

Skill Auto – Heavy Vehicle Engineering

Pre-Competition Activity

These tasks are intended to provide colleges and training centres with suitable tasks to use:

- As part of their competitor preparation prior to Skill Auto qualifier competitions
- In determining whether a prospective competitor is at the correct level
- In providing a different learning experience for heavy vehicle technicians

While these sample tasks do not directly replicate the Skill Auto qualifier tasks, the skills tested do form an inherent part of the knowledge and expertise needed by skilled heavy vehicle technicians and relate to the skills tested at qualifier and national competitions managed by Skill Auto. In general competitors are expected to have achieved a level 2 NVQ/SVQ/VCQ/VRQ and/or be working towards their level 3.

In the main the tasks are intended to be carried out in a practical situation but some testing of underpinning knowledge and problem solving is included. Centres can devise their own tasks to replace or enhance the examples provided but approval should be sought from WSUK or the IMI.

You should adhere to the times suggested as performing under time constraints is an integral part of competitions.

Centres are advised to download the relevant competition briefs from the WorldSkills UK website at www.worldskillsuk.org/champions/worldskills-uk-competitions/find-a-competition/engineering-and-technology/heavy-vehicle-engineering

Setting up the tasks

- The tasks should be arranged so that all materials and equipment needed to complete the tasks are available to competitors including any report sheets and explanatory task material
- Expect the unexpected, consider each eventuality and how you'd deal with it. Breakages etc.
- Tasks should be strictly timed as time management is a skill that benefits competitors in gaining maximum marks at any competition, Timings should be challenging but not unachievable.
- Tasks can be "doubled up" where practical to enable more competitors to participate

- There should be enough staff available to monitor progress, co-ordinate tasks and competitors and judge completed tasks.
- Maximum benefit for the competitors will be gained if the competition can be observed by an audience of fellow students and or staff/invited guests as this adds an extra pressure. The competition could form part of a college open day for example.
- Centres should run through the tasks themselves prior to the competition to ensure that tasks are of the correct timing and that they are able to be completed successfully.
- Health and safety should be maintained throughout the tasks.

Preparing competitors

Competitors should be encouraged to participate but not pressured into competing

- It should be explained beforehand that competitors should:
 - Concentrate on the task in hand and not get distracted
 - Manage the time available effectively
 - Think logically when a task involves a problem solving element
 - Aim for excellence in their performance and not just competence
- Walk competitors through the tasks and task area outlining briefly what they are required to do and the results they are expected to achieve. They should check any points they are unclear about at this stage as minimum assistance will be available once the competition commences.

Assessing task results

All marking is intended to be carried out on a purely objective basis and results obtained or witnessed will either be right or wrong. There are no half marks. Some tasks are processes which need to be monitored throughout and therefore a judge will need to be allocated throughout to such tasks. Judges need to be subject/skill specific but not necessarily have formal assessing qualifications e.g. local employers or technicians. They should however be briefed (preferably the day before the tasks are intended to be carried out) so that they can confirm the standards for each task. Centres are welcome to add their own marking criteria/make changes to those provided here to enhance their competition.

Standardization is a process where a group of judges sets the standard they require competitors to meet in order to gain the marks. E.g. acceptable tolerances for any

measurements taken. These standards should be aiming for excellence but not be so high that no competitors can achieve nor to low that all quality is omitted. Once set these standards should be applied to EACH competitor equally and in the same way.

Above all the competition should be an enjoyable activity for those participating and enable them to experience what it is like to participate in a competitive arena with the pressures this brings. Their involvement will hopefully encourage them to move on to entering the online tests which lead to selection for the IMI Skill Auto qualifying competitions.
www.theimi.org.uk/landing/skillauto/

Further help and guidance on setting up and running your pre competition activity along with information on Skill Auto regional and national competitions is available by contacting the IMI on 01992 511521 or email skillauto@theimi.org.uk

Have a great competition!

Task A – Vehicle Inspection Competitor Instruction Sheet

This task is intended to test your ability to carry out a safety inspection on a vehicle

1. Carry out a visual inspection on the vehicle as prescribed on the report sheet.
2. Complete the safety inspection report recording any faults identified.

Note: you are not required to rectify any faults found

You have **30 minutes** to complete this task

Marking Schemes

Competitor:

Use this form for all objective marking.

Competition element: Task A - Vehicle Inspection	Pre Competition Activity Heavy Vehicle Engineering
Date:	
Venue:	

Start Time: **Finish Time:** **Max Time Allowed. 30 mins**

Aspect ID	Max Mark	Marking Criteria or Description	Requirement	Mark Awarded
1.1.	1	Appropriate vehicle care taken throughout task		
1.2	1	Safe working practices observed throughout task		
1.3	2	Logical procedure followed to carry out inspection		
1.4	2	Inspection checklist completed correctly and accurately		
1.5	6	Faults correctly identified and reported	2 points per fault	
1.6	2	No additional faults reported		
1.7	2	Report sheet signed and dated		
1.8	2	Task completed in time allowed		
	18	Maximum Marks		

Signatures of markers to confirm the accuracy of these results. Please sign and print name.

Marker 1		Moderator
Marker 2		

Candidate Name:		Date	
Vehicle Make/Model:		Vehicle Reg No.	
Mileage:			
	√x		
INTERIOR		Faults/Defects Identified	
Front/rear seat belts and all seats secure			
Dashboard warning lights			
Switches - secure and functioning correctly			
Windscreens clear and free from damage			
Wipers and washers			
Control pedals			
Parking brake, steering wheel & column			
Horn			
EXTERIOR			
Front/rear registration plates			
Front lamps, including fog lights and indicators			
Front/rear wheels and tyres (see table)			
Rear lights, including brake lights, rear fog lights and number plate lamps			
Fifth wheel and trailer couplings			
Door locks			
Wheels and nuts			
Wings including spray suppression			
UNDER VEHICLE INSPECTION			
Steering inc. power steering			
Prop shafts			
Suspension, shock absorbers			
Brake lines and clips			
Exhaust system			
Fuel tank/fuel lines			

	N/S Front	O/S Front	N/S Rear	O/S Rear	Spare
Min tread depth (mm)					
Tyre Pressure					

Judges Guidance

- Assistance to check lights, brakes, steering etc can be provided.
- The inspection is purely visual and no components need be removed. E.g. wheels, dust covers etc.
- Judges should agree tyre minimum tread depths and pressures prior to commencement of competition. Allow +/- 2psi (0.15 bar) tolerance on tyre pressures
- Tyre pressures should be rechecked regularly to ensure accuracy

Host Centre Brief:

A vehicle in good condition should be positioned on the ramp. The vehicle should have a maximum of 3 faults introduced from the selection below, ensuring no more than one fault from each selection is used. (See Aspect ID 1.6) All faults should be obvious to the candidate.

Minimum tyre tread depths and tyre pressures should be taken for reference by judges.

Lighting

- Indicator repeater inoperative
- Brake light inoperative
- Side light inoperative
- Cab lights inoperative

Brakes

- Leaking brake hose
- Hose securing clip loose or broken
- Bolt missing/loose on brake calliper
- Damaged/misconnected trailer couplings

Tyres

- Damaged wheel rim
- Badly worn/cut tyre
- Underinflated/overinflated tyre
- Missing, loose wheel nut

Steering/Suspension

- Shock absorber bolt loose
- Track rod end nut loose (securing nut or track adjuster)
- Anti-roll bar, wishbone or link arm bolt/fixing loose

Exhaust

- Exhaust mounting missing
- Exhaust bracket damaged
- Exhaust clamp loose

Interior

- Windscreen washer jets misaligned
- Hazard warning lights inoperative
- Seat belt damaged
- Seat belt fixing loose

Tools and Equipment List:

Centres may wish to use existing faults that are present on the vehicle but these must be obvious to the candidate and be from the systems described in the example list.

(DO NOT USE A VEHICLE THAT HAS ADDITIONAL FAULTS)

Task A	Item Description	Number per competitor	Number per competition (4 competitors)
	Vehicle in good general condition with three faults from the list provided introduced	1	1
	Vehicle Hoist (or crawler board)	1	1
	Pry bar or similar	1	1
	Tapping hammer		
	Inspection Lamp	1	1
	Tyre Tread Depth Gauge	1	1
	Tyre pressure gauge	1	1
	Vehicle Safety Report Checklist (example provided)	1	4
	Pen/pencil	1	1
	PPE (hard hat, goggles, gloves))	1	1

Task B – Vehicle Electrical Diagnosis Competitor Instruction Sheet

This task is intended to test your ability to carry out fault diagnosis on vehicle electrical systems.

The customer has advised that the vehicles braking lights are no longer functioning correctly.

1. Diagnose the fault in the brake light circuit.
2. Record the fault on the report sheet provided.
3. Rectify the fault using the most appropriate materials and components provided.
4. Answer the related questions

You have **30 minutes** to complete this task

Marking Schemes

Competitor:

Use this form for all objective marking.

Start Time:

Finish Time:

Max Time Allowed. 30 mins

Competition element: Task B- Vehicle Electrical Fault			Pre-Competition Activity Heavy Vehicle Engineering	Mark Awarded
Diagnosis				
Date:				
Venue:				
Aspect ID	Max Mark	Marking Criteria or Description	Requirement	
1.1.	1	Appropriate vehicle care taken throughout task		
1.2	1	Safe working practices observed throughout task		
1.3	2	Initial check on security of electrical connections		
1.4	2	Correct test procedure is followed		
1.5	2	Correctly diagnose fuse blown/ incorrect fuse fitted	1 mark for each	
1.6	2	Correctly identifies blown bulb	2 marks	
1.7	2	Correctly report faults		
1.8	2	No additional faults reported		
1.9	4	Correctly rectify faults (replace fuse and bulb)	Deduct marks if incorrect replacement fuse fitted.	
1.10	2	Checked operation after rectifying faults		
2.0	1	Replaced and secured fuse box cover		
2.1	3	Answer question paper correctly	1 mark per correct answer	
2.2	1	Task completed in time allowed		
	25	Maximum Marks		

Signatures of markers to confirm the accuracy of these results. Please sign and print name.

Marker 1		Moderator
Marker 2		

Competitor Report Sheet

The faulty braking lights were caused by:

Answer the following questions:

1) What is the normal wattage of a brake light bulb?

2) Why will a short circuit cause a fuse to blow in an electrical circuit?

3) What is the unit of electricity used to measure resistance in an electrical circuit?

Competitor Name:

Judges Guidance

- Assistance to check the operation of the brake lights can be provided.
- The competitor should follow a logical sequence to test the circuit and diagnose the fault. E.g. check security of connections, measure power supply to brake lights, check functionality of bulbs, fuses and switches.
- After correctly diagnosing the fuse fault judges should note if candidate replaces blown fuse with one of the correct rating for the circuit. Deduct mark if incorrect replacement fuse selected.
- Competitors should then identify faulty bulb in brake lamp and fit replacement
- Competitors should test system and verify faults corrected on completion
- Judges are permitted to stop the competitor if they are likely to injure themselves or cause damage to the vehicle.

Host Centre Brief:

A vehicle is fitted with an open circuit fuse of the incorrect rating for the brake light circuit. The fuse box cover should be in place.

A faulty bulb is fitted to one brake light

If necessary trim should be removed to allow easy access to the brake light connections, bulbs, switch etc.

The selection of electrical components made available should include same rated fuse as blown one, one of the correct rating and a selection of others.

Tools and Equipment List:

Task B	Item Description	Number per competitor	Number per competition (4 competitors)
	Vehicle with blown fuse of incorrect rating fitted to brake light circuit and blown bulb fitted	1	1
	Workshop manuals appropriate to the vehicle with wiring diagrams. (Printed copy of the wiring diagram alone can be used along with location diagram for components provided all fuse ratings are included)	1	1
	Selection of hand tools e.g. screwdrivers, pliers, wire strippers	1	1
	Multi-meter/Power Probe	1	1
	Inspection Lamp/Torch	1	1
	Selection of electrical components including distracters. E.g. wire, connectors, switches, fuses, bulbs, relays.	Include same rated fuse as blown one; one correctly rated one and a selection of others.	One correct replacement fuse must be available for each candidate.
	Report Sheet (example provided)	1	4
	Pen/pencil	1	1
	PPE (hard hat, goggles, gloves))	1	1

Task C – Vehicle Braking Systems

Competitor Instruction Sheet

This task is intended to test your ability to carry out a disc brake serviceability check

The driver is complaining of shuddering through the steering wheel when braking

1. Inspect the front brake assembly and report on the serviceability of the brake components. (one side only)
2. Record your measurements on the report sheet.
3. Fit the replacement brake disc pads.

Note: You are not required to remove the brake calliper and the brake disc runout measurement should be taken in the middle of the brake pad contact area

You have **30 minutes** to complete this task

Marking Schemes

Competitor:

Use this form for all objective marking.

Competition element: Task C – Vehicle Braking Systems	Pre-Competition Activity Auto Tech
Date:	
Venue:	

Start Time: **Finish Time:** **Max Time Allowed. 30 mins**

Aspect ID	Max Mark	Marking Criteria or Description	Requirement	Mark Awarded
1.1.	1	Appropriate vehicle care taken throughout task		
1.2	1	Safe working practices observed throughout task		
1.3	1	Brake pads removed using correct tools		
1.4	2	DTI positioned securely		
1.5	2	DTI preloaded and zeroed		
1.6	2	Correct brake disc runout measurement procedure followed		
1.7	4	Max Brake disc runout measured correctly	+/_	
1.8	1	Brake disc serviceability reported correctly		
2.3	2	Brake fluid level checked before piston(s) pushed back		
2.4	1	Reservoir cap removed before piston(s) pushed back		
2.5	2	Replacement brake pads fitted correctly		
2.6	1	Brake pedal “reset”		
2.7	1	Reservoir cap refitted		
2.8	1	Complete task in time allocated		
	22	Maximum Marks		

Signatures of markers to confirm the accuracy of these results. Please sign and print name.

Marker 1		Moderator
Marker 2		

Competitor Report Sheet

Brake Disc Run-out (mm)	
--------------------------------	--

Based on your measurements and the manufacturers specifications provided would you advise the customer to replace the discs?

Yes No

Competitor:

Judges Guidance

- Any tolerances to be allowed on measurements should be agreed with all judges prior to competition commencing.
- Any bearing end play should be removed
- Run out measurement should be taken at the mid-point of brake pad contact area.
- Judges should measure and note the run out themselves to satisfy themselves of a baseline figure.
- Manufacturers specification should be available (or a dummy specification sheet made up) indicating maximum run out allowed.
- Ensure the replacement brake pads are submitted
- The competitor is not required to apply any brake grease to components at re-assembly

Host Centre Brief:

A vehicle with hydraulic/ air over hydraulic front disc brakes should be positioned on a wheel free ramp or supported on axle stands and a front wheel removed.

Two sets of brake pads should be available and marked for easy identification. Different colours or letters/numbers can be painted on each set.

Brake pads should be checked for ease of removal and refitting

Tools and equipment should be positioned on a bench nearby

The DTI should be calibrated and of a manual type (not digital)

It is recommended some spare clips and retaining devices are available in case of damage

Tools and Equipment List:

Task C	Item Description	Number per competitor	Number per competition (4 competitors)
	Vehicle with brake discs fitted to front	1	1
	Vehicle Hoist (wheel free) or axle stands to raise vehicle	1	1
	Pliers (plain and long nose)	1	1
	Hammer	1	1
	Vice grips	1	1
	Large Screwdriver	1	1
	Steel rule	1	1
	Brake pad removal tool	1	1
	Brake calliper piston retraction tool	1	1
	Supply of spare retaining shims/pins/clips/springs	n/a	Min 2
	Replacement brake pads – colour coded/numbered/lettered	1	1
	Cloth to clean disc surface	1	1
	Calibrated Dial Test Indicator	1	1 (plus 1 spare)
	Workshop manual/Technical data for vehicle being used	1	1

	PPE (hard hat, goggles, gloves)	1	1
--	---------------------------------	---	---

Task D – Vehicle Wheel Alignment Competitor Instruction Sheet

This task is intended to test your knowledge of vehicle front wheel alignment

The vehicle is displaying abnormal tyre wear and you have been asked to check and report on the front wheel alignment

1. Carry out the necessary checks prior to carrying out the front wheel alignment check
2. Record the alignment specifications for the vehicle in the technical data manual
3. Check and record your readings for the wheel alignment check on the report sheet

Note: You are not required to make any adjustments to the steering system

You have **30 minutes** to complete this task

Marking Schemes

Competitor:

Use this form for all objective marking.

Start Time:

Finish Time:

Max Time Allowed. 30 mins

Competition element: Task D – Vehicle Steering Systems			Pre-Competition Activity Heavy Vehicle Engineering	
Date:				
Venue:				
Aspect ID	Max Mark	Marking Criteria or Description	Requirement	Mark Awarded
1.1.	1	Appropriate vehicle care taken throughout task		
1.2	1	Safe working practices observed throughout task		
1.3	2	Appropriate pre checks carried out (tyres/suspension/wheels)		
1.4	2	Settles suspension after pre checks		
1.5	1	Identifies correct manufacturers specifications		
1.6	2	Fits and calibrates (if necessary) alignment equipment		
1.7	2	Correct procedure used to check wheel alignment		
1.8	2	Suspension settled before alignment checked		
1.9	2	Correctly measure and report front wheel alignment		
2.0	2	Correctly identifies cause of tyre wear		
2.1	2	Correctly identify effect of misalignment		
2.2	1	Complete task in time allocated		
	20	Maximum Marks		

Signatures of markers to confirm the accuracy of these results. Please sign and print name.

Marker 1		Moderator
Marker 2		

Competitor Report Sheet – Task D - Vehicle Wheel Alignment

	N/S	O/S
Manufacturers Specification in mm / degrees (delete as appropriate)		
Vehicle Readings in mm / degrees (delete as appropriate)		

Based on your measurements and comparing them to the manufacturer's specifications what type of tyre wear would you expect to see on the vehicle?

What is the causes of this type of wear?

Competitor Name:

Judges Guidance

- All measurements should be checked and agreed prior to commencing competition

Host Centre Brief:

A vehicle is positioned (on floor or ramp) without test equipment attached.
Sufficient room should be available to allow settling of suspension
Front wheel alignment is set incorrectly to display excessive "toe in".

Tools and Equipment List:

Task D	Item Description	Number per competitor	Number per competition (4 competitors)
	Suitable Vehicle	1	1
	Ramp (optional)	1	1
	"2 wheel" optical alignment equipment	1	1
	Relevant data manual for vehicle	1	1
	Inspection lamp/torch	1	1
	Chalk or similar	1	1
	Tyre pressure gauge	1	1
	Pen/pencil	1	1
	PPE (hard hat, goggles, gloves)	1	1

Consolidated Score Sheet

Average for all competitors = _____ %

Competitor	Task A (18 marks)	Task B (25 marks)	Task C (22 marks)	Task D (20 marks)	Total Marks	Max Marks	Score %
Judge (print name)		Signature			Task(s)	Date	