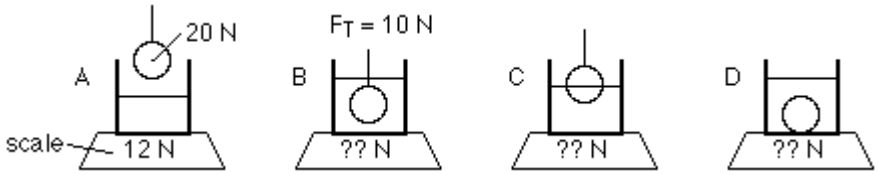
Conceptual Exercise 3 – PY105S – Summer 1, 2007 - Solutions

Name _____ Day/Time _____ Score _____(1+0.5 ea)



In Figure A, a 20 N ball is supported by a string. It hangs over a beaker of fluid that sits on a scale. The scale reading is 12 N. In Figure B the ball is completely submerged in the fluid. In Figure C the ball is exactly half submerged. In Figure D the string has been cut and the ball rests on the bottom of the beaker.

(a) In figure A, what is the tension in the string?

[ ] 0 [ ] 5 N [ ] 10 N [ ] 15 N [**X**] 20 N [ ] 32 N
This is just T – mg = ma = 0, where mg = 20 N.

(b) In figure B, what is the buoyant force on the ball?

[ ] 0 [ ] 5 N [**X**] 10 N [ ] 15 N [ ] 20 N [ ] 32 N
This is just $T+F_B$ – mg = ma = 0, where mg = 20 N. Since T = 10 N, the buoyant force is 20N-10N=10N

(c) In figure B, what is the scale reading?

[ ] 7 N [ ] 12 N [ ] 17 N [**X**] 22 N [ ] 27 N [ ] 32 N
Ball+water weighs 32N, has T=10N upward, needs 22 more from the scale…

(d) In figure C, what is the buoyant force on the ball?

[ ] 0 [**X**] 5 N [ ] 10 N [ ] 15 N [ ] 20 N [ ] 32 N
It displaces only half as much water as in (b), so the buoyant force is only half as much as (b)

(e) In figure C, what is the tension in the string?

[ ] 0 [ ] 5 N [ ] 10 N [**X**] 15 N [ ] 20 N [ ] 32 N
The weight of the ball is still 20 N, but the buoyant force is only 5N so the string must be 15 N.

(f) In figure C, what is the scale reading?

[ ] 7 N [ ] 12 N [**X**] 17 N [ ] 22 N [ ] 27 N [ ] 32 N
The water + ball is still 32 N, but T is now 15 N, so the scale is 32-15 = 17 N

(g) In figure D, what is the buoyant force on the ball?

[ ] 0 [ ] 5 N [**X**] 10 N [ ] 15 N [ ] 20 N [ ] 32 N
It displaces the same amount of fluid as in (b), so it still is 10 N.

(h) In figure D, what is the scale reading?

[ ] 7 N [ ] 12 N [ ] 17 N [ ] 22 N [ ] 27 N [**X**] 32 N *It supports ball+water*