UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Science

B.Sc. IN ENVIRONMENTAL HEALTH SCIENCE

MAIN EXAMINATION PAPER, DECEMBER 2017

TITLE OF PAPER   : RESEARCH METHODS

COURSE CODE   : EHS309 / EHM308

DURATION   : 2 HOURS

MARKS   : 100

INSTRUCTIONS   : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY

: QUESTION ONE IS COMPULSORY

: IN ADDITION, CHOOSE AND ANSWER ANY THREE QUESTIONS FROM QUESTIONS 2, 3, 4 AND 5.

: EACH QUESTION **CARRIES 25** MARKS.

: WRITE NEATLY & CLEARLY

: NO PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.

: BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE (Part A and Part B carry 12 and ½ marks each)

1A. A retrospective cohort study was undertaken to determine the cause of Giardia epidemic among people who visit a local swimming pool. The study was conducted by requesting most of the people in the cohort (those who visit the swimming pool) to complete the questionnaire asking them if they had spent time in the kids pool and if they have suffered from giardia (one suspicion is that swimmers who spent time in the kids pool are at greater risk of contracting giardia because of children shedding giardia through diarrhea). A total of 479 swimmers were surveyed. The table below shows the result of the survey.

Observation	Developed disease	No disease	Total
Exposed	16	108	124
Not exposed	14	341	355
Total	30	449	479

Using Chi-square test at 95% confidence level and referring to the Chi-square table provided below, determine if giardia incidences were caused by exposure at kids pool.

χ^2 (Chi-Squared) Distribution: Critical Values of χ^2

Significance level

Degrees of freedom	5%	1%	0.1%
1	3.841	6.635	10.828
2	5.991	9.210	13.816
3	7.815	11.345	16.266
4	9.488	13.277	18.467
5	11.070	15.086	20.515
6	12.592	16.812	22.458
7	14.067	18.475	24.322
8	15.507	20.090	26.124
9	16.919	21.666	27.877
10	18.307	23.209	29.588

1B. A diarrhea prevalence study is to be undertaken within a given population of 3000 from which suitable sample has to be drawn. The estimated prevalence of diarrhea in the region is around 26%. If the confidence level chosen is 95% (z = 1.96) with 3% margin of error in the estimate of the proportion, determine the sample size required taking into account the non-response which is estimated at 10%.

QUESTION TWO (five marks for each section)

2A. In a broader definition, environmental health typically concerns itself with the physical, mental and psychological human health outcomes of exposure to environmental hazards. An argument occasional arises as to whether environmental health research should be a quantitative or qualitative research. In light of the broader definition given above, discuss the research paradigm of environmental health stating the relevance of quantitative, qualitative or mixed methods of research.

2B. Supposing a researcher wants to study the impacts of two different types of noise created in different environments. One is neighborhood noise, i.e., noise created by neighbors and perception of community members about the level of irritation that such noises cause. The other noise research is the impact of noise due to aircraft because of the proximity of airport to a community. Discuss the appropriateness of quantitative and qualitative approaches in each of these two different research studies.

2C. A researcher wants to study the range of possible long-term effects of a chemical exposure (pesticides) on workers who are working on a sugarcane plantation. Explain the suitable type of research (exploratory vs. descriptive, cross-sectional vs. longitudinal, etc.) that would be appropriate for this particular study.

2D. Health sciences research often focus on natural experiment or carefully constructed observation instead of experimental approach adopted in natural sciences where by the researcher has complete control over the variables to be manipulated. State why the later approach (experiment with complete control) may not always be suitable for health sciences research.

2E. Supposing you want to carry out a study consisting of the sequence of activities listed below. Discuss the research approach to be undertaken under each phase of this research and the type of study to be undertaken.

    i. Study the possible causes of lung cancer.

    ii. From study in (i) smoking has been suspected as the major factor in the incidences of lung cancer. It is required to study if there is an association between the two.

    iii. From study in (ii), it has been established that smoking is associated with lung cancer. A hypothesis has been established that smoking causes cancer. It is required to carry out a research to prove or disprove this hypothesis.

QUESTION THREE (Five marks for each section)

3A. State the type of study adopted in the following research:

> *In a study in three states in the USA with a population of 13 million, all mothers of leukemic children of 1-4 years old (diagnosed in 1959-67) were interviewed. As controls, a sample of 13 000 other women were taken. Four factors were considered, two preconceptional (preconceptional radiation and previous reproductive wastage) and two post-conceptional (in utero irradiation and viral infection during pregnancy). Analysis showed that each factor was related to leukemia in their children (Gibson et al., 1968).*

3B. State the type of research study followed on the following case:

> *In a classic study, researchers Doll and Hill compared the smoking habits of two groups of patients in London hospitals: Those with carcinoma of the lungs and those with other cancers. Several aspects of smoking behavior were investigated as potential antecedent events, including the number of cigarettes smoked, history of smoking and whether smoked or inhaled. Although both groups contained a great proportion of smokers, evidence for an association between cigarette smoking and lung cancer was obtained from the study.*

3C. Comparing the three types of observational studies, namely case control, cohort and cross sectional study, state one major advantage of case control and cohort studies over cross-sectional studies.

3D. Suppose you want to carry out a case-control study to determine whether smoking by pregnant mother causes birth defects. The study area is based in Mbabane hospital. Discuss the appropriate research design using this case-control approach.

3E. A research study was undertaken to determine if health and hygiene education among group of community members resulted in practical change in behaviors. The study involved educating members of the community in health and hygiene and observing their practice at home afterwards and comparing with the practices of members of the community that did not participate in the training. State the type of research design adopted in this case.

QUESTION FOUR (Five marks for each section)

4A. A researcher sets out to study knowledge attitude and practice concerning hand washing and hygiene among members of a given city. The researcher prepared an open-ended questionnaire and decided to administer it in the form of telephonic interview. Discuss the validity of his research design and the problem that may arise as a result.

4B. A research study was conducted in a community to determine if members of the community who abstract water from a nearby river were exposed to water borne illnesses. The total population of households is 2000 and the households were randomly selected from this population and a representative sample size was selected using statistical criteria. State the possible error that exists in this sampling approach.

4C. Comparing risks to validity or reliability, in each of the following cases:

    i. A researcher decides to take a very large sample or goes to the extreme of taking a census. Which of the two (reliability or validity) will be at greater risk and why?

    ii. A researcher decides to take a smaller size sample than would be a representative size. Which of the two (reliability or validity) will be at greater risk and why?

4D. State the specific type of validity a researcher is trying to measure in each of the following cases:

    i. A researcher prepared questionnaire to assess the level of anxiety and depression related to over-working and under-payment in a company. During the piloting phase, the researcher asked the workers if the questions that he/she was asking truly measured the anxiety and depression.

ii.   A researcher prepares a questionnaire on assessment of anxiety and depression and asks an expert in the field to evaluate whether these questionnaires correctly assess anxiety and depression.

iii. A researcher prepares a questionnaire to assess the level of anxiety and depression and wants to evaluate whether workers who score high on the scale of anxiety and depression also score low on the scale of happiness and work satisfaction.

4E. A research study aims to calculate the effect of pharmaceutical care on the health of hypertensive patients in terms of reducing morbidity and mortality. Because of the long-term study period that would be required for measuring morbidity and mortality, instead reduction in blood pressure was taken as surrogate variable. Previous studies conclusively indicated that reduction in blood pressure is also associated with reduced in morbidity and mortality. Such available previous finding has been used by the researcher to validate the choice of this surrogate variable, i.e., blood pressure. State and reason out what specific type of validity test the researcher has been using in his argument.

QUESTION FIVE (Marks are indicated against each section)

5A. Classify whether each of the following data collection methods are quantitative or qualitative.. [5 marks]

   i.   A survey of accident records in a company

   ii.   Observation of the use of personal protection equipment among workers in a company.

   iii. Observation of the general level of cleanliness of the work place in a company.

   iv.   Workers perception of the occupational health and safety climate in a company

   v.   Questionnaire to workers on the frequency of accidents, illnesses, absences experienced.

5B. Classify whether each of the following data collection approaches are qualitative or quantitative. Indicate with (QN) for quantitative and (QL) for quantitative types.

..............[5 marks]

Distribution of gender in the organization	Autonomy and control by workers in planning work activities
Clarity of tasks provided to workers	Work schedule
Workers satisfaction on the reward system provided	Existence of interpersonal conflict management system
	Frequency of work interruption
Disciplinary sanctions	Boredom

5C. A researcher conducted a focus group discussion among solid waste workers of a given city. The objective of the focus group discussion was to gather information about the knowledge, attitude and practice of solid waste collectors towards solid waste collection, management and the occupational safety and health associated with this work. The researcher first delivered a verbal lecture on the different methods of solid waste management, the types waste s produced and the risks they carry. He noticed that the participants could not properly grasp what he was saying due to the jargons and high level language he used. Discuss what this researcher could have done better in this regard.   ....[5 Marks]

5D. A certain company boasted that, following the introduction of a better management system towards minimizing occupational health and safety risk to its workers, the annual rate of accident and injury reduced below the industry average. The company employs 80 people and the average annual number of accident and injury was just five. The industry wide annual average of occupational accidents is 7 with standard deviation of 3.6. Using the z score table provided at the end of this exam paper and choosing a confidence level of 95%, determine if the claim by the company is statistically valid...[10 Marks]
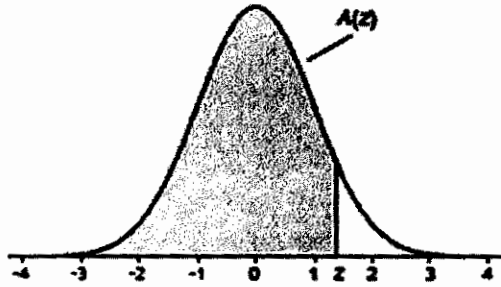
$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	A(z)	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							