Intermediate Physics Challenge [Online] – Sample Questions
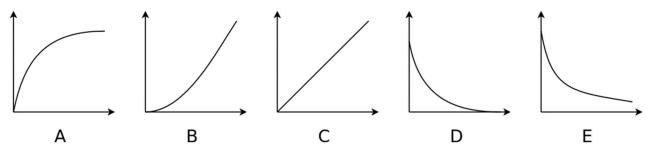
Formulae given:

$E = mgh$ $KE = \frac{1}{2} mv^2$ $P = V \times I$ $R = V/I$ $v = f\lambda$ $v = u + at$ $V_1/V_2 = N_1/N_2$
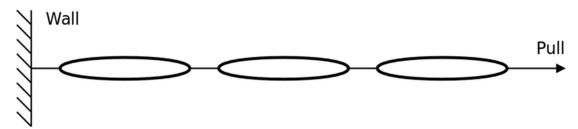
Q1

A small ball bearing is released from rest just beneath the surface of the water in a tall measuring cylinder. The ball bearing reaches terminal velocity before it reaches the bottom of the measuring cylinder. Consider the following graphs:

Which graph best represents the distance travelled by the ball bearing, plotted against time?

Q2

Three identical elastic bands are tied together end to end. One end is fixed to a wall and the other end is pulled.

Which of these statements is correct?

  A. Their lengths remain equal

  B. The band furthest from the wall is stretched the most

  C. The middle band extends twice as much as the other two

  D. The band nearest the wall extends twice as much as the other two

  E. The ratio if the extensions is 1 : 2 : 3

Q3

Which of the following is a unit of force?

  A. joule per second

  B. joule per coulomb

  C. coulomb per second

  D. joule per watt

  E. joule per metre

Q4

A ball is thrown vertically upwards from a point P, 10 m above the ground. It reaches a maximum height of 30 m above the ground at point Q and then falls back down to the ground at point G.
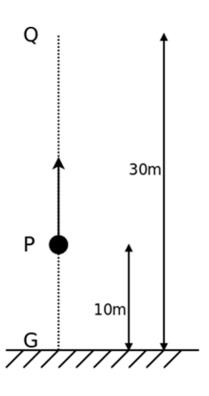
The difference in gravitational potential energy of the ball at P and Q is +400 joules. The gravitational potential energy is taken to be zero at ground level.

Air resistance may be neglected.

g = 10 N/kg

The mass of the ball in kg is:
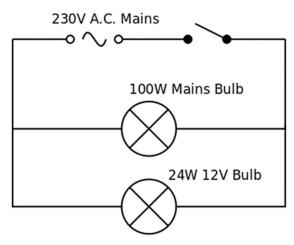
  A. 2

  B. 3

  C. 20

  D. 30

  E. 60

Q5

Two cubes of different materials are labelled A and B. Cube A has twice the mass of cube B. The length of one side of cube A is twice the length of one side of cube B.

The density of cube A is:

  A. 4 times bigger than the density of cube B

  B. 2 times bigger than the density of cube B

  C. The same as the density of cube B

  D. 2 times smaller than the density of cube B

  E. 4 times smaller than the density of cube B

Q6

The circuit shown is set up with two different bulbs.

230V A.C. Mains

100W Mains Bulb

24W 12V Bulb

What will happen to the bulbs when the switch is closed?

  A. The 100 W bulb will be bright, the 24 W bulb will be very dim

  B. The 100 W bulb will be very dim, the 24 W bulb will be bright

  C. The 100 W bulb will be bright, the 24 W bulb will blow

  D. The 100 W bulb will be bright, and the 24 W bulb will also be bright

  E. The 100 W bulb will go out and the 24 W bulb will blow

Q7

A student standing on a harbour wall watches waves entering the harbour. They time them against a fixed mark and find 25 wave crests pass the post each minute. A particular wave crest travels between two adjacent posts 7 m apart in 1.8 seconds.

The wavelength of the waves in the harbour is:

  A. 9.3 m

  B. 3.9 m

  C. 0.42 m

  D. 0.16 m

  E. 0.065 m

Q8

A radioactive substance has a half-life of 8 hours. The count rate is measured to be 1890 counts per minute. One day later the count per minute is most likely to be measured as:

A. 80

B. 240

C. 320

D. 470

E. 950

Q9

Particles in a gas behave like small incompressible spheres in random motion that undergo elastic collisions (collisions where kinetic energy is conserved). This is the basis of the gas laws.

This is an example of:

A. a fact based on observation of experiment

B. a false statement

C. a model

D. a definition

E. a deduction from theory confirmed by experiment

Q10

Which one of the diagrams shows a path which is NOT possible for a ray of light in air meeting a glass prism?

A   B   C   D   E