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There are no further activities or notes associated with this module.

A2 Agriculture and food – Workbook answers

1	<table border="1"> <thead> <tr> <th data-bbox="280 371 533 472">Type of product</th> <th data-bbox="533 371 791 472">Examples from plants</th> <th data-bbox="791 371 1046 472">Examples from animals</th> <th data-bbox="1046 371 1302 472">Examples from microorganisms</th> </tr> </thead> <tbody> <tr> <td data-bbox="280 472 533 618">from a gathered harvest (where the organism survives)</td> <td data-bbox="533 472 791 618">many kinds of fruit or nuts</td> <td data-bbox="791 472 1046 618">milk, eggs, wool</td> <td data-bbox="1046 472 1302 618">antibiotics, enzymes</td> </tr> <tr> <td data-bbox="280 618 533 763">from harvesting the whole organism</td> <td data-bbox="533 618 791 763">wheat, maize, sugar beet, many vegetables</td> <td data-bbox="791 618 1046 763">animals, birds and fish reared for slaughter</td> <td data-bbox="1046 618 1302 763">mycoprotein yeast (Marmite)</td> </tr> <tr> <td data-bbox="280 763 533 954">for use in environmental management, food processing, or as fuel</td> <td data-bbox="533 763 791 954">biofuel, wood, hedges and other habitats, windbreaks</td> <td data-bbox="791 763 1046 954">animals for sport, pets, draught animals</td> <td data-bbox="1046 763 1302 954">making bread, yoghurt and cheese, sewage and water treatment</td> </tr> </tbody> </table>	Type of product	Examples from plants	Examples from animals	Examples from microorganisms	from a gathered harvest (where the organism survives)	many kinds of fruit or nuts	milk, eggs, wool	antibiotics, enzymes	from harvesting the whole organism	wheat, maize, sugar beet, many vegetables	animals, birds and fish reared for slaughter	mycoprotein yeast (Marmite)	for use in environmental management, food processing, or as fuel	biofuel, wood, hedges and other habitats, windbreaks	animals for sport, pets, draught animals	making bread, yoghurt and cheese, sewage and water treatment
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	<p data-bbox="217 1458 240 1480">b</p> <pre data-bbox="280 1469 1398 1581"> graph LR A[wheat in the field] --> B[harvest the wheat and separate grain] B --> C[mill to make flour] C --> D[istribute and sell in shops] D --> E[袋 of flour in the kitchen] </pre>																
3	<p data-bbox="280 1603 555 1637">Clockwise from top left:</p> <ul data-bbox="280 1648 1437 1973" style="list-style-type: none"> • to feed farm animals – root crops, grains, grass • for people to eat directly – all fruit and vegetables • for processing into food ingredients – wheat, sugar beet, corn or potatoes for starch, sunflower seeds, olives • for biofuels – straw, alcohol (from fermented sugar), biodiesel from vegetable oil, waste wood or bark • for fibres and fabrics – cotton, flax/linen • for other materials – wood for construction 																
4	<p data-bbox="280 1995 1390 2051">From left to right: threshed at harvest, seeds crushed and pressed, (top) meal for animal feed, (bottom) oil refined</p>																

Further guidance: Workbook answers

5	a	carbon dioxide + water → glucose + oxygen
	b	Missing words: the Sun, the air, temperature
6	a	Clockwise from top left: <ul style="list-style-type: none"> • ventilation – helps to control the temperature and humidity • lamp – maintains photosynthesis even on dull days • glass – shelters plants, traps energy from the Sun for warmth • water – prevents plants drying out and wilting • heater – prevents frost damage in winter • soil – provides nutrients plants need for growth • carbon dioxide source – raising CO₂ level in the air speeds photosynthesis
	b	For example: biological pest control, e.g. parasitic wasps
*7	a	CO ₂ concentration in the air, water supply, temperature, leaf area, brightness of light
	b	CO ₂ concentration in the air, temperature, brightness of light
8	a	Underlined/highlighted: suitable pH, available water, provides support for the plant roots, available CO ₂ , available mineral nutrients
	b	<ul style="list-style-type: none"> • water – from the solution around the roots • energy – from sunlight • mineral nutrients – from the solution flowing past the roots
9	a	Insects that might be harmful to crop plants – caterpillars, whitefly, greenfly
	b	Chemicals used to control insect pests – contact insecticide, herbicide, pesticide, systemic insecticide
10		peas for freezing – wet mass wheat grain – dry mass potatoes – wet mass herbs to sell fresh – number of standard bunches Christmas trees – number over a minimum size lettuces – number over a minimum size daffodil flowers – number of standard bunches hay (dried and baled) – dry mass herbs for processing – dry mass strawberries – number of punnets or wet mass
11	a	One of: grass, maize, oats
	b	One of: peas, apples
	c	...different characteristics from the parent plant
12	a	Warmth, oxygen, water

Further guidance: Workbook answers

	b	850–900										
	c	No contamination by seeds from other plants Not affected by pests or diseases										
13	a	Diagrams or descriptions, for example: <ul style="list-style-type: none"> • Preparing the cutting – cut a shoot just below a leaf, cut off lower leaves close to the stem • Planting the cutting – dip the cut stem in rooting chemical (if used), plant in moist soil, cover with clear plastic • Looking after the cutting – keep moist in good light but shaded from direct sunlight 										
	b	Missing words: identical, similar, show, can										
	c	Missing words: identical, similar										
14	a	Step 1 – take a small piece of tissue from a healthy parent plant Step 2 – culture in a sterile medium with plant growth chemicals Step 3 – allow the callus to develop into a small plant Step 4 – transfer to soil and keep in a controlled environment until ready to plant out										
	b	<ul style="list-style-type: none"> • Advantages of using mixed seedlings – variety of flower colours, will show variation, disease problems are less likely to spread fast through all the plants, flowers will not all come at the same time • Advantages of using plants propagated by tissue culture from a strong plant with good flowers – consistent growing characteristics, disease-free healthy young plants, consistent flower quality 										
15		For example: <table border="1" data-bbox="284 1256 1460 1615"> <thead> <tr> <th>Type of product</th> <th>Examples</th> </tr> </thead> <tbody> <tr> <td>foods</td> <td>meat, offal, milk and other dairy products, eggs</td> </tr> <tr> <td>textiles</td> <td>wool, leather</td> </tr> <tr> <td>fertilizers</td> <td>bone meal, manure</td> </tr> <tr> <td>other products</td> <td>feathers, fur</td> </tr> </tbody> </table>	Type of product	Examples	foods	meat, offal, milk and other dairy products, eggs	textiles	wool, leather	fertilizers	bone meal, manure	other products	feathers, fur
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16		<ul style="list-style-type: none"> • selective breeding • better understanding of diet and nutrition • slows growth of bacteria • kills pathogenic bacteria • protects customers from poor quality or unsafe milk 										

Further guidance: Workbook answers

17	a	For example, if poultry is chosen:											
		<table border="1"> <thead> <tr> <th>Poultry</th> <th>Welfare on the farm should include:</th> </tr> </thead> <tbody> <tr> <td>Freedom from hunger and thirst</td> <td>Access to a sufficient and suitable diet from clean contained</td> </tr> <tr> <td>Freedom from discomfort</td> <td>No overcrowding; controlled environment and protection from extremes of weather</td> </tr> <tr> <td>Freedom from fear and distress</td> <td>Protection from predators; care by trained staff</td> </tr> <tr> <td>Freedom from pain, injury or disease</td> <td>Regular inspection with treatment when necessary</td> </tr> <tr> <td>Freedom to express normal behaviour</td> <td>Enough space and freedom to peck, bathe, dust bath and</td> </tr> </tbody> </table>	Poultry	Welfare on the farm should include:	Freedom from hunger and thirst	Access to a sufficient and suitable diet from clean contained	Freedom from discomfort	No overcrowding; controlled environment and protection from extremes of weather	Freedom from fear and distress	Protection from predators; care by trained staff	Freedom from pain, injury or disease	Regular inspection with treatment when necessary	Freedom to express normal behaviour
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	b	Trained and caring staff; food and water; inspection and treatment of disease; housing and living conditions.											
18	a	Intensive animal rearing:											
		<ul style="list-style-type: none"> • Diseases are promptly treated with medication. • Concentrated feed is used to maximize growth. • Animals may be kept in a warm, controlled environment. 											
		Organic animal rearing:											
		<ul style="list-style-type: none"> • Animals have space to forage. • Natural feed from the farm is used when possible. • Animal management aims to reduce disease problems and medication. 											
	b	For example, if pigs are chosen:											
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	c	Concerns about animal welfare											
19	a	Valuable in dairy cattle – long lactation period, long lived, high milk yield Valuable in beef cattle – muscular, fast growing, large calves											
	b	Tolerant of cool/wet weather											

Further guidance: Workbook answers

	c	Rapid growth, limited tendency to put on fat, equable temperament
20	a	Missing words: semen, cooled, straws, uterus, sperm, ovum, embryo
	b	Controlled timing of pregnancies, can use different bulls depending on whether the calf is for dairy or beef
21		1 – D, 2 – B, 3 – E, 4 – C, 5 – A
*22	a	Missing words: pregnant, 21 days, on heat, produces
	b	All the calving will happen at about the same time, which can be more efficient; it helps to manage total milk yield from the herd
23	a	Foods made using live microorganisms – e.g. yoghurt, bread, cheese Foods made with extracts or products of microorganisms – e.g. yeast extract, mycoprotein Fuels – methane from sewage, alcohol from fermented sugars Drinks – all alcoholic drinks
	b	<ul style="list-style-type: none"> • white sliced bread – yeasts • strawberry yogurt – lactic acid bacteria • cheddar cheese – enzymes from microorganisms, lactic acid bacteria • cider – yeasts • mycoprotein meat substitute – fungi
24		1 – kills harmful bacteria 2 – the milk must be at the right temperature for the bacteria to grow well 3 – this starts the fermentation 4 – enzymes from bacteria turn sugars into lactic acid, which turns the milk into yogurt 5 – this stops the fermentation 6 – this helps to prevent the yogurt and extend its shelf-life
25	a	glucose → alcohol + carbon dioxide + energy
	b	For example: beer, cider, wine
26	a	glucose + oxygen → carbon dioxide + water + energy
	b	Missing word: aerobic
27	a	<ul style="list-style-type: none"> • Biomass measurement – The mass of all the organisms present is measured. • Colony count – Diluted samples are grown on nutrient agar; colonies grow from viable organisms and can be counted. • Turbidity measurement – The cloudiness of a suspension of organisms is measured.
	b	Colony count

Further guidance: Workbook answers

28	a	<ul style="list-style-type: none"> • Clean surface – a surface that has been washed so that no dirt can be seen • Sterilized surface – a surface that has been washed and treated to destroy any living microorganisms • Disinfectant – a substance capable of destroying or inhibiting microorganisms • Aseptic technique – a way of working that takes special precautions to avoid contamination by unwanted microorganisms 												
	b	<ul style="list-style-type: none"> • wash hands before and after working, wear protective clothing • never put sterilized equipment (e.g. cotton wool, loop, lid) down on work surfaces • open flask and Petri dish for the minimum time 												
*29	a	<table border="1"> <thead> <tr> <th></th> <th>Needs</th> <th>How does the brewer provide these needs?</th> </tr> </thead> <tbody> <tr> <td>Source of energy</td> <td>sugars</td> <td>present in the wort</td> </tr> <tr> <td>Temperature</td> <td>warm</td> <td>water in pipes through the vessel</td> </tr> <tr> <td>Aerobic or anaerobic</td> <td>anaerobic</td> <td>fermentation tanks are not aerated; head of carbon dioxide excludes air</td> </tr> </tbody> </table>		Needs	How does the brewer provide these needs?	Source of energy	sugars	present in the wort	Temperature	warm	water in pipes through the vessel	Aerobic or anaerobic	anaerobic	fermentation tanks are not aerated; head of carbon dioxide excludes air
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Aerobic or anaerobic	anaerobic	fermentation tanks are not aerated; head of carbon dioxide excludes air												
	b	It has to be cleaned and sterilized.												
	c	From top to bottom: fresh nutrients added, water into jacket to control the temperature, water out, air pumped in, suspension of fungus												
*30	a	<p>Graph divided into four: A start of the curve, B steepest part of the curve, C around the peak, D after the peak</p> <p>B – a period of fast growth</p> <p>D – a decline when there are more dying organisms than new ones</p> <p>C – a steady period when new and dying organisms are balanced</p> <p>A – a lag period of adaptation</p>												
	b	Steepest part / B												
31		Missing words: gene, protein, enzyme												
*32		<p>Steps that need restriction enzymes – 2, 3</p> <p>Steps that use ligases – 4</p>												
33	a	<ul style="list-style-type: none"> • Pathogen – an organism that causes disease • Toxins – poisons produced by microorganisms that can be dangerous in small doses • Food poisoning – illness caused by eating food containing harmful microorganisms or toxins 												
	b	5–20 °C, moist, nutrients available												
	c	Toxins and food poisoning bacteria are often not visible.												
	d	To prevent deterioration and the growth of harmful microorganisms.												

Further guidance: Workbook answers

34		<table border="1"> <thead> <tr> <th data-bbox="272 293 639 394">Qualitative techniques</th> <th data-bbox="639 293 967 394">Semi-quantitative techniques</th> <th data-bbox="967 293 1310 394">Quantitative techniques</th> </tr> </thead> <tbody> <tr> <td data-bbox="272 394 639 633"> visual inspection of food for mould visual inspection of plant leaves for health presence or absence of bubbles in fermentation </td> <td data-bbox="639 394 967 633"> pH paper resazurin hygiene test turbidity estimation </td> <td data-bbox="967 394 1310 633"> pH meter seed germination rate (%) freezing point depression </td> </tr> </tbody> </table>	Qualitative techniques	Semi-quantitative techniques	Quantitative techniques	visual inspection of food for mould visual inspection of plant leaves for health presence or absence of bubbles in fermentation	pH paper resazurin hygiene test turbidity estimation	pH meter seed germination rate (%) freezing point depression
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35		<ul style="list-style-type: none"> Defra – provide advice on farm animal health and welfare, advise farmers on good management and sustainability FSA – protect the interests of the consumer all along the chain of supply, give advice about safe food handling and healthy eating Inspectors – inspect abattoirs, register and inspect dairies, inspect food storage in shops, promote cooperation between food producers and processors Environmental health departments – inspect food preparation premises, protect the interests of the consumer all along the chain of supply 						
36	a	To sustain farming where it would otherwise be unprofitable and so look after the countryside in these areas						
	b	As a response to popular demand from taxpayers						
	c	To promote and develop renewable energy supplies						
37		<table border="1"> <thead> <tr> <th data-bbox="272 1214 799 1285">Advantages to the consumer</th> <th data-bbox="799 1214 1310 1285">Advantages to the supplier</th> </tr> </thead> <tbody> <tr> <td data-bbox="272 1285 799 1429"> less risk of food poisoning accountability if something goes wrong consistent quality </td> <td data-bbox="799 1285 1310 1429"> assurances about quality of products fewer customer complaints </td> </tr> </tbody> </table>	Advantages to the consumer	Advantages to the supplier	less risk of food poisoning accountability if something goes wrong consistent quality	assurances about quality of products fewer customer complaints		
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less risk of food poisoning accountability if something goes wrong consistent quality	assurances about quality of products fewer customer complaints							
38		<ul style="list-style-type: none"> crop rotation, use of manures encourage natural predators use food grown on the farm, keep animals outside as far as possible retain smaller fields, plant clumps of trees 						