1.24 Externalities: Negative and Positive Production and Consumption Effects

Total Marks

AQA 7136 · Calculators not allowed · about 80 minutes · Write-in edition

Name: _____ Date: ____ / ____ / _____

Answer all questions in full sentences where appropriate. Show working for any calculations. Allow about 80 minutes for the whole pack. At least three questions require full sentence answers (look for 'Explain' or 'Assess' command words).

1 Calculate the marginal social cost (MSC) per unit if a small brewery's marginal private cost (MPC) per unit brewed is £8 and the estimated marginal external cost to nearby residents is £2. Then calculate the Pigovian tax per unit that would internalise the externality and state its value.

(Total for Question 1 is 4 marks)

2 State the difference between marginal private cost (MPC) and marginal social cost (MSC) in the context of a firm producing bricks that generate dust pollution for nearby households.

(Total for Question 2 is 2 marks)

3 Define marginal private benefit (MPB) and marginal social benefit (MSB) for the case of a person receiving a seasonal influenza vaccine, and state which is larger when positive consumption externalities are present.

(Total for Question 3 is 2 marks)

4 Distinguish between externalities and information failure as two different sources of market failure, and give one brief example of how an information failure might interact with an externality (without repeating material on public goods or moral hazard).

(Total for Question 4 is 6 marks)

5 Explain briefly how the concept of marginal social benefit could justify government subsidising adult education courses, and give one potential drawback of such a subsidy.

(Total for Question 5 is 3 marks)

6 A small town has three brickworks. The marginal private cost schedule per unit of dust-producing output is constant at £7. If the marginal external cost per unit is estimated at £3 and the market demand for brickworks output is such that without intervention the equilibrium quantity is 100 units, explain using arithmetic what the socially optimal price and quantity would be if supply were perfectly competitive and the social optimum requires setting price equal to MSC. Assume demand at price £10 is Q = 100 and that demand is perfectly elastic at that price for the purposes of this calculation. State the socially optimal price and the Pigovian tax required.

(Total for Question 6 is 6 marks)

7 Explain one limitation of using a Pigovian tax to correct a negative production externality from an urban brickworks that emits dust affecting nearby residents.

(Total for Question 7 is 3 marks)

8 Explain, using a brief numerical example, how a subsidy to buyers can correct a positive consumption externality for a good such as seasonal flu vaccination. Show how the subsidy shifts private benefit to social benefit and calculate the change in equilibrium quantity if initial MPB intersects supply at Q1 and a subsidy of £5 per dose increases MPB by £5 at each quantity, moving equilibrium from Q1 = 40 doses to Q2 = 60 doses.

(Total for Question 8 is 8 marks)

9 Explain one possible unintended consequence of regulating a negative production externality by imposing a quantity limit (tradable permits) on firms emitting particulate dust in a city brickworks cluster.

(Total for Question 9 is 4 marks)

10 Evaluate the view that government intervention is necessary to correct the negative production externalities caused by urban brickworks emitting dust, considering alternatives such as negotiation, regulation, taxes or tradable permits, and practical limitations such as measurement problems, enforcement costs and potential distributional effects. Use diagrammatic reasoning where appropriate and reach a supported judgement.

(Total for Question 10 is 15 marks)

Mark scheme · 1.24 Externalities: Negative and Positive Production and Consumption Effects

Question 1

MSC = MPC + marginal external cost = 8 + 2	**M1**
MSC = £10 per unit	**A1**
Pigovian tax should equal the marginal external cost to internalise the externality	**M1**
Pigovian tax = £2 per unit	**A1**

Answer: MSC = £10 per unit; Pigovian tax = £2 per unit.

Question 2

MPC is the additional cost to the firm of producing one more unit, including private inputs and operating costs	**B1**
MSC equals MPC plus the external cost imposed on third parties, such as health and cleaning costs from dust pollution	**B1**

Answer: MPC is the firm's extra cost of producing one more brick; MSC is MPC plus the external costs borne by nearby households, for example higher cleaning and health costs from dust.

Question 3

MPB is the benefit to the individual consumer from consuming one more unit, e.g. reduced own risk of illness from the vaccine	**B1**
MSB equals MPB plus external benefits to others, so when vaccines produce positive consumption externalities MSB > MPB	**B1**

Answer: MPB is the private benefit to the vaccinated person; MSB is MPB plus benefits to others (reduced transmission), so MSB is larger than MPB when vaccines give positive externalities.

Question 4

correctly defines externalities as external costs and benefits that affect third parties, captured by the MPC/MSC and MPB/MSB distinctions	**M1**
explains that information failures concern imperfect or asymmetric information between market participants, a different market-failure mechanism	**A1**
gives a concrete example of interaction, e.g. consumers underestimating vaccine benefits could mean subsidies are less effective because demand remains low, so information campaigns may complement subsidies	**M1**
explains the interaction briefly, e.g. without good information the shift from MPB to MSB via subsidy may be smaller than expected	**A1**
notes that information failure is a distinct market failure that can nonetheless interact with an externality	**B1**
concludes with a short policy implication, e.g. combining information provision with subsidy can be more cost effective	**B1**

Answer: Externalities are external costs and benefits affecting third parties, captured by MPC/MSC and MPB/MSB; information failures are about imperfect knowledge, a distinct market-failure mechanism, but the two can interact, for example if people underestimate vaccine benefits then subsidies alone may not shift demand to the social optimum and information campaigns are needed alongside subsidies.

Question 5

states that MSB > MPB for education because there are wider benefits such as higher productivity and lower crime	**M1**
explains that a subsidy shifts MPB toward MSB, increasing consumption of education towards the social optimum	**A1**
gives one drawback, e.g. fiscal cost to the government, risk of deadweight loss if subsidy is poorly targeted, or displacement of private provision	**B1**

Answer: MSB exceeds MPB for education because others benefit from higher skills; a subsidy raises private take-up towards the socially optimal level, but it has fiscal costs and risks being poorly targeted.

Question 6

calculates MSC = MPC + external cost = 7 + 3 = £10	**M1**
states that if demand is perfectly elastic at £10 and equilibrium without intervention is at price £10 and Q = 100, then setting price equal to MSC keeps quantity at 100	**A1**
identifies the Pigovian tax equals marginal external cost = £3 per unit	**M1**
states socially optimal price is £10 and quantity Qs = 100 under these assumptions	**A1**
explains briefly that the tax raises private supply cost to MSC, internalising the externality so firms face the social cost when deciding output	**B1**
notes limitation: real demand is rarely perfectly elastic, so in practice quantity would change and the calculation is a simplification	**B1**

Answer: MSC = £10, so socially optimal price = £10 and quantity remains 100 under the perfect elasticity assumption; Pigovian tax = £3 per unit.

Question 7

identifies a plausible limitation, for example the practical difficulty of measuring the true marginal external cost per unit of output	**M1**
explains the consequence, e.g. if the tax is set too low the externality is not corrected, if too high it creates excessive firm costs and deadweight loss	**A1**
offers a further developed evaluative point, for example political resistance or administrative costs may make precise Pigovian taxes impractical and reduce net welfare gains	**B1**

Answer: Measuring the true marginal external cost is difficult, so a tax set incorrectly may under- or over-correct; additionally political and administrative costs can reduce the net welfare benefit.

Question 8

identifies that a subsidy to buyers increases the private benefit at each quantity, shifting MPB rightwards towards MSB by the subsidy amount	**M1**
applies the numerical subsidy: MPB increases by £5 per dose	**M1**
shows the initial equilibrium Q1 = 40 where original MPB = supply (or price)	**M1**
shows the new equilibrium Q2 = 60 where MPB + subsidy = supply, hence increased quantity	**M1**
calculates the change in quantity as Q2 - Q1 = 20 doses	**A1**
explains that the subsidy reduces the private price paid or increases perceived benefit, encouraging more consumption towards the social optimum	**A1**
notes a limitation, for example subsidy cost to the government or risk of overconsumption if MSB is overestimated	**B1**
concludes that the subsidy can increase consumption to a level closer to social optimum by internalising external benefits	**B1**

Answer: A £5 subsidy shifts MPB right by £5, moving equilibrium from 40 to 60 doses, an increase of 20 doses. The subsidy internalises external benefits but has budgetary costs and requires correct sizing.

Question 9

identifies an unintended consequence, e.g. permit markets can lead to permit price volatility or concentration of permits among larger firms	**M1**
explains how concentration could occur: larger firms can buy permits and expand output while smaller firms are forced to exit, reducing competition	**A1**
offers a second consequence or elaboration, e.g. if permit prices rise unexpectedly costs are passed to consumers or firms may relocate production outside the urban area, shifting pollution rather than reducing it	**M1**
explains the welfare implication, e.g. potential loss of local jobs, higher consumer prices, or 'leakage' of pollution to other locations	**A1**

Answer: Tradable permits can concentrate permits with large firms, harming competition, and permit price volatility can raise costs or push firms to relocate, shifting pollution rather than eliminating it.

Question 10

Level 1 Basic points about externalities and possible interventions, limited development, little or no use of diagrammatic reasoning, judgement absent or unsupported. **1-5**

Level 2 Clear explanation of how intervention (e.g. Pigovian tax, regulation, permits) could correct the externality, with some evaluation of alternatives and practical constraints, partial diagram use and a tentative conclusion. **6-10**

Level 3 Detailed analysis of multiple policy options with diagrams, evaluation of measurement, enforcement and distributional issues, consideration of second-best or complementary policies, and a well-supported final judgement. **11-15**

Indicative content:

- Explain how a negative production externality leads to MSC > MPC and market overproduction, with reference to a MPC/MSC diagram and the welfare loss triangle.
- Analyse Pigovian taxes: how a tax equal to marginal external cost can internalise the externality and restore the social optimum; discuss measurement difficulties in estimating marginal external cost and administrative costs of applying the tax.
- Consider regulation and technology standards: how emission limits or required filters can reduce emissions; discuss monitoring/enforcement costs and potential for firms to pass costs to consumers or relocate.
- Discuss tradable permits: how cap-and-trade sets a clear emissions cap and allows cost-effective reductions; evaluate permit market volatility, initial allocation consequences and potential for market concentration.
- Consider negotiation and Coasean solutions: where property rights are clear and transaction costs low, bargaining between brickworks and residents might achieve efficient outcomes without government action; assess the realism given many affected households and high transaction costs.
- Evaluate distributional and political economy issues: who bears costs of intervention, potential job losses, impact on housing prices and local businesses, and acceptability of policies.
- Consider complementary measures: combining subsidies for cleaner technology, information provision, or relocation support to affected households to increase acceptability and efficiency.
- Conclude with a balanced judgement: government intervention is often justified when transaction costs prevent bargaining and when external costs are significant, but the choice of instrument must consider measurement, enforcement, cost effectiveness and fairness; a mix of regulation and market-based measures, possibly with targeted compensation, may be best.