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POSTGRADUATE INSTITUTE OF MEDICINE
UNIVERSITY OF COLOMBO

POSTGRADUATE DIPLOMA IN MEDICAL PHYSIOLOGY
EXAMINATION – APRIL 2016

STRUCTURED ESSAY QUESTION (SEQ) PAPER

Date :- 2nd April 2016

Time :- 9.30 a.m. – 10.30 a.m.

NEUROPHYSIOLOGY I

Answer all three (03) questions
Answer each question in a separate book.

1. Explain the physiological basis of the following
 - 1.1. Size of the pupil is monitored in assessing the adequacy of atropine therapy. (40 marks)
 - 1.2. Salbutamol is used in the management of preterm uterine contractions. (30 marks)
 - 1.3. Treatment of abdominal cramps with hyoscine butylbromide can cause urine retention. (30 marks)
2. Explain the physiological basis for the following observations :
 - 2.1. Reduction in nerve conduction velocity in multiple sclerosis. (50 marks)
 - 2.2. Muscle fatiguability in myasthenia gravis. (50 marks)
3. A patient who has fallen from a height on his right arm, presents with the following features:
 - (a) weakness of the right upper arm, forearm and hand
 - (b) decreased biceps and triceps jerks on the right side
 - (c) numbness of the right upper limb
 - 3.1. State the possible site of the lesion. (20 marks)
 - 3.2. What are the spinal levels of biceps and triceps jerks? (20 marks)
 - 3.3. Explain the pathophysiological basis of (a), (b) and (c). (60 marks)

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Date :- 2nd April 2016

Time :- 12.00 noon – 1.00 p.m.

NEUROPHYSIOLOGY II

Answer all three (03) questions

Answer each question in a separate book.

1. Explain the physiological basis of the following in relation to hearing.
 - 1.1. Localisation of sound (20 marks)
 - 1.2. Determination of loudness of sound (20 marks)
 - 1.3. Determination of pitch of sound (20 marks)
 - 1.4. Protection from loud noises by audio-motor reflexes (40 marks)

2. A patient with a neurological lesion showed the following:
 - (a) Loss of vision of the right hemi-fields of both eyes.
 - (b) Constriction of both pupils when a light was directed to the right eye, but no pupillary constriction when the light was directed to the left eye.
 - 2.1. What is the site of the neurological lesion? (20 marks)
 - 2.2. Explain the physiological basis of the observations (a) and (b) above. (80 marks)

3. Write short notes :
 - 3.1. REM Sleep (40 marks)
 - 3.2. Expressive aphasia (30 marks)
 - 3.3. Short term memory (30 marks)

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STRUCTURED ESSAY QUESTION (SEQ) PAPER

Date :- 2nd April 2016

Time :- 2.00 p.m. - 3.30 p.m.

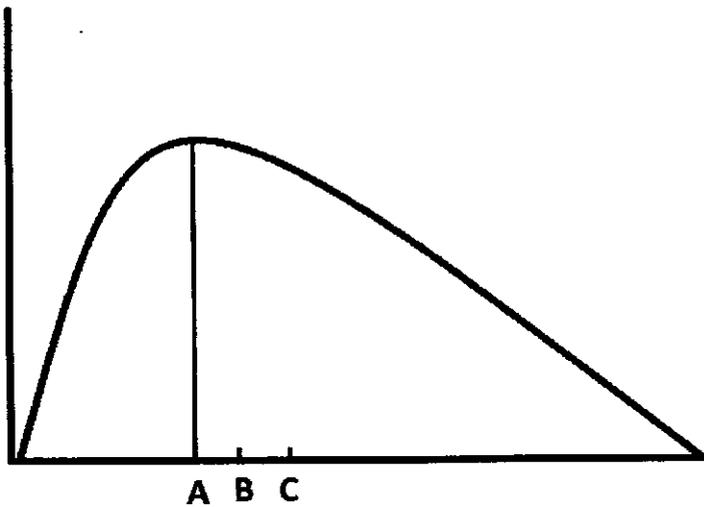
STATISTICS

Answer all four (04) questions
Answer each question in a separate book.

1. A researcher aimed to examine the effect of exposure to spice dust on lung functions of males. He compared a group on spice-mill workers (i.e. test group) with a control group of manual labourers. He collected the following variables from his subjects: group, age, height, smoking status (smoker vs. non smoker) and peak expiratory flow rate and FEV1/FVC ratio.
 - 1.1. Identify the independent variable/s and dependent variable/s in the above study. Indicate the scale of measurement against each variable. (60 marks)
 - 1.2. What is the statistical model that can be used to analyse the relationship between independent variables and each dependent variable? (10 marks)
 - 1.3. The number of days of work per week among 11 spice mill workers was as following: 2,5,7,6,5,3,3,4,6,5,4. Calculate the mean, mode and median for this dataset. (30 marks)

Contd...../2-

2. You aim to examine whether company executives have higher systolic blood pressures. You compare the SBP of a group of company executives (test group) with a group of farmers (control group).
- 2.1. What is the statistical test that you use to compare the SBPs of these two groups? (10 marks)
- 2.2. The mean SBP of the test group is 140mmHg and that of the control group is 125mmHg. If the standard deviation of SBP in the general population is 10 mmHg, calculate the effect size for the mean difference of SBPs between the two groups. (25 marks)
- 2.3. You aim to add a third group – doctors - to the study. What is the statistical test that you should use to compare the SBP among the three groups? (15 marks)
- 2.4. Write the null hypothesis of the test you mentioned in 2.4. above. (25 marks)
- 2.5. After running the above test you decide to compare the mean SBP between each pair of groups.
- 2.5.1. How many pair-wise comparisons should you do? (10 marks)
- 2.5.2. If you set a level of significance to a cut off P value of 0.05 for the study and decide to conduct Bonferroni correction for the pair-wise comparisons, what is the cut off P value? (15 marks)
- 2.6. You also measured the BMI of the subjects. The following graph shows the frequency distribution curve of the BMI of the test group with measures of central tendency are labelled A, B and C.



Name the measures A, B and C.

3. A researcher studied whether memory performance of a cohort of healthy individuals at the age of 60 years can predict occurrence of dementia after 10 years. He obtained the following baseline data of the sample:

Variable	Values and coding
Sex	Male = 0, female = 1
Education	10 years or more = 0, > 10 years = 1
Family history of dementia	present = 1, absent = 0
Memory test score (baseline)	Continuous score
Dementia	present = 1, absent = 0

- 3.1. Out of 100 subjects who had family history, 30 developed dementia whereas out of 200 subjects who did not have a family history 40 developed dementia.

3.1.1. Calculate the relative risk of dementia between those who had a family history and those who did not have a family history of dementia. (15 marks)

3.1.2. What is the statistical test that you would use to test the significance of the 3.1.1. above? (10 marks)

Contd...../4-

3.2. The researcher conducted a multiple logistic regression model to analyse the data incorporating sex, years of education, family history and memory score as predictor variables and dementia as the outcome variable. The output of the statistical analysis (multiple logistic regression) is given below:

Variable	coefficient	95% confidence interval	p
Memory score	0.93	0.92-0.95	0.001
Sex	2.4	1.6 – 4.8	0.004
Family history	1.6	1.1 – 2.5	0.023
Education	0.8	0.6 – 1.1	0.07
Overall model (Adjusted R squared = 0.35)			0.001

3.2.1.1. Which predictor variables are significantly associated with dementia? (15 marks)

3.2.1.2. Write a concise results paragraph (~100 – 200 words) based on the above output. (60 marks)

4. A researcher recruited a group of subjects (400 men and 400 women) between 45 to 65 years and measured their bone density.

4.1. There was a negative correlation between age and bone density among women but no significant correlation between age and bone density among men. Draw two correlation plots to indicate the above relationships. (40 marks)

4.2. The researcher split the study group into two subgroups based on age (45-55 and 55-60), and compared the relative risk of fractures between men and women in each subgroup. The results are shown below:

Subgroup	Relative risk Women / Men)	95% CI for relative risk	P value
45-55 years	1.5	(1.3 – 1.8)	0.0001
55-65 years	4.5	(2.1 – 8.8)	0.01

Contd...../5-

- 4.2.1. The result of which group has the greater statistical significance?
(10 marks)
- 4.2.2. The result of which group has the greater clinical significance?
(10 marks)
- 4.2.3. Write a concise (~100 - 150 words) results paragraph based on the results presented in the above table.
(40 marks)

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POSTGRADUATE DIPLOMA IN MEDICAL PHYSIOLOGY
EXAMINATION – APRIL 2016

STRUCTURED ESSAY QUESTION (SEQ) PAPER

Date :- 3rd April 2016

Time :- 11.00 a.m. – 12.00 noon

ENVIRONMENTAL PHYSIOLOGY

Answer all three (03) questions
Answer each question in a separate book.

1. A 28 year-old Sri Lankan male diver who went to sea in a small motor boat on a dry, sunny morning was lost in the sea for 36 hours. The motor of the boat had malfunctioned in the sea and he had paddled the boat exhaustively for 24 hours to reach the land. He had had no food for 24 hours and run out of water approximately 8 hours before reaching land.

On admission to hospital he was wearing a diving suit, was dehydrated and confused. His rectal temperature was 41.2°C and he had flushed skin and no sweating. His blood pressure was 90/70 mmHg and his heart rate was 128/minute.

- 1.1. State the most likely condition this patient is suffering from. (10 marks)
- 1.2. Explain the reasons for the following :
- 1.2.1. Body temperature (20 marks)
- 1.2.2. Flushed skin (10 marks)
- 1.2.3. Blood pressure (30 marks)
- 1.2.4. Lack of sweating (10 marks)
- 1.3. State the main steps in the management of this patient. (20 marks)

2. A healthy Sri Lankan visited a city in Nepal at an altitude of 3500m and stayed for 2 weeks.

2.1. Explain the basis of the changes you would expect in his respiratory rate during his stay. (50 marks)

2.2. Draw and label the normal oxygen haemoglobin dissociation curve and describe the changes you would expect in the curve in this person. (50 marks)

3.

3.1. Outline the mechanisms by which environmental pollutants harm male reproductive function. (50 marks)

3.2.

3.2.1. List the different types of hypoxia. (20 marks)

3.2.2. Explain the basis for the type of hypoxia that results in carbon-monoxide poisoning. (30 marks)