اسم الطالب (رضاية): "
المسرور: "
رقم الخلوص: "

توقيع الملاحظين بصحة البيانات:

 krista swanson

تمスタンدwise earnste
تعليمات هامة:

عزيزي الطالب:

1. أقرأ السؤال بعناية، وفكر فيه جيدًا قبل البدء في إجابته.
2. أجب عن جميع الأسئلة ولا تترك أي سؤال دون إجابة.
3. عند إجابتك للأسئلة بال还有很多ة، أجب فيما لا يوجد عن المساحة المحددة لكل سؤال.
   مثال:

4. عند إجابتك عن أسئلة الاختيار من متعدد إن وجد:
   ظل الرمز الدال على الإجابة الصحيحة تظليلًا كاملًا لكل سؤال.
   مثال: الإجابة الصحيحة (ج) مثلا

- في حالة ما إذا أجبت إجابة خاطأ، ثم قمت بالشطب وأجبت إجابة صحيحة تسب الإجابة صحيحة.
- وفي حالة ما إذا أجبت إجابة صحيحة، ثم قمت بالشطب وأجبت إجابة خاطأ تسب الإجابة خطأ.
- وفي حالة التظليل على أكثر من رمز، تعتبر الإجابة خطأ.

ملفوفة:

لا تكرر الإجابة عن الأسئلة الموضوعية (الاختيار من متعدد)،
فإن تقدر الإجابة الأولى فقط.

5. إذا أجبت عن سؤال من الأسئلة المقالية بإجابتين ، فسيتم تقدير الإجابة الأولى فقط ، فاستبط
   أن الإجابة التي لا ترغب فيها.
6. عدد أسئلة كرسة الامتحان (50) سؤال.
7. عدد صفحات كرسة الامتحان (29) صفحة.
8. فاقد من ترمي الأسئلة تصميمًا ، ومن عدد صفحات كرسة الامتحان ، فهي مسؤولتك.
9. زمن الاختيار (3) ساعات.
10. الدرجة الكلية للاختبار (60) درجة.
Answer the following questions:

1. Choose the proper answer:

Doping a silicon crystal with impurities of aluminum atoms leads to an increase in ………

A. Its positive potential.
B. Its negative potential.
C. Free electrons.
D. Positive holes.

2. How would you explain?

The existence of dark lines (Fraunhofer lines) in the solar spectrum when analyzes.

A. جهدها الموجب
B. جهدها السالب
C. الإلكترونات الحرة
D. الفجوات الموجبة
3. Write down the mathematical relation that is used to calculate the maximum kinetic energy of the electrons emitted from a metal surface on which light falls.

4. Compare between:

<table>
<thead>
<tr>
<th>Point of comparison</th>
<th>The dynamo</th>
<th>The motor</th>
</tr>
</thead>
<tbody>
<tr>
<td>The role of the commutator connected to the coil.</td>
<td>………………..</td>
<td>………………..</td>
</tr>
</tbody>
</table>
5. Choose the proper answer:
The common feature of laser and (x) rays photons is that they:
(A) are coherent.
(B) are monochromatic.
(C) have the same speed.
(D) have the same energy.

6. What is meant by:
 Resistivity of copper at a temperature of 20 °C = 1.86 x 10^-8 Ohm.meter?

7. Give one factor that can increase the resistance of a uniform metallic wire.
8. When does the photon mass equal zero?

Questions (9 – 10):

In the given circuit, the current intensity passing through the resistance 30 Ohm = 1 Ampere and the internal resistance of the battery = 2 Ω

9. Calculate the total resistance of the circuit.

10. Find the electromotive force of the battery.
11. Write down the scientific concept expressed by the following statement:

In the active medium of laser, the state in which the number of atoms in the excited state is greater than that in the ground state.

12. Write down the mathematical relation that is used to calculate the concentration of the majority of charge carriers in n-type crystal.

13. What is the role of the triangular prism in the spectrometer?
14. Mention one factor that can increase the mutual inductance between two adjacent coils.

15. Write down the scientific concept expressed by the following statement:
The ratio of the electric energy gained in the secondary coil of a transformer to the electric energy supplied to the primary coil.

16. What is meant by:
The current gain of a transistor = 99?
### Compare between:

<table>
<thead>
<tr>
<th>Point of comparison</th>
<th>Spontaneous emission</th>
<th>Stimulated emission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition of occurrence (Without drawing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>شرط الحدوث (دون رسم)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 18.

What are the results based on using molybdenum (atomic number 42) instead of tungsten (atomic number 74) as a target material in Coolidge tube with respect to the produced wavelengths of x rays?

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Questions (19 – 20):

An AC generator supplying a voltage of 30 volts across its poles at frequency 400 Hertz is connected in series to a coil of inductance 0.06 Henry and a capacitor of capacitance 5 microfarad. If the total ohmic resistance in the circuit is 90 Ohms,

19. Calculate the impedance of the circuit.

20. Find the consumed power in the circuit.
21. How would you explain using thermal imaging in criminology?

22. What is the scientific idea of using the diode semiconductor as a switch?

23. How could you increase the frequency of a tuning circuit to double by changing the inductance of the coil only?
24. When does the magnetic flux density produced at the common center of two metal rings placed in one plane equal zero, if they carry electric currents and the diameter of one of them equals the radius of the other ring?

25. Write down the mathematical relation that is used to calculate the shortest wavelength of the continuous spectrum of x-rays produced by Coolidge tube.
26. Name the electrical measuring instrument whose measuring range is from zero to infinity?

27. Draw a labeled diagram for the circuit of npn transistor as a switch in (on) condition.
28. Mention the scientific idea on which the operation of the cathode ray tube is based.

Questions (29 – 30):

A sensitive galvanometer of coil resistance 490 Ω whose pointer deflects to full scale when a current of 0.002 A passes through its coil. A shunt resistance of 10 Ω is connected to the galvanometer coil to convert it into an ammeter.

29. Calculate the maximum current intensity measured by the ammeter.
30. How can the ammeter obtained in problem (29) be converted into a voltmeter that can measure potential difference up to 10 V?

31. Choose the proper answer:

The opposite diagram shows two insulated wires carrying electric currents I and 2I. The magnetic flux density vanishes at the point:

A. A
B. B
C. C
D. D
### 32. Compare between:

<table>
<thead>
<tr>
<th>Point of comparison</th>
<th>OR Gate</th>
<th>AND Gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR Gate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AND Gate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value of the output when only one of its inputs = 0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### 33. Write down the scientific concept expressed by the following statement:

The self-inductance of a coil that induces an emf of 1 V when the current through it changes at a rate of 1 A/s

### 34. Mention the scientific principle on which the operation of the hot wire ammeter is based.
35. Mention one factor only that can reduce the loss in the electric energy through the transformer.

36. How would you explain?
The existence of defects in the sound and image in analog transmission.
37. Mention the scientific principle on which the operation of the electron microscope depends.

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38. Write down the mathematical relation that is used to find the force exerted by a beam of photons on a surface when reflected at a rate of \( \Theta \) photon per second.

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Questions (39 – 40):

When the atomic spectrum of the hydrogen atom is analyzed, a blue spectral line in the visible region of wavelength 434.1 nanometer is obtained.

| 39. | Write down the mathematical relation that is used to determine the shell energy in the hydrogen atom. Then calculate the energy of the shell to which the electron has transmitted to emit such spectral line. |
| 40. | Determine the energy level from which the electron has transmitted to emit this wavelength. |

- \[ E_n = -\frac{13.6}{n^2} \text{ eV} \]

For the given wavelength, the shell energy is calculated as:

- \[ n = \sqrt{\frac{13.6 \times 434.1}{13.6}} = \sqrt{434.1} \approx 20.85 \]

Therefore, the shell energy is approximately:

- \[ (20.85)^2 \approx 434 \text{ eV} \]

The energy level from which the electron has transmitted to emit this wavelength is approximately 434 eV.
41. Compare between:

<table>
<thead>
<tr>
<th>Point of comparison</th>
<th>Effect of increasing light frequency</th>
<th>Effect of increasing light intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of electrons emitted by the effect of light incident on the metal surface.</td>
<td>تأثير زيادة تردد الضوء</td>
<td>تأثير زيادة شدة الضوء</td>
</tr>
<tr>
<td>معدل انبعاث الإلكترونات بتأثير الضوء الساقط على سطح المعدن</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

42. Write down the scientific concept expressed by the following statement:

The potential difference between the poles of an electric cell when its circuit is open.

42-اكتب المصطلح العلمي الذي تعبر عنه العبارة الآتية:
فرق الجهد بين قطبي عمود كهربائي عندما تكون دائرته مفتوحة.
Choose the proper answer:
A red laser beam can travel for a longer distance than that traveled by a beam of ordinary blue light having the same intensity, because:

A. The energy of the red laser beam is greater than the energy of the ordinary blue light beam.
B. The mass of the red laser photon is less than the mass of the ordinary blue light photon.
C. The speed of the red laser photon is greater than the speed of the ordinary blue light photon.
D. The spreading angle of the red laser beam is less than the spreading angle of the ordinary blue light beam.

Mention only one factor that can increase the power of the electric motor.

43-إختر الإجابة الصحيحة:
يمكن لحزمة من الليزر الأحمر أن تصل لمسافة أكبر من تلك التي تصلها حزمة من الضوء الأزرق العادي ولها نفس الشدة، لأن:

- الطاقة حزمة الليزر الأحمر أكبر من الطاقة حزمة الضوء الأزرق العادي.
- كتلة فوتون الليزر الأحمر أقل من كتلة فوتون شعاع الضوء الأزرق العادي.
- سرعة فوتون الليزر الأحمر أكبر من سرعة فوتون الضوء الأزرق العادي.
- زاوية تفرق حزمة الليزر الأحمر أقل من زاوية تفرق حزمة الضوء الأزرق العادي.

44-ذكر عاملا واحدا فقط يمكنه زيادة قدرة المحرك الكهربائي.
45. Choose the proper answer:

In Compton effect, gamma photon is scattered and its .......... increases:

A. energy.
B. speed.
C. wavelength.
D. momentum.

46. How would you explain?

No electric current passes through an electric circuit containing a battery and a capacitor.
What are the results based on connecting a pn junction to an alternating supply having a suitable voltage?
Questions (48 – 50):

An AC dynamo whose coil has a cross sectional area of $\frac{2}{\pi}$ m$^2$ rotates in a magnetic field of flux density $10^{-3}$ Tesla at a constant frequency $f$ (Hz). Assume that the number of coil turns ($N$) could be varied and the maximum emf generated between its terminals ($V_{\text{max}}$) could be determined, the results obtained were as shown in the table below:

<table>
<thead>
<tr>
<th>$N$</th>
<th>10</th>
<th>20</th>
<th>25</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{\text{max}}$ (Volt)</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>8</td>
<td>×</td>
<td>16</td>
<td>20</td>
</tr>
</tbody>
</table>

On the graph grid, plot the graphical representation between the the maximum emf generated between the coil terminals ($V_{\text{max}}$) on the vertical axis and the number of coil turns ($N$) on the horizontal axis.
<table>
<thead>
<tr>
<th>Question</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>49.</strong></td>
<td>From the previous graph, find the average emf generated during a quarter of coil rotation when the number of turns in the coil is 60 turns.</td>
</tr>
<tr>
<td><strong>50.</strong></td>
<td>From the previous graph, find the slope of the obtained line and then calculate the frequency ( f ) (Hz) of the coil rotation.</td>
</tr>
</tbody>
</table>
Best Wishes