4292-30 - Level 3 Certificate in the Automotive Industry

030/530 Automotive Industry - Theory exam

March 2019

<table>
<tr><td rowspan="3">1</td><td colspan="3">a) Explain the meaning of the term 'Thermosetting plastic'.

b) Name two types of thermosetting plastic materials.</td></tr>
<tr><td>Acceptable answer(s)</td><td>Guidance</td><td>Max mks</td></tr>
<tr><td>a) A synthetic material(1) that becomes stronger after heat treatment (1) but cannot be successfully reshaped (1)
The plastic is heated to form into shape (1 mark)
When it cools it cannot be reshaped (1 mark)
Heat cannot melt thermosetting plastics (1 mark)

b) One mark for each of the following:
• Acrylic
• Polyvinyl Chloride
• Carbon Fibre</td><td>Accept any other suitable answers.</td><td>3

2</td></tr>
<tr><td rowspan="3">2</td><td colspan="3">Describe how a laminated glass screen is constructed.</td></tr>
<tr><td>Acceptable answer(s)</td><td>Guidance</td><td>Max mks</td></tr>
<tr><td>It consists of a number of layers of glass (1) bonded by an elasto-polymeric layer (1)</td><td></td><td>2</td></tr>
<tr><td rowspan="2">3a</td><td colspan="3">Explain the advantages of using carbon fibre in vehicle suspension construction compared to using mild steel.</td></tr>
<tr><td>Acceptable answer(s)</td><td>Guidance</td><td>Max mks</td></tr>
</table>

	Carbon fibre is lighter in weight (1), does not corrode (1), provides more rigidity and strength (1).		3
3b	State the melting point of i) Cast iron ii) Mild Steel		
	Acceptable answer(s)	**Guidance**	**Max mks**
	i) 1200°C (allow ± 100°C) (1 Mark) ii) 1600°C (allow ± 100°C) (1 Mark)		2
4	Name the **two** types of gas shielded arc-welding processes used in vehicle construction or repair.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Metal Inert Gas (1 mark) Tungsten Inert Gas (1 mark)		2
5	 Source: www.eurocarparts.com Figure 1 Identify the test equipment in Figure 1.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	Cooling system tester (1 mark only) Cooling system pressure tester (full 2 marks)		2
6	State **four** legislative requirements (Regulations) that apply to personal safety when in the workplace.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	1 mark per legislative requirement to a maximum of 4 marks: • COSHH • Manual Handling Operations Regulations • PPE Regulations • Noise at Work Regulations	*Accept any other suitable answer.*	4
7	Name **two** UK legal requirements that apply to vehicles operating on the public highway.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	One mark for each of the following: • Vehicle Testing (MOT) requirements • The Highway code • The Road Vehicles (Construction and Use) Regulations. • Insurance • Road tax		2
8	Explain the method used to carry out systematic inspections on a light vehicle hydraulic steering system and components.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Check for free play/wear at steering wheel with the vehicle on the ground (1). Raise the vehicle and check for free play/wear in the steering joints (1). Check ball joint dust covers for splits/tears/etc (1). Check steering gaiters for condition (1) move steering lock to lock to check for tight spots and no obstructions to related components (1). Checking power steering for leaks and corroded pipework (1)		6

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Source: https://www.quora.com

Figure 2

a) Identify the component in Figure 2.

b) Name the component parts labelled
i) A
ii) B
iii) C.

Acceptable answer(s)	Guidance	Max mks
a) Crankshaft (1) b) i) main bearing journal (1) ii) crankpin /big end bearing / journal (1) iii) web / counter/balance weights(1)		1 1 1 1

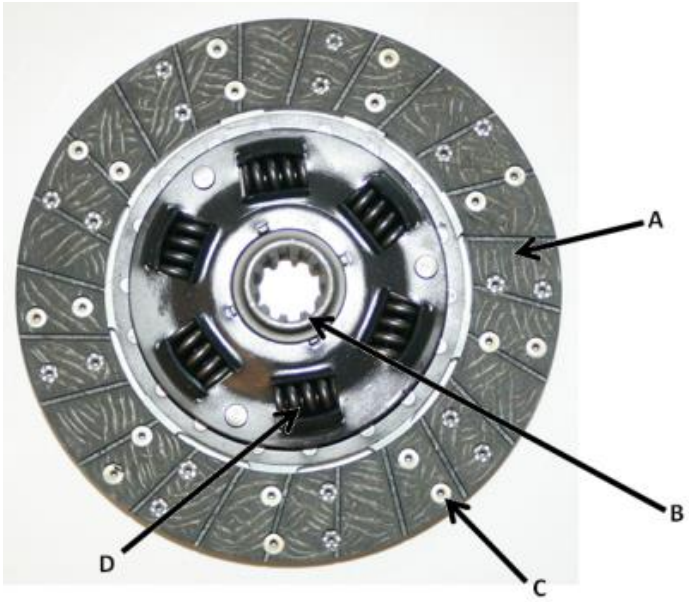
10 a) Explain the term 'Compression ratio'.

b) Calculate the compression ratio using the following data:
swept volume 450 cm^3 and a clearance volume of 55 cm^3.

Show working out and formula. Give answer to 2 decimal points.

Acceptable answer(s)	Guidance	Max mks
a) The ratio of cylinder volume, when piston is at BDC (1) plus the combustion chamber volume (1) to the volume when the piston is at TDC (1). b) CR = $\frac{\text{Vs (Swept) + Vc (Compressed)}}{\text{Vc (Compressed)}}$ (1 mark) 450 +55 = 505 / 55 (1 mark) = 9.18:1 (1 mark)		3 3

11



Source: www.superformance.co.uk

Figure 3

Identify and explain the purpose of items labelled A-D in Figure 3.

Acceptable answer(s)	Guidance	Max mks
A - Friction lining (1) – to provide a frictional surface with the cover and flywheel (1) B- Splined teeth/ hub for the input shaft (1) – to allow the centre plate to connect to the gearbox input shaft (1) C - Rivets (1) – to secure the friction material to the centre plate (1) D- Torsional springs (1) – to absorb torsional loads during take up of drive and speed changes (1)		8

12

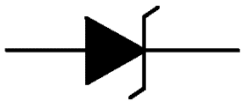
Source: www.rimmerbros.co.uk

Figure 4

Identify the component in Figure 4 and state its purpose.

	Acceptable answer(s)	Guidance	Max mks
	Brake servo (1) - to reduce driver effort (1).		2

13

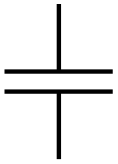


Source: http://ecetutorials.com

Figure 5

a) Name the component represented by the symbol in Figure 5.

b) Explain the **main** functions of the component named in 13a.



Source: https://commons.wikimedia.org

Figure 6

c) Identify the component represented by the symbol in Figure 6 and state its function.

Acceptable answer(s)	Guidance	Max mks
a) Zener diode (1) b) Allows current to flow in one direction only up to a certain value (1), it then allows current flow in both directions (1). C) Capacitor (1) – used to store electrical energy (1).		1 2 2

14 Differentiate between 'RAM' and 'ROM' in regards to computers.

Acceptable answer(s)	Guidance	Max mks
RAM can be accessed randomly (1), is temporary (1) and is used for memory storage (1) ROM can only be read (1) and is permanent (1)		5

a) State the formula for calculating Current flow using Ohms Law.

15	b) State the formula for calculating Watts using Ohms Law.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	a) Current = Voltage / Resistance (1) b) Watts = Current X Volts (1)		1 1
16	Name **three** different types of circuit protection used in vehicle electrical systems.		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Fuses (1), Fusible Links (1), Circuit breakers (1)		3
17	Resistances of the following values are connected in Series - 2 Ohms, 3 Ohms and 6 Ohms. Calculate the total resistance in a 12 Volt circuit. (Show the formula used)		
	Acceptable answer(s)	**Guidance**	**Max mks**
	Total Resistance = R1 + R2 + R3 (1) = 11 Ohms (1)		2
18	Name **three** different types of computer programming language.		
	Acceptable answer(s)	**Guidance**	**Max mks**

	One mark for each correct type, examples are: • ActionScript. • Ada • ALGOL • Ateji PX • BASIC • BCPL. • Blue. And any other acceptable answer.		3

19	Discuss the differences between manual and automatic selection gearboxes. In your answer, consider the different applications, operating principles, design and maintenance requirements.		
	Acceptable answer(s)	Guidance	Max mks
	Bands 9-12 marks The learner has produced detailed discussion of comparisons between the different gearboxes. Clearly identifying the differences in design and suitable application for both manual and automatic types. They recognise that automatic gearboxes have an advantage in urban and city areas and may be suitable for local delivery and other work with heavier vehicles (e.g. Local waste collection). They have explained in full detail, the differences in the operating principles of the gearboxes. The learner has been able to correctly identify the different maintenance requirements, particularly to ancillary equipment such as clutch adjustment being required for manual types and specific fluid for some automatics. The candidate has provided a holistic discussion covering all key areas. 5–8 marks The learner has produced a comparison between the different gearbox types. They have identified some differences in design and suitability of the application for both designs. They have an awareness that automatic types may provide an advantage but have not identified under which conditions. They have briefly explained some differences in the operating principles but not covered the full range of	Indicative content The learner must consider the design requirements of the two different gearbox types. They should provide discussion points on the differences in • Suitable vehicle application • Stepped automatic or variable ratio • Manually selected gearbox • Hydraulic or electric gear change • Maintenance/adjustments.	12

	gearbox types i.e. have not mentioned variable ratio, electric applications. The learner has been able to identify that there are different maintenance requirements but does not understand why. The candidate has provided a basic analysis covering some key areas but lacks detail in justifications. 4-1 marks The learner has shown limited understanding of the differences between the gearbox types and does not provide any depth of knowledge regarding operating principles, design and application. They fail to mention any maintenance requirements. Their analysis is brief and disjointed in structure. 0 marks – no rewardable material		