

0171-514/014 Level 3 Technicals in Agriculture (Farm mechanisation) – March 2020

0171-33 Level 3 Technicals in Agriculture

1	State four methods of transmitting power mechanically in land-based power units. (4 marks)		
	Acceptable answer(s)	Guidance	Max mks
	<ul style="list-style-type: none"> • By using gears • By using shafts • By using belts • By using chains 	1 mark for each method, up to 4 marks:	4
2	Explain two reasons why a 1000 rpm Power Take Off (PTO) is preferable to a 540 rpm PTO when using a 6m power harrow. (4 marks)		
	Acceptable answer(s)	Guidance	Max mks
	<ul style="list-style-type: none"> • Faster speed means lower torque (1) and so the PTO is less likely to break (1) • A 6 metre power harrow takes a lot of power to drive (1) and so if using a 540 rpm PTO it would have to be very heavy/large (1) 	2 marks for each explanations, up to 4 marks: Accept any other suitable answer	4
3	a) Describe the function of the differential lock on a tractor. (2 marks) b) State when the differential lock on a tractor should not be used and give one reason why. (2 marks)		
	Acceptable answer(s)	Guidance	Max mks

	<p>a)</p> <ul style="list-style-type: none"> • To lock the wheels on the same axle so they both turn at the same speed (1) • To aid traction if one wheel is spinning in the field (1) <p>b)</p> <ul style="list-style-type: none"> • Should not be used when turning (headland or road) • It will make turning very difficult and will push the tractor in a straight line 	<p>a) 1 mark for each description, up to 2 marks: b) 1 mark for <i>when</i> and 1 mark for <i>reason</i></p> <p>Accept any other suitable answer</p>	4
4	<p>a) State two advantages of a turbo charger when fitted to a tractor. (2 marks) b) Explain how a turbo charger works. (4 marks)</p>		
	Acceptable answer(s)	Guidance	Max mks
	<p>a)</p> <ul style="list-style-type: none"> • Lighter than the equivalent powered naturally aspirated engine • Increases power • Can be more fuel efficient <p>b)</p> <ul style="list-style-type: none"> • A turbine is driven by the exhaust gasses • A compressor connected to the turbine sucks in air • Pressurises the air into the cylinder • Allows more fuel to be burnt giving a bigger 'bang' 	<p>a) 1 mark for each advantage, up to 2 marks: b) 1 mark for each explanation, up to 4 marks</p> <p>Accept any other suitable answer</p>	6
5	<p>What size fuse should be fitted to a 600 watt hand drill working off a 240V supply? Show all workings. (3 marks)</p>		
	Acceptable answer(s)	Guidance	Max mks
	<p>Watts/Volts = Amps (1) 600/240 = 2.5amps (1) therefore a 3-amp fuse would be fitted (1)</p>	<p>1 mark each</p>	3

6	List four responsibilities of an employee , under the Health and Safety at Work Act 1974 (HASWA). (4 marks)		
	Acceptable answer(s)	Guidance	Max mks
	<ul style="list-style-type: none"> • Take care of the health and safety of themselves and other persons • Cooperate with any requirement imposed by the employer so the employer can comply with any required duty (eg. use PPE equipment provided by the employer) • Not to intentionally or recklessly interfere or misuse anything provided in the interests of health, safety or welfare. • Report any faults with equipment, that effect their safe operation to your employer as soon as practicable 	1 mark each Accept any other suitable answer	4
7	Explain why service intervals on tractors are carried out in hours rather than miles. (2 marks)		
	Acceptable answer(s)	Guidance	Max mks
	<ul style="list-style-type: none"> • Tractors can be working hard when stationary (such as when driving a PTO driven generator), or when travelling very slowly. (1) • Therefore, hours of work completed is a much better reflection of how much the tractor has worked than miles. (1) • in a car the milometer records the mileage, on a tractor it is the odometer (1) 	1 mark each, up to 2 marks. Accept any other suitable answer	2
8	List two features of a) closed centred hydraulics (2 marks) b) open centred hydraulics. (2 marks)		
	Acceptable answer(s)	Guidance	Max mks
	a) Closed centred <ul style="list-style-type: none"> • Uses a variable displacement pump • When services are not being used, no flow is delivered by the pump but system pressure is maintained • More expensive system found extensively on modern tractors 	a) 1 mark for each, up to 2 marks b) 1 mark for each up to 2 marks:	4

	<ul style="list-style-type: none"> • They allow multiple hydraulic functions with one pump • Valves have equal priority <p>b) Open centred</p> <ul style="list-style-type: none"> • Uses a fixed displacement pump • When services are not being used (spool valve in neutral) oil flows back to the reservoir • Low pressure in the system when oil is flowing back to reservoir • Cheap and simple system • Priority given to first valve in line 		
<p>9</p>	<p>a) Explain how double acting and single acting spool valves work. (5 marks)</p> <p>b) Give one example of a machine that uses:</p> <p>i) a single acting ram (1 mark)</p> <p>ii) a double acting ram. (1 mark)</p>		
	<p>Acceptable answer(s)</p>	<p>Guidance</p>	<p>Max mks</p>
	<p>a)</p> <p>Double acting spool valve:</p> <ul style="list-style-type: none"> • Double acting spool valves have two pipes connected (1) • When the spool valve lever is pushed one way, pressurised oil flows through one pipe (A) and oil returns through the other pipe (B). (1) • When the spool valve is pushed in the other direction the pressurised oil flow is reversed. It flows through pipe B and returns through pipe A. (1) <p>Single acting spool valve:</p> <ul style="list-style-type: none"> • With a single acting spool valve only one pipe is usually connected when the spool valve lever is pushed one way, pressurised oil flows through the pipe (1) • When the spool valve is pushed in the other direction it allows the oil to flow back to the sump. (1) <p>bi)</p> <ul style="list-style-type: none"> • A tipping trailer <p>ii)</p> <ul style="list-style-type: none"> • Reversible plough 	<p>a)1 mark for bi & bii – 1 mark each Accept any other suitable answer</p>	<p>4</p>

10	State four potential hazards when using an angle grinder in a workshop.		
	Acceptable answer(s)	Guidance	Max mks
	<ul style="list-style-type: none"> • Sparks from grinder igniting flammable liquids • Metal fragments that may get in to the eye • Sparks igniting gasses (battery on charge) • Electrocution if angle grinder cuts through cable • Personal injury by losing control 	1 mark for each hazard identified, up to 4 marks: Accept any other suitable answer	4
11	a) What metal are hand files made of? (1 mark) b) Why should the hand files be kept apart in storage? (1 mark)		
	Acceptable answer(s)	Guidance	Max mks
	a) carbon steel b) High carbon steel is very brittle and if files are knocked together the teeth could break	a) 1 mark b) 1 mark Accept any other suitable answer	2
12	Aluminium and mild steel are unsuitable for making the vanes on a fertiliser spreader. Considering the characteristics of the fertiliser, give two reasons why each of these metals is unsuitable. (4 marks)		
	Acceptable answer(s)	Guidance	Max mks
	Aluminium is very soft (1) and the abrasive nature of fertiliser would wear it out very quickly (1) Mild steel oxidises (rusts) very quickly (1), the highly corrosive nature of most fertilisers would cause it to rust very quickly (1)	4 marks for explanation Accept any other suitable answer	4
13	You are about to carry out a major service on a tractor in a land-based workshop. Discuss in detail the procedures you need to follow, before, during and after the service, in order to carry out the task safely in accordance to the current legislation and code of practice. (12 marks)		
	Acceptable answer(s)	Guidance	Max mks

	<p>Band 1 (1 – 4 marks) The candidate has failed to discuss many of the procedures for each of the stages (before, during and after) of the service. The candidate has provided minimal rationale as to why the procedures are required to carry out the task safely. The candidate's response is just a list of procedures not following a logical order.</p> <p>Band 2 (5 – 8 marks) The candidate has discussed a range of appropriate procedures for each of the stages of the service. The candidate has occasionally provided reasons as to why the procedures are required to carry out the task safely. The candidate's response is unlikely to have followed a logical order.</p> <p>Band 3 (9 – 12 marks) The candidate has discussed a broad range of appropriate procedures for each of the stages of the service. The candidate has provided clear reasons as to why the procedures are required to carry out the task safely. The candidate's response is comprehensive and follows a logical order.</p>	<p>Indicative content</p> <p>Before: Complete a risk assessment Wear correct PPE Use barrier cream or gloves when dealing with oils Make sure work area is clean and tidy before you start Tools fit for purpose are selected Lifting and jacking equipment have been tested Check the first aid kit is complete</p> <p>During: Any spillages managed appropriately Use axle stands where necessary Use exhaust gas extraction system Keep the work area secure</p> <p>After: Clean and replace tools Appropriate waste disposal Wash hands after use Update records of the service</p> <p><i>For no awardable content, award 0 marks.</i></p>	12
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