0171-514 March 2022

Level 3 Advanced Technical Extended Diploma in Agriculture (Farm Mechanisation)

Level 3 Agriculture – Theory exam (2)

Q	Acceptable answer(s)	Guidance	Max marks
1	a) State **three main** electrical components in the charging system of a land-based power unit. (3 marks) b) What is the function of **each** of the components stated in a)? (3 marks) **Answer:** a) • Battery • Fuse • Alternator • Voltage regulator • Charging light (dial on the dash) b) • The battery stores electricity (1) • The fuse protects the electrical circuit in case of overload (1) • The alternator charges the battery (1) • The voltage regulator controls the flow of electricity going to the battery (1) • Charging light indicates that the charging systems is operating (1)	**a) 1 mark for each component, maximum 3 marks** **b) 1 mark for each function, maximum 3 marks:** Accept any other relevant answer	**6**
2	Explain **three** effects of an auxiliary drive belt/fan belt slipping on a land-based power unit. (6 marks) **Answer:** • The battery will not charge (1) as the fan belt drives the alternator which charges the battery (1) • Charging light comes on (1) to indicate the required power is not going to the battery (1) • The engine will overheat (1) as the fan belt drives the cooling fan (1)	**Up to 2 marks each, to maximum of 6 marks** Accept any other relevant answer	**6**

	• Temperature gauge goes into the red (1) to indicate the engine is overheating (1) • Water pump will not operate correctly (1) making the engine overheat (1) • Auxiliary services will not operate correctly (1) therefore there will be a lack of services (1) e.g air con		
3	State **six** advantages of using a Global Positioning System (GPS) on a land-based power unit. (6 marks) **Answer:** • Avoids overlaps • Avoids misses • Saves money, on inputs such as sprays and fertiliser • Saves time • Can lead to better yields • Less environmental damage • Allows driver to concentrate on other controls • Allows data sharing • Headland management system • Precision farming	**1 mark for each advantage, up to 6 marks** Accept any other relevant answer	**6**
4	Describe **two** consequences of driving a land-based power unit with the air filter warning light illuminated. (4 marks) **Answer:** • Engine would lack power (1) because the engine is restricting the air (1) • Reduced fuel economy (1) as the engine is not operating efficiently (1) • Black smoke from exhaust (1) because the fuel is not being burnt (1)	**Up to 2 marks each, to maximum of 4 marks** Accept any other relevant answer	**4**
5	State **five** types of information recorded on a completed service sheet for a land-based power unit. (5 marks) **Answer** • Date of service • Vehicle recognition; make and model, **or** serial **or** registration number • Maintenance task carried out • Replacement components used • Date when next service due • Name • Hours	**1 mark for each, up to 5 marks** Accept any other relevant answer	**5**

6	Describe **three** reasons why diesel engines, rather than petrol engines, are usually used in land-based power units. (6 marks) **Answer:** • They are heavier and more robust (1) to cope with the high compression pressures (1). • They provide more torque at lower revs (1), ideally suited for the type of work they will be doing (1) • They produce torque over a wide rev range (1) and so when the revs drop they can 'hang on' for longer (1) • They require lower maintenance (1) as they run at lower revs. (1) • They are more efficient, (1) use less fuel for a given amount of work (1) • Fuel handling and storage is easier and safer (1) with diesel as it is less combustible (1) • Cost of diesel is cheaper than petrol (1) therefore more economical (1)	**Up to 2 marks each, to maximum of 6 marks** Accept any other relevant answer	**6**
7	State **five** operator settings that can be undertaken from the tractor cab, to reduce wheel slip when using 3-point linkage equipment. (5 marks) **Answer:** • Raise machine • Work in draft control • Set electronic wheel slip device • Use a higher gear and lower revs • Use 4 wheel drive • Use differential lock • Adjust tyre pressure	**1 mark for each, up to 5 marks** Accept any other relevant answer	**5**

8	a) Other than Personal Protective Equipment (PPE), list **five** facilities that should be provided in a workshop for the health and safety of employees. (5 marks) b) Describe how the facilities listed in a) aid in the health and safety of employees. (5 marks) **Answer:** **a)** • Washing facilities • First aid kit • Granules /sand • Guarded machines • Exhaust gas extraction system • Storage facilities • Adequate lighting • Firefighting equipment • Clean floor surface • Heating • Signage • Emergency cut off points **b)** • Washing facilities - to remove contaminants from hands/to maintain personal hygiene • First aid kit – to deal with cases of minor injuries • Granules/sand- to soak up oil spills to prevent slips • Guarded machines - to protect operator and others from injury • Exhaust gas extraction system- to remove noxious fumes from the working area • Storage facilities –will keep working area clean and tidy/help avoid accidents • Adequate lighting – less chance of accidents in a well-lit area • Firefighting equipment- in case of small fires • Clean floor surface – reduction of slips/trips/dust • Heating – correct temperatures prevents people from becoming ill, improves working environment • Signage – reminder of how to carry out tasks safely • Emergency cut off points – to prevent injuries	**a) 1 mark for each, up to 5 marks** **b) 1 mark for each, up to 5 marks** Accept any other relevant answer	**10**

9	An operator is changing the points on a large cultivator attached to a tractor, in a land-based workshop. Discuss the procedures to be followed in order to carry out the task safely and efficiently. (12 marks) **Band 1 (1-4 marks)** Limited discussion of the procedures to be followed to change the points on a large cultivator. There are minimal suggestions and little justification. Answer may be disorganised and ambiguous. The discussion is mainly descriptive with some use of technical language and specialist terms, but not always used correctly. The discussion does not flow and there is little logic in the order of the points made. **Band 2 (5-8 marks)** Adequate discussion of the procedures to be followed to change the points on a large cultivator. There is good understanding of key factors and reasonable use of technical language. The discussion is mainly logical with good use of specialist terms and adequate detail. Some of the specialist terms may not always be used appropriately. The information is presented mostly in a structured format. **Band 3 (9-12 marks)** Wide discussion of the procedures to be followed to change the points on a large cultivator. There is a detailed understanding of key factors and consistent use of technical language. The discussion has a wide range of suggestions and justification. Specialist terms are used correctly and appropriately. Information will be presented in a well-structured and logical format.	**Indicative content** **Before:** • Carry out a risk assessment or follow any risk assessment already produced for the task – including reference to accident book and RIDDOR • PPE: wear steel toe cap boots, goggles, overalls, ear defenders, barrier cream or gloves to protect hands as appropriate • Pressure wash cultivator if necessary • Make sure work area is clean and tidy before starting • Do not rely on the tractor hydraulics, use axle stands • Make sure the new points and bolts are the right ones before starting (refer to manufacturer's parts book) • Check the first aid kit is complete • Appropriate training undertaken • Remove key **During:** • Ensure tools fit for purpose are selected (ring spanners or sockets of the correct size) • Use of air tools would speed up the work • Beware heads of bolts may be sharp, do not hold with hands • If the bolts will not undo, use angle grinder, oxy-acetylene, or cold chisel to remove them	**12**

		• Use exhaust gas extraction system if starting the tractor • Do not climb on, or put yourself under the machine unnecessarily • Keep the work area secure **After:** • Clean and replace tools • Dispose of old points and bolts in metal re-cycling and other waste appropriately • Wash hands after use • Update records of the service and any advice for future operations • Ensure PPE used is cleaned and stored correctly • Check machine is safe ***For no awardable content, award 0 marks.***	