A : Multiple choice questions.

In each question, select ONE best alternative from A, B, C, D and E. Indicate your answer by completely blackening in pencil the appropriate circle for that question in the MCQ answer sheet. If you wish to change your answer, make sure your first answer is completely erased. MCQs are marked by a computer which rejects double answers and any irrelevant markings on the answer sheet. Do NOT mark the MCQ sheet beyond Q 40.

1. The deltoid muscle is
   A. an elevator of the scapula.
   B. a developmentally dorsal muscle.
   C. the prime mover for flexion of the glenohumeral joint.
   D. the main adductor of the shoulder joint.
   E. one of the rotator cuff muscles.

2. The muscles of the rotator cuff of the shoulder joint:
   A. are all lateral rotators.
   B. are supplied by the lateral cord of the brachial plexus.
   C. include the supraspinatus.
   D. include the pectoralis major.
   E. are attached to the surgical neck of the humerus.

3. The lateral cord of the brachial plexus
   A. gives rise to the ulnar nerve.
   B. is formed by the ventral division of the lower trunk.
   C. supplies the lateral rotators of the humerus.
   D. gives rise to the musculocutaneous nerve.
   E. supplies the triceps brachii muscle.

4. Regarding the biceps brachii muscle:
   A. It acts on both shoulder and elbow joints.
   B. Its long head passes through the shoulder joint.
   C. It receives nerve supply from the musculocutaneous nerve.
   D. A and C are correct.
   E. A, B and C are correct.

5. The radial nerve
   A. is a branch of the posterior cord of the brachial plexus.
   B. supplies the dorsal interosseous muscles of the hand.
   C. supplies the flexor carpi radialis muscle.
   D. winds around the surgical neck of the humerus.
   E. A, B and C are correct.
6. Regarding extension of the elbow joint, all of the following are true EXCEPT:
   A. The movement is limited by the olecranon process fitting into the olecranon fossa.
   B. The superior radio-ulnar joint participates in the movement.
   C. When aided by gravity, it is controlled by the biceps brachii.
   D. The prime mover for the movement is attached to the ulna.
   E. The tendon of the brachialis is a limiting factor.

7. The median nerve:
   A. arises from both medial and lateral cords of the brachial plexus.
   B. gives branches to the brachialis muscle.
   C. is easily damaged by a fracture of the medial epicondyle of the humerus.
   D. supplies all the muscles of the anterior compartment of the forearm.
   E. supplies the palmar interosseous muscles in the hand.

8. The ulnar nerve:
   A. gives branches to the flexor compartment muscles in the arm.
   B. runs in the spiral groove of the humerus.
   C. supplies the extensor carpi ulnaris muscle.
   D. passes through the carpal tunnel.
   E. supplies all the interosseous muscles of the hand.

9. With reference to supination of the forearm:
   A. The supinator muscle is a developmentally dorsal muscle.
   B. The biceps can supinate only when the elbow is semiflexed.
   C. The supinator can act even if the elbow is extended.
   D. When both muscles act, the biceps is more powerful than the supinator.
   E. All of the above.

10. The brachioradialis muscle:
    A. is a flexor of the elbow joint.
    B. develops as a dorsal muscle.
    C. is supplied by the radial nerve.
    D. B and C are correct.
    E. A, B and C are correct.
11. The musculocutaneous nerve
   A. is developmentally comparable to the femoral nerve in the lower limb.
   B. arises from the lateral cord of the brachial plexus.
   C. winds around the surgical neck of the humerus.
   D. supplies the triceps brachii muscle.
   E. is the only nerve in the limbs to supply both muscles and skin.

12. The flexor digitorum profundus muscle can flex the
   A. wrist joint
   B. metacarpophalangeal joints of the fingers
   C. distal interphalangeal joints
   D. joints of the thumb
   E. A, B and C are correct

13. Regarding the movements of the wrist joint:
   A. It can be flexed by the brachioradialis muscle.
   B. The range of adduction is greater than abduction.
   C. All its movements occur only at the radiocarpal joint.
   D. The movement of pronation takes place at this joint.
   E. Its flexion is essential in forming a tight grip by the hand.

14. If the radial nerve is damaged by a fracture in the spiral groove:
   A. There is total loss of supination.
   B. The deltoid muscle is paralysed.
   C. Extensors of the wrist are paralysed.
   D. Abduction of the thumb is impossible.
   E. B and C are correct.

15. Regarding dorsal interosseous muscles of the hand:
   A. They are adductors of the fingers.
   B. They are smaller than the lumbrical muscles.
   C. They are developmentally dorsal muscles.
   D. The middle finger has two dorsal interossei.
   E. None of the above is correct.
16. The quadriceps femoris muscle
   A. acts on the knee joint only.
   B. has a double nerve supply.
   C. is developmentally a dorsal muscle.
   D. has a hiatus for the passage of the femoral artery.
   E. is attached to the fibula.

17. The hamstring group of muscles includes:
   A. semimembranosus
   B. short head of the biceps femoris
   C. semitendinosus
   D. A and C are correct
   E. A, B and C are correct.

18. Regarding the nerves of the foot:
   A. The lateral plantar nerve enters the foot from the lateral side.
   B. The medial plantar nerve is comparable to the ulnar nerve in the hand.
   C. Both lateral and medial plantar nerves are branches of the tibial nerve.
   D. The lateral plantar nerve supplies the peroneal muscles.
   E. Both lateral and medial plantar nerves are purely cutaneous nerves.

19. The psoas major muscle
   A. is a lateral rotator of the femur IF the femoral neck is fractured.
   B. is attached to the greater trochanter.
   C. is an extensor of the vertebral column.
   D. receives nerve supply from the obturator nerve.
   E. None of the above is true.

20. The ankle joint
   A. is formed by the tibia, fibula and the talus.
   B. has the deltoid ligament on the lateral side.
   C. is the joint for the movements of inversion and eversion.
   D. is a saddle type of joint.
   E. All of the above are true.
21. Preaxial structures in the limbs include:
   A. The fibula in the lower limb
   B. The radius in the upper limb
   C. The basilic vein in the upper limb.
   D. The short saphenous vein in the lower limb.
   E. All of the above are true.

22. The posterior cruciate ligament of the knee joint
   A. prevents the femur from slipping forwards on the tibia.
   B. divides the knee joint into two completely separate compartments.
   C. is attached to the femur on the posterior side.
   D. is a part of the popliteus tendon.
   E. is also known as the meniscofemoral ligament.

23. The gluteus maximus muscle
   A. has a large part attached to the iliotibial tract.
   B. takes origin from the ischial tuberosity.
   C. is a medial rotator of the hip joint.
   D. is supplied by the femoral nerve.
   E. prevents tilting of the pelvis to the opposite side during walking.

24. Muscles of the posterior compartment (calf) of the leg
   A. are developmentally dorsal muscles.
   B. are supplied by the tibial nerve.
   C. dorsiflex the ankle joint.
   D. help in clearing the toes from the ground during walking.
   E. include the peroneus (fibularis) longus.

25. The cervical plexus of nerves supplies the
   A. skin of the face.
   B. strap muscles of the neck.
   C. muscles of mastication.
   D. skin of the back of the neck.
   E. muscles of the tongue.
26. The ophthalmic division of the trigeminal nerve
   A. passes through the optic canal.
   B. supplies sensory fibres to the eyeball.
   C. gives parasympathetic fibres to the lacrimal gland.
   D. carries sensory fibres for smell.
   E. supplies the orbicularis oculi muscle.

27. Regarding muscles of facial expression, all of the following are true EXCEPT:
   A. They develop from the second branchial arch.
   B. They are supplied by the 7th cranial nerve.
   C. They include the elevator of the upper eyelid (levator palpebrae superioris).
   D. They all have at least one end attached to the skin.
   E. They are under voluntary control.

28. All of the following are dural venous sinuses EXCEPT:
   A. Sigmoid sinus
   B. Frontal sinus
   C. Transverse sinus
   D. Straight sinus
   E. Cavernous sinus

29. The maxillary division of the trigeminal nerve supplies
   A. a large part of the nasal cavity
   B. lower teeth
   C. the posterior one third of the tongue
   D. muscles of the soft palate
   E. none of the above.

30. Regarding structures which develop from branchial arches, which of the following pairs is correctly matched?
   A. Muscles of the tongue : first arch
   B. Constrictors of the pharynx : third arch
   C. Styloid process : second arch
   D. Muscles of the larynx : third arch
   E. Temporalis muscle : second arch
31. Regarding the facial nerve
   A. It is the nerve of the second branchial arch.
   B. It carries fibres for the sensation of taste.
   C. It emerges from the stylomastoid foramen.
   D. A and B are true.
   E. A, B and C are true.

32. The vagus nerve
   A. supplies the anterior two thirds of the tongue.
   B. carries parasympathetic fibres.
   C. controls the secretion of the parotid salivary gland.
   D. has a spinal root.
   E. None of the above.

33. Regarding the dural venous sinuses, which of the following pairs is matched INCORRECTLY?
   A. Superior sagittal sinus : arachnoid granulations.
   B. Transverse sinus : sphenoid bone.
   C. Inferior sagittal sinus : free margin of the falx cerebri.
   D. Sigmoid sinus : jugular foramen.
   E. Cavernous sinus : middle cranial fossa.

34. Regarding parasympathetic nerve supply to the structures in the head and neck:
   A. Parasympathetic fibres in the oculomotor nerve (III) control the lacrimal gland.
   B. Parasympathetic fibres in the facial nerve end in the otic ganglion.
   C. The pterygopalatine ganglion sends fibres to the parotid gland.
   D. The submandibular ganglion receives fibres from the glossopharyngeal nerve.
   E. The ciliary ganglion sends fibres to the constrictor pupillae muscle.

35. With reference to the muscles of the eyeball:
   A. The superior rectus is an elevator and abductor.
   B. The inferior oblique is an elevator and adductor.
   C. The lateral rectus is supplied by the abducens nerve.
   D. Orbicularis oculi is the circular muscle of the iris.
   E. When both eyes are turned to the right, both lateral rectus muscles contract.
36. In normal speech, all of the following affect the sound produced by the larynx, EXCEPT:

A. Length of the air column above the larynx.
B. Opening of the Eustachian (pharyngotympanic) tube.
C. Position of the tongue.
D. Position of the lips.
E. Position of the soft palate.

37. Regarding the functional anatomy of the larynx:

A. The larynx is elevated during swallowing.
B. Vocal cords control airflow through the larynx.
C. During speech the vocal cords are close to each other.
D. A and C are correct.
E. A, B and C are correct.

38. Regarding the process of swallowing:

A. The soft palate closes the passage between the nasopharynx and oropharynx.
B. Respiratory movements stop during swallowing.
C. Cricopharyngeus relaxes at the end of the pharyngeal phase.
D. The entire sequence of events is under voluntary control.
E. A, B and C are true.

39. With reference to the foramina in the skull and structures passing through them, which of the following pairs is correctly matched?

A. Superior orbital fissure : Maxillary nerve
B. Foramen ovale : Mandibular nerve
C. Optic canal : Oculomotor nerve
D. Jugular foramen : Hypoglossal nerve
E. Foramen magnum : Internal carotid artery

40. The glossopharyngeal nerve (IX)

A. carries taste fibres from the posterior one-third of the tongue.
B. supplies the constrictors of the pharynx.
C. is developmentally the nerve of the second branchial arch.
D. carries parasympathetic fibres for the sublingual gland.
E. supplies the muscles of the tongue.
Section 2 : Q 1 to 12 : Short-answers : Answer only in the space provided.

Question 1. Muscle actions in locomotion

At each stage of locomotion, for each joint and muscle group indicate the movement (flexion or extension) and, if the muscle is active, what sort of action (concentric, isometric, eccentric) it is performing

From heel strike to foot flat

Movement of the knee joint

Quadriceps muscle

Movement of the ankle joint

Anterior tibial muscles

(4)

From foot flat to heel off

Movement of the ankle joint

Calf muscles

Movement of the knee joint

Quadriceps

(4)

From heel off to toe off

Movement of the ankle joint

Calf muscles

(2)

Just after toe off

Movement of the hip joint

Hip flexors

Movement of the ankle joint

Anterior tibial muscles

(4)

14 marks
Question 2.  Brachial plexus.

Name the parts of the brachial plexus indicated A to I

A. ____________________________
B. ____________________________
C. ____________________________
D. ____________________________
E. ____________________________
F. ____________________________
G. ____________________________
H. ____________________________
I. ____________________________ (9)

What does the shading indicate on the nerves
1. The black ____________________________
2. The light stippling ____________________________

Identify the nerves J (branches of E) ____________________________

Identify the nerve K (branch of D) ____________________________

Identify the nerve L. ____________________________ (7)

(16 marks)
**Question 3. – Correspondence between upper and lower limb**

Complete the table below indicating which structures (bones, joints, muscles and nerves) are homologous between upper and lower limbs

<table>
<thead>
<tr>
<th></th>
<th>Upper limb</th>
<th>Lower limb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bones</strong></td>
<td>Humerus</td>
<td>Tibia</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Joints</strong></td>
<td>Glenohumeral</td>
<td>Ankle</td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Muscles</strong></td>
<td>Triceps</td>
<td>Gluteals</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biceps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extensor hallucis longus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Extensor carpi ulnaris</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tibialis posterior</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Palmaris longus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flexor digitorum longus</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dorsal interossei</td>
</tr>
<tr>
<td><strong>Nerves</strong></td>
<td>Axillary nerve</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Femoral plus deep peroneal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ulna, median and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>musculocutaneous nerves</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Lateral plantar nerve</td>
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</tbody>
</table>

(17 marks)
Question 4. - Biarticular muscles

For each of the following joint pairs, give examples of two bi-articular (or multi-articular) muscles that cross both joints.

Glenohumeral and elbow joint: ________________________ and ________________________

Hip and knee: ________________________ and ________________________

Knee and ankle joints: ________________________ and ________________________

Elbow and metacarpophalangeal joints: ________________________

and ________________________

(8)

Name two DISADVANTAGES of biarticular (or multiarticular) muscles, and for each disadvantage give an example:
First disadvantage ________________________

Example.. ________________________

Second disadvantage ________________________

Example.. ________________________

(6)

Name two ADVANTAGES of biarticular (or multiarticular) muscles, and for each advantage give an example:
First advantage ________________________

Example.. ________________________

Second advantage ________________________

Example.. ________________________

(6)

(20 marks)
Question 5. **Femoral triangle**

The femoral triangle is a space in the thigh bounded by the ______ ligament superiorly, the ______ border of the ______ muscle laterally, and the ______ border of the ______ muscle medially.

The femoral triangle is roofed over by the ____________________________.

(6)

The muscular floor of the triangle is formed by three muscles. From medial to lateral these muscle are ________________________, ________________________, and ________________________.

(3)

The femoral triangle contains four major structures that pass between the abdomen and thigh. The most lateral of these structures is the _________________________. Medial to it is the _________________________, then comes the ________________________ ________, and the most medial thing is the _________________________.

(4)

There is a hole in the roof of the triangle which allows the ________________________ vein to pass through and join the ________________________ vein.

(2)

15 marks
Question 6.  Index Finger movements and the extensor expansion.

Name the muscles indicated in the figure, AND
In the table, write “Flex” and “Extend” to indicate the principal flexor and extensor of each (only indicate the PRINCIPAL flexor and extensor of each joint)

![Diagram of the index finger with labeled muscles]

<table>
<thead>
<tr>
<th>Muscles (5)</th>
<th>Metacarpophalangeal (2)</th>
<th>Proximal interphalangeal (2)</th>
<th>Distal interphalangeal (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td></td>
<td></td>
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<tr>
<td>D</td>
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<td>E</td>
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<td>F</td>
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<tr>
<td>G</td>
<td></td>
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</tr>
</tbody>
</table>

What position would the finger joints take if the intrinsic muscles of the hand were paralysed:

Metacarpophalangeal joints ______________________
Interphalangeal joints ______________________

What muscle acting on the INDEX finger is NOT shown in the figure?

____________________________ (muscle H)  (3)

Put the letters A, B, C, D, E, F, G, H beside each of the nerves below to indicate which muscles are supplied by each nerve:

Radial nerve __________________________
Ulnar nerve __________________________, Median nerve __________________________

(8)  (24 marks)
Question 7.  Radial nerve - course distribution and lesions

Injuries

The radial nerve is most commonly damaged where it passes around the ____________ ________________ of the humerus.

Root values

The radial nerve is derived from the __________________________ spinal nerves.

Distribution

In the arm the radial nerve supplies the ___________ and ___________ muscles.

List ten forearm muscles that are supplied by the radial nerve   (4)

__________________________________________  ____________________________
__________________________________________  ____________________________
__________________________________________  ____________________________
__________________________________________  ____________________________
__________________________________________  ____________________________

Deficit

A radial nerve lesion results in a condition called _______________________________, in which the limb takes up a position where the:

Elbow is _________________________________

Forearm is _________________________________

Wrist is _________________________________

Metacarpophalangeal joints are _______________________________

(5)  

19 marks
Question 8. Facial nerve

The Facial nerve is the nerve of the ________ pharyngeal arch.

Name the group of voluntary muscles that it supplies
________________________________________

Name 4 of the branches that supply voluntary muscle
________________________________________
________________________________________
________________________________________
________________________________________

These nerve all emerge from a common stem through the _________________ foramen

(7)

Name the two other major components/modalities that arise in the nervus intermedius and are delivered in the greater petrosal and chorda tympani nerves:
________________________________________
and
________________________________________.

The ganglion of the greater petrosal nerve is the ________________________.
Its fibres are distributed with branches of the ________________________, to the ________________________ and ________________________ (regions).

The ganglion of the chorda tympani nerve is the ________________________.
Its fibres are distributed with branches of the ________________________, to the ________________________ and ________________________ (glands) and the ________________________ (region). (11)

19 marks
Question 9. Bones of the nose

Anterior opening of the nose is called the __________________________

It is bounded by the ____________________________
and ____________________________ bones

The floor and walls of the nasal cavity are formed by the ____________________________
and ____________________________ bones

(5)

The upper part and roof of the nasal cavity is mainly formed by the ____________________________ bone.

The nasal septum is formed partly by cartilage but also by two bones:
______________________________ and ____________________________

The posterior opening of the nasal cavity is called the ____________________________ it is bounded on the sides by the ____________________________ of the sphenoid bone

(5)

The paranasal sinuses lie adjacent to the nose:

The ____________________________ sinus is lateral to the nose

The ____________________________ sinus is above the anterior part of the nose

The ____________________________ sinus is posterior to the upper part of the nose

The ____________________________ air cells are situated between the orbits and nasal cavity

(4)

14 marks
Question 10. Muscles of facial expression

Name the muscles indicated

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
</table>

For each of the following muscles, state the action or facial expression produced.

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
</table>

Give the nerve supply of all these muscles ____________________

(9)

(19 marks)
**Question 11. Deglutition**

Deglutition or swallowing is described in three phases
1. **The oral phase** is voluntary and involves the mastication of food and the preparation of the bolus in the mouth.

2. **The pharyngeal phase** is very fast and reflex and begins when the bolus is pushed into the oropharynx by the tongue.

What triggers the reflex actions that occur?...

Name the mechanical stimulus - ________________________________

Name the sensory nerve that carries this stimulus - ________________________________

What structure prevents food from entering the nasopharynx? ________________

Name two muscles involved in this and give the nerve supply of each.

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve supply</th>
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</table>

What structure/muscle prevents food from returning to the oral cavity (give the muscle and its nerve supply)

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve supply</th>
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</table>

What structure helps to prevent food from entering the larynx? ________________ (10)

The longitudinal muscles of the pharynx draw the pharynx up over the bolus. Name the three longitudinal muscle of the pharynx and give the nerve supply of each

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</table>

The constrictor muscles “grasp” the bolus and help to carry it downwards when the longitudinal muscles relax. They then begin the process of peristalsis that carries the bolus further downwards.

Name the three constrictor muscles and give their nerve supply

<table>
<thead>
<tr>
<th>Muscle</th>
<th>Nerve supply</th>
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<tbody>
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</tbody>
</table>

3. **The third stage** of deglutition is called the ___________________________ phase (13) (23 marks)
Question 12. Cranial cavity and dural venous sinuses

Identify the cranial dural sinuses indicated

A. ______________________
B. ______________________
C. ______________________
D. ______________________
E. ______________________

(5)

Name two dural venous sinuses (marked “F” in the diagram) that drain the cavernous sinus

____________________________________
____________________________________

Name one other route by which blood can drain from the cavernous sinus?

____________________________________

Name four cranial nerves that run in relation to the cavernous sinus?

____________________________________
____________________________________
____________________________________
____________________________________

What two sinuses join to form the internal jugular vein?

____________________________________
____________________________________

(9)

(14 marks)