



Government of **Western Australia**
School Curriculum and Standards Authority



AUTOMOTIVE ENGINEERING AND TECHNOLOGY

GENERAL COURSE

Marking key for the Externally set task
Sample 2016

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Automotive Engineering and Technology

Externally set task – marking key

1. Use the image of a cut through 6-cylinder OHV petrol engine on the previous page to name each of the numbered parts and explain **two (2)** operational functions of each part. **(24 marks)**

Description	Marks
Part name (1 mark each)	
Name of engine parts 1. spring or valve return spring 2. spark plug 3. connecting rod or con rod 4. crank shaft 5. inlet valve 6. piston 7. cylinder or cylinder block 8. oil dip stick or oil indicator stick	1–8
Functions (2 marks for explanations) Candidates could include any of the following information in their answers	
1. Spring or valve return spring • keeps the valve closed • compresses to let the valve open • expands to close off the combustion chamber prior to combustion	1–2
2. Spark plug • high voltage electric device to ignite the air/fuel mixture in the cylinder • ceramic insulating casing sealed into metal body screwed into cylinder head • spark made by HT electricity jumping from centre electrode to earth electrode	1–2
3. Connecting rod or con rod • connects the piston to the crankshaft • supports the combustion load • allows the piston to travel up and down while the crankshaft moves in a rotary motion	1–2
4. Crank shaft • supports the connecting rod and piston • made up of counterweights to reduce vibration • provides the means of converting reciprocating (up and down) motion to rotary motion (round and round)	1–2
5. Inlet valve • opens to let air and fuel into the combustion chamber • opens and closes in time with the engine • is kept closed by the valve spring	1–2
6. Piston • the piston is the item that the expanding combustion gases push against • transfers reciprocating (up and down) motion through the connecting rod • rotary (circular) motion through the crankshaft	1–2

Description	Marks
7. Cylinder or cylinder block <ul style="list-style-type: none"> • supports the piston in its travel up and down the cylinder • with cylinder head allows for compression and combustion of fuel • provides a place for oil to lubricate piston and con rod 	1-2
8. Oil dip stick or oil indicator stick <ul style="list-style-type: none"> • graduated length of metal indicating minimum/maximum oil levels • used to check the level of oil in the oil pan or sump • can be used to check condition of oil or internal engine problems 	1-2
Total	24

2. A technician has just completed a wet and dry compression test on a 6-cylinder engine. The results are in the table below. The manufacturer's specified compression pressure for each cylinder is 900 kPa.

(26 marks)

- (a)(i) Using your workshop knowledge and skills, list and describe **five (5)** symptoms of worn engine parts that could be evident from the figures above. (10 marks)

Description	Marks
Student may choose any following five: <ul style="list-style-type: none"> • engine misfiring • excessive smoke out of exhaust pipe • high oil consumption • engine overheating • oil in radiator • engine will not idle • engine runs rough at any speed • water in oil • bubbles in the top tank of the radiator • inlet and exhaust valve damage 	1-5
Clearly states in detail four to five engine symptoms	4-5
Uses general terms to state two to three engine symptoms	2-3
Shows little understanding of the question	0-1
Total	10
Answer could include, but is not limited to:	
Engine symptoms <ol style="list-style-type: none"> 1. Engine misfires because oil is fouling sparkplugs and won't allow the mixture to ignite. 2. Engine runs rough because engine is burning oil in the combustion chamber and thick white or blue smoke will come out of the exhaust pipe. 3. Blown head gasket can cause combustion gases and or oil to enter the cooling system and bubbles will be seen in the radiator top tank. 4. Crack in cylinder and/or combustion chamber will cause symptoms as in (3). 5. Engine at idle, and at high speed, is rough, due to one cylinder (number 3) not firing properly due to above (1 to 4). 6. Increase in wet test would indicate worn rings. 	

- (ii) Describe the steps involved in preparing a compression test to diagnose the cause of one engine symptom. (6 marks)

Description	Marks
Describes in detail the steps involved in the wet/dry test process	5–6
States the wet/dry test process	3–4
In general terms, states one of the steps involved in the wet/dry process	1–2
Shows very little understanding of the wet/dry compression test process	0
Total	6
Answer could include, but is not limited to:	
<ul style="list-style-type: none"> • start engine and warm up • start dry test • remove spark plugs and lay in a tray in order of removal • inspect spark plugs for oil fouling and carbon build-up • set induction butterfly to full open • insert compression tester to cylinder number 1 and crank engine until compression gauge needle stops fluctuating • record reading • complete for the rest of the cylinders in the engine • start wet test (to seal worn rings, burnt valves, tiny cracks in head or cylinder) • steps as in dry test but inject three squirts of engine oil in each cylinder before conducting compression test in each cylinder. 	

- (b) List in sequence **ten (10)** of the steps taken to repair a blown head gasket. (10 marks)

Description	Marks
Identifies at least 10 of the correct steps in logical order, as listed below	10
Identifies between eight and ten steps with one or two out of sequence	7–9
Identifies between five and seven steps with more than three out of sequence	5–6
Identifies two to four steps in sequence	2–4
Shows little understanding of how to repair a head gasket	0–1
Total	10
Answer could include, but is not limited to:	
<p>Remove and refit cylinder head</p> <ul style="list-style-type: none"> • remove rocker or tappet cover • remove rocker arms/push rods or remove cam gear from overhead cam • remove overhead cam if fitted • remove head bolts according to manufacturer's specifications (usually in a circular motion from the centre of the head to the outside) • set aside the head bolts in order of removal • inspect head bolts for damage or fatigue • remove head and place on soft surface on a bench • remove and inspect head gasket • if evidence of blow by replace head gasket • remove valves and inspect, if evidence of burnt or chipped valves repair or replace to manufacturer's specifications • inspect face of head and inspect for twist and bend with straight edge • if evidence of twist and bend, head needs machining to manufacturer's specifications • reassemble head to manufacturer's specifications • if engine rings are damaged overhaul engine block to manufacturer's specifications • assemble engine to manufacturer's specifications 	