



**PROGRAM** : B.OPTOM & B. CUR

**SUBJECT** : HUMAN PHYSIOLOGY II

**CODE** : Optometry: HPH 02A2 (HPH 10A2 & HPH 20A2)  
Nursing : HPH 2A10 & HPH 2A20

**DATE** : JULY SUPPLEMENTARY EXAMINATION  
28 JULY 2016

**DURATION** : 180 minutes

**WEIGHT** : 50: 50

**TOTAL MARKS** : 50 x 2 =100

---

**EXAMINER** : P.C. DE LANGE- JACOBS

**MODERATOR** : S. EAGLETON

**NUMBER OF PAGES** : 5 PAGES

---

**REQUIREMENTS** : 2 X EXAMINATION SCRIPTS

---

**INSTRUCTIONS TO CANDIDATES:**

1. THIS QUESTION PAPER MUST BE RETURNED WITH YOUR EXAMINATION ANSWER SCRIPTS.
2. PLEASE ANSWER SECTION A & B in SEPARATE BOOKS
3. **MARK ALLOCATION: ½ MARK PER FACT UNLESS INDICATED OTHERWISE**

**SECTION A****Optometry: HPH 02A2 (HPH10A2)****Nursing : HPH 2A10****DURATION: 90 minutes****QUESTION 1**

Discuss the role of sweat glands and perspiration in thermoregulation by referring to:

- 1.1 The difference between insensible and sensible perspiration. (1)
  - 1.2 Composition of sweat. (1)
  - 1.3 Structure of water. (2)
  - 1.4 A special characteristic of water that plays an important role in thermoregulation. (2)
  - 1.5 The mode of secretion of sweat at the cellular and tissue level. (2)
  - 1.6 Homeostatic control. (2)
- [10]**

**QUESTION 2**

The movement of substances through the plasma membrane is of the utmost importance to maintain cellular homeostasis.

Explain the difference(s) between:

- 2.1 active and passive transport (2)
  - 2.2 the reaction of a living cell when placed in a hypertonic and hypotonic solution. (2)
  - 2.3 carrier proteins and channel proteins (2)
  - 2.4 simple diffusion and facilitated diffusion (2)
- [8]**

**QUESTION 3**

3.1 Explain to a patient the importance of exercise and nutrients for healthy bone growth and development. (3)

3.2 Explain the following:

3.2.1 The epiphyseal plate (1)

3.2.2 The functions of osteoprogenitors cells and osteoblasts. (2)

3.3 Briefly discuss Paget's disease. (2)

**[8]**

**QUESTION 4**

ATP manufactured during aerobic and anaerobic respiration provides the energy needed for muscle contraction.

4.1 Name the two main processes in aerobic respiration, then indicate the cellular site of the process and net gain in energy (ATP) for both. (3)

4.2 Explain the pattern of energy production and use during **moderate levels** of activity. (2)

4.3 Discuss in detail the contraction cycle of a skeletal muscle fibre. (10)

**[15]**

**Question 5**

5.1 List **two** characteristics of muscle hypertrophy. (1)

5.2 Explain **three** effects of calcitonin on blood calcium levels. 3 x 1 = (3)

5.3 Explain the underlying cause for the following disorders/diseases:

5.3.1 Botulism (1)

5.3.2 Vitiligo (1)

5.3.3 Osteopenia/osteoporosis (1)

5.4 Provide **two** reasons why most cancers developed from epithelial tissue.

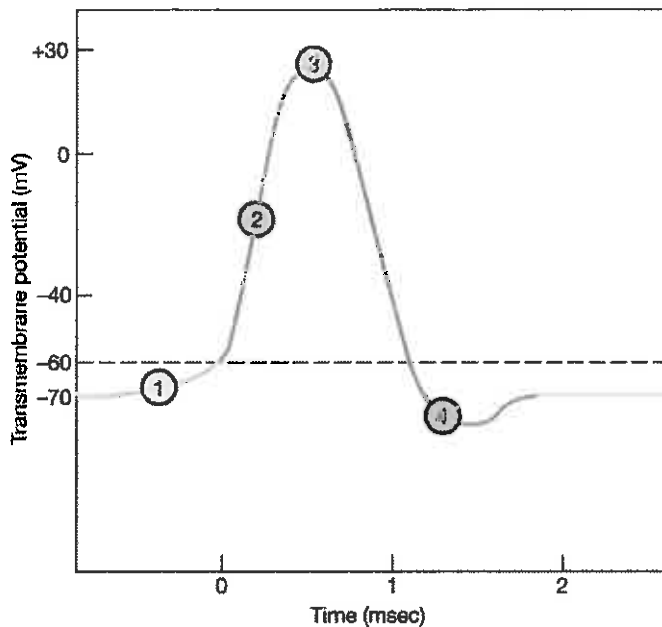
2 x 1 = (2)

**[9]**

---

**SECTION A: TOTAL MARKS: 50**

---

**SECTION B****Optometry: HPH 02A2 (HPH 20A2)****Nursing : HPH 2A20****DURATION: 90 minutes****Question 1:****Figure 1***Use Figure 1 to answer the following questions:*

- 1.1 Explain the events represented by #1 on the graph. 4 x ½ = (2)
  - 1.2 Explain the events represented by #2 on the graph. 4 x ½ = (2)
  - 1.3 Which area of the graph represents the events when chemically-gated sodium channels are open? (½)
  - 1.4 Explain the events represented by #3 on the graph. 4 x ½ = (2)
  - 1.5 Which area of the graph represents hyperpolarization? (½)
  - 1.6 Explain the duration of the refractory period. (1)
- [8]**

**Question 2**

- 2.1 Explain epidural block. (1)
- 2.2 Discuss the relevance of the plantar reflex and Babinski sign. (2)
- 2.3 Use the flexor reflex as an example to discuss reciprocal inhibition. (3)
- 2.4 Explain a convergent neural circuit. (1)

**[7]**

5/...

**Question 3**

3.1 Distinguish between:

3.1.1 Fast pain and slow pain (3)

3.1.2 Referred pain and phantom limb pain 2 x 1= (2)

3.2 Use only a flow diagram to explain the sequence of events from the moment of detection of a **crude touch stimulus** up till the moment of perception. (8)

[13]

**QUESTION 4**

4.1 The hypothalamus forms an important part of the limbic system. Explain:

4.1.1 The connection between the hypothalamus, autonomic function and psychosomatic illnesses. (4)

4.1.2 The physiological basis of biofeedback. 2 x 1= (2)

4.2 Briefly explain Alzheimer's disease. (3)

4.3 Explain the cellular mechanisms of long-term memory formation. (3)  
[12]

**Question 5**

5.1 Name **two** structures in the ear where equilibrium **sensations** originate and then indicate the specific sensation(s) provided by each. (2)

5.2 Describe the pathway of a sound wave from where it enters the pinna until it gets interpreted in the auditory cortex. For each structure mentioned, describe its function. (6)

5.3 Explain the mechanisms involved in the reception of a sweet taste sensation. (2)  
[10]

---

**SECTION B: TOTAL MARKS: 50**

---