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## UACE P515/2 Principles and practices of agriculture 2014

### Instructions

- This paper consists of sections: **A, B, C, D and E**
- Answer **question 1** in section A and four other questions, selecting **one** from each of the sections **C, D and E**.
- Write your answers in the answer booklets provided
- Any additional question(s) answered will not be marked

### SECTION A (20MARKS)

Question 1 is compulsory

1. In an ecosystem which was affected by a pesticide, analysis of energy and concentration of the pesticide in parts per million (ppm), at each trophic level in the food chain was made. The result are shown in a pyramid of biomass of the ecosystem in figure 1

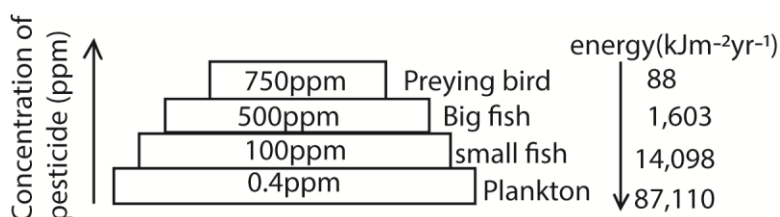


Fig. 1

- (a) What does the width of each bar of the pyramid represents? (02marks)
- (b) Explain why from producers to the tertiary consumers the
  - (i) Level of the pesticide increase (04marks)
  - (ii) Flow of energy decrease (04marks)
- (c) From the biomass explain how producer sustain primary consumers. (02marks)
- (d) Outline the ecological problems that may arise through the use of pesticides. (08marks)

## **SECTION B (20MARKS)**

### **CROP PRODUCTION**

Answer **one** question from this section

2. (a) Outline ways by which soil fertility may be lost. (06marks)  
(b) Explain the factors that determine the method of fertilizer application. (08marks)  
(c) What factors affect the efficiency of fertilizer use? (06 marks)
3. (a) Why is soil sampling important in farming? (04marks)  
(b) Describe the procedure followed when sampling soil. (12marks)  
(c) Outline sites that should be avoided during soil sampling. (04marks)

## **SECTION C (20MARKS)**

### **ANIMAL PRODUCTION**

Answer **one** question from this section

4. (a) Explain the factors that determine the stocking rate of a pasture. (12 marks)  
(b) Discuss the importance of forage feeding in livestock management. (08marks)
5. (a) Outline steps to be followed to prevent animals from possible sources of parasite infestations (08marks)  
(b) Describe the general practices of preventing and controlling contagious diseases in farm animals. (12 marks)

## **SECTION D (20MARKS)**

### **AGRICULTURAL ENGINEERING**

Answer **one** question from this section

6. (a) What are the effects of overheating in a tractor engine? (06marks)  
(b) With the aid of a diagram, describe the working of water cooling system of a tractor engine (10marks)  
(c) How can the efficiency performance of the cooling system of a tractor engine be ensured (04marks)
7. (a) With the aid of a diagram explain the functions of the components of a cattle dip. (15marks)  
(b) Explain why some farmers prefer to use a spray race instead of dip tank. (05marks)

## **SECTION D (20MARKS)**

## AGRICULTURAL ECONOMICS

Answer **one** question from this section

8. (a) Outline the factors that influenced the elasticity of demand for a product. (08marks)  
(b) Using suitable illustrations describe the different types of elasticity of demand for a product. (12marks)
9. (a) Discuss the causes of high population growth in developing countries. (12marks)  
(b) Outline the importance of labour as a factor of production. (06marks)  
(c) Explain the factors that affect the efficiency of labor utilization in agricultural production. (02marks)

END

## Suggested answers

1. In an ecosystem which was affected by a pesticide, analysis of energy and concentration of the pesticide in parts per million (ppm), at each trophic level in the food chain was made. The result are shown in a pyramid of biomass of the ecosystem in figure 1

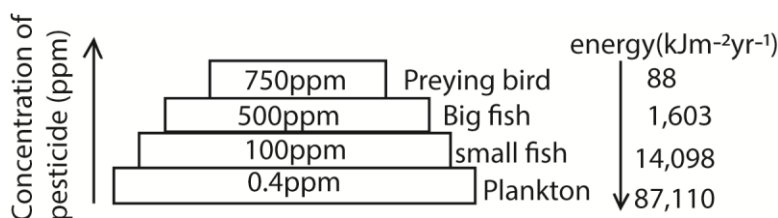


Fig. 1

- (a) What does the width of each bar of the pyramid represents? (02marks)  
Number of organisms at that particular trophic level
- (b) Explain why from producers to the tertiary consumers the
- Level of the pesticide increase (04marks)  
An organism at a higher trophic level consumes very organisms at lower trophic level thereby accumulating the non-biodegradable pesticide. This leads to progressive increase in the pesticide concentration in organisms at higher trophic levels.
  - Flow of energy decrease (04marks)  
From one trophic level to energy is lost through respiration, defecation, urination and decomposition of unconsumed organisms
- (c) From the biomass explain how producer sustain primary consumers. (02marks)  
The producers have a higher turnover compared to the primary consumer
- (d) Outline the ecological problems that may arise through the use of pesticides. (08marks)
- Non-biodegradable pesticides accumulate in plants and animals causing death of predators at higher trophic level
  - Indiscriminately kill organisms including useful ones including useful ones
  - Prolonged use may lead to resurgence of resistant strains of pest.
  - Water pollution
  - Air pollution
  - Soil degradation by killing beneficial microorganisms.

## SECTION B (20MARKS)

### CROP PRODUCTION

Answer **one** question from this section

2. (a) Outline ways by which soil fertility may be lost. (06marks)
- Change of soil PH
  - Buildup of pests and diseases in the soil
  - Burning that destroy useful microorganisms and also destroy soil structure

- Formation of hard pans which restricts root development and access to water and nutrients. Hardpans also impede water drainage which can lead to waterlogging above the hardpan and drought conditions below it.
- Soil compaction by heavy machinery and overgrazing that may reduce the soil's ability to hold water and nutrients
- Deforestation that lead to soil erosion
- Monoculture practices/over cultivation leading to nutrient depletion
- Crop removal during harvesting
- Large number of weeds.
- Overuse of fertilizers and pesticides that can alter soil pH and kill beneficial microorganisms
- Salinization due to irrigation

(b) Explain the factors that determine the method of fertilizer application. (08marks)

- **Crop type:** different crops have varying nutrient requirement and root structure which can affect the choice of application method. For example, row crops might benefit from band placement, while broad-acre crops might be better suited for broadcasting.
- **Soil characteristics:** soil texture structure and nutrient content play a crucial role. Sandy soils may require more frequent applications while clay soils might hold nutrients longer.
- **Stage of development of the crops:** fertilizers intended for use by young plants are placed close to the plant
- **Weather conditions of the area:** in very hot conditions, fertilizers that can be lost in vapor are better dug into the soil. Also heavy rainfall can wash away surface-applied fertilizers making subsurface methods more effective in such conditions.
- **Timing:** the growth stage of the crop is critical. Some method, like side-dressing are timed to coincide with specific growth stage to maximize nutrient uptake.
- **Availability of equipment** may determine the method of application used
- **Cost and efficiency:** the choice of application of fertilizers is important to reduce wastage and ensure even distribution of fertilizers.
- **Availability of labour**
- **Size of the farm:** a big farm requires machines like tractors to broadcast fertilizers.

(c) What factors affect the efficiency of fertilizer use? (06 marks)

- Soil properties such as texture, pH, temperature, moisture, and organic matter.
- Type of fertilizer whether it contains minerals deficient in the soil.
- Method of application whether broadcasting, banding, foliar etc.
- Timing of application such as stage of a crop
- Type of crop
- Environmental conditions: temperature and precipitation can impact nutrient availability.
- Amount/dosage of fertilizer used
- Rate of application

3. (a) Why is soil sampling important in farming? (04marks)

- To determine soil pH
- To determine the organic matter content of the soil
- To determine soil aeration
- To find out soil moisture
- To determine the type of fertilizer to apply
- To know the type of crop to grow
- To know the capillarity of the soil
- To reveals soil microbial activity.
- To tailors nutrient management plans.
- To determines optimum rates of fertilizer and lime.

(b) Describe the procedure followed when sampling soil. (12marks)

- Determine the size of land where sampling is to be carried out
- Obtain the material and equipment needed for sampling such as polythene bags, soil auger and shovel
- Clean and dry equipment to be used
- Select the sampling method
- Identify spots from which samples are to be taken
- Clear the vegetation around the sampling areas
- Make a vertical cut into the soil to a depth of 15 -25cm for crop land and 5cm for pasture land
- Take a slice from the vertical cut made or use a soil auger to scoop out soil.
- Collect the soil from each sampling point identified into polythene bag and mix to get a representative or composite sample
- Dry the representative sample under controlled temperatures
- Put the representative sample into a labeled container showing the date, place/location of sampling
- Carry the sample to the laboratory.

(c) Outline sites that should be avoided during soil sampling. (04marks)

- Anthills
- Old house sites
- Kraals,
- Ditches
- Roads
- Where vegetation has been burnt
- Pig site
- Water logged areas
- furrows

## SECTION C (20MARKS)

### ANIMAL PRODUCTION

Answer **one** question from this section

4. (a) Explain the factors that determine the stocking rate of a pasture. (12 marks)
- **Size of pasture land:** the bigger the size of pasture land, the higher the carrying capacity
  - **Absence of pests and diseases** lead to high carrying capacity
  - **Forage production:** The amount of forage available in the pasture.
  - **Rate of growth of pasture plant:** high rate of growth of pasture plants support high stocking rate
  - **Availability of supplements:** e.g. silage, hay support high stocking rate
  - **Composition of pasture:** mixed pasture have high stocking rate than pure strand
  - **Forage quality:** The nutritional value of the forage.
  - **Grazing system:** The type of grazing system employed on the pasture.
  - **Soil fertility:** The nutrient content in the soil.
  - **Climate and weather conditions:** The environmental factors affecting pasture growth.
  - **Animal species and class:** different animals (cattle, sheep, goats etc.) and their specific classes (e.g. dry cow, lactating cow, bull) have varying forage requirements.
  - **Rainfall and climate:** the amount, timing and dependability of rainfall, as well as overall climate conditions affect growth and availability of pasture grass
  - **Topography and soil characteristics:** determine the amount of forage produced
  - **Availability of water:** the quality, quantity and distribution of water source for the livestock are essential for determining how many animals the pasture can support
  - **Management goals and practices:** such as grazing methods and maintenance of animal health.
- (b) Discuss the importance of forage feeding in livestock management. (08marks)
- Cheap source of feeds for livestock that significantly reduce the overall cost of feeding livestock.
  - Forages, such as pasture grasses and legumes, provide essential nutrients that support the health and productivity of livestock
  - High-quality forages contribute to better digestion and overall health of the animals.
  - It can be conserved and stored for future use.
  - Enhance high productivity.
  - Fix nitrogen and improve soil fertility for sustainable use of soil
5. (a) Outline steps to be followed to prevent animals from possible sources of parasite infestations (08marks)
- Dipping and spraying animals with recommended acaricides and pesticides
  - Hand dressing of the animals using pye grease on most important parts like udder, ear, underneath the tail etc.

- Practice rotation grazing break the life cycle of the parasites
- Controlled burning of old pasture in dry season to kill parasite such as ticks
- Hand picking and killing ticks
- Fencing keep away stray animals that may carry parasites
- Routine deworming with drugs
- Use of tsetse fly traps
- Providing animals with good quality water
- Proper hygiene and sanitation
- 

(b) Describe the general practices of preventing and controlling contagious diseases in farm animals. (12 marks)

- Restrict access to a farm to essential personnel only
- Restrict movement of animal in case of contagious disease outbreak
- Quarantine new animals for a given period before introducing it to the animal herd
- Practice proper sanitization: regularly clean
- Vaccination for instance Foot and mouth disease
- Monitor animals for signs of illness and ensure early treatment
- Ensuring personal hygiene like washing hands and use of protective clothes
- Regularly clean and disinfect tools and equipment after use to prevent cross contamination.
- Properly manage and dispose of animal waste to reduce risk of disease transmission
- Provide proper ventilation to animal to reduce risks of airborne diseases
- Education and training of farm workers about diseases prevention and control measure
- Sensitize visitor about biosecurity and ensure that they comply with the standard operating procedures.

#### **SECTION D (20MARKS)**

#### **AGRICULTURAL ENGINEERING**

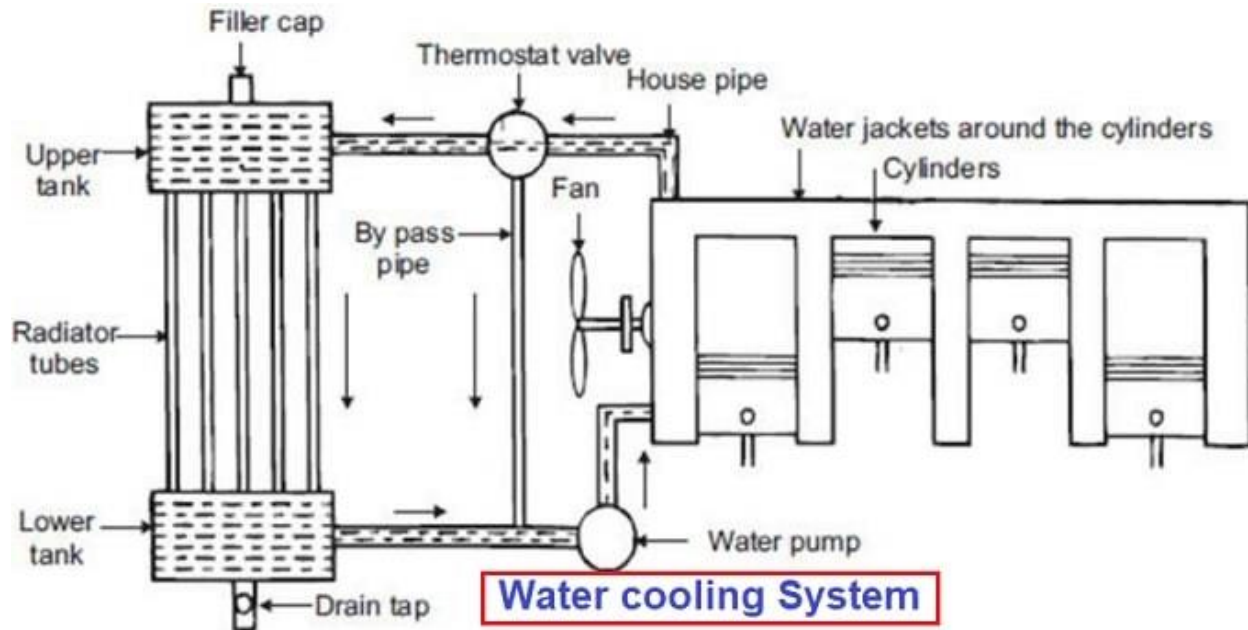
Answer **one** question from this section

6. (a) What are the effects of overheating in a tractor engine? (06marks)

- Reduced engine efficiency
- Prolonged overheating can damage camshaft, crankshaft, bearing, radiator core and hoses
- Piston wear and seizure
- Power loss
- Leaking of coolant
- Reduced fuel efficiency
- Increased emission causing environment pollution.



(b) With the aid of a diagram, describe the working of water cooling system of a tractor engine (10marks)



Process

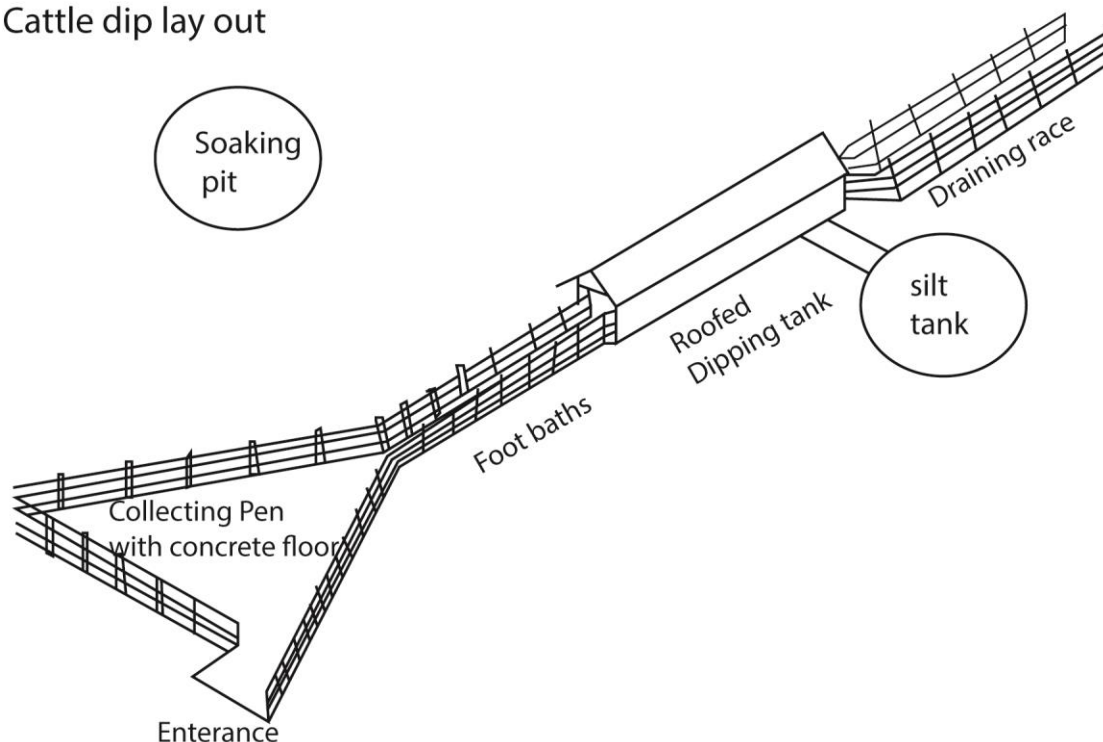
- Water pump pushes the coolant through the engine block and cylinder head where it absorbs heat.
- The hot coolant flows to the radiator where heat is lost to the surrounding through the radiator fins. This is promoted by the fan that draws air through the radiator.
- The thermostat controls the flow of coolant to maintain the engine temperature

(c) How can the efficiency performance of the cooling system of a tractor engine be ensured (04marks)

- Top up coolant
- Use right coolant
- Replace coolant regularly according to specification
- Ensure radiator does not leak
- Ensure the fan works properly
- Ensure the water pump is in proper working condition
- Monitor engine temperature from the temperature gauge and act appropriately

7. (a) With the aid of a diagram explain the functions of the components of a cattle dip. (15marks)

## Cattle dip lay out



- **Plunge/dipping Tank:** A narrow channel where animals walk, immersing them in progressively deeper liquid until fully submerged (except for their heads to breathe). The channel then becomes shallower as the animal exits.
- **Holding Yard/collecting pen:** An area where livestock gather before entering the dip.
- **Foot Bath:** A shallow pool where animals' feet are treated with acaricides.
- **Jump:** A barrier that prevents animals from turning back once they enter the dip.
- **Dip Tank:** The main structure where animals are immersed in liquid containing parasiticides.
- **Draining Race:** A channel where excess dip solution drains off.
- **Silt Trap Outlet:** Collects sediment and prevents clogging.
- **Roof:** Provides shade and protects the dip solution from sunlight.
- **Water Tank:** Stores water for diluting the dip solution.
- **Soaking pit:** a pit where used dip solution is disposed of.

(b) Explain why some farmers prefer to use a spray race instead of dip tank. (05marks)

- Spray races use less water compared to dip tanks
- The Acaricide is recycled in a spray race to minimize wastage
- Limited chances for animal to shallow Acaricide
- It is fast
- It flexible i.e. can be applied to different location
- It is suitable for other animals like goats and sheep
- Requires less labor

## SECTION D (20MARKS)

### AGRICULTURAL ECONOMICS

Answer one question from this section

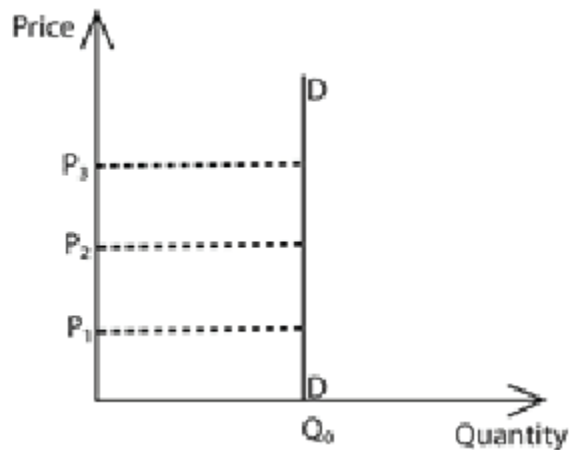
8. (a) Outline the factors that influenced the elasticity of demand for a product. (08marks)

- **Level of consumers' income.** The higher the level of consumers' income, the lower the elasticity and the lower the level of income, the higher the elasticity of demand (elastic).
- **Degree of necessity of the commodity.** The higher the degree of necessity of the commodity like salt, the lower the elasticity of demand (inelastic) while the lower the degree of necessity of the commodity the higher the elasticity of demand (elastic).
- **Degree of availability of substitutes.** The demand for a commodity with many substitutes tends to be elastic while the demand for a commodity with few or no substitutes tends to be inelastic.
- **The cost of the commodity.** The demand for the commodity that takes a small proportion of the consumers' income tends to be inelastic. For example elasticity of demand for a match box is inelastic. On the other hand, the demand for a commodity that takes a large proportion of consumers' income tends to be elastic.
- **Habit (addiction) in the consumption of the commodity.** The demand for the commodity for which the consumer is addicted tends to be inelastic for example a consumer who is addicted to the consumption of cigarettes. On the other hand, the demand for the commodity for which the consumer is not addicted tends to be elastic.
- **Number of uses of the commodity.** The demand for the commodity that has many uses "tends to be elastic. For example, if the unit price of electricity increases, consumers use less of it for only vital purposes for lighting: On the other hand, the demand for the commodity that has few uses tends to be inelastic.
- **Degree of durability of the commodity.** The demand for a durable commodity tends to be inelastic. This is because even if the price of such a commodity falls, the consumer may not demand more of that commodity because he already has that commodity. On the other hand, the demand for a perishable commodity tends to be elastic.
- **Level of advertisement for the commodity.** The demand for a commodity that is highly advertised tends to be inelastic but the demand for the commodity that is not highly advertised tends to be elastic.
- **Future price expectations.** The demand for the commodity whose price is expected to decrease in future makes its current demand to be elastic but the demand for the commodity whose price is expected to increase in future makes its current demand to be inelastic.
- **The demand for a commodity whose use can be postponed.** The demand for the commodity whose use can be postponed to a future date tends to be elastic but the demand for the commodity whose use cannot be postponed tends to be inelastic.
- **Time period.** In the short run, the demand for the commodity may be elastic because the consumers are not yet used to the new product on the market while in the long run the demand for such a commodity may be inelastic after the consumers getting used to the product.
- **Level of consumers' ignorance.** Consumers may buy commodities at a high price when they do not know where such commodities or their substitutes are sold. Consumers may also mistake the increase in the price to be a result of increase in the quality of products which may not be the case. Consumers' ignorance therefore leads to low elasticity of demand of commodities.

- **Degree of convenience in obtaining the commodity.** The higher the level of convenience, the lower is the elasticity of demand and the lower the level of convenience, the higher the elasticity of demand.

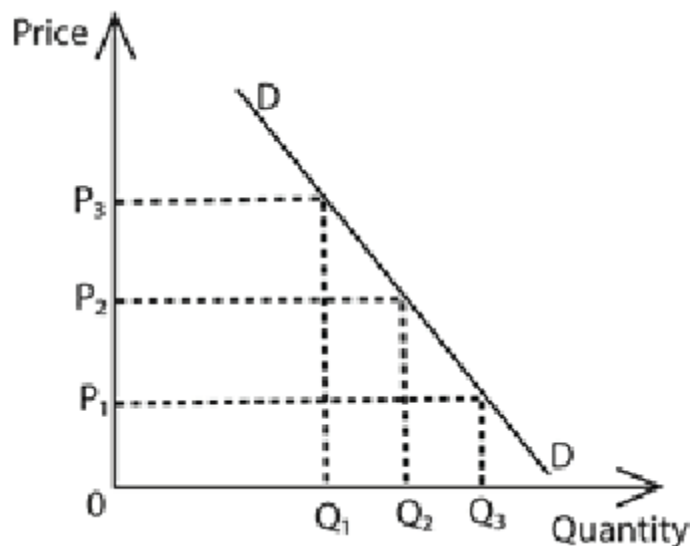
(b) Using suitable illustrations describe the different types of elasticity of demand for a product.  
(12marks)

**(i) Perfectly inelastic demand ( $E_p = 0$ ).** This is when price elasticity of demand equals to zero. Here the quantity demanded does not respond to changes in price at all.



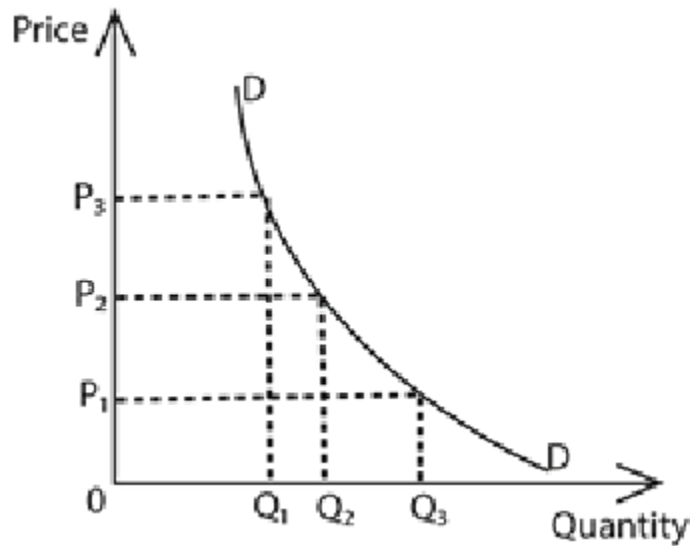
From the graph a change in price from  $OP_1$  to  $OP_2$  to  $OP_3$  leaves quantity demanded unchanged at  $OQ_0$ .

**(ii) Inelastic demand ( $0 < E_p < 1$ )**



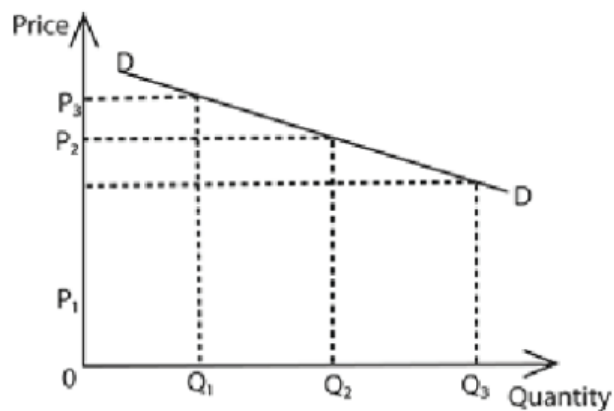
In this case, the price elasticity of demand is greater than zero but less than one. A big proportionate change in price leads to a smaller percentage change in quantity demanded.

**(iii) Unitary elasticity of demand**



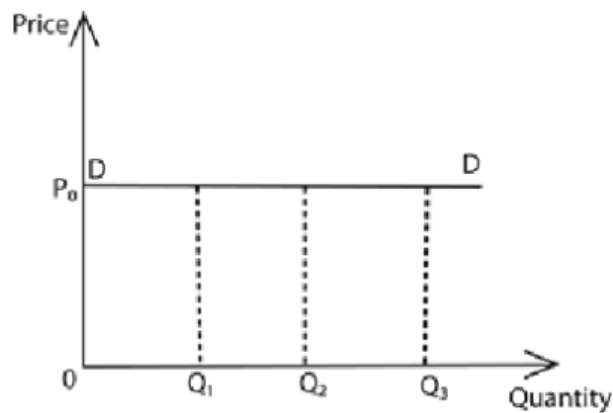
In this case, the price elasticity of demand equals to one. The percentage change in quantity demanded equals to the percentage change in price. It is illustrated by a rectangular hyperbola.

**(iv) Elasticity of demand ( $1 < E_p < \infty$ )**



In this case, the price elasticity of demand is greater than one but less than infinity or is between one and infinity. A big percentage change in quantity demanded is due to a small percentage change in price.

**(v) Perfectly elastic demand ( $E_p = \infty$ )**



9. (a) Discuss the causes of high population growth in developing countries. (12marks)

- **Polygamy practices by Muslims** in Nigeria who are religiously accepted to marry up to four wives has led to an increase in the population in Nigeria since each woman or wife produces usually on a competition basis of who will give birth to more children hence the number of children has drastically increased.
- **Reduced infant mortality rates** due to improved medical services such as immunization against killer diseases like measles, diphtheria, polio; tetanus which used to kill many of the infants has led to increase in population Nigeria.
- **High fertility rate** among Nigerian women and men leading to more births have led to increase in population
- **Low levels of education** with a high illiteracy rate results into an increase in population because the less educated people tend to produce more children at an early age, have limited knowledge about family planning all of which raise the chances of having many children.
- **Limited family planning education** and facilities both countries has resulted into increase in population rates. The limited use of contraceptives, condoms and other family control procedures has resulted into many pregnancies whenever intercourse is done.
- **Reduced maternal mortality rate** due to better health care such as antenatal care.
- **Government policy that encourages high population growth** to develop a strong market base for agricultural and industrial goods.
- **Increased life expectancy** due to improved medical facilities
- **Immigration** especially in Nigeria
- **Poverty among the rural people** because they lack ambitions, ideal and have enough time at their spouse doing nothing
- **Political stability**
- **Unemployment** giving a lot of time to sex

(b) Outline the importance of labour as a factor of production. (06marks)

- Labor is essential for transforming raw materials into finished products and providing various services.
- Labor provides individuals with wages/income, which they use to purchase goods and services.
- Training of labor is a source of income to education institution
- Skilled workers is a source of innovation to new technologies

- Employments leads to low crime and high social cohesion
- Labor manage resources

(c) Explain the factors that affect the efficiency of labor utilization in agricultural production.  
(02marks)

- on job training
- effective supervision/management
- encouraging specialization
- providing incentives such as attractive salary
- improving technology
- timely payment of wages
- provision of job security
- motivation
- division labor among employees
- favorable climate/temperature
- maintaining good health of workers

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