F6 Physics Mock Exam 2019 to 2020 Paper I - Section A Solution

1	2	3	4	5	6	7	8	9	10
A	C	C	C	C	B	C	B	C	B
11	12	13	14	15	16	17	18	19	20
C	D	C	C	C	B	D	A	A	A
21	22	23	24	25	26	27	28	29	30
A	B	A	B	B	D	D	C	A	C
31	32	33							
B	A	A							

Explanation

1. (1) F $T_F = 1.8\ (0) + 32 = 32$ °F.
   (2) T $T_F = 1.8\ (100) + 32 = 212$ °F.
   (3) F from (1), $T_F = 1.8\ (0) + 32 = 32$ °F.
   For $T_C = 1$ °C, $T_F = 1.8\ (1) + 32 = 33.8$ °F.
   $\Delta T_F = 1.8$ °F

2. By $Pt = mc\,\Delta T$

   Same heater ⇒ P kept constant

   Same material ⇒ c kept constant

   ⇒ $t = m\,\Delta T$

   ⇒ $\frac{\Delta T}{t} = \frac{1}{m}$

   $\therefore \frac{1}{m_x} : \frac{1}{m_y} = \frac{60-20}{t} : \frac{60-40}{t}$

   ⇒ $m_x : m_y = 1 : 2$

5. Density $\rho = \frac{Mass}{Volume}$

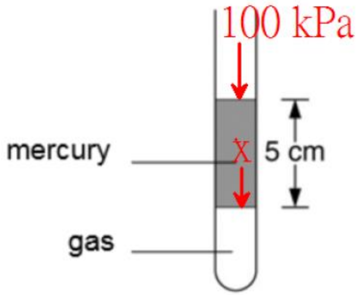
   volume = 2 cm^2 x 5 cm = 10 cm^3

   mass of mercury = 13.4 x 10 = 0.134 kg

   Weight of mercury = 0.134×9.81=1.315 N

   Pressure of mercury exerted on the gas = $\frac{F}{A}$ = $\frac{1.315}{2\ cm^2}$ = 6572.7 Pa = 6.6 kPa

   At equilibrium, the pressure of the gas = 100 kPa + 6.6 kPa = 106.6 kPa



6. Average velocity = $\frac{Displacement}{Time} = \frac{3+3+4+4}{2+5}$

7. $u = 0$, $a = g$, $s = y$, $t = 1$

By $s = ut + ½at^2$

$y = g/2$

$u = 0$, $a = g$, $s = ?$, $t = 2$

By $s = ut + ½at^2$

$s = 2g = 4y$

The distance travelled in the 2nd second = $4y - y = 3y$

8. The acceleration of the system $a = F/m$

$a = 2 / 5 = 0.4$

The tension S: $F = ma$

$F = 3 \times 0.4 = 1.2$ N

9. $\sqrt{20^2 + 30^2}$

10. $mgh = mc\Delta T$

$9.81h = 4200(0.15)$

$h = 64.22$ m

11. By conservation of momentum: $5000(0) = 2000v_1 + (-3000)v_2$

$v_1 : v_2 = 3 : 2$

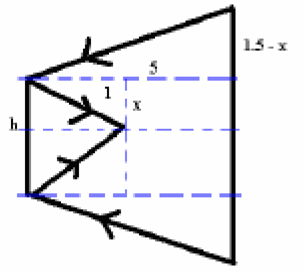
now, $m_1 : m_2 = 2 : 3$

$KE_1 : KE_2 = 2/3 \times (3/2)^2 = 3 : 2$

13. F is provided by the friction between the tyre and the road surface. It's not provided by the tyres.

14. $a = \frac{GM}{r^2}$

15. By similar triangle



$1/5 = x/(1.5 - x)$

$x = 0.25$ m

minimum $h = 0.25 \times 2 = 0.50$ m

18. From the diagram, $\lambda = 0.55 – 0.05 = 0.5$ m

By $v = f\lambda = \lambda/T$

$T = 0.5 / 20 = 0.025$ s

27. $P_{sin\text{-}curve} = 2I_o^2R$ (=4W)

$P_{square\text{-}curve} = 2.5I_o^2R$ (=5W)

31. $0.8 = e^{-\lambda t'}$ $\therefore t' = 743$s

$0.02 = e^{-\lambda t}$ $\therefore t = 13040$s

Time required = $t – t'$

33. No. of *Po* atoms in 1 kg = $\frac{1}{210x1.66^{-27}}$

No. of Po nucleus decayed in 64 days = $\frac{1}{210x1.661^{-27}}$ - $\frac{1}{210x1.661^{-27}}$ $e^{-64\lambda}$

Energy released = No. of Po nucleus decayed in 64 days x 5.31 Mev