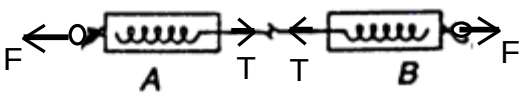
PACE-IIT & MEDICAL

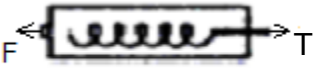
(SOLUTION)

Physics

1. Soln.: (1)

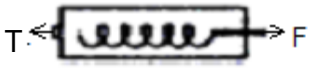


fbd of A



T – F – 1.5 N

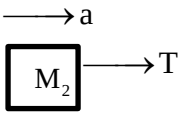
fbd of B



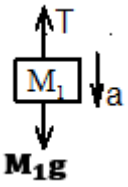
T = F = 1.5 N

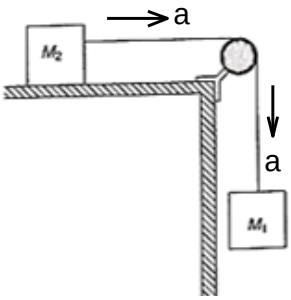
2. Soln.: (1)

bbd of M_2



Bbd of M_1





$M_2a = T$

$M_1a = M_1g - T$

$= M_1g - M_2a$

$\Rightarrow a = \dfrac{M_1g}{(M_1 + M_2)}$

3. Soln.: (2)

Mass of any object remains the same weight of the object changes on Moon and Earth

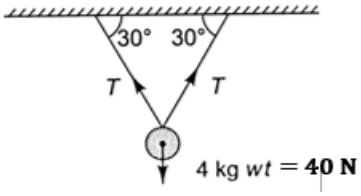
4. Soln.: (2)

Impulse = (final momentum – initial momentum)

$= 0 - 3 \times 10$

–30 Ns

5. Soln.: (1)



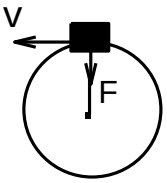
$\Rightarrow \quad 2T\cos 60 = 40$

$T = 40$ N

6. Soln.: (3)

The direction of force is always perpendicular to the direction of displacement.

Hence, work done = 0J



7. Soln.: (4)

Work done = 4900 J = mgh

$4900 = 50\times 9.8\times h$

$h = \dfrac{4900}{50\times 9.8}$

h = 10 m

8. Soln.: (1)

1 hp = 746 W

= 0.746 kW

9. Soln.: (4)

P = mv

$P_{new} = 2mv = 2P$

$KE = \dfrac{P^2}{2m} \Rightarrow KE_{new} = \dfrac{P_{new}^2}{2m}$

$KE_{new} = \dfrac{4P^2}{2m} = 4KE$

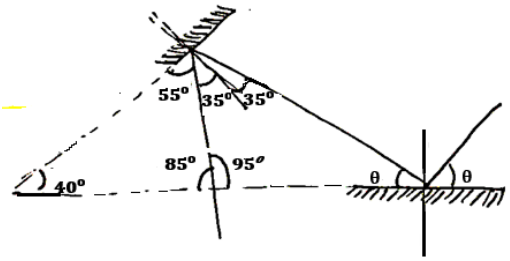
$\Rightarrow \Delta = \left(\dfrac{4KE - KE}{KE}\right)\times 100\%$

$\Delta = 300\%$

10. Soln.: (2)

Photocell give electric energy as an output

11. Soln.: (1)



$\theta + 95^o + 70^o = 180^o$

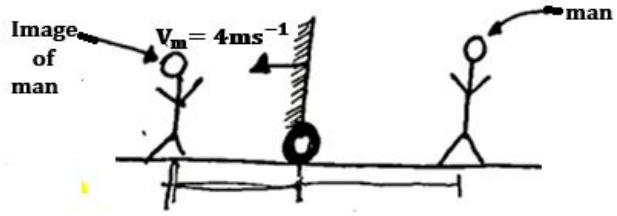
$\theta = 110 - 95^o$

$\theta = 15^o$

12. Soln.: (1)

Only a plane mirror can reflect parallel become to back as parallel becomes

13. Soln.: (1)

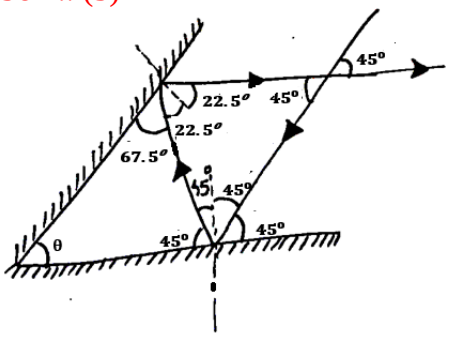


Velocity of Image = 2 V_m

$= 2 \times 4$

$= 8ms^{-1}$

14. Soln.: (3)



$\theta + 45 + 67.5^o = 180^o$

$\theta = 67.5^o$

15. Soln.: (4)

u = –30cm

f = 30cm

$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

$\frac{1}{30} = \frac{1}{v} - \frac{1}{30}$

$\frac{1}{v} = \frac{1}{15}$

v = 15 cm

and as v is Positive image is formed behind the mirror

Chemistry

16. Soln.: (1)
The element has ionization energies $I_1 = 496$, $I_2 = 4560$, $I_3 = 6910$. The sharp rise after I_1 indicates the element has only 1 valence electron

17. Soln.: (4)
Electron gain enthalpy becomes more negative across a period (stronger attraction for added electron); Si has highest effective nuclear charge in this sequence.

18. Soln.: (2)
Cl and Br both are halogens (group 17) with similar reactivity (form similar salts, gain 1 electron); Cl is gas, Br is liquid at room temperature.

19. Soln.: (2)
Mendeleev arranged by atomic mass but Te (127.6) was placed before I (126.9) despite higher mass; Moseley's atomic number law resolved this by using atomic number.

20. Soln.: (4)
Electronegativity decreases down a group as atomic size increases and outer electrons are less attracted to nucleus.

21. Soln.: (1)
the increasing order of first ionization enthalpy in period 3. Due to the stability of the $3s^2$ subshell in Mg, the order is Na < Al < Mg < Si.

22. Soln.: (1)
Lower electronegativity of X (Al) makes it form amphoteric oxide Al_2O_3; higher electronegativity of Y (Cl) makes Cl_2O acidic.

23. Soln.: (2)
Na and Cl_2 combine to form NaCl (combination reaction); large negative ΔH indicates highly exothermic.

24. Soln.: (3)
In the reaction $H_2S + I_2 \rightarrow S + 2HI$, the question asks for the oxidizing agent and the product of reduction.

25. Soln.: (1)
Acidified $KMnO_4$ oxidises I^- to I_2 (brown solution), itself reducing MnO_4^- to Mn^{2+} (colourless); purple disappears due to decolourisation.

26. Soln.: (2)
Displacement reactions are not always exothermic (some are endothermic, though many metals are exothermic).

27. Soln.: (2)
Reaction with Acid: Metal M is Magnesium (Mg). It reacts with hydrochloric acid (HCl) to produce Magnesium Chloride and Hydrogen gas (H_2). Hydrogen is the gas that burns with a characteristic "pop" sound. Reaction with Air: When Magnesium is heated strongly in air, it reacts with oxygen to form Magnesium Oxide (MgO), which is a white powdery solid (N).
Reaction with Water: Magnesium Oxide reacts slowly with water to form Magnesium Hydroxide ($Mg(OH)_2$) .Since Magnesium Hydroxide is a base, it turns red litmus paper blue.

28. Soln.: (1)
NO from nitrate reduction complexes with Fe^{2+} to form brown $\left[Fe(H_2O)_5NO\right]SO_4$ complex

29. Soln.: (4)
Ag is below Cu in reactivity series, so Ag cannot displace Cu from $CuSO_4$; others follow reactivity order

30. Soln.: (1)
Cr in $Cr_2O_7^{2-}$ is + 6; reduced to + 3 in $CrCl_3$; simultaneously Cl^- oxidized to Cl_2

Biology

31. Soln.: (3)
Pisum Sativum

32. Soln.: (4)
Gene

33. Soln.: (1)
Bisexual flowers

34. Soln.: (1)
Pollination

35. Soln.: (2)
Stamen, Carpel (Pistil)

36. Soln.: (1)
Ethylene

37. Soln.: (1)
Grana

38. Soln.: (4)
277 Kcal

39. Soln.: (3)
Pyruvic acid

40. Soln.: (4)
Acetyl CoA

41. Soln.: (4)
Gall bladder

42. Soln.: (1)
left atrium and left ventricle

43. Soln.: (3)
During inhalation, ribs move inward and diaphragm is raised.

44. Soln.: (4)
For every molecule of fat there is a gene. Explanation: A section of DNA that contains information for a specific protein is called the gene for that protein. Hormones and enzymes are proteins, and the formation of any particular protein is controlled by a particular gene. Fat biosynthesis occurs through metabolic reaction. They are not related to genes.

45. Soln.: (4)
Synapse

46. Soln.: (4)
his pancreas was not secreting the required hormone in proper amounts.
Explanation: Insulin is a hormone produced by the pancreas that regulates blood sugar levels. If the pancreas does not produce enough insulin, it can lead to diabetes, requiring insulin injections to manage blood glucose levels.

47. Soln.: (2)
(1) and (III)
Hormones are secreted by endocrine glands and are released directly into the blood stream. Testosterone and estrogen are two sex hormones released by human males and females respectively. These hormones are associated with puberty.

48. Soln.: (4)
Longer small intestine
Herbivores often have an extended small intestine to efficiently digest and absorb nutrients from their plant-based diet.

49. Soln.: (4)
Test tube B as HCl will activate pepsin for breakdown of protein into simple molecules.
Explanation: Pepsin will be activated in test tube B as a result of the HCI and the protein will be broken down into simple molecules. Pepsin requires an optimal pH for its function, which is provided by HCL.

50. Soln.: (4)
Thin walled capillaries richly supplied with blood.
Alveoli are balloon-like structures with thin walls and fine surface present in the lungs. The walls of the alveoli contain an extensive network of blood capillaries for exchange of gases.
Nephrons, the functional units of the kidneys, have a more complex and elongated shape. They are attached to thin-walled tubule present in the kidneys. Bowman's capsule is supplied with cluster of capillaries, called glomerulus for filtration.