College of Science *Department of physics*	First Stage Physics Magnetism	2023

1) 1) What is the electric flux through a sphere that has a radius of 2.00 m and carries a charge of $1.00 %C at its center? (10 marks)

2) The Electric Flux depends on how ---------- ----- --- , how ------- ---- --- , and the ---------- ---------- with respect to ----------.

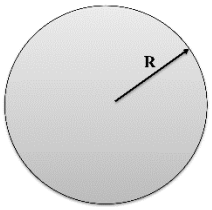
4) Charge *Q* is distributed uniformly throughout an insulating sphere of radius *R*. Calculate the magnitude of the electric field at a point *R*/2 from the center.

5) Charge is distributed uniformly along a long straight wire. The electric field 2 cm from the wire is 20 N/C. Calculate the electric field 4 cm from the wire.

6) A total charge of 6.3 × 10–8 C is distributed uniformly throughout sphere with radius of 2.7-cm. Find the volume charge density of this sphere.

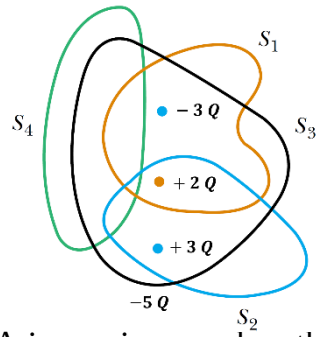
7) Drive the Gauss's law: Consider a positive point charge **q** located at the origin of a sphere of radius **r**. (**Gauss's law – derivation**).

8) An insulating solid sphere of radius R has a uniform volume charge density $\boldsymbol{\rho}$ and carries a total positive charge Q.
Calculate the magnitude of the electric field:
(A) At a point outside the sphere $\boldsymbol{r > R}$.
(B) At a point inside the sphere $\boldsymbol{r < R}$.



9) Find the electric field due to an infinite plane of positive charge with uniform surface charge density$\boldsymbol{\sigma}$.

10) Four closed surfaces are sketched in the Figure. Find the electric flux through each surface.

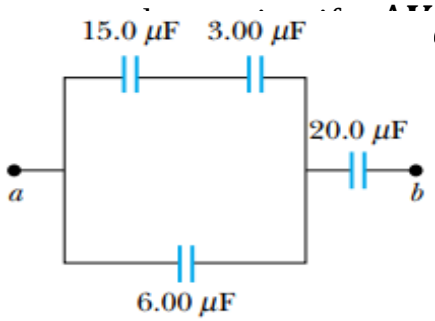


11) The electric flux through a surface of fixed area A is maximum when the surface is:
a. parallel to the electric field.
b. antiparallel to the electric field.
c. perpendicular to the electric field.
d. at an angle of 45◦ to the electric field.
e. closed, but does not contain the charge.

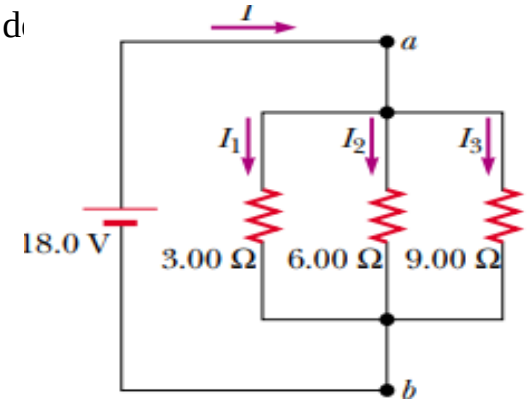
Φ_E is zero when $\theta =$ ---- that is when the normal to the surface is ---------- to the electric field.

12) Two conductors having net charges of **+10 µC** and **-10 µC** have a potential difference of **10 V** between them. (a) Determine the capacitance of the system.
(b) What is the potential difference between the two conductors if the charges on each are increased to **+100 µC** and **-100 µC** ? **(5 Marks)**

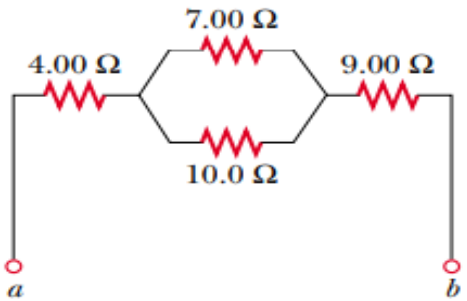
13) Four capacitors are connected as shown in Figure.
(a): Find the equivalent capacitance between points a and b .
(b): Calculate the c $V_{ab} = 15\ V.$ **(5 Marks)**



14) Three resistors are connected in parallel as shown in Figure. A potential difference of 18.0 V is maintained between points a and b .
(a): Find the current in each resistor.
(b): Calculate the power d tal power delivered to the combination of resistors. **(5 Marks)**

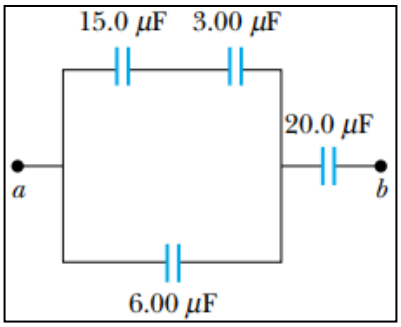


15) (a) Find the equivalent resistance between points a and b in Figure.
(b) A potential difference of **34 V** is app
Calculate the current in each resistor. **(5 Marks)**

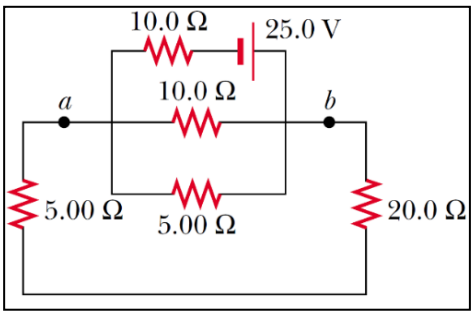


16) Define the following:
Electric Current: (2 marks)
Capacitor:

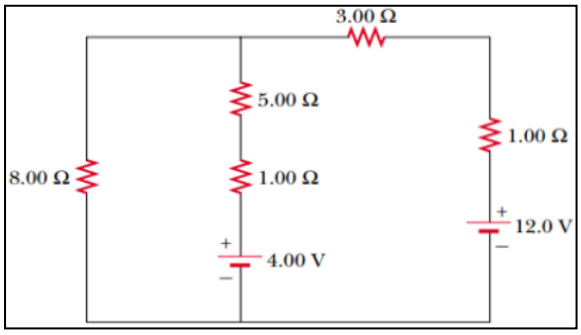
17) Four capacitors are connected as shown in Figure (a) Find the equivalent capacitance between points a and b. (b) Calculate the charge on each capacitor if ΔV_{ab} = 15 V. (5 marks)



18) Find the equivalent resistance of the circuit shown in the Figure below. (4 marks)



19) Determine the current in each branch of the circuit shown in Figure. (5 marks)



20) Factors Affecting Resistance R are: (4 marks)
1) Iron has …….. than a geometrically similar copper conductor.
2) The higher temperatures usually result in …….. resistances.
3) Larger cross-sectional area of the material offer …….. resistance.
4) Longer materials have …….. resistance.