حل أسئلة الفصل الأول
QUESTIONS

Q1 Choose the correct statement in each of the following

1- An atom is neutral if:

a. Its' contents do not carry any charge.

b. Number of electrons equal the number of protons.

c. Number of electrons is greater than the number of protons.

d. Number of electrons equal the number of neutrons.

١- الذرة المتعادلة هي a :- التي تحمل مكونات أية شحنة. **b** عدد الكتروناتها يساوي عدد بروتوناتها
C .عدد الكتروناتها أكبر من عدد بروتوناتها **d** . عدد الكتروناتها يساوي عدد نيوتروناتها.
الجواب **b**

2- An atom become positively charged if son of its:

a- Number of electrons is greater than the number of protons.

b- Number of electrons is less than the number of protons.

c- Number of neutrons in nucleus is greater than the number of electrons.

d- Number of protons in nucleus is greater than the number of neutrons

٢ .يصبح الجسم مشحونا بشحنة موجبة اذا كانت بعض ذراته تمتلك **a :-** عدد من الالكترونات أكبر من عدد البروتونات . **b** عدد من الالكترونات أقل من عدد البروتونات **c.** عدد من النيوترونات في النواة أكبر من عدد الالكترونات. **d** عدد من البروتونات في النواة أكبر من عدد النيوترونات. الجواب **b**

3- When losing a charge of ($1.6 \times 10^{-9}\ C$) from a conducted body which is isolated and neutrally charged, then the number of electrons that was loss from this body will equal:

a- 10^{8} **electrons .** **b-** 10^{10} **electrons.**

c- 10^{9}**electrons.** **d-** 10^{12}**electrons**

٣-عند فقدان شحنة مقدارها($1.6 \times 10^{-9}\ C$) من جسم موصل معزول متعادل الشحنة فإن عدد الالكترونات التي فقدت من هذا الجسم يساوي

$$Number\ of\ electrons = \frac{charge\ of\ body}{charge\ of\ electron}$$

$$Number\ of\ electrons = \frac{1.6 \times 10^{-9}}{1.6 \times 10^{-19}} = 10^{-9+19} = 10^{10} electrons$$

4- The distance between two points charges is 10cm. if one of the charges replaced by a negative with the same value, then the force between them will be:

a- Zero. **b- Less than before.**

c- Greater than before. **d- Does not change.**

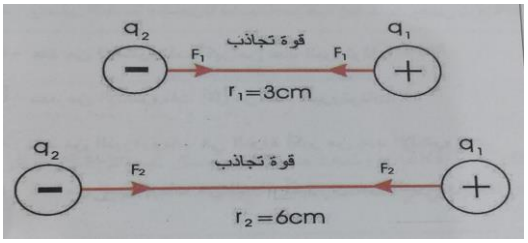
٤-شحنتان نقطيتان موجبتان البعد بينهما **10cm** فإذا استبدلت احدى الشحنتين باخرى سالبة وبالمقدار نفسه فإن مقدار القوة بينهما:**a** صفرا. **b** أقل مما كانت عليه . **c** أكبر مما كانت عليه . **d** لا تتغير.

الجواب: **d** لا تتغير.

5- Two points charge ($q1$, $q2$) one of them is positive and the other one is negative. When the distance between them was (3cm) the attracting force was ($F1$). If the distance becomes longer (6cm) then the force ($F2$) between them will be:

a- $F2 = 1/2\ F1$ $b - F2 = 2F1$

$c - F2 = 4F1$ $d - F2 = 1/4\ F1$



٥-شـحنتان نقطيتان $q1, q2$ احداهمـا موجبة والاخرى سالبة وعندما كان البعد بينهما **cm**٣ كانت قوة التجاذب بينهما $F1$ فإذا ابعدت الشحنتين عن بعضهما حتى صار البعد بينهما **cm**٦ اصبحت عندها القوة بينهما $F2$ تساوي :-

$$\frac{F_2}{F_1} = \frac{K\frac{q_1 q_2}{r_2^2}}{K\frac{q_1 q_2}{r_1^2}} = \frac{r_1^2}{r_2^2} \quad \Longrightarrow F_2 = F_1\frac{(3)^2}{(6)^2} = F_1\frac{9}{36} = \frac{1}{4}F_1$$

6- Walking on a woolen carpet then touching a metal body such as a door handle, you usually fell a minor electric shock. This is due to the loss of electric charge between the fingers and the metal body. The reason for this is that, electric charges are:

a- Generated by your body
b- Generated by the carpet
c- Generated by the metal
d- Generated as result of friction between your feet and the carpet.

٦ -بعد سيرك على سجادة من الصوف والمست جسما معدنيا مثل مقبض الباب فإنك غالبا ما تصاب بصعقة كهربائية خفيفة، نتيجة للتفريغ الكهربائي بين اصبع يدك والجسم المعدني وسبب ذلك ان الشحنات الكهربائية قد **a.** ولدها جسمك. **b** ولدتها السجادة. **C.**ولدها الجسم المعدني **d.**تولدت نتيجة الاحتكاك بين جسمك والسجادة

الجواب: **d** تولدت نتيجة الاحتكاك بين جسمك والسجادة

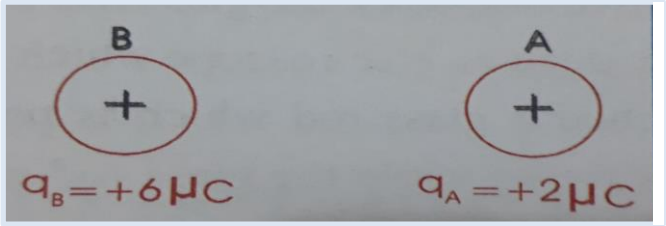
7- The charge of a body A is (+2μC) and the body B has a charge (+6μC) the electric force between the bodies A and B is:

a- $3F_{AB} = -F_{BA}$

b- $F_{AB} = +F_{BA}$

c- $F_{AB} = -F_{BA}$

d- $F_{AB} = -3F_{BA}$



٧.الجسم (A)مشحون بشحنة +٢μC ( ) والجسم B شحنته (+٦μC) فإن القوة الكهربائية المتبادلة بين الجسمين (A , B) هي:-

الجواب الصحيح ($F_{AB} = -F_{BA}$) (c لان القوه الكهربائيه متبادله بين الشحنتين و تعتمد على حاصل ضربهما بحيث القوه التي تؤثر بها الشحنه الاولى تساوي القوه التي تؤثر بها الشحنه الثانيه لكن باتجاه معاكس

8- When the positively charged body gets closer to the to the electroscope disk with two positively charged leaves, this will lead to

a- The leaves will get apart further. **b- The leaves will get closer.**

c- The leaves will get identified. (close gap) **d- Nothings changes**

٨-عند تقريب جسم مشحون بشحنة موجبة من قرص كشاف كهربائي ذي الورقتين مشحون بشحنة موجبة ايضا فإن ذلك يؤدي الى: **a** ازدياد انفراج ورقتي الكشاف. **b** نقصان مقدار انفراج ورقتي الكشاف . **c** انطباق ورقتي الكشاف **d**. لا يتأثر مقدار انفراج ورقتي الكشاف

الجواب(a)ازدياد انفراج ورقتي الكشاف

9- When a negatively charged body approached the neutral electroscope's disc which is connected to earth:

a- The leaves open as result of negative charges on the leaves

b- The leaves open as result of positive charges on the leaves.

c- Nothings changes in spite of positive electric charge on the disc.

d- Nothings changes in spite of negative electric charge on the leaves.

٩ -عند تقريب جسم مشحون بشحنة سالبة من قرص كشاف كهربائي متصل بالارض:-

a. تنفرج ورقتا الكشاف نتيجة ظهور شحنة سالبة عليهما **b.** تنفرج ورقتا الكشاف نتيجة ظهور شحنة موجبة عليهما **c.**تبقى ورقتا الكشاف على انطباقهما على الرغم من ظهور شحنة موجبة على قرصه **d.** تبقى ورقتا الكشاف على انطباقهما على الرغم من ظهور شحنة سالبة على قرصه.

الجواب: (c)تبقى ورقتا الكشاف على انطباقهما على الرغم من ظهور شحنة موجبة على قرصه.

Q2 Explain the following علل ما يأتي:

(1) Fuel carries (lorries with fuel) are supplied with metal chains at the tail of the carrier touching the ground

▶ To discharge static electrical charges resulting from fuel friction with the tank walls and collected at the outside of the fuel carrier to the ground, to avoid an electric shock to ignite the vehicle.

(1) تجهز سيارات نقل الوقود بسلاسل معدنية في مؤخرتها تلامس الأرض.

ج/ للتخلص من الشحنات الكهربائية المتولدة من احتكاك النفط بجدران الخزان والمتجمعة عند السطح الخارجي للخزان و تفريغها للارض لتجنب توليد شراره كهربائيه تؤدي لاشتعال المركبه.

2) Any positively or negatively charged body will neutralize if it was connected to earth

▶ Because the earth is a large reservoir for charges, if the body is a positive charge, it receives electrons from the earth. And if its charge is negative, it loses its to the ground.

(٢) تتعادل شحنة الجسم المشحون بالشحنة الموجبة أو السالبة عند ايصاله بالأرض. ج/لان الارض مستودع كبير للشحنات فالجسم المشحون بالشحنة الموجبة هو فاقد الالكترونات فعند إيصاله بالارض يكتسب الكترونات منها لتتعادل شحنته، بينما الجسم المشحون بالشحنة السالبة يحتوي فائض من االالكترونات فعند إيصاله بالارض سيفرغ االالكترونات الزائدة بالارض ليكون متعادل الشحنة، لان الارض تعتبر خزان كبير من الشحنات.

3) The two negatively charged leaves of the electroscope will get apart further if a negatively charged body close to disk

▶ That is because the electron charge body repel with electroscope disk charge far apart to the leaves will get further

(٣)يزداد انفراج ورقتي الكشاف الكهربائي المشحون بالشحنة السالبة عند تقريب جسم مشحون بشحنة سالبة .

ج/ لان الالكترونات الجسم المشحون تتنافر مع الكترونات قرص الكشاف وتبعدها الى ابعد موقع لها وهو على الورقتين فيزداد انفراج ورقتيه.

Q3 Explain how the electroscope can be positively charged using:
(a) A positively charged glass rod. (b) A negatively charged rubber rod.

► (a)charging by contact:-

Tools: electroscope, glass rod, piece of silk.

Steps: 1- Rub the glass rod with silk, it will get a positive charge.

2- We make the glass rod touching the disk of electroscope, note two leaves repel with them.

Conclusion: The two leaves were moving away from each other, indicating that the electroscope was charged with a positive charge.

► (b) charging by induction

Tools: electroscope, rubber rod , wool piece.

Steps: 1- Rub the rubber rod with the wool piece (the leg shows a negative charge).

2 - Close the rubber rod from the disk of electroscope. You will see that the two leaves repel with them.

3. Connect the disk with the ground by wire (or placing the finger on the disc) with the rubber leg held close to electroscope.

4 - Disconnect of the electroscope from the ground and then move the rubber rod, we notice the two leaves will be repel.

Conclusion: The two leaves were moving away from each other, indicating that the electroscope was charged with a positive charge.

س٣/ وضح كيفية شحن كشاف كهربائي بشحنة موجبة باستعمال:
(a)ساق من الزجاج مشحونة بشحنة موجبة. (b) ساق من المطاط مشحونة بشحنة سالبة

ج / a)بطريقة التماس b)بطريقة الحث

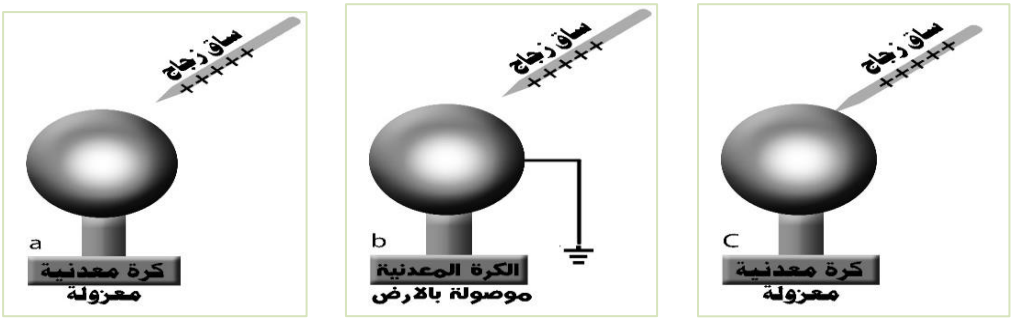
a- شحن الكشاف بشحنة موجبة باستعمال ساق من الزجاج موجبة.
الادوات: كشاف كهربائي، ساق من الزجاج، قطعة من الحرير . الخطوات:-: ١ ندلك ساق الزجاج بقطعة من الحرير حتى تكتسب شحنة موجبة نلاحظ ابتعاد ورقتي الكشاف. -٢ نجعل ساق الزجاج يلامس قرص الكشاف المتعادل كهربائيا الاستنتاج: ابتعاد ورقتي الكشاف عن بعضهما دلالة على ان الكشاف الكهربائي اصبح مشحونا بشحنة موجبة

b - شحن الكشاف بشحنة موجبة باستخدام ساق من المطاط سالبة :
الادوات كشاف كهربائي، ساق من المطاط، قطعة الصوف. خطوات النشاط **1** -ندلك ساق المطاط بقطعة الصوف تظهر على الساق شحنة سالبة نلاحظ تنافر ورقتي الالمنيوم -٢ نقرب ساق المطاط المشحونة من قرص الكشاف المتعادل كهربائيا ٣ --نوصل قرص الكشاف بالارض بوضع أصبع اليد على قرص الكشاف مع بقاء ساق المطاط بالقرب من قرص الكشاف. ٤ نقطع إتصال قرص الكشاف من الارض ثم نبعد ساق المطاط عن الكشاف، نلاحظ تنافر ورقتي الكشاف. الاستنتاج: ان ابتعاد ورقتي الكشاف عن بعضهما يدل على ان الكشاف اصبح مشحونا بشحنة سالبة

Q4 What are the charging methods?

Charging by :- 1-Rubbing 2-Contact 3- Induction

Q5 You have used a glass rod which has been rubbed with silk (positive charge) and a metal insulated ball as in the diagram (a ,b ,c). Do the electrical charges transfer in the cases (a, b, c)? Explain the method of transferring charges (if any). Determine the kind of electric charges which appear in each case. What happens in the positive charge on the glass rod in each of the three cases?



1 - (Figure C) some electrons travel from the surface of the sphere to the rod by contact, so the rod's charge decreases.

2 -(Figure A) the surface of the sphere opposite to the rod showing a negative charge and the surface of the sphere on the other side showing a positive charge

(Figure B) The surface of the sphere opposite to the rod shows a negative charge and the free electrons from the ground equaled positive charge to the ball. (Fig. C) The ball is charged with a positive charge

3- (Figure A) does not change, (Figure B) does not change ,(Figure C) the rod's charge decreases.

س٥/ أستعملت ساق من الزجاج مدلوكه بالحرير (شحنتها موجبة) وكرة معدنية معزولة متعادلة. لاحظ الاشكال الثلاثة التالية (a-b-c): (١) هل تنتقل شحنات كهربائية فى الحالات الثلاث (a-b-c)؟ وضح طريقة انتقال الشحنات ان حصلت. (٢) عين نوع الشحنات الكهربائية التى ستظهر على الكرة المعدنية فى كل حالة. (٣) ماذا يحصل لمقدار الشحنة الموجبة على ساق الزجاج في كل من الحالات الثلاثة

الحل: (١) (الشكل **c**) تنتقل بعض الالكترونات من سطح الكرة الى الساق بالتماس فتقل شحنة الساق. (٢) (الشكل **a**) سطح الكرة المقابل للساق تظهر عليه شحنة سالبة وسطح الكرة من الجهة الثانية تظهر عليه شحنة موجبة

(الشكل **b**) سطح الكرة المقابل للساق تظهر عليه شحنة سالبة والشحنة الموجبة تعادلت بسبب تسرب الالكترونات من الارض الى الكرة. (الشكل **c**) تشحن الكرة بشحنة موجبة

(٣)(الشكل **a**) لا تتغير (الشكل **b**) لا تتغير(شكل**c**) تقل شحنة الساق.

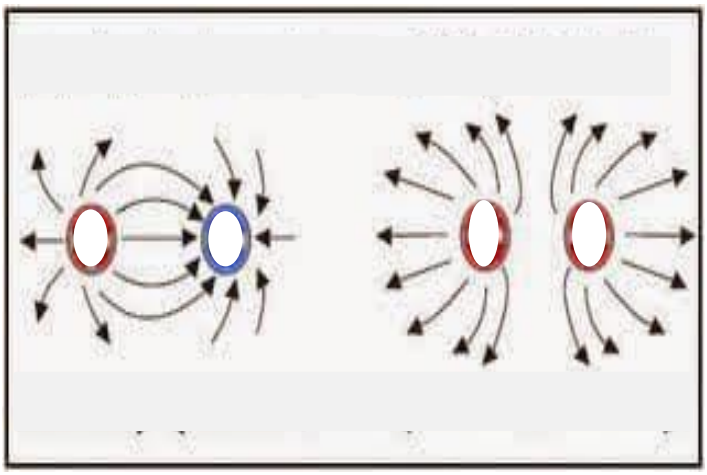
Q6 A student wanted to charge an electroscope which is neutralized using the method of induction so he approached a glass rod which is positively charged and touched the electroscope's disk fingers while the glass rod was still close to the disk. Then he removes the rod away from the disk. Subsequently, the student found that the leaves are closed. Explain this.

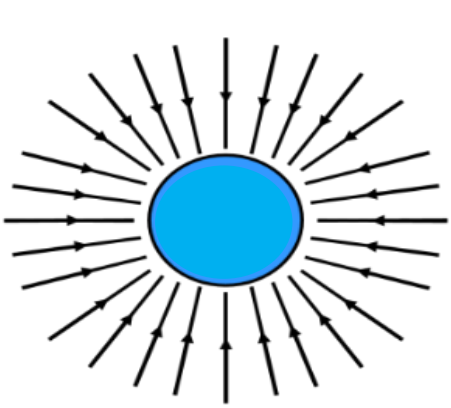
▶ Because the student moved the rod before moving his finger therefore the addition charges discharged to earth.

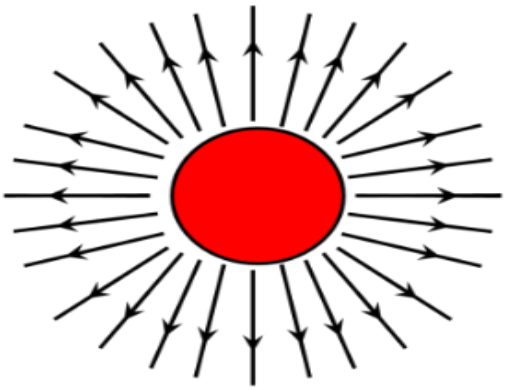
س٦/ أراد أحد الطلبة أن يشحن كشافا كهربائيا متعادلاً بطريقة الحث فقرب من قرصه ساق من الزجاج مشحونة بشحنة موجبة ولمس قرص الكشاف بأصبع يده مع وجود الساق قريبة من قرصه. ثم أبعد الساق من قرص الكشاف وأخيراً رفع إصبع يده عن قرص الكشاف. بعد كل هذه الخطوات وجد الطالب انطباق ورقتى الكشاف (أي حصل على كشاف غير مشحون). ما تفسير ذلك؟

ج/ لان الطالب رفع الساق المشحونة قبل رفع أصبع يده تسبب في غياب تأثير الشحنات الموجبة للساق الزجاجية وبذلك تسربت جميع الشحنات التي أكتسبها الكشاف الى الارض فبقي الكشاف متعادل الشحنة

Q7:- Write type of the charge in figures below?







PROBLEMS مسائل الفصل الاول

P-1 Two-point identical electric charge has repelled the force between them ($9\times10^{-7}N$) when the distance between them was 10 cm. Calculate the charge of each one of them.

س١/ شحنتان كهربائيتان نقطيتان متماثلتان قوة التنافر بينهما تساوي($9\times10^{-7}N$) عندما كان البعد بينهما (10cm). إحسب مقدار شحنة كل منهما؟

$$F = k\frac{q_1 q_2}{r^2}$$

$$9\times10^{-7} = 9\times10^{9}\frac{q^2}{(10^{-1})^2}$$

$$q^2 = \frac{F\,r^2}{k}$$

$$q^2 = \frac{9\times10^{-7}\times10^{-2}}{9\times10^{9}}$$

$$q^2 = 10^{-7-2-9} \implies q^2 = 10^{-18} \implies q = 10^{-9}C = 1nC$$

P-2 Two-point charges both positive identified of ($3\times10^{-9}C$) and the distance between them (5cm). calculate the repelling force between them

س٢/ شحنتان كهربائيتان نقطيتان متماثلتان مقدار كل منهما ($3\times10^{-9}C$) وكان البعد بينهما (5cm). إحسب مقدار القوة المتبادلة بينهما؟

$$F = k\frac{q_1 q_2}{r^2}$$

$$F = 9\times10^{9}\frac{3\times10^{-9}\times3\times10^{-9}}{(5\times10^{-2})^2}$$

$$F = \frac{9\times3\times3\times10^{9}\times10^{-9}\times10^{-9}}{25\times10^{-4}}$$

$$F = 3.24\times10^{9-9-9+4} = 3.24\times10^{-9+4} = 3.24\times10^{-5}N$$

P-3 An electric charge of +3μC located at a point P in an electric filed.

The electrical filed was $4x10^6$N/C. calculate the acted electric force.

س٣) شحنة كهربائية مقدارها +3μC وضعت عند نقطة P في مجال كهربائي وكان مقدار المجال الكهربائي $4x10^6$N/C ، احسب مقدار القوة الكهربائية المؤثرة فيها.

$$E = \frac{F}{q'} \quad \rightarrow \quad 4x10^6 = \frac{F}{3\times10^{-6}} \quad \rightarrow$$

$$F = 4x10^6 \text{ x } 3x10^{-6} = 12N$$

المسائل الخاصة بالفصل الأول الوزارية

- شحنتان كهربائيتان نقطيتان متماثلتان قوة التنافر بينهما تساوي (9×10^{-7}N) عندما كان البعد بينهما (10cm) احسب مقدار شحنة كل منهما. علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$
- شحنتان نقطيتان موضوعتان في الهواء مقدار الشحنة الأولى (+6μc) والثانية (+ 2μc) والبعد بينهما (cm 30) احسب مقدار القوة الكهربائية المتبادلة بينهما مبيناً نوع القوة. علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$
- شحنتان نقطيتان احداهما موجبة ومقدارها (+ 2μc) والأخرى سالبة ومقدارها (5μc) وكان البعد بينهما (3cm). فما مقدار قوة التجاذب بينهما؟ علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$
- شحنتان نقطيتان متماثلتان موجبتان مقدار كل منهما (3×10^{-9}c) والبعد بينهما (5cm). احسب مقدار قوة التنافر بينهما. علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$
- اختر الإجابة الصحيحة: الجسم (A) مشحون بشحنة (+2μc) والجسم B شحنته (+6μc) فأن القوة الكهربائية المتبادلة بين الجسمين (AوB) هي (FAB=-3FBA) ، (FAB=-FBA) ، (FAB=+FBA)
- عند فقدان شحنة مقدارها (1.6×10^{-9}c) من جسم موصل معزول متعادل الشحنة، كم هو عدد الالكترونات التي فقدت من هذا الجسم؟
علماً أن الشحنة الالكترون =1.6×10^{-19}c
- شحنتان كهربائيتان نقطيتان متماثلتان مقدار كل منهما (2×10^{-9}c) والبعد بينهما(6cm)، احسب مقدار القوة المتبادلة بينهما مبيناً نوع القوة، علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$
- شحنة كهربائية مقدارها (+3μc) وضعت عند نقطة P في مجال كهربائي وكان مقدار المجال الكهربائي 4×10^6N/C. احسب مقدار القوة الكهربائية المؤثرة فيها.
- شحنة كهربائية نقطية مقدارها $+3\times10^{-9}$c وضعت عند نقطة في مجال كهربائي فتأثرت بقوة مقدارها 6×10^{-6}N ما مقدار المجال الكهربائي في تلك النقطة؟
- شحنتان كهربائيتان نقطيتان مقدارهما (2×10^{-6}C ، -8×10^{-6}C) وضعتا على بعد (0.06m) من بعضهما، احسب مقدار القوة التي تؤثر بها الشحنة الأولى على الشحنة الثانية وما نوعها؟ علماً أن ثابت كولوم في الفراغ $k=9\times10^9 N.m^2/C^2$

◀ شحنة كهربائية مقدارها ($+2x10^{-9}C$) وضعت عند نقطة **P** في مجال كهربائي، وكان مقدار المجال الكهربائي ($2x10^{3}N/C$)، احسب مقدار القوة كهربائية المؤثرة فيها.

◀ شحنتان كهربيتان متساويتان بالمقدار ، قوة التجاذب بينهما ($9x10^{-5}N$) عندما كان البعد بينهما (**10cm**)، احسب مقدار شحنة كل منهما . علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنتان كهربائيتان نقطيتان أحداهما ($+2x10^{-6}C$) والأخرى ($-8x10^{-6}C$) قوة التنافر بينهما (**90N**) أحسب مقدار البعد بين الشحنتين. علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنتان كهربائيتان إحداهما ($4\times10^{-6}C$)،والاخرى ($9\times10^{-6}C$) قوة التنافر بينهما (**90N**) احسب مقدار البعد بين الشحنتين. علماً أن ثابت كولوم $k=9\times10^{9}N.m^{2}/C^{2}$

◀ وضعت شحنة كهربائية نقطية وجبة مقدارها ($4\times10^{-9}C$) على بعد (**10cm**) من شحنة كهربائية نقطية اخرى موجبة أيضاً مقدارها ($9\times10^{-9}C$) احسب مقدار القوة التي تؤثر بها الشحنة الثانية عل الشحنة الأولى ، وما نوعها؟

◀ شحنتان كهربائيتان نقطيتان متماثلتان ، مقدار كل منهما $10^{-9}C$ عندما كان البعد بينهما (**10cm**) احسب مقدار قوة التنافر بينهما. علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنة كهربائية مقدارها **+6μc** وضعت عند نقطة **A** في مجال كهربائي وكان مقدار القوة الكهربائية المؤثرة فيها (**24N**) جد مقدار المجال الكهربائي في تلك النقطة.

◀ شحنتان كهربائيتان نقطيتان موجبتان متماثلتان قوة التنافر بينهما (**90N**) والبعد بينهما (**6cm**) احسب مقدار شحنة كل منهما. علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنتان كهربائيتان نقطيتان مقدار احداهما (**2μC +**) والأخرى مقدارها (**6μC +**) والبعد بينهما (**3cm**) ، أحسب مقدار القوة التي تؤثر بها الشحنة الأولى على الشحنة الثانية ، وما نوعها؟ علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنتان كهربائيتان نقطيتان متماثلتان قوة التنافر بينهما تساوي(**10N**)عندما كان البعد بينهما **6cm** ، احسب مقدار شحنة كل منهما. علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ وضعت شحنة كهربائية نقطية وجبة مقدارها (**4μC**) على بعد (**3cm**) من شحنة كهربائية نقطية اخرى موجبة أيضاً مقدارها (**2μC**) احسب مقدار القوة التي تؤثر بها الشحنة الأولى عل الشحنة الثانية ، وما نوعها؟ علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ وضعت شحنة كهربائية نقطية موجبة مقدارها ($+5\times10^{-6}C$) على بعد (**10cm**) فأثرت الشحنة الأولى على الثانية بقوة مقدارها (**27N**) احسب مقدار الشحنة الثانية؟
علماً أن ثابت كولوم في الفراغ $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنة كهربائية مقدارها (**3μc +**) وضعت عند نقطة **P** في مجال كهربائي فتأثرت بقوة كهربائية مقدارها (**24N**) جد مقدار المجال الكهربائي في الشحنة.

◀ شحنة كهربائية نقطية موجبة مقدارها ($+2\times10^{-9}C$) وضعت عند مجال كهربائي مقداره ($4\times10^{3}N/C$) فما مقدار القوة التي تتأثر بها هذه الشحنة؟

◀ شحنتان كهربائيتان نقطيتان متماثلتان قوة التنافر بينهما تساوي ($81\times10^{-7}N$) عندما كان البعد بينهما (**10cm**) ، احسب مقدار شحنة كل منهما اذا علمت ان ثابت كولوم يساوي $k=9\times10^{9}N.m^{2}/C^{2}$

◀ شحنتان كهربائيتان نقطيتان متماثلتان مقدار كل منهما ($3x10^{-9}c$) والبعد بينهما (**5cm**) احسب مقدار قوة التنافر بينهما علماً ان ثابت كولوم يساوي $k=9\times10^{9}N.m^{2}/C$

▶ 2019 first role **:Two electrical point charge (+2μc) and (-5μc) and the distance between them is (3cm). calculate the attracting force between them** $k=9\times10^{9}N.m^{2}/C^{2}$

▶ 2019 second role: **Two-point charge (+6μc) and (+2μc) the repelling them $12x10^{-1}$N. calculate the distance between them. k=9×10^{9}N.m^2/C^2**

▶ 2019 third role: **The losing a charge from a conducted body which is isolated and neutrally charged equal ($1.6x10^{-9}$c) calculate the number of electrons that was lost from this body**

Homeworks

Q1:- Two identical Charges , If the repelling force between them (9×10^{-5}N) distance between them (10cm) calculate the charge for each one ?

Q2:- Two point charges ($q_1=+6\mu c$, $q_2=+2\mu c$) The distance between them (30cm) calculate 1- the electric force 2- Electric field which generate q_2

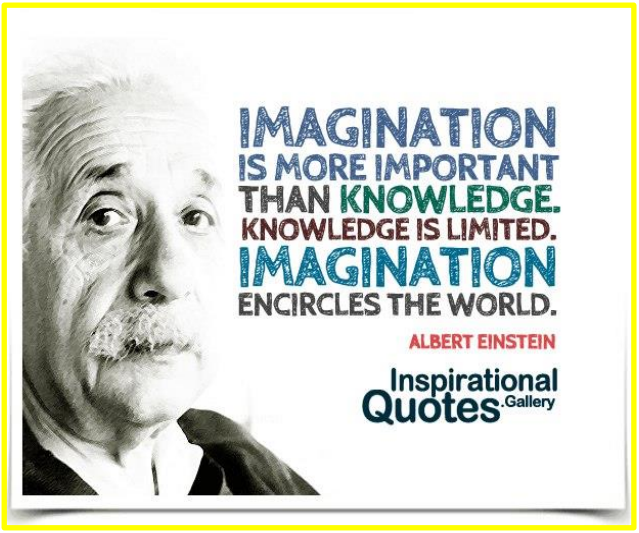
Q3:- Two point charges ($q_1=+2\mu c$, $q_2=-5\mu c$) and the distance the between them (3mm) calculate the electric force .

Q4:- Two identical charge ($10^{-9}c$) find electric force if the distance between them (10cm)

Q5 :- Two identical charge the repelling force between them (10N) and the distance between them (6cm) find the charge for each one .

Q6 : Two identical charges (10nc) and the electric Force between them ($9\times10^{-7}N$) find the distance between them ?

Q7 :- Two positive charges ($q_1=6\mu c$, $q_2=?$) , the electric Force (1.2N) and the distance between them (10cm) calculate q_2 ?



QUESTIONS CH2 حل أسئلة الفصل الثاني

Q-1 Choose the right statement for the following:

1- **A magnetic compass is used the draw the lines of a magnetic field around a certain magnet because the needle of the compass is:**

a- A small permanent magnet which can rotate freely in horizontal plane around a vertical pointed axis.

b-An electric magnet loses it magnetism after certain period of time once the electric source is cut off.

c- Made of copper.

d- A permanent magnet with a "U" shape.

1.تستعمل البوصلة المغناطيسية لرسم خطوط المجال المغناطيسي حول مغناطيس معين وذلك لأن ابرة البوصله هي:- الاختيار الصحيح :-

a مغناطيس دائمي صغير يمكنه الدوران بحرية في مستوى افقي حول محور شاقولي مدبب

2-pemanent magnets are made of the following materials:

a- Copper. **b- Aluminium.** **c- Iron.** **d- Steel.**

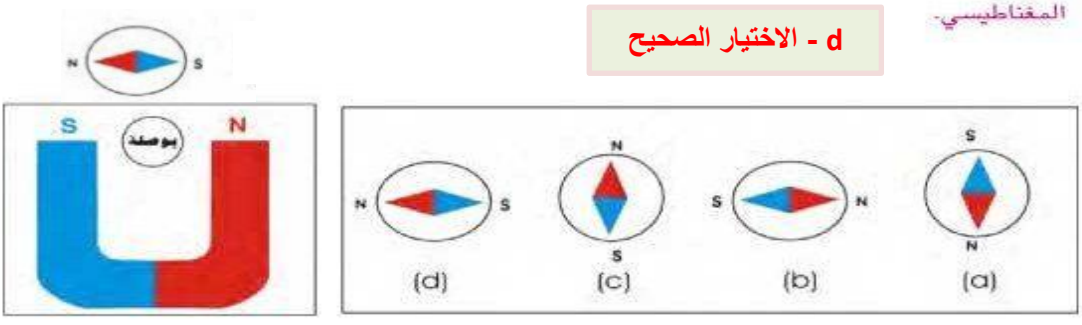
2 .المغانط الدائمية تصنع من مادة :- الاختيار الصحيح

d الفولاذ

3- A small magnetic compass placed between the two poles of permanent magnet in the shape of "U" as illustrated in the diagram. Which of the following directions will it take: The right direction which the needle can take inside the magnetic field.

3- وضعت بوصلة مغناطيسية صغيرة بين قطبي مغناطيس دائمي بشكل حرف U كما في الشكل ادناه اي من الاتجاهات التالية هو: الاتجاه الصحيح الذي تصطف به إبرة البوصلة داخل المجال المغناطيسي.

d - الاختيار الصحيح



4-Different materials are classified according to their magnetic properties :

a- Diamagnetic. **b- Paramagnetic**

c- Ferromagnetic **d- Diamagnetic ,Paramagnetic and Ferromagnetic**

4-تصنف المواد تبعا لخواصها المغناطيسية الى -: الاختيار الصحيح

d دايامغناطيسية ، بارامغناطيسية ، فيرومغناطيسية.

5- Magnetic field is represented by lines that characterized by being:

a- Unclosed

b- moving from the north pole to the south pole outside the magnet

c- Cross between them

d-Visible

5:المجال المغناطيسى يمثل بخطوط تتصف بأنها

a.غير مغلقة.

b .تتجه من القطب الشمالي الى القطب الجنوبي خارج المغناطيس b

c .تتقاطع مع بعضها

d. مرئية

6- when a magnet bar is cut into small pieces:

a- We get small non-magnetized pieces.

b- Each piece will have only one magnetic pole either north or south.

c- Each piece will have four magnetic poles, two north poles and two south poles.

d- Each piece will have two magnetic poles, one north and one south.

6.عند تقطيع ساق مغناطيسية الى قطع صغيرة

a.نحصل على قطع صغيرة غير ممغنطة

b.تمتلك كل قطعة منها قطب مغناطيسي واحد أما قطب شمالي او قطب جنوبي

c.تمتلك كل قطعة منها اربعة اقطاب مغناطيسية قطبان شماليان وقطبان جنوبيان

d. تمتلك كل قطعة منها قطبين مغناطيسيين احدهما شمالي والاخر جنوبي d

Q2 Explain why the magnets are used on the wardrobe and fridge doors?

Because the wardrobe and fridge made of ferromagnetic materials therefore its will be attract with the magnet.

س٢ علل/ في كثير من الاحيان تكون المغانط ملائمة للأستعمال في أبواب خزانات الملابس والثلاجة ؟

لان أغلب خزانات الملابس والثلاجات تصنع من مادة فيرومغناطيسية لذلك نضع على حافة أبوابها مغانط لكي تنجذب الباب نحو الخزانة وتغلق بإحكام

Q3: If you were given three identical bars which were aluminium, iron and a permanent magnet explain how you can distinguish one from the other

1- Put tree bars together with them, we observed that two bars attracted to each other they are iron and magnet, but third bar was not attracted to them it is aluminium.

2- Put one of the two attracted bars at horizontal level and near another bar to meddle of the first what do you observe?

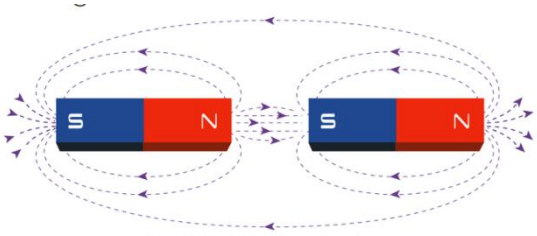
If the bars attracted then the first horizontal bar is iron and other is magnet.
If the bars do not attract then the first horizontal bar is magnet and other is iron

س٣ :لو أعطي لك ثلاث سيقان معدنية متشابهة تماماً احداهما ألمنيوم والاخرى حديد والثالثة مغناطيس دائمي، وضح كيف يمكنك أن تميز الواحدة منها عن الاخريات

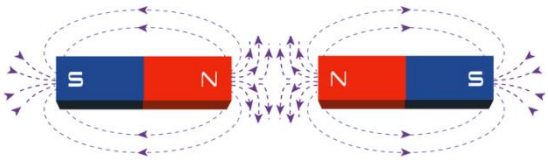
ج/١.نقرب السيقان الثلاثة من بعضها البعض سيتجاذب إثنان من السيقان هما الحديد والمغناطيس أما الثالث فهو المنيوم لانه لم يتأثر بالمغناطيس

٢ .نضع أحد الساقين اللذان تجاذبا بشكل أفقي ونقرب من منتصفه طرف الساق الاخر فأن حصل تجاذب فالساق الذي قربناه من الساق الافقي هو المغناطيس لان القطب المغناطيسي يكون في الاطراف وإذا لم يحصل التجاذب فالساق العمودي حديد والساق الافقي مغناطيس

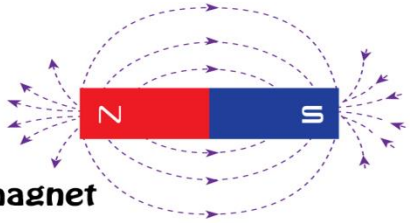
Q4:- Draw a diagram explaining the lines of magnetic fields for the following diagrams:



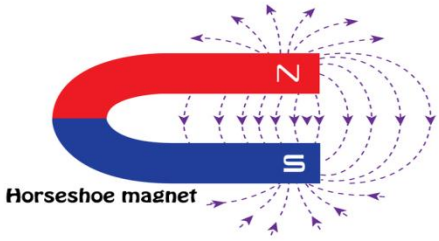
Two Unlike Poles Together Attract



Two Like Poles Together Repel



Bar magnet



Horseshoe magnet

Think :- **What is the purpose of connecting the electric cells (batteries) in**

1- parallel 2-Series 3- Mix ?

cells in series		cells in parallel
1-In this kind of connection cells , the positive pole of the first cell will be connected with negative pole of the second cell and the positive of the second cell with negative of the third cell and so on		1- In this kindof connection cells all the positive poles will be connected togather and all negative poles will also be connected togather
2 -To supply higher voltage (**large emf**) This is a result of adding the voltage of the cells. $(V_t = V_1 + V_2 + V_3 \ldots\ldots)$		2- The total voltage is equal to the voltage for the one cell equal $(V_t = V_1 = V_2 = V_3 \ldots \ldots)$
3- The total electric current is equal to the electric current for the one cell $(I_t = I_1 = I_2 = I_3 \ldots \ldots)$		3 - To supply electric current . This is a result of adding the currrent of the cells. $I_t = I_1 + I_2 + I_3$

Questions of chapter Three

حل اسئلة الفصل الثالث

Q1/ Choose the correct statement for the following:

1-The characteristics of connecting lamps in parallel are

a- When one lamp is off other lamps will remain on
b- All lamps are directly connected to the battery
c- There are many paths through which the current can flow
d- All the above

1-من خصائص المصابيح المربوطه على التوازي :-
a- عند انطفاء احد المصابيح فان الاخرى تبقى تعمل و لا تنطفئ
b- كل المصابيح تربط مباشرة للبطاريه
c-هناك اكثر من مسار للتيار
d-كل ما سبق صحيح

2- Increasing the number of connected resistance which are connected in parallel between the two poles of a battery in an electric circuit, then one of the statement will be correct:

a- The total potential difference will decrease across each resistance.
b- The current flow will increase in all resistance.
c- The equivalent resistance will decrease.
d- The total potential difference will increase through each resistance.

2-عند زيادة عدد المقاومات المربوطة مع بعضها على التوالي بين قطبي بطارية في دائرة كهربائية،
فإن احدى العبارات الاتية صحيحة :-

a-يقل مقدار فرق الجهد الكهربائي عبر كل مقاومة
b .يزداد مقدار التيار المنساب في جميع المقاومات
c .يقل مقدار المقاومة المكافئة للمجموعة
d . يزداد مقدار فرق الجهد الكهربائي الكلي عبر المقاومة المكافئة

الجواب a :يقل مقدار فرق الجهد الكهربائي عبر كل مقاومة

3- Increasing the number of resistance which are connected in series in an electric circuit containing a battery:

a- The amount of potential difference will be same each resistance.

b- The amount of potential difference will increase of equivalent resistance.

c- The amount of current flow will be equal in all resistance.

d- The equivalent resistance will decrease.

3.عند زيادة عدد المقاومات المربوطة مع بعضها على التوازي في دائرة كهربائية تحتوي نضيدة

a.يتساوى مقدار فرق الجهد الكهربائي بين طرفي كل مقاومة

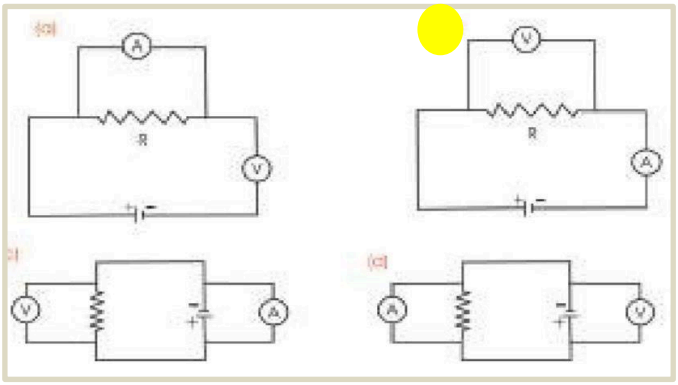
b.يزداد مقدار فرق الجهد الكهربائي بين طرفي المقاومة المكافئة

c.يتساوى مقدار التيار المنساب في جميع المقاومات

d.يزداد مقدار المقاومة المكافئة .

الجواب a :يتساوى مقدار فرق الجهد الكهربائي بين طرفي كل مقاومة

4- Which one of the following circuits in regarded as correct when used to measure small resistance by connecting an Ammeter and Voltmeter. Look at the indicated figure:



4.أي مخطط من مخططات الدوائر الاتية تعد صحيحة عند استعمالها لقياس مقاومة صغيرة بربط الاميتر والفولتميتر، لاحظ الشكل المجاور.

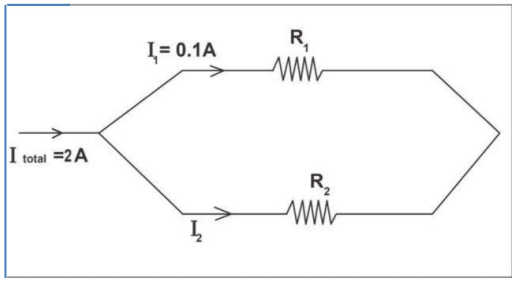
الجواب b

5- The electric current flow (I_2) in resistance (R_2) in the electric circuit diagram given below equals:

a- 0.1 A **b- 2 A** **c- 2.1 A** **d- 1.9A**

5.ان مقدار التيار الكهربائي(I_2) المنساب في المقاومة (R_2) لاحظ في مخطط الدائرة الموضحة بالشكل المجاور يساوي :

$$I_t = I_1 + I_2 \rightarrow I_2 = 2 - 0.1 = 1.9A$$



6- If the reading of the Ammeter connected to the circuit in the diagram is (6A) the reading of the Voltmeter in this circuit equals:

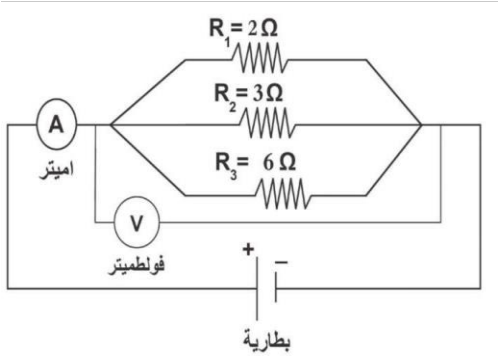
a- 6V **b- 12 V** **c- 18 V** **d- 3 V**

6.اذا كانت قراءة الاميتر المربوط في الدائرة من الشكل تساوي (6A) فإن قراءة الفولتميتر في هذه الدائره =

(6V) .a (12V) .b (18V).c (3V).d

$$\frac{1}{R_{eq}} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6} \rightarrow R_{eq} = \frac{6}{6} = 1\Omega$$

$$V_t = I_t \times R_{eq} = 6 \times 1 = 6V$$



7- One of these is the unit for measuring the electric resistance:

a- Ampere/Volt **b- Volt/Ampere** **c- Volt x Ampere** **d- Coulomb/second**

7- احدى الوحدات الاتية هي وحدة قياس المقاومة الكهربائية: (جواب b)

$$R = \frac{V}{I} = \frac{\text{Volte}}{\text{Ampere}} = \Omega$$

7- Electric resistance for a conductor cable does not depend on:

a- Cable's diameter. **b- Length of the cable.**

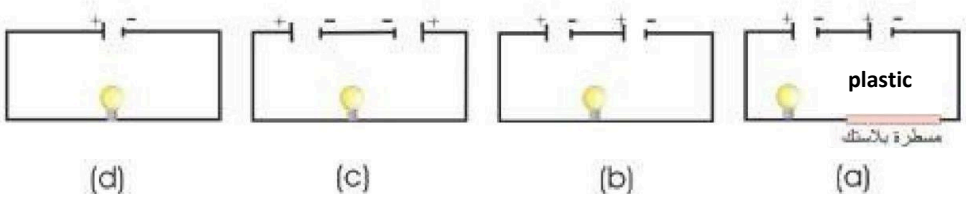
c- The type of material of the cable. **d- The electric current flow in the cable**

7-لا يعتمد مقدار المقاومة الكهربائية لسلك موصل على

a.قطر السلك b. طول السلك c. نوع مادة السلك d. التيار الكهربائي المنساب في السلك

الجواب d: التيار الكهربائي المنساب في السلك.

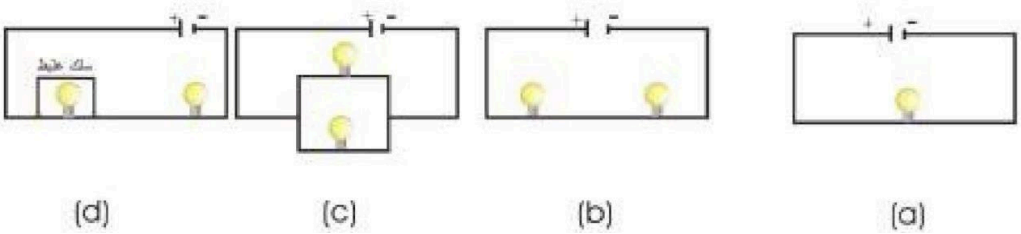
8- The batteries in the following electric circuit are identical. Explain in which one the lamp glow sharper:



8.اذا كانت الاعمدة في الدوائر الكهربائية التالية متماثلة، وضح في أي منها يكون توهج المصباح أكبر؟

الجواب b: يكون توهج المصباح أكبر

9- The electric lamps in a circuit are identical. Which of the lamps glow weaker?



9.اذا كانت المصابيح الكهربائية في الدوائرالكهربائية التالية متماثلة، وضح في أي منها يكون توهج المصباح او المصباحين ضعيفا؟

الجواب b: توهج المصباحين يكون ضعيفا.

10- In this diagram a thick cable has been connected to the sides of the second lamp (between the points c , b):

a- The second light will be off with the resistance(R2) increasing the flow of the first light of resistance(R1) will increase.

b- The second lamp is off Resistance(R1) will increase the glow of the second lamp with resistance(R2) will increase .

c- No difference in the glow of the tow lamps ($R1$) or ($R2$) .

d- Both of the lamps the will be off ($R1$) and ($R2$).

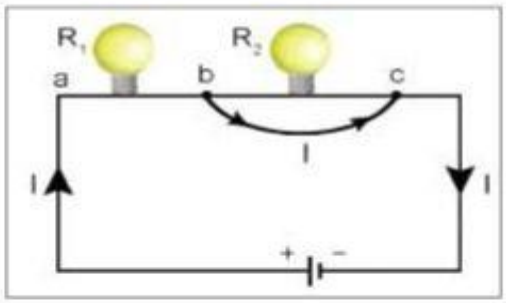
10- في الشكل المجاور، ربط سلك غليظ بين طرفي المصباح الثاني (بين النقطتين b و c). نلاحظ:

a- إنطفاء المصباح الثاني ذو المقاومة (R_2) مع زيادة توهج المصباح الأول ذو المقاومة(R_1).

b- إنطفاء المصباح الأول ذو المقاومة (R_1) مع زيادة توهج المصباح الثاني ذو المقاومة(R_2)

c- لا يتغير توهج أي من المصباحين (R_1) و (R_2).

d- إنطفاء كل من المصباحين (R_1) و(R_2).



الجواب a .انطفاء المصباح الثاني ذو المقاومة (R2) مع زيادة توهج المصباح الاول ذو المقاومة(R1)

Q2 To measure the electric current flow in a circuit/circle, an Ammeter is required. Is the Ammeter connected in series or in parallel in this circuit? Explain.

▶The Ammeter must be connected in series, to allow all the electric charge pass in the part where the Ammeter is located.

س٢: أذا أرادنا قياس التيار الكهربائي المنساب في حمل بإستعمال جهاز الاميتر، هل يربط الاميتر في هذه الدائرة على التوالي أم على التوازي؟ وضح ذلك؟

◄ربط جهاز الاميتر على التوالي ليسمح لجميع الشحنات المنسابة في ذلك الجزء من الدائرة بالمرور خلال الأميتر المربوط معه

Q3 Why is the preferable to connect the lamps and the other equipment in the electric circuit in the house in parallel?

The reasons are

1- All one of the other lamps are directly connected to the any one lamp of lamps will get the same electric potential difference source.

2-There are many paths through the electric circuit

3- When one lamp is off or remove the other lamps will not be affected and remain on.

س٣ لماذا يفضل ربط المصابيح وألاجهزة الكهربائية في الدوائر الكهربائية في المنازل على التوازي

ج/ وذلك للاسباب التاليه :-

1.تربط جهز جميع الأجهزة المنزلية مباشرة لمصدر واحد لذلك تعمل بفولتية واحده

2. هناك اكثر من مسار للتيار الكهربائي

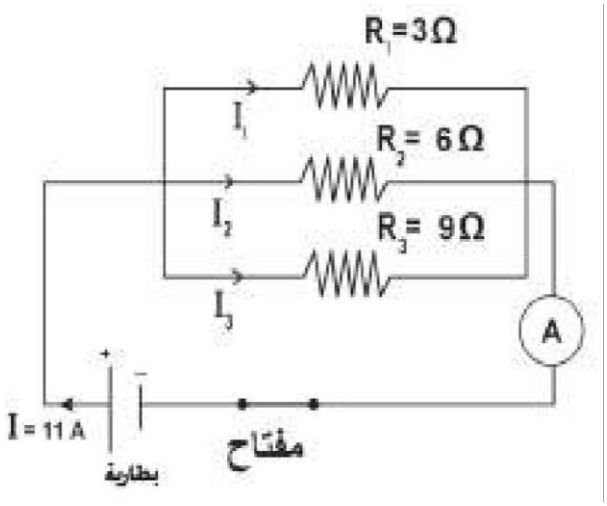
3 . وكذلك عند عطب تلف أو رفع أحد ألاجهزة الكهربائية فإن جميع الأجهزة الكهربائية الاخرى المربوطة معه العطب على التوازي تستمر بالعمل وذلك لتوقف التيار الكهربائي فقط في فرع الجهاز الذي أصاب

Problems – Chapter 3

P-1 What is the current flow through the cross section in a conductor passing through its electrical charges of 9μ in time (3μs)

$$\mathbf{I = \frac{q}{t} \Rightarrow I = \frac{9\mu c}{3\mu s} \Rightarrow I = 3A}$$

P-2 By observing the diagram calculate: (a)The equivalent resistance for all the resistance which are connected in the electric circle. (b)The potential difference at the ends of each of the resistance. (c)The amount of current of current flow in each



a

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

$$\frac{1}{R_{eq}} = \frac{1}{3\Omega} + \frac{1}{6\Omega} + \frac{1}{9\Omega}$$

$$\frac{1}{R_{eq}} = \frac{6+3+2}{18}$$

$$\frac{1}{R_{eq}} = \frac{11}{18} \rightarrow R_{eq} = \frac{18}{11}\Omega$$

b

$$R = \frac{V}{I} \rightarrow V_t = R_t \times I_t$$

$$V_t = \frac{18}{11} \times 11$$

$$V_t = 18V = V_1 = V_2 = V_3$$

C

$$I_1 = \frac{V_1}{R_1} \Rightarrow I_1 = \frac{18}{3} = 6A$$

$$I_2 = \frac{V_2}{R_2} \Rightarrow I_2 = \frac{18}{6} = 3A$$

$$I_3 = \frac{V_3}{R_3} \Rightarrow I_3 = \frac{18}{9} = 2A$$

P-3 The two resistance are (R and 2Ω) connected in series with each other, then they were to the sides of a source of potential difference 12V. this led to the flow of electric current in the circle of 2A. calculate the amount: (a) the electric resistance R. (b)potential difference at the end of the resistance.

$$R_{eq} = \frac{V_t}{I_t} = \frac{12}{2} = 6\Omega$$

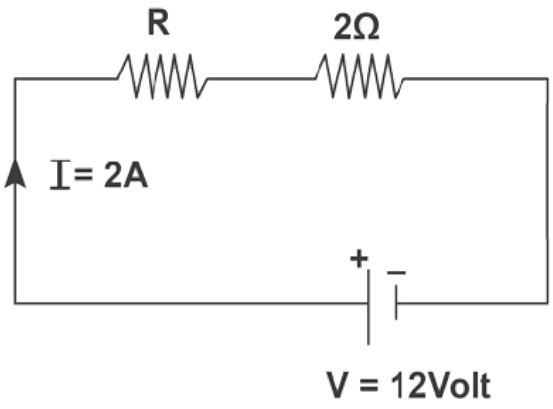
$$R_{eq} = R_1 + R_2$$

$$6 = R_1 + 2 \Rightarrow R_1 = 6 - 2 = 4\Omega$$

$$I_t = I_1 = I_1 = 2A$$

$$V_1 = R_1 \times I_1 = 4 \times 2 = 8V$$

$$V_2 = R_2 \times I_2 = 2 \times 2 = 4V$$



Questions - chapter 4

Q1: Choose the correct statement for the following:

1. The unit of the electromotive force (emf) is Volt (V) and equals:

a) A/C b) J/C c) C/s d) C/J

2. The simple Galvano cell is:

a) Primary battery. b) Secondary battery.
c) Fuel battery. d) Rechargeable battery.

3.: A car battery of (12V) is consist of six cells connected to each other:

a) All in series.
b) All in parallel.
c) Three cells in parallel and three cells in series.
d) Two cells in series and four cells in parallel.

4. In (Lithium – ion) batteries, the insulation boards between its two poles will carry:

a) Allow ions to pass through it.
b) Allow electrolyte solution to pass through it.
c) Allow the ions and electrolyte solution to pass through it.
d) Does not allow any of the above to flow.

5. When charging a car battery, the amount of:

a) Source voltage must be slightly greater than the electromotive force (emf) for the battery.
b) Source voltage must be less than the electromotive force (emf) for the battery.
c) The source voltage equals (emf) for the battery.
d) The source voltage is much greater than (emf) for the battery

6. Hydrogen fuel cell converts:

a) Electric energy to chemical energy.
b) Chemical energy to electrical energy.
c) Light energy to chemical energy.
d) Electrical energy to light energy.

Q2: What is a secondary battery? Give an example?

This is a kind of electric battery which can be recharged. During its function, the chemical material inside it react, and then the chemical energy stored in the battery will be converted into electric energy.

An example of this types is:

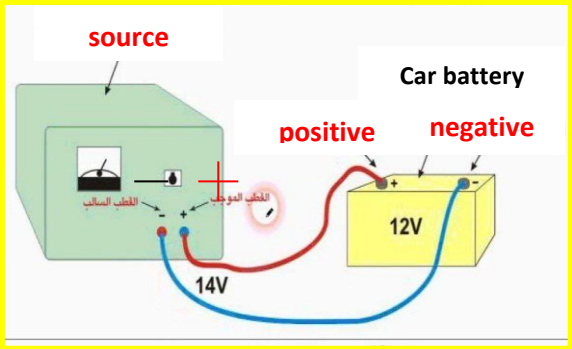
1) Car batteries.

2) (Ion – lithium) batteries

Q3:What is the type of energy stored in a secondary battery?

The chemical energy stored in the battery will be converted into electric energy

Q4 :- Explain by diagram the process of charging a car battery?



Q5 What procedures are needed in order to maintain the car battery?

1) Avoid extracting high current from the car battery for long period of time. Because that will generate a large amount of temperature which damage the battery.

2) The level of the acid solution (electrolyte) must be slightly higher than the level of the battery plates.

3) The battery should not be left for long time without usage because that would cause making an insulation layer of sulphate on the boards.

Q6: List four pieces of device's in which a dry battery is used?

Dry cell is used in:

(1) Torches.

(2) Generating electric pulse units for remote controls.
(3) Cameras.
(4) Electric children's toys.

Q7: What are the properties of hydrogen fuel?

1) It does not contaminate the environment or the consumption of ordinary fuel which can affect the human health because hydrogen is extracted from water by oxidation, and returns to water again.
2) hydrogen technology does not contain dangerous factors. It safe to use.
3) It has a very high working efficiency. It directly converts the chemical energy to electrical one. So there is no loss of energy.
4) It lasts very long compared to the other kinds of batteries.

Q8 What are contents of: a) Dry battery . b) Lithium – ion

a) Dry battery consists of:

- **It is a cell which is dry medium.**
- **It consists of a vessel of zinc, acts as a negative pole.**
- **There is a bar of carbon inside zinc vessel which acts as a positive pole.**
- **The carbon bar is surrounded by electrolyte paste (made of ammonium chloride, zinc chloride, water, manganese dioxide and carbon powder).**
- **The vessel is closed with an insulated lid.**

b) Lithium – ion battery consists of:

(1) A solid cover especially designed to resist high pressure and the heat which generated inside the battery.
(2) The cover contains three thin layers wrapped in a spiral way.
These layer represent:
(a) The positive pole, (Made of oxide lithium cobalt)
(b) Insulation, (of plastic material).
(c) negative pole, (made of carbon).
(3) The three layers are sunk in electrolyte solution (mostly Ether).

Problems -chapter -4

P1: Calculate the amount of work spent on a moving charge of (2C) in an electrical circuit containing a battery with electromotive force (emf) (1.5v).

$$\text{emf} = \frac{W}{q} \Rightarrow 1.5 = \frac{W}{2} \Rightarrow W = 1.5 \times 2 \Rightarrow W = 3J$$

P2: The electromotive force (emf) for a battery (12v) and the amount of work supplied by the battery in order to move a charge (q) (120J). Calculate the amount of moving charge (q).

$$\text{emf} = \frac{W}{q} \Rightarrow 12 = \frac{120}{q} \Rightarrow q = \frac{120}{12} \Rightarrow q = 10C$$

Questions – Ch5

حل اسئلة الفصل الخامس

Q1: Choose the correct statement in the following:-

1. The fuse must be connected:

a. In series with the live wire.
b. In series with the neutral wire.
c. With the earthed wire.
d. In parallel with the live wire.

2. (kW-h) is a unit of:

a. Power. **B. Potential difference.** **c. Resistance.** **d. Electric energy.**

3. One of the following is not a unit of electric power:

a. J/s **b. Watt.** **c. A x V** **d. J x s**

4. An electric teapot uses (1200W) if the current which flows in the teapot is (5A), what is the voltage which the system work on:

a. 60 V **b. 120 V** **c. 240 V** **d. 600V**

$$P = IV \rightarrow \quad 1200 = 5 \times V \rightarrow \quad V = \frac{1200}{5} = 240V$$

5. Electrical device consumes energy (18000J) in five minutes. The rate of power consumed is:

a. 360 Watt. **b. 180 Watt.** **c. 30 Watt.** **d. 60 Watt.**

$$P = \frac{E}{t} = \frac{18000}{5 \times 60} = 60W$$

Q2: Give the reason of the following:

1. The fuse is connected to the electrical circuit of the house in series with the live wire before providing the electric device with electric energy

▶ **It is used to protect the electric device by cut off the current when there is a current flow more than a certain current flow**

2.Electric device will be earthed, especially the ones with metal covers.

▶ **for the electric safety to avoid the electric shock**

3. A bird can stand on a live wire which has very high power without being shocked.

▶ **Because the resistance of the bird is very large at the point of touch, and the resistance of wire is very small that lead to the electric current flow in the smallest resistance (wire) but not in bird (large resistance)**

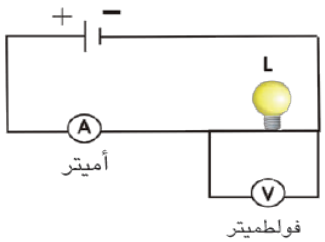
Q3: Is the fuse connected in parallel or in series in the electric circuit of the required device that you want it to be safe? Why?

▶ **The Fuse must be connected in series with the live wire before the current enter the device. to protect the electric device by cut off the current when there is a current flow**

Problems – Ch5

حل مسائل الفصل الخامس

P1 **The nearby diagram represents an electric containing a lump (L), Voltmeter an Ammeter. If the reading of the Voltmeter is (3V) and the reading of the Ammeter is (0.5A) calculate: a) The lump resistance. b) The lump power**



(1) $R = \frac{V}{I} = \frac{3}{0.5} = 6\Omega$

(2) $P = I \times V = 0.5 \times 3 = 1.5 Watt$

P2 **Two resistance (180Ω and 90Ω) are connected to each other in parallel. The set is connected to a source with a potential difference (36V). Calculate:**
a) The current which flows in each resistance.
b) The consumed power in each resistance by to different methods. Compare between the two quantities of consumed power in resistance. What can you conclude

a) $I_1 = \frac{V}{R_1} = \frac{36}{180} = 0.2A$

$I_2 = \frac{V}{R_1} = \frac{36}{90} = 0.4A$

b) $P_1 = I_1 \times V = 36 \times 0.2 = 7.2 watt$

$P_2 = I_2 \times V = 36 \times 0.4 = 14.4 watt$

Or

$P_1 = I_1^2 R_1 = 0.2 \times 0.2 \times 180 = 7.2 watt$

$P_2 = I_2^2 R_2 = 0.4 \times 0.4 \times 90 = 14.4 watt$

$\frac{P_2}{P_1} = \frac{14.4}{7.2} \Rightarrow \frac{P_2}{P_1} = 2 \Rightarrow P_2 = 2P_1$

Q3: A lump has following properties (24W), (21V). Calculate in (kW-h) the consumed energy during a time period of (10 hours)

$P=24watt/1000=0.024\ Kw$

$E=P\times t$

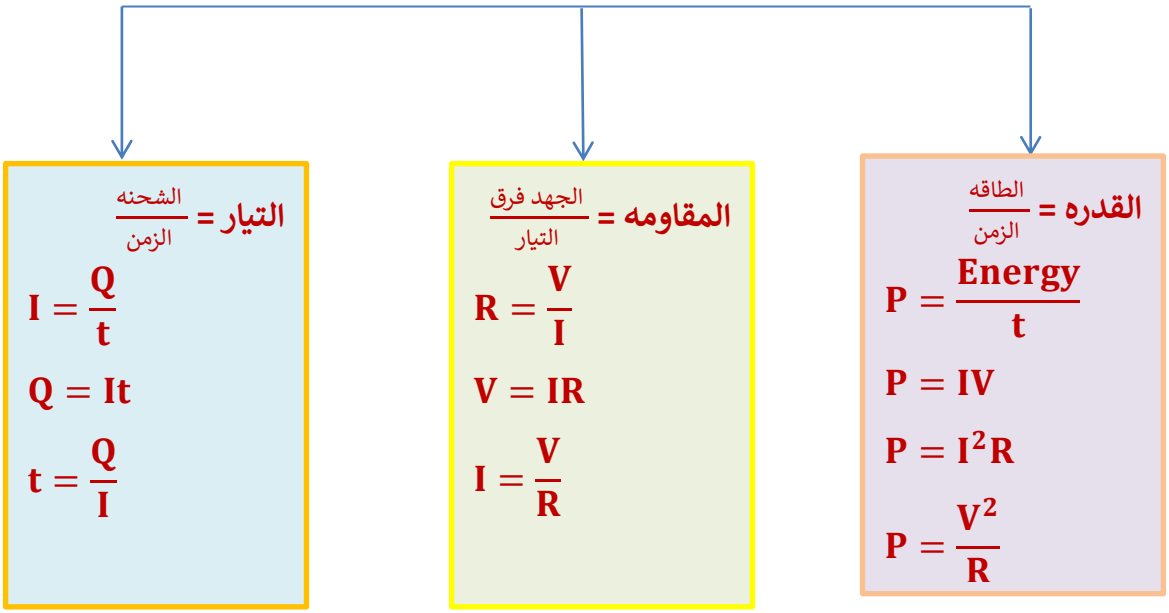
$E=0.024\times 10=0.24\ KW\text{-}h$

P4: An electric boiler consumes power of (2kW). It worked for (6 hours). What is the cost of consumed energy if the price of 1 (kW-h) is 100 Dinars?

$Cost_{(Dinar)}=P_{(KW)}\times t_{(h)}\times U.Price_{(Dinar/KW\text{-}h)}$

$Cost_{(Dinar)}=2_{(KW)}\times 6_{(h)}\times 100_{(Dinar/KW\text{-}h)}$

$Cost_{(Dinar)}=1200\ Dinar$



Question of chapter – 6- حل اسئلة الفصل السادس

Q-1 Choose the correct statement for the following:

1) Induced electro motive force (emf) is generated as a result of changing in:

a) Electric field. **b)** Magnetic field.

c) Electric potential difference. d) Mechanical force.

2) The induced electric current in a wire coil circuit increases if:

a) The magnet is moved slowly inside the coil.

b) The magnet is moved faster inside the coil.

c) The magnet is fixed in the coil.

d) The coil is pulled slowly away from the magnet

3) An alternating current generator can be transferred to a direct current generator. This is can be done by lifting the two slippery rings away and connecting the two ends of the coil to the:

a) Exchanger. b) Electric lamp. c) Thick wire. d) Voltmeter.

4) The electric generator converts the mechanical energy to:

a) Chemical energy. **b)** Electric energy.

c) Magnetic energy. d) Lightening energy.

5) Electric motor converts the electric energy to:

a) Mechanical energy. b) Chemical energy.

c) Magnetic energy. d) Light energy

6) Which one of the following do not increase the electromagnetic force for a coil:

a) Entering a copper bar inside the coil space.

b) Entering an iron bar inside the coil space.

c) Increase the number of wrapping in the coils per length unit.

d) Increasing the amount of current flow in the coil.

7) Insulated conducted wire is wrapped around soft iron nail. The two ends of the wire are connected to a battery with a proper voltage. Which one of the following statements is not true for this case:

a) The nail will be a permanent magnet.

b) One end of the nail will be a north pole and the other a south pole.

c) The nail generators magnetism around it.

d) The magnetic field of the nail will disappear after a period of time when the current is cut of

8) The moving electric charges generate:

a) An electric field only.

b) Only a magnetic field.

c) An electric and a magnetic field

Q2 In which way does the electromagnet differ from a permanent magnet?

Electromagnet		Permanent magnet
Made of iron		Made of steel
Its poles reverse with the current direction		Its poles do not reverse.
Its magnitude is variable with magnitude of the current flowed		The magnitude is constant
Used to lift pieces of steel or scrap metal		Cannot used

Q3 In the nearby diagram, a magnetic bar is moving inside the coil space?

a. Why does the electric current flow in the milli-ammeter which is connected between the two ends of the coil?

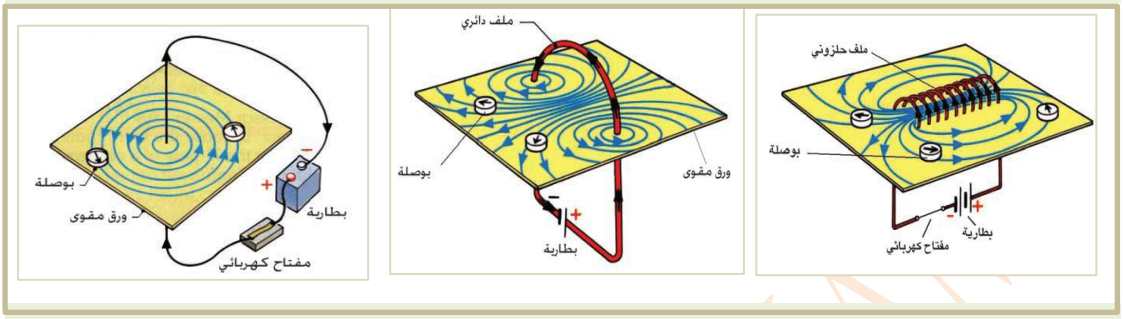
b. What is the source of the electric energy generated in the circuit

(a) Generating an induced current in the closed circuit is due to an induced potential difference generated at the two ends of a conductor called induced electromotive force (induced emf). This is measured in volt

(b) The source of the induced electromotive between two points of circle as result of external work to overcome the stomach force for magnetic motion.

Q4 Draw a diagram illustrating the lines of the magnetic force for a magnetic field produced by electric direct current flow in

1. A straight conductor wire.
2. A ring conductor wire.
3. A wire coil in a spiral shape.



Q5 Explain (with giving reasons) in which of the following two cases a straight conducted wire with an electric current flow will be affected by a magnetic force when placed inside a regular magnetic field:

1. The length of perpendicular wire to the magnetic field lines.

2. The length of perpendicular wire parallel to the magnetic field line

(1) it is effected by magnetic force when it is putting perpendicular inside regular magnetic field.

(2) Do not effect with any magnetic force. (the reason is not any deformation in the magnetic field).

Q6 The magnetic field of a coil with electric direct current field increases when a piece of iron is placed inside it. Give your reasons.

Because the iron ferromagnetic material so the magnetic flux increases through .

Q7 What are the basic components of:

a) An electric generator.

b) An electric motor.

a) Electric generator consist of:

1- A coil of conducted wire, insulated and wrapped around an iron core.

2- Two insulated metal rings or exchanger.

3- Two carbon brushes.

4- A permanent magnet or electromagnet in a (U) shape.

b)Electric motor consist of:

1- The core of the motor: This is made of a coil of isolated copper wire contained a piece of iron.

2- A permanent strong magnet where the coil is placed between its two poles.

3- Commutator: This is the two halves of a metal ring isolated electrically and they are connected to the ends of the wire of the rotated core coil

4- Two brushes of carbon touching the two halves of the exchanger and they connected to the two poles of electric direct current.

Q8 What are the principles of the functioning of each of the following:

a) An electric motor. b) An electric generator.

a) The electric motor depends on the principle of: The magnetic force in the wire in which the direct electric current flows.

b) The electric generator depends on the principle of: Induced Electromagnetism phenomena. (generating an electric impulse (emf) in a coil around the heart of wrought iron when rotating in a regular magnetic field)

Q9 What is the difference between the alternating current generator and a direct current generator respect to:

a) The consisting parts.

b) The output current from them.

a) The difference is that the two rings use in alternating generator. But in direct current generator use of the two halves of the metal ring is electrically isolated from each other, and they join the two ends of the core coil, called the commutator

b) Alternating current generator: it has variable amount and direction of current.

Direct current generator: it has constant direction and variable amount of current.

QUESTIONS - Chapter (7)
حل أسئلة الفصل السابع

Q-1 Choose the correct statement for the following?

1.)The alternating current flows in the secondary coil of an electric transformer is an induced current is generated by:

a. A changing electric field.

b. A changing magnetic field through the iron core.

c. An iron core of the transformer.

d. Coil's movement

2.) The ratio between the voltage of a secondary coil and the voltage of a primary coil in an electric transformer does not depend on:

a. The ratio of the turns number in the two coils.

b. The resistance of wires in the two coils.

c. The output voltage from the primary coil.

d. The output voltage from the secondary coil

3.) If the turns number in a primary coil in an ideal transformer is 800 turn and the secondary coil of 200 turn and the current which flows in the secondary coil is 40 A, then the current which flows in the primary coil is:

a. 10A b. 80A c. 160A d. 8000A

$$\frac{N_2}{N_1} = \frac{I_1}{I_2} \rightarrow \frac{200}{800} = \frac{I_1}{40} \rightarrow I_1 = \frac{200\times40}{800} = 10A$$

4.) An electric transformer has two coil, the turns number of a secondary coil in is 300 turn and the turns number of its primary coil is 6000 turn. If the alternating voltage around its primary coil is 240V, then the output voltage from its secondary coil is:-

a.12V b.24V c.4800V d.80V

$$\frac{N_2}{N_1} = \frac{V_2}{V_1} \rightarrow \frac{V_2}{240} = \frac{300}{6000} \rightarrow V_2 = \frac{3\times240}{60} = 12V$$

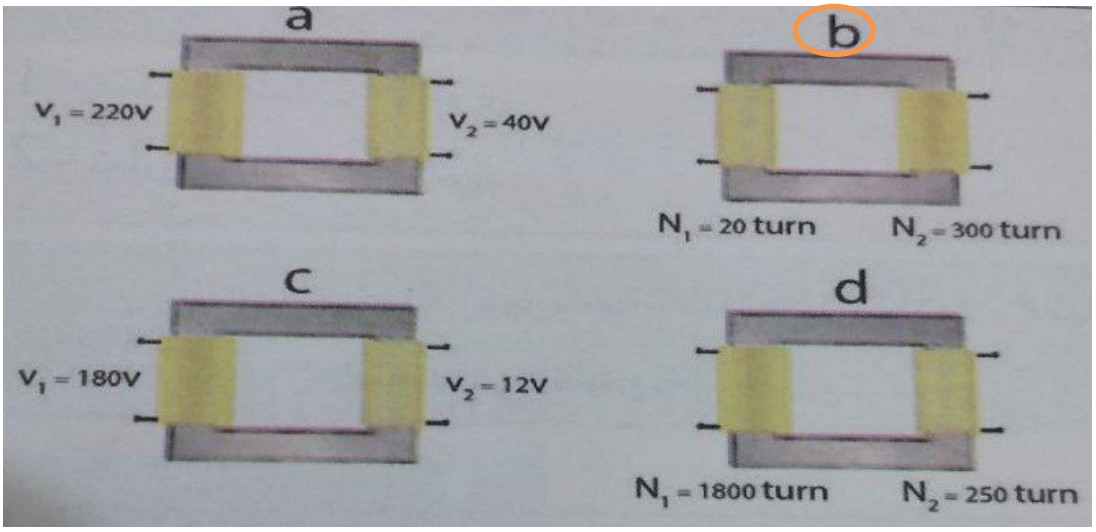
5.An ideal electric transformer (its loss is neglected) has 600 turn in the primary coil and the turns number in the secondary coil is 1800 turn and the input alternating power in its primary coil is 720W with a voltage of 240V. Then its secondary coil current is:

a.1A b.3A c.0.1A d.0.3A

$$P_1 = I_1 \times V_1 \rightarrow I_1 = \frac{P_1}{V_1} = \frac{720}{240} = 3A$$

$$\frac{N_2}{N_1} = \frac{I_1}{I_2} \rightarrow \frac{1800}{600} = \frac{3}{I_2} \rightarrow I_2 = \frac{3\times600}{1800} = 1A$$

6-) The following diagram shows four types of electric transformer. According to the information which given under each Figure, show which one of them will be a step- up transformer



Q2 : What is the differences between the step up transformer and the step down transformer?

Step –down		Step-up
1.The turns number in the secondary coil (N2) will be less than the turns number in the primary coil (N1). عدد لفات ملفها الثانوي أقل من عدد لفات ألابتدائي.		1.The turns number in the secondary coil (N2) will be greater than the turns number in the primary coil (N1). عدد لفات ملفها الثانوي أكبر من عدد لفات ألابتدائي
2.The output voltage from the secondary coil (V2) will be less than the input voltage (V1) in the primary coil. الفولتية الخارجة من ملفها الثانوي أقل من الفولتية الداخلة في ملفها إلابتدائي.		2.The output voltage from the secondary coil (V2) will be greater than the input voltage (V1) in the primary coil. الفولتية الخارجة من ملفها الثانوي أكبر من الفولتية الداخلة في ملفها إلابتدائي
3.The output current from the secondary coil (I_2) will be greater than the input current (I_1) in the primary coil. التيار الخارج من ملفها الثانوي أكبر من التيار الداخل الى ملفها إلابتدائي.		3.The output current from the secondary coil (I_2) will be less than the input current (I_1) in the primary coil. التيار الخارج من ملفها الثانوي أقل من التيار الداخل الى ملفها إلابتدائي.
4. $N2/N1$ is less than one. نسبة التحويل ($N2/N1$) أصغر من واحد.		4. $N2/N1$ is greater than one. نسبة التحويل ($N2/N1$) أكبر من واحد

Q3: What is the basic function of the electric transformer?

(Mutual Induction phenomena)-transformers use the properties of magnetic induction to change a varying current in a primary coil into a new current in a secondary coil

Q4: Explain how the electric transformer operates to change the voltage.?

It is a device which operates to rise or reduce the alternative voltage (changing the amount of alternating voltage)

When ($N2 > N1$)it is called (step – up) and it rise the voltage and reduce the current.

But when ($N2 < N1$)it is called (step – down) and it reduce the voltage and rise the current

Q5: Where can the electric transformers be used?

1. Step up 2. Step down

Step-up-transformer: Which are used in:

(1) Used in TV to supply high voltage to the electronic shooter of screen.

(2) Also use this kind of transformer when they transmit electric power to the cities.

Step-down transformer: Which are used in:

(1) The input voltage of the houses.

(2) Electric welding.

(3) The mobile phone transformers (chargers)

Q6: Explain the economic advantage of transforming electrical power to far distances with a high voltage and low current.

To minimize Loss as a result of wires resistance of the two coil

Q7: Why does the electric transformer need alternating current in order to operate?

When an alternative current flows in the primary coil for the transformer, this will generate a varied magnetic field inside the iron core. This field penetrates the second and the primary coils. The electromotive produced and induced current flow in secondary coil.

Q8: Does the electric transformer operate if a battery is used between the two ends of its primary coil? Explain that.

Does not operate when a battery used between the two ends of its primary coil because no change happens in the magnetic field inside the iron core

Q9: In order to supply a large factory with electric power by a generating station the factory is far from the generating station in a certain distance, what is the kind of electrical trans former used

1- At the beginning of the power transforming lines in the generating station.

2- At the end of the power transforming lines before reaching to the factory

1- Used Step-up-transformer.

2- Used Step-down-transformer

The Problems

P-1 A transformer with an efficiency of 100% and the rate of transformation is (1/ 2) operates on an alternating voltage of (220V). The current which flows in its secondary coil is (1.1A) calculate:

1. the voltage of the secondary coil
2. The primary coil current.

$$\frac{N_2}{N_1} = \frac{V_2}{V_1} \rightarrow \frac{1}{2} = \frac{V_2}{220} \rightarrow V_2 = 110V$$

$$\frac{N_2}{N_1} = \frac{I_1}{I_2} \rightarrow \frac{1}{2} = \frac{I_1}{1.1} \quad I_1 = \frac{1.1}{2} = 0.55A$$

P-2 An electric transformer has an efficiency of (80%) and the output power is (4.8kW). What is the input power in the transformer?

$$\eta = \frac{P_2}{P_1} \times 100\%$$

$$80\% = \frac{4.8}{P_1} \times 100\%$$

$$80 = \frac{4.8}{P_1} \times 100 \quad \rightarrow \quad \frac{80}{100} = \frac{4.8}{P_1}$$

$$P_1 = \frac{4.8 \times 10}{8} = 6KW$$

P-3 An electric transformer with an efficiency of (95%) The input power was (9.5km). What is the output power?

$$\eta = \frac{P_2}{P_1} \times 100\%$$

$$95\% = \frac{P_2}{9.5} \times 100\% \quad \rightarrow \quad \frac{95\%}{100\%} = \frac{P_2}{9.5}$$

$$P_2 = \frac{95 \times 9.5}{100} = 9.025\ KW$$

P-4 An electric lamp, its voltage is (6V) and power is (12 W). The lamp is connected with a secondary coil for an electrical transformer. Its primary coil is connected with an alternating voltage source of (240V). If the number of turns in the primary coil is(8000) turn, it glows (you can assume the transformer is ideal) Calculate:

a- The turns number of its secondary coil.

b- The current which flow in the lamp.

c- The current which flows in the primary coil

a) $\frac{V_2}{V_1} = \frac{N_2}{N_1} \rightarrow \frac{6}{240} = \frac{N_2}{8000} \rightarrow N_2 \times 240 = 6 \times 8000$

$N_2 = \frac{48000}{240} = 200\ Turns$

b) $P_2 = V_2 \times I_2 \rightarrow I_2 = \frac{P_2}{V_2} = \frac{12}{6} = 2A$

c) $\frac{I_1}{I_2} = \frac{V_2}{V_1}$ محوله مثالية $\rightarrow \frac{I_1}{2} = \frac{6}{240} \rightarrow I_1 = \frac{2\times6}{240} = 0.05\ A$

Question of chapter (8)

Q1 **Choose the correct statement for each of the following:-**

1- Some of the non-renewable resources are:

a. Tidal energy **b. Wind energy**

c. Coal energy **d. Hydrogen energy**

2- Which of the following is a renewable energy:

a. Natural gas. **b. Oil**

c. Solar cell energy **d. Nuclear energy**

3- A solar cell is made of:

a. Titanium **b. Aluminum** **c. Carbon** **d. Silicone**

4- Solar cell converts:

a. Heat energy to electric energy.

b. Heat energy to light energy.

c. Solar energy to light energy.

d. Light energy to electric energy

5- A floating generators use in the seas to generate:

a. Hydrogen energy **b. Tidal energy** **c. Wind energy** **d. Solar energy**

6- The best fuel for nuclear reaction is:

a. Cadmium **b. Radium** **c. Thorium** **d. Uranium**

7- The energy generated by movement or falling water is called:

a. Bioenergy **b. Water energy**

c. Solar energy **d. Nuclear energy**

8- The rate of maximum energy received in one second in each square meter (solar radiation power) over the surface of a solar cell is:

a. 1200 $Watt/\ m2$ **b. 1000 $Watt\ /m2$**

c. 1400 $Watt\ /m2$ **d. 1100 $Watt/\ m2$**

9- The converting efficiency of a solar cell is (0.17) for an area of (0.01 m2). The solar radiation intensity is (1400). The power produced is:

a. 2.2 Watt **b. 1.8 Watt**

c. 2.38 Watt **d. 2 Watt**

$$Pin = i \times A = 1400 \times 0.01 = 14 \text{ Watt}$$

$$\eta = \frac{P_{out}}{P_{in}} \times 100\%$$

$$17\% = \frac{P_{out}}{14} \times 100\%$$

$$P_{out} = \frac{17\% \times 14}{100\%} = 2.38\ watts$$

10-If the current generated by a solar panel is (0.5 A) with a potential difference of (10V), the output power is:

a. 6 Watt **b. 5 Watt** **c. 8 Watt** **d. 4 Watt**

$$Pout = I \times V = 0.5 \times 10 = 5 \text{ Watt}$$

11-If the output power of a solar cell is (4 Watt) and the input power is (32 Watt), then the efficiency of the solar cell converting energy is:

a. 4.5% **b. 12.5%** **c. 5%** **d. 5.5%**

$$\eta = \frac{P_{out}}{P_{in}} \times 100\% = \frac{4}{32} \times 100\% = 12.5\ \%$$

Q2 **If the number of solar cells which are connected in series are increased, explain how the amount of the output voltage is varied?**

The output voltage will be increase.

Q3 **A glass layer is placed on the solar panel when it is manufactured. What is the advantage of that?**

To protect the solar cell from the external effects.

Q4 **Renewable energy is preferred to non-renewable energy. Explain.?**

1- Because it does not exhaust (finish).

2- It is clean energy (not contaminated) contrary to the fossil fuel which has gases when they are burnt and then gases contaminate the environment.

3- It can exist locally on the contrary of fossil fuel. 4- Low production costs

Q5 **State the basic function of:**

a. Solar cell technology.

b. Wind energy technology.

a. Converts the sun light to electric energy.

b. Depends on the investment of wind power to rotate air fans. The fan is connected to an electric generator enabling the core of the generator to rotate.

Questions of Chapter (9)

Q1 Choose the correct statement for each of the following:

1-The atmosphere is composed of a mixture of several gases that exist with each other in percentages:

a. variable. **b. fixed.** c. equal. d. neutral.

2-The atmosphere layer which contains Ozone is called:

a. Mesosphere. **b. Stratosphere.** c. Troposphere. d. Exosphere

3-The highest layer in the atmosphere is:

a. Stratosphere. b. Thermosphere. **c. Exosphere.** d. Mesosphere

4-The means of connection between the transmitter and the receiver is called communication channel, and it can be:

a. Wired only. b. Wireless only.

c. Wired or optical fibers. **d. Wired or wireless**

5- Axial cables consist of:

a. Two metal cylinders with insulation between them.

b. Three cylinders and insulation between them.

c. Metal net surrounded with insulation material.

d. One metal cylinder surrounded by insulation material

6- Optical fiber consists of:

a. Four layers. **b. Three layers.** c. Two layers. d. One layer.

7- Sky waves are used for communications which are:

a. Long range. b. Short range.

c. Medium range. d. Long and medium ranges

8- The purpose of scientific satellites is:

a. Take photos for locations on earth.

b. Monitoring the weather and meteorology.

c. Communication.

d. Military purposes.

Q2 Correct the following statements if they are incorrect without changing the underlined phrases

1. The atmosphere is mixture of gases which all have various rates.
False,: have constant rates)

2. The atmosphere of the earth is a homogeneous mass with many layers each one above other.
False , (: nonhomogeneous).

3. In the troposphere layer, the pressure, density and temperature increases with increasing height from the earth's surface.
False, (: density and temperature decreases with increasing height from the earth's surface.)

4. Stratosphere layer is recognized by its content of free electrons and Ions.
False, (: its content of ozone's layer).

5. because of the effect of Ultraviolet of type (A, B) on oxygen the ozone is generates. True

6. The stratosphere layer exists at the middle of the atmosphere.
False, (: above of the atmosphere)

7. The thermosphere layer is recognized by its ability to reflect radio waves.
True

8. A communication system consists of three basic units. True

9. The surface radio waves are sometimes called the sky waves
. False , (correct is: the earth waves or the surface wave)

10. Communications satellites heights are very high from the surface of the earth.
True

Q3 State four atmospheric gases?

Oxygen, nitrogen, Argon, the carbon dioxide.

Q4 State the main atmospheric layers?

1. Troposphere. 2. Stratosphere.
3.Mesosphere. 4. Thermosphere. 5. Exosphere.

Q5 State the characteristics of the following layers:

1. Troposphere. 2. Stratosphere. 3. Mesosphere.

1. Troposphere:

- It's higher about 14km.
- The pressure and the density decrease rapidly.
- The temperature also decreases at this layer at a constant rate called fixed decrease. For instance, the temperature decreases about 6.5oC for each kilometer.
- This layer forms 80% of the atmosphere. It is the most upset layer. - All climate phenomena take place at this layer.

2. Stratosphere:

- It's higher about (14-50) km.
- The pressure and the density less than 1st Lay
- It's temperature increase: From (–60℃) *to* (–15℃).
- It contains the ozone layer.
- It is at about the middle of the stratospheric layer.

3. Mesosphere:

- It's higher about (50-90) km.
- The pressure and the density less than 2nd Layer.
- the temperature is the lowest which equal to (-120℃).
- Its gases are helium and hydrogen.

Q6 what is Ozone? Where does it exist? How does it form?

Ozone is a gas consist of three atoms union to be (O3) - Ozone in the stratosphere. - The largest concentration of ozone at the height of (25km) from the surface of the earth. that the ultraviolet, which the sun its source, absorbed by (O2), molecules which is in the atmosphere, and break down into two oxygen atoms (O+O). After that each atom will merge with a molecule of oxygen (O2) producing the ozone molecule as in the following equations:

$$O2 + UV \rightarrow O + O$$

$$O + O2 \rightarrow O3$$

Q7 from what are the contents of the modern communication systems and what is the function of each one?

1. Transmitting unit: It is responsible for converting signals from the information source (sound, image, data, etc.) to electrical or light signals (electromagnet waves) so that they become suitable to transmit through the communication channels.

2. Communication channel: It is used between the transmitter and receiver. This can be wired or wireless.

3. Receiving unit: it is responsible for extracting information signals which comes from the transmitter and converting it to its original form, as it was before transmission

Q9 what are the main contents of mobile phone?

1. Electronic circuit containing a processor and memory chips.
2. Aerial.
3. Display screen speaker.
4. Key board.
5. Sound receiver.
6. Speaker.
7. Battery.

Q10 state three satellite uses?

They are used for the following purposes:

1. Communication satellites.
2. Scientific Satellites.
3. Military purpose satellites