1) Answer: **B**
Resistivity ρ and is measured in Ohm Meters or kg m^3 A^{-2} s^{-3}

2) Answer: **D**
K.E. = ½ (80) $(10)^2$ = 4000 J

3) Answer: **B**
percentage uncertainty the largest $\frac{\Delta x}{X}$, X should be the smallest. Therefore a – b
because $a - b$ = 2 cm and 2/2 x 100 = 100%!

4) Answer: **A**
$R = \sqrt{\frac{V}{L}}$ => $\frac{\Delta R}{R} = 0.5\ (\frac{\Delta V}{V} + \frac{\Delta L}{L})$ => Uncertainty of $R = \frac{1}{2}x + \frac{1}{2}y$

5) Answer: **B**
Collision is inelastic, especially so when there is friction. The displacement after rebound does not reach the original height.
The displacement time graph is curved because S = ½ a t^2

6) Answer: **C**
Can relate the graph to impulse (change in momentum)

7) Answer: **C**
Using s = ½ g t^2, t = 4.52 s.
Within 4.52 s, relative distance covered = (35 – 15) x 4.52 = 90.4 m.
So relative distance to cover before dropping bomb = 550 – 90.4 = 459.6 m
Time to wait before releasing bomb = 459.6 / 20 = 23 s

8) Answer: **B**
ACW moments = CW moments
(2m)(Lsinθ) = (m)(½Lsin(90-θ))
tanθ = ¼ => θ = 14°

9) Answer: **B**
At the steady speed of 1.38 ms^{-1}, air resistance = weight component along slope
1.38 k = (80.0)(9.81)sin(5.0)
k = 49.565

At the steady speed of 5.55 ms^{-1}, air resistance = (5.55)(49.565) = 275.086 N
Additional force required = 275.085 – (80.0)(9.81)sin(5.0) = 207 N

10) Answer: **B**
When tube is upright with open end at the top, pressure of trapped air is the greatest. When the tube is upright with the open end at the bottom, pressure of trapped air is the least.
When pressure is the greatest, length of air column is the least.

11) Answer: **D**
Solution:
F = (1+2+3)a
a = F/6

Considering 1 kg mass:
F_{net} = ma

F – f = 1(F/6)
f = 5F/6

12) Answer: **C**
Solution:
A is not possible as this means final momentum is mv to the right (ball must rebound along same path)
B is not possible as this means final momentum is zero.
C is possible as this means final momentum is mv to the left $\Rightarrow$ speed and hence KE has decreased.
D is not possible as this means final momentum is 2mv to the left $\Rightarrow$ speed and hence KE remains unchanged.

13) Answer: **B**
Solution:

$$F_{net} = \frac{dp}{dt} = \frac{400 - 100}{5.5 - 4.0} = \frac{300}{1.5} = 200 \text{ N}$$

14) Answer: **D**
W.D by person = Gain in GPE + W.D against friction
= mgh + fd
= 200 (1.5) + 150 (1.5 / sin 30°) = 750 J

15) Answer: **A**
solution: some KE lost due to completely inelastic collision.

COM:
5.0 (200) = (95 + 5) v'
v' = 10 m s^{-1}

COE: Loss in KE = Gain in GPE
½ (95+5)(10)2 = (95+5) (9.81) h
h = 5.1 m

16) Answer: **D**
Solution:

$$\text{efficiency} = \frac{P_{out}}{P_{in}} \times 100\% = \frac{IV}{mgh/t} \times 100\% = \frac{200 \times 6000}{500 \times 9.81 \times 300} \times 100\% = 82\%$$

17) Answer: **D**

18) Answer: **C**

$$I \propto \frac{1}{x^2} \quad \text{and} \quad I \propto A^2$$

$$\therefore A \propto \frac{1}{r}$$

$$\frac{A_Q}{A_P} = \frac{r}{2r}$$

$$A_Q = \frac{r}{2r}(6) = 3.0 \text{ μm}$$

19) Answer: A

20) Answer: **D**

	Unpolarized light	After 1st polarizer	After 2nd polarizer
Amplitude		A	A cos 60 = 0.5 A
Intensity		A^2	0.25 A^2
	8 *I*	4*I*	*I*

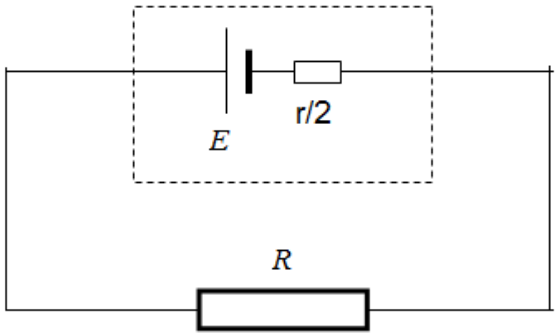
21) Answer: **B**

$\Delta x = \lambda D/a = 6.0 \times 10^{-7} \times 1.50 / 3.0 \times 10^{-3}$

$= 0.30$ mm

22) Answer: **C**

The equivalent circuit is



By potential divider method, the p.d. across internal resistance is $E \dfrac{(\frac{r}{2})}{R+\frac{r}{2}} = E \dfrac{r}{2R+r}$

Fraction of Power = $\dfrac{P_r}{P_{total}} = \dfrac{IV_r}{IV_{total}} = \dfrac{V_r}{E} = \dfrac{r}{2R+r}$

23) Answer: **D**

Resistance of the truncated
$R = \dfrac{\rho h}{\pi ab}$

For the "truncated cone" shaped wire, the resistance varies along the length. Only the current is the same for P and Q.

24) Answer: **D**

Initial p.d. of X = 30 - 2/3 * 45 = 0 V

Final p.d of X = 30 – 1/5 * 45 = 21.0 V

The change in p.d. is 21.0 V

25) Answer: **C**

P(loss) = $I^2 R = (P/V)^2 R = (100*10^3/10*10^3)^2 * 5 = 500$ W

26) Answer: **C**

$$B = \frac{\mu_0 I}{2\pi d}$$

When I = 6.0A and d = 2.0 cm, B = 6.00 x 10^{-7} T into of the plane of the page at P.
At P. the net B = 1.00 x 10^{-7} T out of the plane of the page.
$B_{net} = B_{6.0A} + B_0$
$B_0 = B_{net} - B_{6.0A}$ = 1.00 x 10^{-7} T – (-6.00 x 10^{-7}) = 7.00 x 10^{-7} T out of plane of the page.
At Q, $B_{net} = B_{6.0A} + B_0$ = (6.00 x 10^{-7} + 7.00 x 10^{-7}) = 13.00 x 10^{-7} T out of plane of the page

27) Answer: **D**
The B field due to the straight wire is pointing into the plane of the paper. Therefore, by fleming left hand rule, the direction of F is in D direction.

28) Answer: **B**
Based on eqn $KE_{max} = hf - \phi$ where $KE_{max} = eV_1$ and work function $\phi = hf_o$

29) Answer: **D**
momentum of photon = $h/\lambda = hf/c$
change in momentum on rebound from sail = 2 hf/c = 2E/c
total energy E per unit time = Intensity x Area = IA
force = rate of change of momentum = 2IA/c

30) Answer: **B**
$hc/\lambda_3 = hc/\lambda_1 + hc/\lambda_5$