
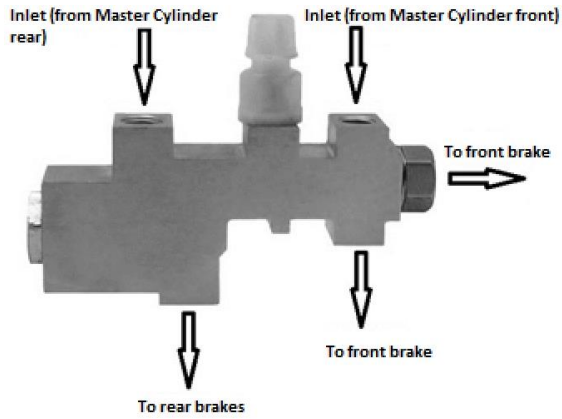


4292-21 - Level 2 Certificate Award in Vehicle Technology
 022/522 Level 2 Automotive Theory Exam
 March 2019

| | | | |
|----|--|----------|----------------|
| 1a | State two ways to reduce accidents in the workplace. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | 1 mark for each of the following: <ul style="list-style-type: none"> • Eliminate the hazard • Replace the hazard with one less dangerous • Guarding the hazard • Wear personal protection • Attend safety education / training • Health and safety policy and procedures | | 2 |
| 1b | Explain the main safety precautions that should be taken when working on a high voltage hybrid vehicle electrical system. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | The person working on the hybrid electrical system should be trained in high voltage hybrid systems (1 mark) use the correct PPE (1 mark) the vehicle should have signage placed on it (1 mark), the keys and isolator plug should be a suitable distance away from the vehicle or locked in a toolbox / cabinet (1 mark) | | 4 |
| 2 | State two reasons why an employer may terminate an employee's contract of employment. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |

| | | | |
|----------|--|---|-------------------------|
| | <p>1 mark for each of the following:</p> <ul style="list-style-type: none"> • Unable to carry out the job • Illness • redundancy • Summary dismissal • statutory restriction • Gross misconduct | <p><i>Also accept any other plausible answer.</i></p> | <p>2</p> |
| <p>3</p> | <div style="text-align: center;">  <p>Source: http://www.lasertools.co.uk Figure 1</p> </div> <p>Describe the function and state the advantage of using the measuring equipment shown in Figure 1 on a braking system.</p> | | |
| | <p>Acceptable answer(s)</p> | <p>Guidance</p> | <p>Ma x mks</p> |
| | <p>To measure the thickness of a vehicles brake pads (1 mark) when in situ (1 mark).</p> | | <p>2</p> |
| <p>4</p> | <p>Name two sources of vehicle information which could be used when carrying out a vehicle service.</p> | | |
| | <p>Acceptable answer(s)</p> | <p>Guidance</p> | <p>Ma x mks</p> |
| | <p>1 mark for each of the following:</p> <ul style="list-style-type: none"> • Owners service book • Job cards/work orders • Manuals (electronic/ paper) • Data information (electronic /paper) | | <p>2</p> |

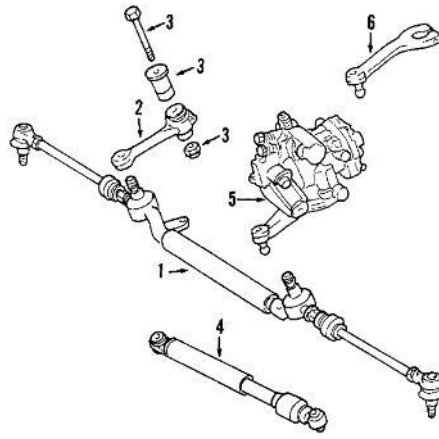
| | | | |
|----|--|-----------------|-------------------------|
| 5 | Compare the different processes between static and dynamic wheel balancing. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | Static wheel balancing is carried out when the tyre is stationary using gravity to determine a heavy spot (1 mark), and dynamic is when the tyre is in motion and a machine measures the forces of unbalance that are generated by the tyre (1 mark) | | 2 |
| 6a | State what is meant by the following battery terminology. a) CCA. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | Cold cranking amps | | 1 |
| 6b | State what is meant by the following battery terminology. b) Ah. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | Amp hour | | 1 |
| 7a | Explain how wheel lock up on an electronically controlled ABS system is prevented to maintain vehicle control when braking quickly. | | |



Source: <https://www.carolinaclassictrucks.com>

Figure 2

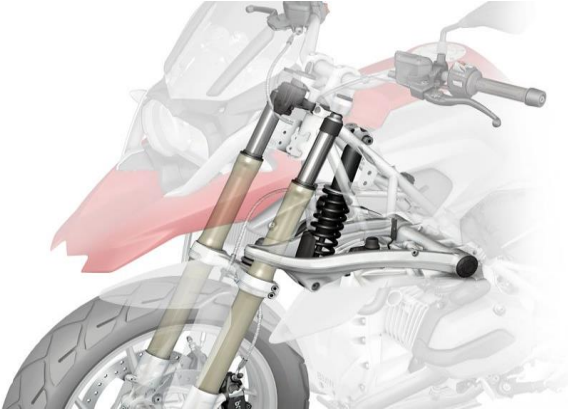
| Acceptable answer(s) | Guidance | Ma x mks |
|--|--|----------------|
| <p>When braking (1 mark) the ABS sensor detects a difference in wheel speed (1 mark) the ECU/ECM controls brake pressure to the slipping wheel to maintain control (1 mark).</p> | | 3 |
| 7b State the purpose of the braking component in Figure 2. | | |
| Acceptable answer(s) | Guidance | Ma x mks |
| <p>To equalise / proportion the pressure between the front and rear brakes.</p> | <p>2 marks for full answer, no 1 mark allowed.</p> | 2 |
| 8a | Compare the difference in the design characteristics between a single and a divided track rod steering system. | |

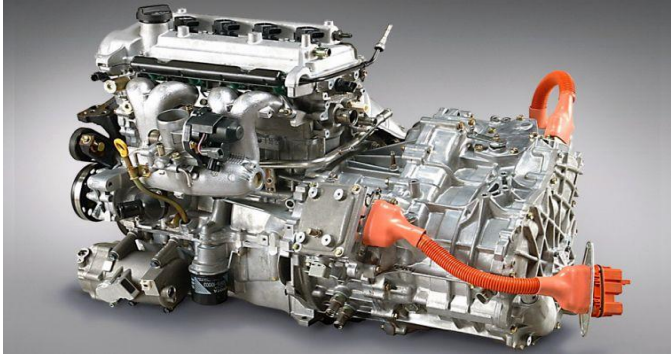


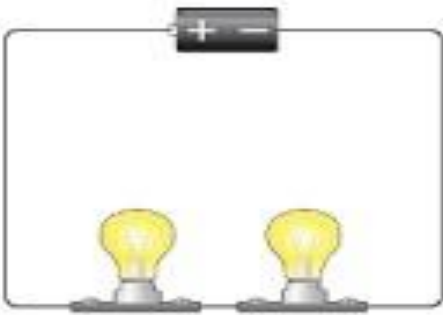
Source: <http://www.benzworld.org>

Figure 3

| Acceptable answer(s) | Guidance | Ma x mks |
|---|----------|----------------|
| <p>A single track rod system only has one rod connecting to the wheels (1mark) a divided system has 2 rods (1 mark) connected by a series of linkages and an idler / arm (1mark)</p> | | 3 |
| <p>8b Identify the steering components numbered 2 and 6 in Figure 3.</p> | | |
| Acceptable answer(s) | Guidance | Ma x mks |
| <p>2 – Idler arm (1 mark) 6 – Pitman arm/drop arm (1 mark)</p> | | 2 |
| <p>9a A vehicle with a mass of 1000 kg produces a total brake force of 250 kN. Calculate the overall braking efficiency. Show formula and working out.</p> | | |
| Acceptable answer(s) | Guidance | Ma x mks |

| | | | |
|-----|---|--|----------------|
| | <p>Brake efficiency = Brake force/mass x 100 (1 mark)</p> <p>250/1000 (1 mark) = 0.25 (1 mark)</p> <p>0,25x100 = 25% (1mark)</p> | | 3 |
| 9b | State two functions of a vehicle's suspension system. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | <p>1 mark for each of the following:</p> <ul style="list-style-type: none"> To support the sprung weight of a vehicle. To minimise the effect of the unsprung weight of a vehicle. To locate the axles/hubs. | <i>Accept any other plausible answer</i> | 2 |
| 9c | Identify the type of suspension system fitted to the motorcycle in Figure 4. | | |
| |  <p>Source: http://blog.motorcycle.com</p> <p>Figure 4</p> | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | Telelever. | | 1 |
| 10a | State two reasons why engines are fitted in different locations. | | |

| | Acceptable answer(s) | Guidance | Ma x mks |
|-----|--|----------|----------------|
| | 1 mark for each of the following: <ul style="list-style-type: none"> • Effects on vehicle design • Effects on engine design • Effects on traction • Effects on road holding and handling | | 2 |
| 10b | Explain why a manufacturer would use an underslung engine on a motorcycle. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | It allows for a low centre of gravity (1 mark), to improve handling (1 mark) it allows manufactures' to fit larger capacity engines into the frame (1mark) | | 3 |
| 10c | Identify the type of light vehicle the engine configuration in Figure 5 is used in. | | |
| |  <p>Source: http://blog.toyota.co.uk</p> <p>Figure 5</p> | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | Hybrid | | 1 |
| 10d | Explain the operation of a turbocharger. | | |

| | | | |
|-----|--|--|----------------|
| | | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | A turbocharger uses exhaust gas to drive a turbine (1 mark) which rotates the impeller (1 mark) which then forces air into the combustion chamber (1 mark). | | 3 |
| 10e | State two statutory requirements that apply to engine design or operation. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | 1 mark for each of the following: <ul style="list-style-type: none"> • Silencers and noise • Smoke emissions • Exhaust and crankcase emissions • Power to weight ratio | | 2 |
| 11a | State two precautions to be aware of when working with vehicle electrical circuits. | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | 1 mark for each of the following: <ul style="list-style-type: none"> • Avoidance of short circuits and power surges. • Electric shock • Overloading of a circuit and damage. | <i>Accept any other plausible answer</i> | 2 |
| 11b | Figure 7 shows a circuit with two bulbs. One bulb has failed and as a result of this, the second will not light up. Explain the reason why. | | |
| |  | | |

Source: <http://www.bbc.co.uk/bitesize/ks3/science>

Figure 7

Acceptable answer(s)

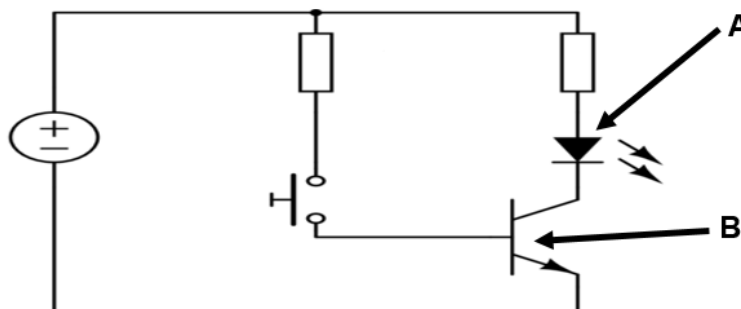
Guidance

Ma
x
mks

This is due to the current not being able to pass through (1 mark) due to the first bulb being in an open circuit state (1 mark)

2

11c



Source: www.pinterest.co.uk

Figure 8

Identify the **two** electrical circuit symbols arrowed A & B in Figure 8.

Acceptable answer(s)

Guidance

Ma
x
mks

A = Diode (LED)
B = Transistor

2

11d

Using Ohms Law, calculate and identify the missing value of an electrical circuit, of a 24 volt system, with a resistance of 10 ohms.

Acceptable answer(s)

Guidance

Ma
x
mks

2.4 (1 marks) Amps (Amperage) (1 mark)

2

12a

Source: www.ebay.co.uk

Figure 9

Explain how the measuring equipment in Figure 9 is used to check a gearbox input shaft run out, when removed from a gearbox.

Acceptable answer(s)

Guidance

Ma
x
mks

The shaft is placed on V blocks (1mark), the tip of the DTI gauge is placed on the shaft and zeroed (1 mark), the shaft is rotated and a reading is taken from the gauge to ensure the shaft is within tolerance (1 mark).

3

12b

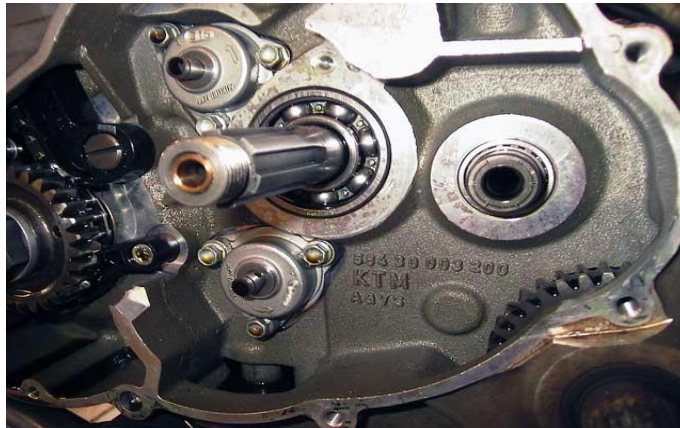
Source: www.ktmlc4transmissionbearingupgrade

Figure 10

Identify the bearing type as indicated by the arrow in Figure 10 and state why it is used in this application.

Acceptable answer(s)

Guidance

Ma
x
mks

| | | | |
|----|--|---|-------------------------|
| | Ball bearing (1 mark) – allows the shaft to rotate smoothly (1 mark). | | 2 |
| 13 | <p>A vehicle's wheel has been brought into the workshop and requires a puncture on it to be repaired.</p> <p>Explain how this task should be carried out with an awareness of health and safety and good workshop practice and procedures.</p> <p>Integrated</p> | | |
| | Acceptable answer(s) | Guidance | Ma x mks |
| | <p><u>Band descriptors</u></p> <p>9-7 marks</p> <p>They completed a fully detailed answer and made reference to health and safety. Showed a good depth of understanding of the task. The removal procedure of the tyre was well detailed; they explained the procedure for checking for a puncture and fitting a repair plug within legal requirements.</p> <p>They explained the correct use of tools used.</p> <p>They gave a detailed account on the refitting of the tyre (rotation)</p> <p>They have an awareness of the need to carry out wheel balancing after inflating to the recommended pressure, and rechecking the repair is completed with no leaks.</p> <p>They have provided detail of several key areas including the appropriate disposal of any waste and clearly demonstrate their ability to correctly link everything together. The answer was well structured.</p> <p>6-4 marks</p> <p>They have provided a complete answer but with some details missing, some reference to health and safety mentioned. Showed an understanding of the task, but not in detail, explained the correct use of tools, and removing the tyre but did not fully explain how to check and repair the puncture. No mention of legal requirements. There was no mention of checking for a leak after the repair or balancing of the tyre, the process was not fully explained, (more of an overview).</p> <p>They have provided detail of some key areas, no mention of the disposal of the waste and links</p> | <p><u>Indicative content</u></p> <ul style="list-style-type: none"> • Health and safety observed through task. • Use of all tyre equipment and tools. • Appropriate disposal of waste. • Correct procedure for removing and refitting the tyre. • Correct method of finding and repairing puncture. • Meeting legal requirements. • Balancing of the wheel. | 9 |

| | | | |
|--|---|--|--|
| | <p>were not fully made between the different stages of the task. The answer had some structure but did not flow in a logical sequence.</p> <p>3-1 marks The learner shows a limited knowledge of the task or how to approach it. No mention made health and safety, some reference to the removal of the tyre, no reference made to the checking and repairing of the puncture, no mention of refitting the tyre and carrying out a check for leaks, wheel balancing was not mentioned,. No mention of tools or equipment used. They have provided limited detail of only one or two key areas but are unable to link them together. The report is disjointed and unstructured.</p> <p>0 marks No rewardable material.</p> | | |
|--|---|--|--|