QUESTIONS Engine Performance

FIRST & LAST NAME

Theory

Using the information in www.gwellwood.com/subjects/mechanics/engineperformance/, the internet, and other sources, to answer the questions below. I might make you think.

> There are NO Partial Marks - when it says "describe" – DESCRIBE This worksheet must be complete before you may work in the shop

1. Describe the relationship between Power and Longevity

- 2. Describe, using your own words, <u>HOW</u> the following components improve power:
 - a. Free Flowing Air Filter
 - b. Cold Air Intake
 - c. High Energy Ignition

- 3. Describe, using your own words, <u>**HOW**</u> the following components improve power:
 - a. Free Flowing exhaust
 - b. Underdrive Pulleys
 - c. Synthetic Fluids

4. Sometimes an aftermarket intake manifold might reduce engine performance in part of the rpm (revolution per minute) range. <u>HOW</u> does this happen?

5. Google intake manifolds for your car (or your favourite car). Hopefully there is one. Which style of intake manifold would you pick?

6. How does increasing Valve Lift make an engine breathe better?

7. How does increasing valve duration make an engine breathe better?

- 8. Google aftermarket camshafts for your engine (or your favourite engine see me if you can't find any companies).
 - a. What would be a good duration (degreees@0.050" lift) for a typical (street-car) operating range of idle to 5500rpm?
 - b. What would be a good duration (degreees@0.050" lift) for a typical hot rod operating range of 3000 to 7500rpm?
 - c. Of the cams that you found, which one would you pick for YOUR vehicle?
- 9. Which do you think would be better, a high-lift camshaft, or a long-duration camshaft? <u>Why?</u>

10. What is it about valve overlap that reduces idle quality?

- 11. What four things did Wellwood have to do to get his '77 Silverado to idle properly with a big cam and high compression?
 - a.
 - b.
 - c.
 - d.
- 12. <u>HOW</u> does Honda's "VTEC" actually work?

- 13. Other manufacturers do something similar to VTEC. Who are they, and what do they call it?
 - a. Toyota:
 - b. Nissan:
 - c. Mazda:
 - d. Subaru:
 - e. Ford:
 - f. Hyundai:
 - g. GM:
 - h. Porsche:

Raising the engine's compression ratio (how much we squeeze the air/fuel charge). At some point, the fuel could be compressed so much that it explodes by itself, even before it is ignited by the spark plug (called Detonation - VERY bad for engines).

14. How high can we realistically go in raising the compression ratio with today's 91 octane gasoline?

15. Good QUENCH is critical to surviving "on the edge" (or past it) of too much compression ratio. *HOW* does quench do this?

- 16. The difference about the combustion chamber shape between openchambered heads and closed-chambered heads is also seen as "shrouding." What is "shrouding," and how come it hurts us?
- 17. What does a windage tray do?
- 18. What could go wrong if a crank scraper were improperly installed?
- 19. What tools would you use to completely de-burr and engine block?

20. When de-burring the inside of an engine block, where should the majority of your effort be placed? (as in: WHERE should you really debur?)

21. When porting a set of heads, what must you be careful of, else you ruin your heads?

22. Below is a cross-section of a cylinder head intake port. Sketch how YOU would re-shape the port for better flow (think "water slide" and don't hit a "water jacket"):



23. What is a disadvantage of polished heads?

24. Describe the Extrude Hone process.

25. How would the engine act if the crankshaft was knife-edged way too much (hint: the crankshaft will be VERY light)?

Describe two types of coatings commonly placed on pistons

 a.

b.

27. Forged pistons are in many ways better than cast pistons. How are they better?

28. Cast pistons are better than forged pistons in only one way. What is it?

29. Hyper-Eutectec pistons are sort of a compromise between cast and forged. But they, too, have a risk – what is that risk??

- 30. There are 6 common types of fastener failures. What are they?
 Google-fu tip use <u>site:arp-bolts.com</u> in your search.
 a.
 - b. c. d. e.

- 31. Polishing connecting rods makes them more resistant to failure. The first step is to grind the edges smooth and then high-speed sanded ~along~ the beam of the rod, not ~across~ it. Why not across it?
- 32. How does shot-peening connecting rods improves engine longevity? *Dude: Google.*

33. Using the rest of this page, describe three modifications you would do with YOUR engine. For each modification, briefly explain why. If you would not make any changes to your engine, in detail, explain why giving at least three reasons why not.