Marking Scheme
Std — XII
Practice — I
Sub — physics.

Dt-25.11.17

01.

1 mark.

2. $W = q \times V_{AB} = q \times 0 = 0$

OR

Work done in the process is zero because equitorial plane of a dipole is equipotential surface and work done in moving charge on equipotential surface is zero. 1 mark

3. $r = (E/V - 1) R$ 1 mark

4. From relation $\vec{F} = qvB[\hat{i} \times (-\hat{k})] = qvB\hat{j}$

Magnetic force $\vec{F}$ along $+Y$ axis

OR

From Fleming left hand rule, thumb points along $+Y$ axis, so the direction of magnetic force will be along $+Y$ axis 1 mark

5. Diamagnetic material 1 mark.

6. Definition — ½
S.I. unit — ½
$\phi = ES\cos\theta$ — ½
Result — ½

7 (i) Fig. — ½

Force on $+q$, Force on $-q$ and Net force — ½

(ii) Work done in dipole

$W = pE(\cos\theta_1 - \cos\theta_2)$ ½

Calculation and result

$W = pE(\cos 0 - \cos 180)$ ½

$W = 2pE$

8. Definition — 01
Graph — ½ + ½

OR

Diagram — ½

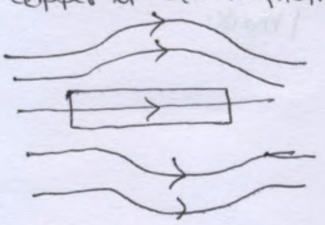
$V_1 = u_1 + a\tau_1$
$V_2 = u_2 + a\tau_2$
$\vec{V}_n = \vec{u}_n + \vec{a}\tau_n$ ½

$V_{av.} = \frac{V_1 + V_2 + \dots + V_n}{n}$ ½

$V_d = a\tau$ ½

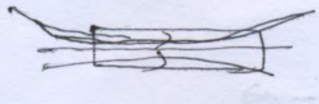
Calculation — ½ mark
Result — ½ mark

10. Copper is dia magnetic



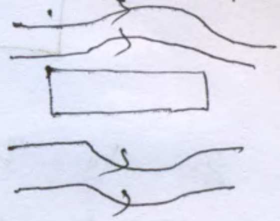
$\frac{1}{2}$

Al is paramagnetic



$\frac{01}{2}$

Mercury cooled at low temp. (at 4.…) is a Super Conductor. (It behaves like a perfect diamagnetic ½



½

11 (i) Charge remains Constant — 01

(ii) $Q = Q'$
$CV = C'V'$
$CV = C/3\, V'$
$\boxed{V' = 3V}$ —— ½
p.d. will be three times
$E' = V'/d = 3V/3d = V/d = E$ ½
Electric field remains Constant.

(iii) Energy becomes three times of initial energy — ½
$U = Q^2/2C,\ U' = Q^2/2C' = \frac{Q^2}{2\times C/3} = 3\,Q^2/2C = 3U$ — ½

12 (i) $\phi = Q/\epsilon_0$ — ½
$\phi = \frac{Q + Q/2}{\epsilon_0} = \frac{3Q}{2\epsilon_0}$ — ½
(ii) Gauss law —— 01
(iii) We know that net electric field or net charge inside the spherical Conducting shell is zero, hence the force on charge $Q/2$ is Zero ½
Force on Charge at A $= \frac{1}{4\pi\epsilon_0}\frac{2Q\times(Q+Q/2)}{x^2} = \frac{1}{4\pi\epsilon_0}\frac{3Q^2}{x^2}$ ½

13. Definition of Electric dipole —— ½
Definition of Electric dipole moment —— ½
Derivation (step wise) —— 2 marks.

14. Initial Energy of the 1st Capacitor $U_1 = \frac{1}{2}C_1V_1^2 = \frac{1}{2}\times(4\times10^{-6})\times(200)^2$ Joule
$U_1 = 8\times10^{-2}$ Joule ½
Common potential (V) $= \frac{Q_1+Q_2}{C_1+C_2} = \frac{C_1V_1+0}{C_1+C_2}$ —— ½
—— ½
$= \frac{4\times10^{-6}\times200}{6\times10^{-6}} = 400/3$ Volt
Final Energy $U_2 = \frac{1}{2}(C_1+C_2)V^2$ —— ½
$= \frac{1}{2}\times6\times10^{-6}\times(400/3)^2$ —— ½
$= 5.33\times10^{-2}$ J
Energy loss $= U_1 - U_2$
$= 2.67\times10^{-2}$ J —— ½

$C_S = C/n$ — ½

$C_P = nC_P$ — ½

$\frac{C_P}{C_S} = n^2$ — ½

For each capacitor in parallel combination

$C_P = nC = 3 \times 3\mu F = 9\mu F$ — ½

$U = \frac{1}{2}CV^2$ — ½

$\frac{U_S}{U_P} = C_S/C_P = \frac{1}{n^2} = 1/3^2 = 1/9$

$U_S : U_P = 1:9$ — ½

15. (a) Potential gradient $(K) = \frac{E_2}{l_2} = \frac{1.02}{51} = 0.02\,V/cm.$ — 01

(b) $E_1 = Kl_1 = (0.02) \times 100cm. \Rightarrow E_1 = 2V$ — 01

(c) NO, when switch S is closed, position of the null point remains unaffected as no current flows through cell E_2 at null points — 01

16. $I = neAV_d$ — ½

$I = \frac{ne^2A\tau}{ml} \times V$ — ½

$V = \frac{ml}{ne^2A\tau} \times I$ — ½

$V = IR$

$R = \frac{ml}{ne^2A\tau}$ — ½

$R = \rho \cdot l/A$ — ½

$\rho = m/ne^2\tau$ — ½

17. $I_3 = I_1 + I_2$ — ½

Applying Kirchoff 2nd law in a loop ABEFA

$6I_1 + 5I_2 = 1.5$ — ½

Applying Kirchoff 2nd law in a loop CDEFC

$5I_1 + 7I_2 = 2$ — ½

On solving $I_1 = 1/34\,A$, $I_2 = 9/34\,amp$, $I = I_1 + I_2 = 10/34\,A$ — 1

p.d. across $R = 5\Omega = (I_1+I_2)R = 10/34 \times 5 = \frac{25}{17}$ volt — ½

18 (i) Derivation of equivalent e.m.f. of the combination — 2 marks

(ii) Equivalent resistance of the combination — 1 mark

19. (i) Track C corresponds to neutron, since neutron is a neutral particle i.e. q = 0, hence it will be undeflected. — ½

(ii) For negatively charged particles i.e. electron, track D corresponds to electron by Fleming left hand rule, it will be towards right — ½ — ½

(iii) For positively charged particle, the direction of force according to Fleming left hand rule will be towards left, so proton and α particles both will move towards left. — ½

P.T.O

$r = \ldots Bq$

$r \propto m/q$

$\frac{r_p}{r_\alpha} = \frac{m_p}{m_\alpha} \times \frac{q_\alpha}{q_p} = (m/4m) \times (2e/e) = 1/2$ — 01

$r_\alpha = 2r_p$

$r_\alpha > r_p$

So track B corresponds to α particle and track A to proton — 1/2

20. Derivation (step wise markup) — 2
Definition of one Ampere — 1

21. Definition of magnetic moment — 1
Derivation (step markup) — 2

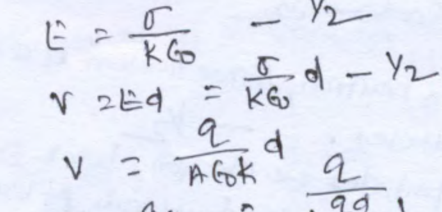
22. (i) Two magnetic lines of force never intersect each other because at the point of intersection, there will be two direction of magnetic field which is quite impossible. 01

(ii) Magnetic lines of force form continuous closed loops because magnet is always dipole and as a result the net magnetic flux of a magnet is always zero. 01

(iii) When diamagnetic substance is placed in an external magnetic field, a feeble magnetism is induced in opposite direction. So magnetic lines of force are repelled. 01

23. (i) The strength of earth's magnetic field varies from place to place on the earth's surface will be order of 10^{-5} T — 01
The earth's magnetic field changes on a continuous basis. Values — 01
Analytical skills, scientific temperament, observational skills —
(ii) Diagram of Earth element — 01

24 (i) Expression for capacitance of parallel plate capacitor — $2\frac{1}{2}$ marks



01 mark

$\sigma = q/A$

$E = \frac{\sigma}{K\epsilon_0}$ — 1/2

$V = Ed = \frac{\sigma}{K\epsilon_0} d$ — 1/2

$V = \frac{q}{A\epsilon_0 K} d$

$C = q/V = \frac{q}{\left(\frac{qd}{KA\epsilon_0}\right)}$ — 1/2

$C = K\frac{\epsilon_0 A}{d}$

P.T.O.

(ii) (a) $C_{air} = \epsilon_0 A/d = 2\mu F$

$C_{die.} = K\epsilon_0 A/d = 12\mu F$

$C_{air}/C_{die.} \Rightarrow K = 06$ } 01

(b) Induced charge due to polarisation is given by

$q' = q(1 - 1/K)$ — ½

$q = 6\times10^{-6}C$, $K = 06$

$q_p = 6\times10^{-6}(1 - 1/6) = 5\times10^{-6}C = 5\mu C$ 01

OR

Gauss theorem — 01
outside — 01
Surface — 01
inside — 01
Graph. — 01

25. 1st part (Stepwise) – 3 marks
2nd part – 2 marks.

OR

1st part – 3 marks
2nd part – 2 marks

$F = Bil\sin\theta$

26 (i) Principle of Potentiometer – 01
Circuit diagram – 01
Working and formula – 01

(ii) (a) To increase the sensitivity of potentiometer

(b) In the process of measuring emf of a cell by potentiometer in the null point position, no current flows in the cell circuit, so cell remains in open circuit. Hence, we obtain the actual value of emf.

OR

(a) Circuit diagram – 01
principle – 01
Working and formula – 01

(b) (i) The resistance of copper strips and connecting screws have not been taken in to account. These resistances are called end resistances. Therefore very small resistances can not be found accurately by meterbridge.

(ii) If any one resistance in wheatstone bridge is either very small (or very large) in respect of other, then balance point might be very close to terminal A or terminal B. So generally balance point is taken in the middle of the bridge wire.