

Question 1

ai) A reaction function for a firm in this setting is an equation that reports the profit maximising output choice of that firm (e.g. firm A) for any given level of output produced by the other firm (e.g. firm B). Game theoretically, a reaction function can be thought of as a best response function for a player.

In this question, the reaction function for each firm may be found as follows:

Firm A

For any given q_B , profit for firm A is given by:

$$\pi_A = q_A(2500 - (q_A + q_B)) - 100q_A$$

A maximises profit by choosing q_A such that:

$$d\pi_A/dq_A = 2500 - 2q_A - q_B - 100 = 0$$

Solving for q_A yields A's reaction function:

$$q_A = \frac{1}{2}(2400 - q_B)$$

Firm B

Repeating this method for firm B:

$$\pi_B = q_B(2500 - (q_A + q_B)) - (200 + 80q_B)$$

For any given q_A , B maximises profit by choosing q_B such that:

$$d\pi_B/dq_B = 2500 - q_A - 2q_B - 80 = 0$$

Solving for q_B yields B's reaction function:

$$q_B = \frac{1}{2}(2420 - q_A)$$

iii) In the Stackelberg game with firm A as leader, A must choose its output to maximise its profit knowing that B will respond according to its reaction function. Thus A must choose q_A to maximise:

$$\pi_A = q_A(2500 - (q_A + q_B)) - 100q_A \quad \text{given } q_B = \frac{1}{2}(2420 - q_A)$$

Substituting B's reaction function into A's profit equation, A must choose q_A to maximise:

$$\pi_A = q_A(2500 - (q_A + \frac{1}{2}(2420 - q_A))) - 100q_A$$

The first order condition for this is:

$$d\pi_A/dq_A = 2500 - 2q_A - 1210 + q_A - 100 = 0$$

Solving yields A's Stackelberg output:

$$\underline{q_A = 1190}$$

To find B's equilibrium output, substitute A's output into B's reaction function:

$$q_B = \frac{1}{2}(2420 - 1190)$$

$$\underline{q_B = 615}$$

The equilibrium price is therefore:

$$P = 2500 - (1190 + 615)$$

$$\underline{P = 695}$$

b) The nominal exchange rate is the nominal price of one currency in terms of another currency (bilateral) of currencies (a weighted combination). The real exchange rate is the real purchasing power of a currency with the nominal exchange rate adjusted for cross-country differences in the prices of goods and services. Some candidates may note that the real exchange rate is a better measure of price competitiveness.

c) The law of one price is the notion that identical commodities (or a similar bundle of commodities) will sell at the same price no matter where they are sold. This is based on the argument that arbitrage will force prices to converge. It can be argued that this will mean that the real exchange rate will tend to be stable as movements in the nominal exchange rate will be compensated for by changes in relative inflation (and visa versa). Some candidates may point out some of the limitations of the law of one price, such as:

- Transportation costs
- Border effects (tariffs, etc.)
- Goods prices tend to be 'sticky'

d) There are number of plausible impacts with much depending on whether the depreciation of the nominal exchange rate leads to a depreciation of the real excahgae rate. Assuming that it does (at least in the short-run) it should lead to an improvement in trade performance but this will depend on: firms' pricing strategies; the price elasticities of demand (Marshall Lerner condition); and the existence of sufficient capacity (supply elasticities). A possible process is as follows. In the short-run there may be a deterioration in trade performance due to the J curve effect. In the medium-run, a depreciation may increase competitiveness and aggregate demand (given that prices and wages adjust slowly). In the long run, a depreciation may not have much

effect on the economy (if prices and wages have adjusted upwards returning the real exchange rate back to its initial position).

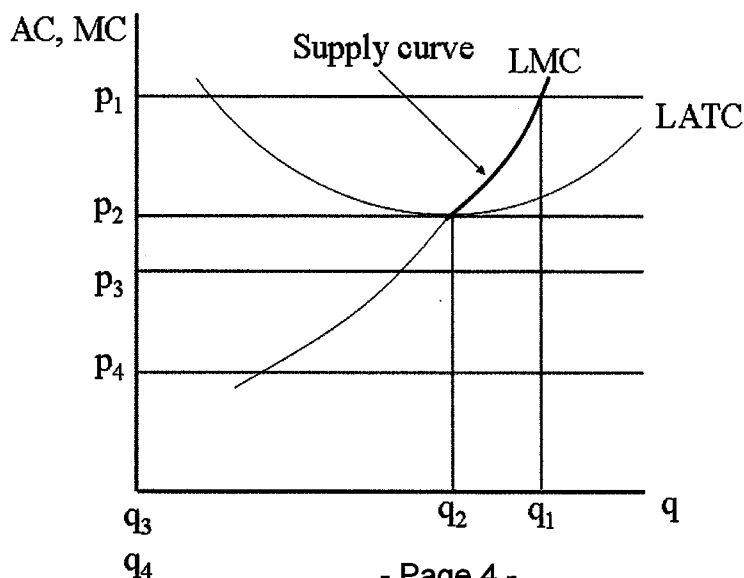
Question 2

a) A price taker is a firm that is unable to influence the price of the output it produces, being able to sell as much as it wants at the prevailing market price (limited only by the scale of overall market demand). A price taking firm therefore faces perfectly elastic demand for its output.

A firm in a perfectly competitive market is a price taker because by assumption that firm is one of many small sellers of an identical product, with zero transaction costs, perfect information and many (small) buyers. In such a situation a firm has no power to influence the market price of its output, but instead can sell as much as it wants at the prevailing market price. A perfectly competitive firm is therefore necessarily a price taker.

ib) This statement is broadly correct in that it identifies a competitive firm's supply curve with its marginal cost curve, but it is more accurate to say that the long-run supply curve of a competitive firm is the *upward sloping part* of the long-run marginal cost curve *lying above its long run average cost curve*.

The first step is to explain that the long-run supply curve is (some portion of) the upward sloping part of the long-run marginal cost curve. A diagram such as the following (from the lecture notes) is useful:



Remembering that the firm is a price taker, for any given market price, p_1 say, the demand curve for the firm's output is the horizontal line at that price. This is also the firm's AR and MR curve. Since profit maximisation requires the firm to set an output such that $MC=MR$, the firm's optimal output given some price p_1 is found from the LMC curve, in this case q_1 . It is in this sense that the LMC curve is the firm's long-run supply curve – for any given price the MC shows the firm's profit maximising output.

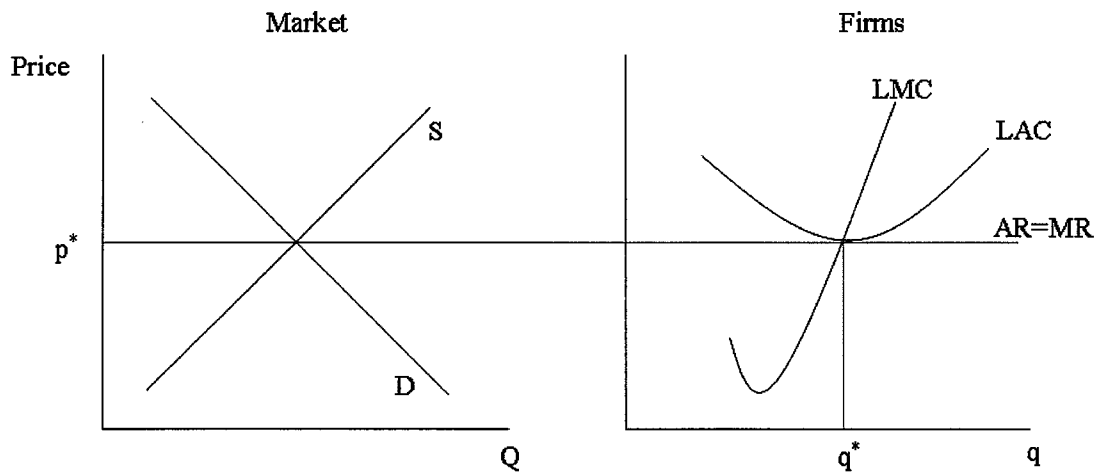
The two caveats mentioned earlier can be explained as follows.

First, the downward sloping part of the LMC curve cannot form part of the long-run supply curve. The reason for this is that profit can never be maximised if the firm is operating on the downward sloping part of the MC, since profit would always be increased by expanding output (leaving MR unchanged but decreasing MC).

Second, the long-run supply curve is only that part of the (upward sloping portion of the) LMC curve that lies above the long run average cost curve. This is because in the long-run a firm should shut down if it is making a loss. Thus for any price below p_2 in the diagram above, the firm does best by producing nothing (rather than producing along the LMC curve).

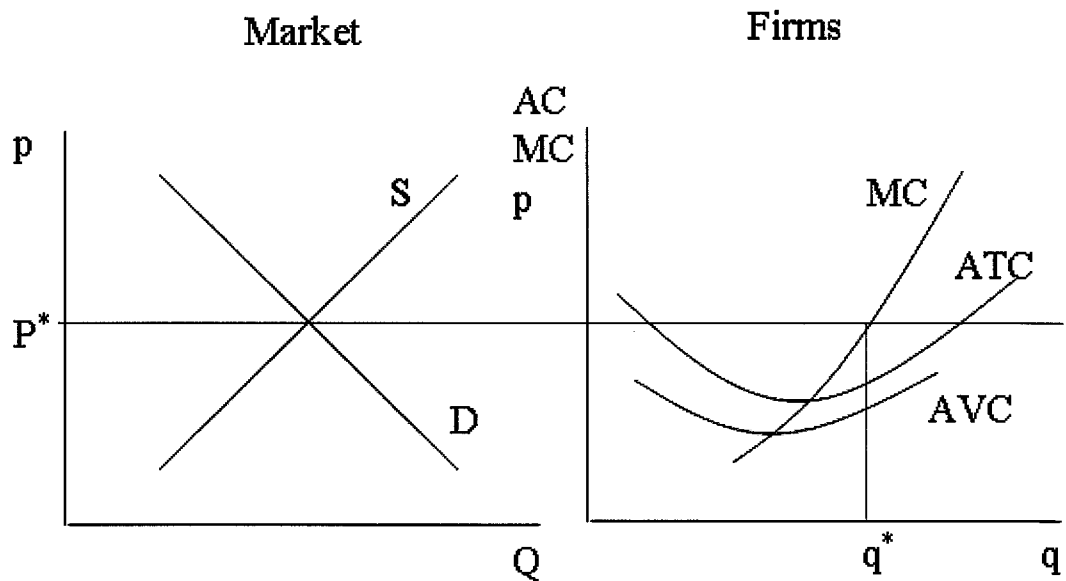
c) This statement is true in long-run equilibrium, but not necessarily true in the short run.

In long-run equilibrium, adjustments in scale by existing firms and/or entry by new firms will ensure that the market price in a perfectly competitive market is driven down to the minimum value of firms' long run average costs (p^* in the diagram below). This is the unique equilibrium price in the long-run, since any other market price would create incentives for firms to enter or exit the industry (or existing firms to alter their scale).



Since each firm will take the market price, p^* , as given and profit maximise by producing at q^* , it follows that each firm will operate at its minimum efficient scale.

In the short-run, however, where there is no entry or exit and existing firms have fixed factors, the equilibrium market price need not be driven down to min LAC as above. The following, for example, is compatible with short-run equilibrium:



In this case firms are not operating at their MES. Indeed each firm is making a positive profit, which in the long-run would be eroded (and the price driven down) by the entry of new firms. Thus firms may not be operating at their MES in short-run equilibrium.

d) The European single market involves the removal of barriers to trade to create single market rather than have individual national markets. This includes the removal of the following:

- Physical Barriers - customs formalities etc.
- Technical Barriers - standardising specifications; open public procurement; no state subsidies.
- Fiscal Barriers - tax harmonisation

Candidates may note that the process of creating a single market is not complete and, in particular, the extent of tax harmonisation is limited.

e) There are number of economic impacts of the single market. First, companies can sell their products anywhere in the member states and consumers can buy where they want with no penalty. Second, citizens of the member states can live and work in any

other country and their professional qualifications should be recognised. Third, currencies and capital can flow freely between the member states and European citizens can use financial services in any member state. Fourth, professional services such as banking, insurance, architecture and advertising can be offered in any member state.

The single market is often seen as a “positive sum game” – if it enhances productivity and economic growth. It should lead to more intensive competition within member nations. And European businesses are better able to exploit economies of scale by selling with a much larger single market. Furthermore there are potential welfare gains from freer movement of labour.

There have been a number of economic trends since the process of creating a single market started. First, rising intra-EU trade – following from the trade creating effects of the reduction in trade barriers and increased factor and financial mobility. Second, an expansion of cross-border shopping. Third, a wave of cross frontier (EU) mergers and acquisitions and an increased number of “joint ventures” and technological alliances between European companies. Fourth, increased Japanese and US foreign direct investment.

Some candidates may note that the single European market may not benefit all parts of Europe and that its success will also depend on the performance of the EURO.

Question 3

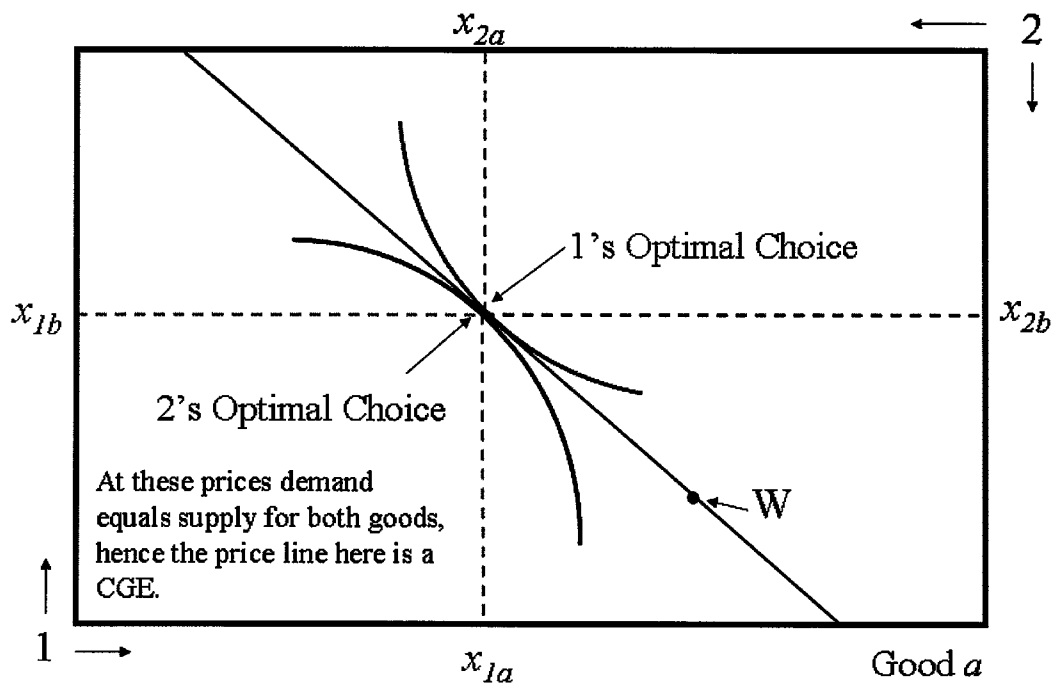
a) A resource allocation, X, is said to be Pareto Superior (PS) to another resource allocation, Y, if every individual is at least as well off in X compared to Y, and at least one person is strictly better off in X.

An allocation is Pareto Efficient (PE) if there exists no other feasible allocation that is Pareto Superior to it. Hence a PE allocation is one at which no individual can be made better off without making at least one person worse off.

b) Since we are using an Edgeworth Box we will assume a world of just two goods and two consumers.

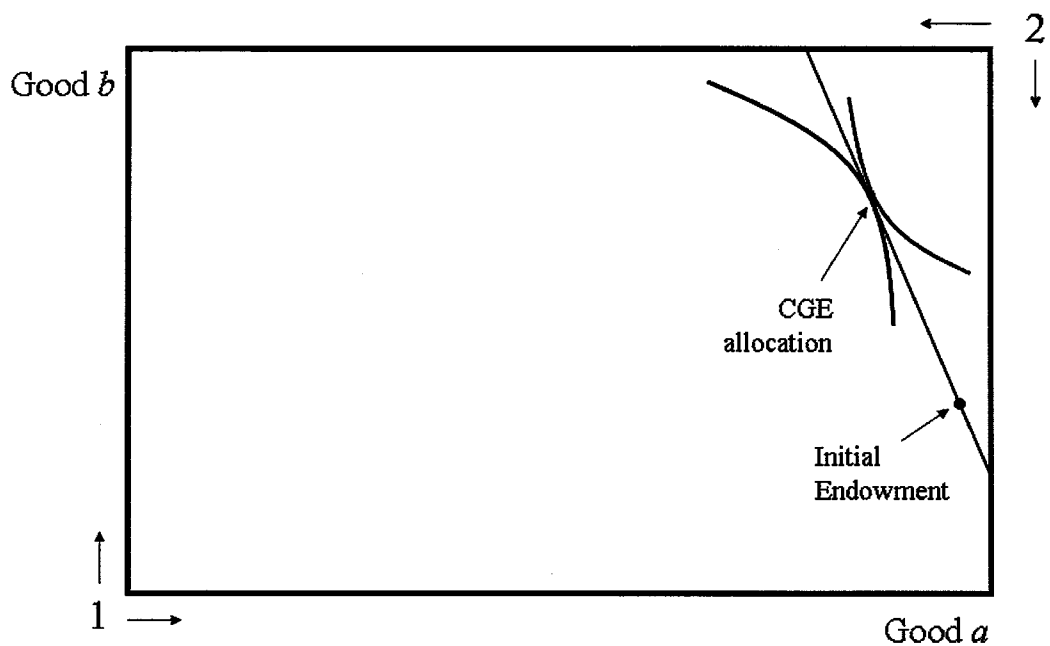
First define a Competitive General Equilibrium (CGE). A CGE consists of a set of prices, one for each good, such that when each consumer takes these prices as given and chooses optimally, the consumer's choices are compatible in the sense that demand equals supply in each market.

In an Edgeworth Box, with the two consumers labelled 1 and 2, and the two goods denoted a and b, a CGE can be depicted as a price line through the initial endowment (W) such that each individual chooses the same point in the Edgeworth Box:



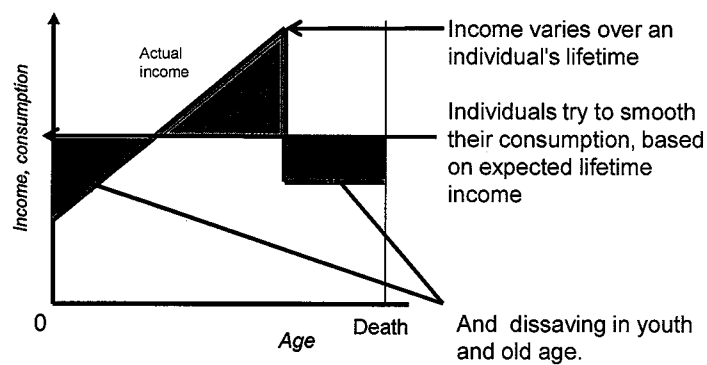
At these prices demand equals supply for both goods, hence we have depicted a CGE.

The final part of the question asks whether a CGE will necessarily result in a fair distribution of resources within an economy. The answer is no. While the first fundamental theorem of welfare economics shows that a CGE will be Pareto efficient, a CGE need not be fair. While the above diagram depicts a relatively fair equilibrium outcome, with both individuals consuming similar amounts of each good, a CGE might involve one individual receiving most of both goods. Consider for example:



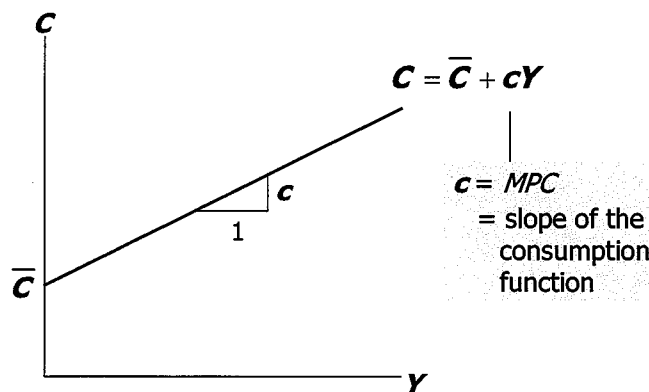
Here the equilibrium outcome is relatively unfair, with individual 1 receiving more of both goods compared to individual 2. A very good answer might point out that the second fundamental theorem offers a way, in theory, of ensuring that a CGE brings about a fair (as well as efficient) outcome.

ci) This life cycle hypothesis (LCH) theory regards consumption as a constant proportion k of long-term income. The LCH emphasises the age of the consumer, and proposes that he/she attempts to smooth consumption over a lifetime in which income fluctuates widely (see below)



Therefore a temporary increase in income tax will have little effect on long-term consumption as it will not have a major impact on long-term income. This suggests that Keynesian demand management of the economy may not be effective. Candidates may note some of the limitations of the LCH including: perfect foresight; liquidity constraints; and the differences between consumption and consumers expenditure.

cii) The Keynesian consumption function indicates that current consumption (C) is determined by current personal disposable income (Y), often of the form below:



The implications of the Keynesian consumption function are that: the distribution of income will affect total consumption: economies may suffer from ‘underconsumption’ as they grow; Government’s can manage demand through fiscal policy. Thus a temporary increase in income taxes will reduce consumption and reduce demand in the economy. Candidates may explain that the extent of the impact will depend on the size of the multiplier. They may also add that such policy is usually adopted when an economy is ‘overheating’ and is used to reduce ‘demand-pull’ inflation.

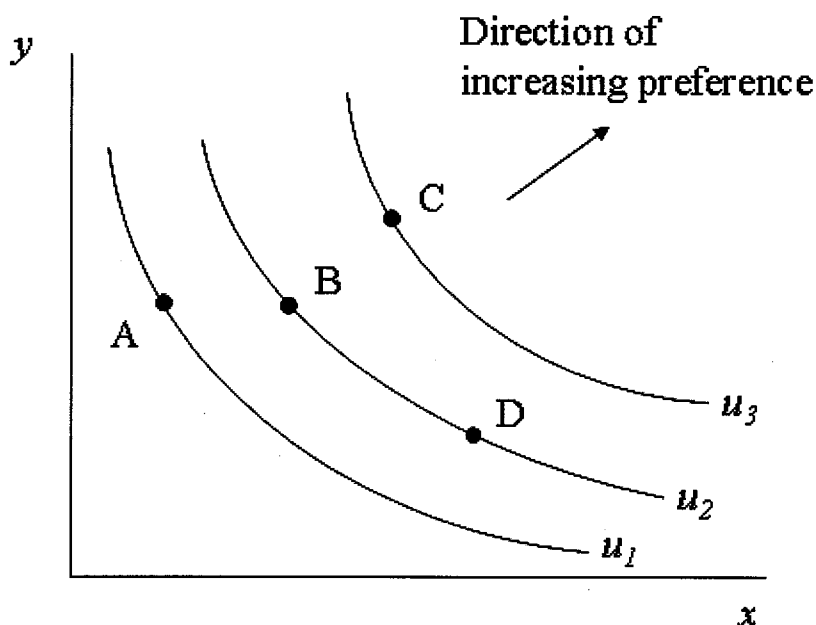
Question 4

a) Economists assume that a consumer’s preferences over different bundles of goods satisfy certain basic assumptions, namely completeness, transitivity and reflexivity. These ensure that a consumer can order all available bundles from best to worse, an ordering we call a preference ordering. A preference ordering summarises a consumer’s tastes for different goods.

Indifference curves provide a means of representing a preference ordering graphically. An indifference curve is the set of bundles between which a consumer is

indifferent. Thus bundles lying on a given indifference curve lie at the same level of a consumer's preference ordering. By drawing an indifference curve map – a collection of distinct indifference curves – each representing a different level of the preference ordering we can therefore depict a consumer's preference ordering.

Provided preferences are well-behaved (exhibit non-satiation and strict convexity), a typical indifference curve map might look as follows:



Here we have shown three distinct indifference curves, labelled u_1 , u_2 and u_3 . Because of non-satiation bundles to the north-east are preferred to bundles to the south-west. Each indifference curve has a convex shape in virtue of the assumption of strict convexity.

These indifference curves represent the consumer's preferences. They show, for example, that bundle C is preferred to bundle B, that both C and B are preferred to A, and that B and D are considered equally desirable.

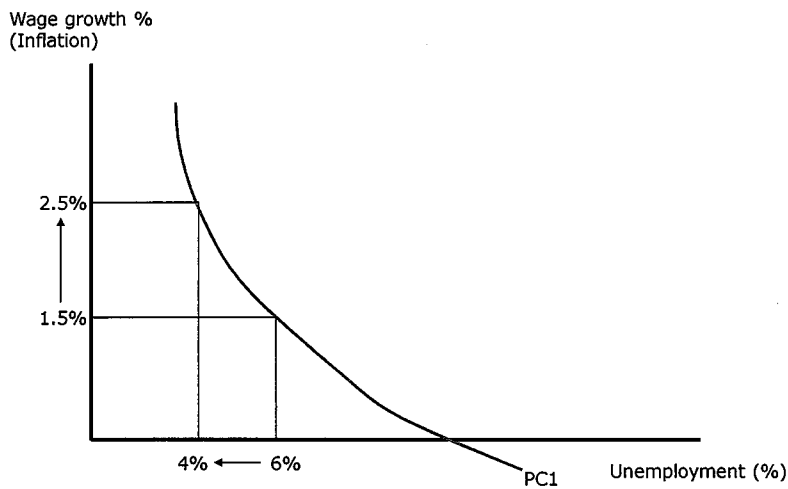
b) Both parts of this statement are false. A correct statement would be: a Giffen good is necessarily inferior, while an inferior good need not be a Giffen good.

Begin by defining the two key terms. A Giffen good is a good for which quantity demanded rises as its price rises; an inferior good is one for which quantity demanded falls when income rises.

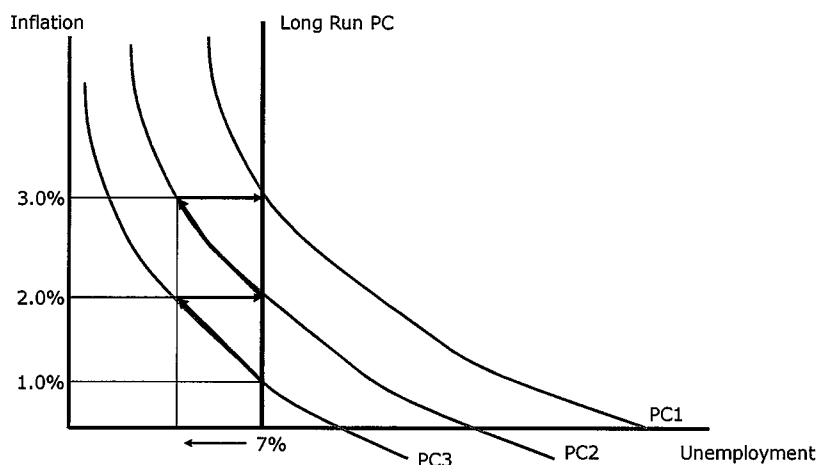
Then argue that a Giffen good is necessarily inferior. The standard way to do this is to argue in terms of the substitution and income effects associated with a change in the price of a good. For a rise in price, the substitution effect will always lead to a fall in quantity demanded, whatever kind of good is being considered. Thus in the case of a Giffen good, where quantity demanded rises in response to a rise in price, the income effect must be in the opposite direction to (and indeed outweigh) the substitution effect. Thus the income effect must be such that a price rise leads to a rise in quantity demanded, i.e. the good must be inferior. Use a version of the Giffen diagram in the lecture notes to illustrate this.

Based on the same reasoning, for an inferior good to be a Giffen good the income effect must outweigh the substitution effect. Since this may not be the case, an inferior good need not be a Giffen good.

c) The Phillips Curve shows an inverse relationship between inflation and unemployment. It suggested that if governments wanted to reduce unemployment it had to accept higher inflation as a trade-off (see below).



In the 1970s the Philipps curve relationship broke down as there was rising unemployment and rising inflation (stagflation). An alternative explanation was developed by the Monetarist school: the expectations augmented Phillipps curve (see below). With the model there is only an inflation/unemployment trade-off in the short run but not in the long run. A long-run equilibrium can occur at any rate of inflation, provided that the expected rate of inflation is equal to the actual rate. Attempting to push unemployment below the equilibrium rate of unemployment will lead to accelerating inflation. Lowering the rate of inflation requires a period of sustained unemployment above the Equilibrium rate until expectations of inflation have been revised downwards.



d) The neoclassical exogenous growth model investigates how economic growth is determined by: growth of the labour force (L); investment in human capital (H); investment on physical capital (K) and technological change. Often presented as an aggregate production function:

$$GDP = A(L, H, K)$$

This approach builds on key assumptions: the aggregate production function displays decreasing returns to any single factor; the aggregate production function displays constant returns when all factors are increased in the same proportion

At any moment the capital stock is a key determinant of the economy's output but the capital stock can change and this can lead to economic growth. If the savings rate is high the economy will have a large capital stock and a high level of output but if the saving rate is low, the economy will have a small capital stock and a low level of output. Higher savings leads to faster growth - but only temporarily: an increase in the rate of saving raises growth until the economy reaches the new steady state.

A population increase increases output. But countries with high population growth (with no change in capital) will have lower capital per worker and so lower levels of output per person.

Improvement in human capital means more output, even at current levels of physical capital and labour. An increase means higher steady state level of output and capital
May explain cross-country growth differentials

Only technological change can explain persistent increases in per capita growth.
The simplest assumption about technological progress is that it increases the efficiency of labour – it is labour-augmenting technological progress

Candidates may highlight some of the restrictive assumptions of the neoclassical exogenous growth model, such as:

- Full employment
- Capital and labour are substitutes
- Diminishing returns to capital
- Technology is exogenous
- Capital is homogenous
- Labour is homogenous