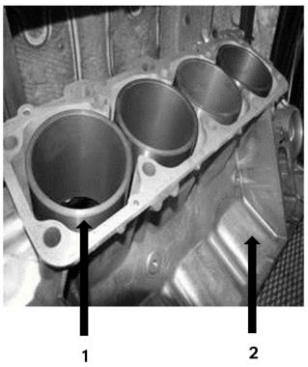
Qualification: 4292-30-030/530 Level 3 Advanced Technical Certificate in the Automotive Industry – Theory Exam

June 2018

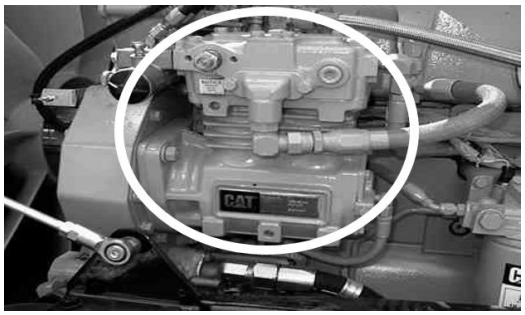
1ai	State **two** types of composite materials used in vehicle manufacturing.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1 mark each for any of these: • Carbon fibre • GRP –glass reinforced plastic • Fibre glass • Any other acceptable answer		2
1aii	State **two** types of metals that are classed as a 'hard metal'.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Carbon steel - cast iron, and any other acceptable answer.		2
1b	Explain how and why elements are used to produce stainless steel.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Steel is made by adding iron to carbon (1 mark) which hardens the iron (1 mark), then chromium is added (1 mark) as this prevents rust (1 mark)		4
2a	Describe what is meant by the following terms. Annealing.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	Annealing is where the metal is heated to a specific temperature (1 mark) and allowed to cool slowly (1 mark).		2
2b	Describe what is meant by the following terms. Quenching.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Quenching is heating of metal (1 mark) then rapid cooling of the metal in water or oil (1 mark).		2
2c	Explain why MIG welding is used in vehicle construction and repair.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	MIG welding produces no slag (1 mark), so does not need dressing/cleaning (1 mark), no flux is required (1 mark) allows for fast welding speeds (1 mark) it can weld different thicknesses of metal (1 mark)	Accept any other suitable answer.	2
3ai	State **two** different types of vehicle inspections.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1 mark for each of the following: • Pre-purchase /sales • safety • pre-delivery • servicing		2
3aii	Identify the equipment in Figure 1.  https://www.otctools.com/products **Figure 1**		
	Acceptable answer(s)	**Guidance**	**Max mks**

	Brake fluid tester		1
3b	Explain how beam setting equipment is used to check headlight alignment.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Line the headlamp up (1 mark) check beam pattern against the scale (1 mark).		2
4a	State **three** health and safety legislations relating to vehicle inspections and servicing.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1 mark each for any of the following: • Health and safety at work act • Noise at work regulations • PPE regulations • Coshh • Any other sensible answer		3
4b	State **two** types of information that can be downloaded from a manufacturers' website.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1 mark each for any of the following: ▪ vehicle specification ▪ recall information ▪ technical support ▪ component location ▪ Any other sensible answer		2
4c	Summarise the advantages of a garage electronic job recording system compared to a paper one.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	It can be accessed/ transferred easily (1 mark), it is password protected for data protection (1 mark) there can be different access levels from read only to full access to make changes (1 mark).		2

5	Explain why it is important for the information entered on job cards to be accurate.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	As it shows the correct amount of time (1 mark) and to allow the customer to see what work has been carried out (1 mark) Gives the technician information (1 mark) Correct parts ordering (1 mark)	Accept any other suitable answer.	2
6	Explain what is meant by the term 'compression ratio'.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	It is the difference between how much air has been drawn into the engine and the space into which it is compressed (2 marks).	No marks if only one point made. Both points are needed for 2 marks.	2
7ai	Identify the **two** engine components arrowed in Figure 2.  https://www.indiamart.com/proddetail/ **Figure 2**		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1=Wet cylinder liner (1 mark) 2=crankcase/block (1 mark)		2
7aii	Explain why component 1 is used in an engine.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	▪ They can be replaced without replacing the crankcase(1 mark) ▪ No wear on the block / crankcase (1 mark). ▪ There is no requirement to re-bore an engine the piston is located in the liner (1 mark) ▪ They can be removed easily (1 mark) ▪ They provide better cooling as they come into contact with the coolant directly (1 mark).		4
7b	State **three** reasons why a vehicle requires a transmission system.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Any of the following: ▪ To provide smooth take up of drive ▪ To allow permanent and temporary breaks in the drive ▪ To provide an increase in torque ▪ To allow a range of vehicle speeds ▪ To transmit drive through a range of angles.		3
7c	Identify the component in Figure 3.  http://pandnmotorrepairs.co.uk **Figure 3**		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Clutch plate / friction plate		1
8a	Identify the braking component circled in Figure 4.		



https://www.smartdrivetest.com

Figure 4

	Acceptable answer(s)	**Guidance**	**Max mks**
	Air brake compressor.	Must have air brake compressor for 2 marks. 1 mark for compressor, no marks for just air brake.	2

8b	Explain what is meant by 'trail', with reference to steering, and how it effects the handling of a motorcycle.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Trail is the measurement between the point of the front wheels contact with the ground (1 mark), drawn through the axis of the steering head (1 mark), with too much trail the motorcycle is difficult to turn, (1 mark) to little it is unstable (1 mark).		4

8c	State **two** types of wheel construction.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Steel / alloy /spoked/magnesium		2

9a	Name **two** devices used to protect components in an electrical circuit.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	Fuse (1 mark) and circuit breaker (1 mark)		2
9b	Identify the electrical component in Figure 5.  http://cfnewsads.thomasnet.com **Figure 5**		
	Acceptable answer(s)	**Guidance**	**Max mks**
	A carbon composite (1 mark) resistor (1 mark)		2
9c	Explain the principles of how a capacitor operates in an electrical circuit.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Voltage flows into a capacitor (1 mark) energy is stored within the capacitor (1 mark) and is then released as required (1 mark).		3
10a	Explain why a gateway is used in a multiplexed vehicle system.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	It allows the transfer of data (1 mark), and converts (1 mark) between the high speed networks (1 mark) and the low speed networks (1 mark).		4
	State what is meant by a ‘part multiplexed’ vehicle.		

10b	**Acceptable answer(s)**	**Guidance**	**Max mks**
	A part multiplexed vehicle only has part of its electrical system networked such as CAN only (1 mark) and the body system hard wired (normal wiring) (1 mark) Allow 1 mark if mention of two different systems.		2
10ci	Define the following terms in computing. Hardware.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Hardware is the physical components of a computing system (memory / CPU/ hard drive).		1
10cii	Define the following terms in computing. Software.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Software is the programme that allows the computing system to run instructions/code (windows).		1
10d	Describe how a video card works in satellite navigation.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	A video card is connected or integrated to the mother board (1 mark) it takes data from the CPU and generates an image which is seen/displayed on the screen (1 mark).	Accept any other suitable answer.	2
11	State **three** pieces of equipment that are used to carry out electrical measurements on coolant sensor in an engine management system.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	1 mark for each of the following: • Multimeter • Oscilloscope • Power probe • Diagnostic / code reader.		3
12	Discuss the differences between single plate and multi-plate friction clutch assemblies. In your answer, consider the different applications, the co-efficient of friction, materials, operating principles and maintenance requirements.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Bands **9-12 marks** The learner has produced detailed discussion of comparisons between the different clutch types. Clearly identifying the differences in design and suitable application for wet and dry clutches of both designs. They recognise that by having more friction plates, there is the possibility of higher friction with a reduced overall diameter of a multi plate clutch design. They have explained in full detail, the differences in the operating principles of the range and types of clutches. The learner has been able to correctly identify that different maintenance requirements such as different adjustment methods to maintain optimum performance to account for wear. The candidate has provided a holistic discussion covering all key areas. **5–8 marks** The learner has produced a comparison between the different clutch types. They have identified some differences in design and suitability of the application for wet and dry clutches of both designs. They have an awareness that having more friction plates may affect the friction but unable link it to the correlation of the diameter of a multi plate clutch design. They have briefly explained some differences in the operating principles but not covered the full range and types of clutches. The learner has been able to identify that there are different maintenance requirements but does not understand why it is needed. The candidate has provided a basic analysis covering some key areas but lacks detail in justifications.	**Indicative content** The learner must consider the design features of the two different clutch types. They should provide discussion points on the differences in • Application - light, heavy and ATV • the co-efficient of friction • Single and multi-plate • Wet and dry friction plates • Maintenance/adjustments.	12

	4-1 marks The learner has shown limited understanding of the differences between the clutch systems and does not provide any depth of knowledge regarding operating principles, friction and application. They fail to mention any maintenance requirements. Their analysis is brief and disjointed in structure. **0 marks – no rewardable material**		