# HINTS & SOLUTIONS

## ANSWER KEY

| Ques. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ans. | d | d | b | a | c | c | b | b | a | d | c | d | b | b | d |
| **Ques.** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| **Ans.** | a | d | b | a | d | d | c | a | b | a | d | c | c | d | a |

**31.** **(A)**

(i) $2\,ZnS + 3O_2 \rightarrow 2\,ZnO + 2SO_2$

(ii) $ZnCO_3 \xrightarrow{\Delta} ZnO + CO_2$

(iii) $ZnO + C \longrightarrow Zn + CO$

**(B)**

(i) Ans (iv)

(ii) $Fe_2O_3 + 2\,Al \longrightarrow Al_2O_3 + 2Fe$

**(C)**

Given $P_1 = 250K\ Pa = 0.25 \times 10^6\ Pa$

$T_1 = 300\ K$

$P_2 = 1 \times 10^6\ Pa$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

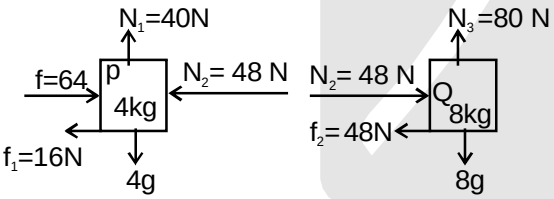
$$\frac{0.25\times10^6}{300} = \frac{1\times10^6}{T_2}\ \{P_{max} = 1 \times 10^6\}$$

$T_2 = 1200\ K$

m.p. of cylinder is 1800 K so cylinder will blast at 1200 K.

**32.** **(A)**

**I.**




$f = f_1 + f_2$

$f = 0.4 \times 4g + 0.6 \times 8g$

$f = 1.6g + 4.8\ g = 6.4\ g$ $\qquad g = 10\ m/s^2$

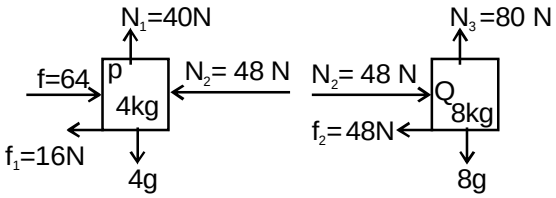
$f = 64\ N$

**II.** for exerted by the table on Q ,
$F_Q = \mu mg = 0.6 \times 8 \times 10 = 48$ N. upward normal to table
Table exerted Vertical force Fy = $N_3 = 80$ N

Net force exert by Table = $\sqrt{48^2 + 80^2}$ = 93.29 N

Direction of makes angle of $tan^{-1}(5/3)$ with the horizontal, inclined towards P.

**III.**




**32.** **(B)** The total time in one full pedal is 6 second

**I.** energy given to cycle = 2 mgh
= 2 ×75 × 10 × 0.2 = 300 J

power given to cycle = $\frac{300}{6}$ = 50 watt

**II.** Distance covered by cycle in one paddle road = $10 \times 2\pi \times 0.5 = 10\pi$ m

velocity of cycle = $\frac{10\pi}{6} = 5\pi/3$

K.E. of cycle = $\frac{1}{2}mv^2 = \frac{1}{2} \times 25 \times \left(\frac{5\pi}{3}\right)^2$

$= \frac{625}{18}\pi^2$ $\quad \therefore \pi^2 = 9.8$

K.E. = $\frac{625 \times 9.8}{18}$ = 340.3J

**III.** The student provides 300J of energy to the cycle in one full pedal. However the kinetic energy of the cycle remains constant as it moves with uniform velocity. So 300 J of energy is lost in dissipation in one full pedal.

Fraction = 300/340.3 = 0.88 $\approx$ 0.9 = 90%

**33.** 1000 eV $\beta$ particle will give 15 low energy photons.

So 10 keV i.e. 10,000 eV $\beta$ particle will give 150 photons.

At 10% efficiency photomultiplier will generate 15 electrons.

Now these 15 into m i.e. 15m electrons will generate a charge of 15fq.

C=120 pF and voltage is 2 mV so Q on capacitor is CV = $120 \times 10^{-12} \times 2 \times 10^{-3}$
= $240 \times 10^{-15}$ Q
Which is same as $f \times 15 \times 1.6 \times 10^{-19} Q \rightarrow f = 10^5$.

**34. (I)** (ii) ~425

**(II)** (ii) Violet-blue, violet or blue.

(iii) Chlorophyll

(iv) a) Absorb

b) Transmit

(v) Yes

(vi) $6CO_2 + 12\,H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6O_2 + 6H_2O$

(vii) Spectrophotometre / colorimeter

**35.(I)** (i) $H_3PO_4 + 3NaOH \rightarrow_4 Na_3PO_4 + 3H_2O$

(ii) Account to balanced chemical equation

1 mole $H_3PO_4 \equiv$ 3mole NaOH

Mass of NaOH = $23 \times 10^{-3} \times 0.9 \times 3 \times 40 = 2.484$ grams

(iii) Volume of HCl = 100 / 1.047 ml

Molarity = $\frac{10/36.5}{100/1.047} \times 1000 = 2.86$ M

**35.(II)** $HCl + NaHCO_3 \rightarrow \underbrace{NaCl + H_2O} + CO_2$

45.6 g 1.2g 46.7 g

mass of HCl = $40 \times 1.140 = 45.6$ g

According to the law of conservation of mass is

Mass of reactant = Mass of product

45.6 g + 1.2g = 46.7 g + mass of $CO_2$

mass of $CO_2 = 0.1$ g

Volume of $CO_2 = \frac{0.1}{1.98}$ ml = 0.05 Ltr.

**36. (A)**

**I.** $r = 2\,[G^x c^y m^z]$

$M^0L^1T^0 = 2[M^{-1}L^3T^{-2}]^x (L^1T^{-1})^y M^z]$

$M^0L^1T^0 = M^{-x}L^{3x}T^{-2x}\ L^yT^{-y}M^z$

$M^0L^1T^0 = M^{-x+z}L^{3x+y}T^{-2x-y}$

$-x + z = 0$ .....(1)

$3x + y = 1$ .....(2)

$-2x - y = 0$ .....(3)

From equation (1),(2) & (3) $x = 1, y = -2, z = 1$

**II.** Schwarzschild radius of earth

$r = 2\left(\frac{Gm}{C^2}\right)$

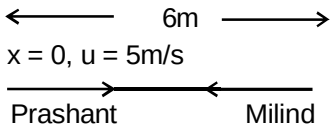
$r = \frac{2 \times 6.67 \times 10^{-11} \times 6 \times 10^{24}}{9 \times 10^{16}}$

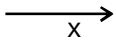
$r = \frac{26.68 \times 10^{-3}}{3} = 8.89 \times 10^{-3}$ m = .9cm

When mass of earth fully convert into black hole . Then distance between moon & earth is remain same so Gravitational force between earth and the moon is unaffected.

**36. (B)**

**I.**




u= 0
$a = 2\ m/s^2$

suppose they will meet at x and travel time t

$x = 5t$ .....(1)

and $(6-x) = \frac{1}{2} \times 2t^2$ .....(2)

From equation (1) and (2) an adding

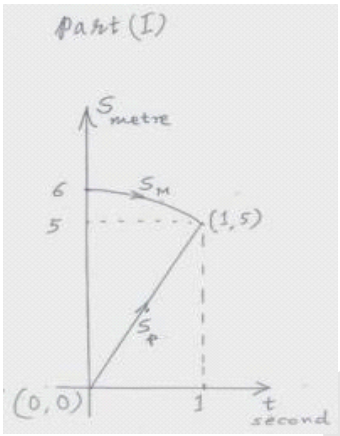
$6 = t^2 + 5t$

$t^2 + 5t - 6 = 0$

$t = -\frac{-5 \pm \sqrt{25+24}}{2}$

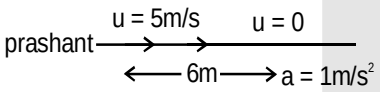
$t = \frac{-5 \pm 7}{2} = 2/2 = 1$ Ans.

x = 5 m from prashant




**36. (B)**

**II.**




They will meet after t sec

for milind $S = \frac{1}{2} \times 2t^2$ ..... (1)

for prashant

$s + 6 = 5t$ ..... (2)

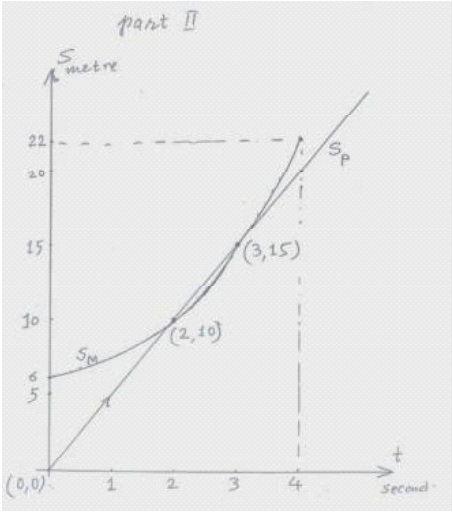
equation (1) & (2)

$-6 = t^2 - 5t$

$t^2 - 5t + 6 = 0$

$(t-3)(t-2) = 0$

t = 2 second and 3 second




**37.** **(I)** $6CO_2 + 6H_2O \longrightarrow C_6H_{12}O_6 + 6O_2$
**(II)** $C + O_2 \longrightarrow CO_2$
Given
Coal (C) = 1 ton (70% purity) = 700 kg (100% purity) = $700 \times 10^3$ gm (100% purity)
12g carbon on complete combustion produces = 1 mole $CO_2$
$\therefore$ 1g carbon on complete combustion produces = 1/12 mole $CO_2$

$\because$ $700 \times 10^3$ g carbon on complete combustion produces = $\frac{1}{12} \times 700 \times 10^3$ mole $CO_2$

= 58333 mole $CO_2$ produced

6 mole $CO_2$ gives 1 mole $C_6H_{12}O_6$ i.e. 180 gm

$\because$ amount of sugar produced = $\frac{58333 \times 180\,gm}{6}$ = 1749.9 kg = 1750 kg

**38.** Given reactions

$2KClO_3 \longrightarrow 2KCl + 3O_2$ ..... (1)

$2KHCO_3 \longrightarrow K_2CO_3 + CO_2 + H_2O$ ..... (2)

$K_2CO_3 \longrightarrow K_2O + CO_2$ ..... (3)

So, if 18 g water paper obtained from
eq. (ii) so 2 moles of $KHCO_3$ = 18 g of water
So mass of $KHCO_3$ = 200 g
40 g of oxygen gas obtained from equation ..... (1)
2 mole $KClO_3$ = 3 × 32 gm $O_2$

Mass of $KClO_3 = \frac{2}{3} \times \frac{40}{32} \times 122.5 = 102.08$

Total mass of mixture = 1000 gm = $KClO_3$ + $KHCO_3$ + $K_2CO_3$
Mass of $K_2CO_3$ = 1000 – (200 + 102.08) = 697.92

% of $KClO_3 = \frac{102.08}{1000} \times 100 = 10.2\ \%$

% of $KHCO_3 = \frac{200}{1000} \times 100 = 20\ \%$

% of $KHCO_3 = \frac{697.92}{1000} \times 100 = 69.7\ \%$

**39.** $T^1 = T - 6$ $\left(\frac{2(u\cos\theta)(u\sin\theta)}{g} = 160\right)$

$$\frac{2u\sin\theta}{g} = \frac{2u\cos\theta}{g} - 6$$

$$\frac{160}{u\cos\theta} = \frac{2u\cos\theta}{g} - 6$$

$u_x^2 - 3g\,u_x - 80\,g = 0$

$a = 1\ b = -3g\ c = -80\,g$

$$u_x = \frac{3g \pm \sqrt{9g^2 + 320g}}{2} = \frac{3g \pm \sqrt{4100}}{2}$$

$= 15 \pm 32$

$u_x = 47$

$$u_y = \frac{1600}{2u_x} = \frac{1600}{2 \times 47}$$

$= 17.02$

$u = \sqrt{289 + 2209}$

$= \sqrt{2498}$

$= 49.97 = 50$ m/s

**40.** (I) P1 Nucleus

P2 Mitochondria

P3 Membrane Fraction

P4 Ribosome

(II) P1 Hematoxylin (basic dye)

P2 Redox dyes

P3 Lipophilic stains

(III) Mitochondria / In plant cells: Mitochondria and chloroplast

(IV) Smooth Endoplasmic reticulum

**41.** (I) (i) P

(II) (i) P

(III) (iii) R

(IV) (iii) $O_2$, $H_2O$ and temperature

(V) (ii) Increase in germination frequency

**42.** (I) (ii) Water

(II) (ii) active transport of salts from ascending tubule to interstitial fluid.

(III) (iii) It will excrete large amount of dilute urine.

(IV) (i) Aquatic

(V) (i) semipermeable, isotonic, passive