2018 Captains Tryouts: Hovercraft Key

~NCSSM, NC~

(each part is 1 pt unless otherwise specified)

Total: 41pt

1. (1pt for each law)
   Newton's 1st Law: An object in motion remains in motion in a straight line until acted on by an outside force. An object at rest remains at rest until acted on by an outside force.
   Newton's 2nd Law: F_net-ext = m*a (net force)
   Newton's 3rd Law: Forces occur as action/reaction pairs of equal magnitude but opposite direction.
2. A
3. (1pt for each) relativistic particle; non-relativistic particle
4. Pascal's; incompressible
5. A
6. (1pt for each) Buoyancy ; Viscosity
7. B
8. B
9. E
10. D
11. (1pt for each answer and 1 pt for each explanation) Equal force b/c Newton's 3rd law; The light one b/c less mass means greater acceleration
12. 141,000 N/m^2 (or Pa)
13. 25.19 m/s
14. In fluid dynamics, Bernoulli's principle states that an increase in the speed of a fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy. Or for fluids in a confined pipe, P + 1/2PV^2 + PGY
15. a) F = mg = 8(10) = 80N
    b) F_Buoy = (1000)(.002)(10) = 20N → F = 80 − 20 = 60N
16. 640 N
17. 30,000 pascals
18. (1 pt for each) Saunders-Roe Nautical 1; Christopher Cockerell; He was the inventor of the hovercraft.
19. 19.5m
20. (40*17-10*23)/(17+23) = 11 m/s
21. 8.66rad/s
22. (1 pt for ans, 2 pt for explanation) Slow continuous pull. Due to inertia, the pinata will try not to move. With a slow continuous pull, the pinata will move more. So, the force it exerts on the top rope will be more likely to exceed its tension, causing it to snap.
23. Ft = mv – mv0 = (15 kg)*(3 m/s) - 0 kg · m/s = 45 kg-m/s → 15N
    Impulse = 15 N * 3 s = 45 N-s
24. 765.6 m/s
25. 19.6m/s
26. −28.9 m/s

27. (1pt for each) Landing Craft Air Cushion; Swampy or marshy regions and similar answers
28. 65700J