First Semester

Physics

كلية الحرس التقنية

(Questions)





امتحان دبلوم التعليم العام

لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)

للعام الدراسي ١٤٤٥/١٤٤٦ هـ - ٢٠٢٣ / ٢٠٢٤ م - الدور الأول - الفصل الدراسي الأول

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١٣) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Questions (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (○) next to the **correct** answer for each item.

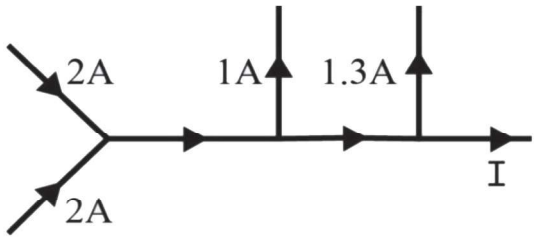
1) What is the unit for resistance?

- ○ Joule.
- ○ Ampere.
- ○ Watt.
- ○ Ohm.

2) What is the current passing through a device of (2 kW) power and (20 Ω) resistance?

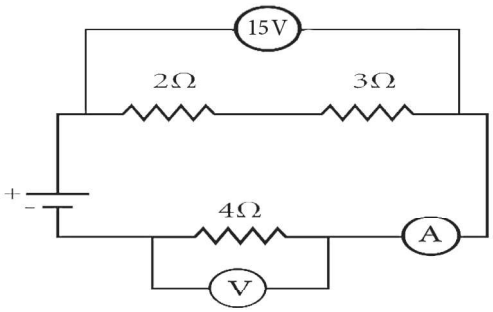
- ○ 0.010 A.
- ○ 0.10 A.
- ○ 10 A.
- ○ 100 A.

3) What is the magnitude of the current (I) in the figure below?



- ○ 1.3 A.
- ○ 1.7 A.
- ○ 3.7 A.
- ○ 4.3 A.

4) What are the readings of the voltmeter and the ammeter in the circuit below?



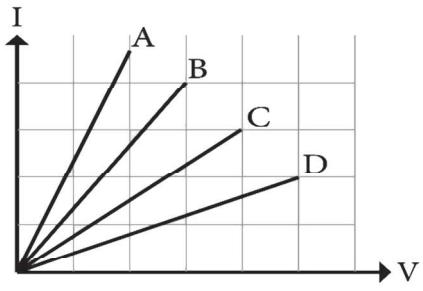
	Ammeter reading (A)	Voltmeter reading (V)
○	3	12
○	1.6	12
○	1.6	15
○	3	27

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Question 1 continued

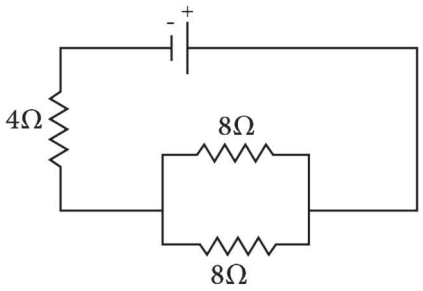
5) The figure opposite shows (I-V) graph for four different metals (A, B, C and D) at the same temperature.

Which wire will have the largest resistance?



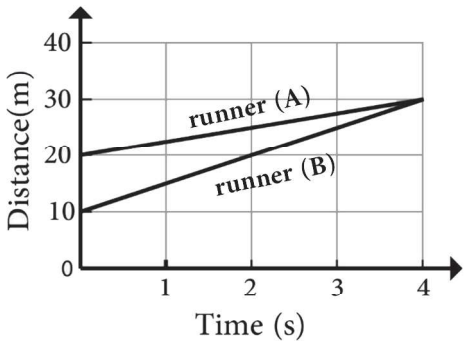
- ☐ A.
- ☐ B.
- ☐ C.
- ☐ D.

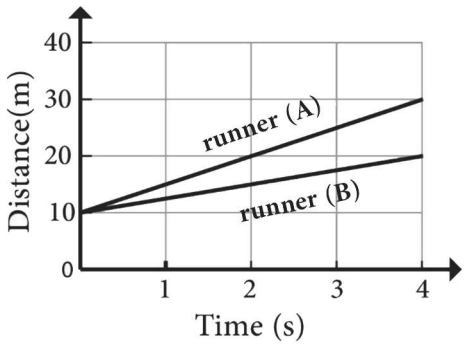
6) What is the total resistance for the circuit opposite?

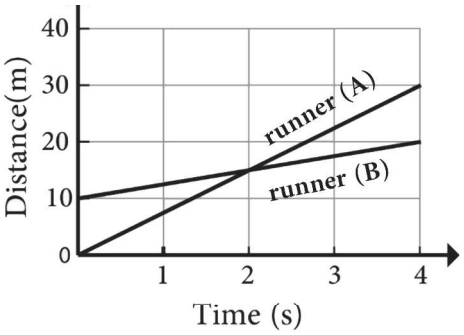


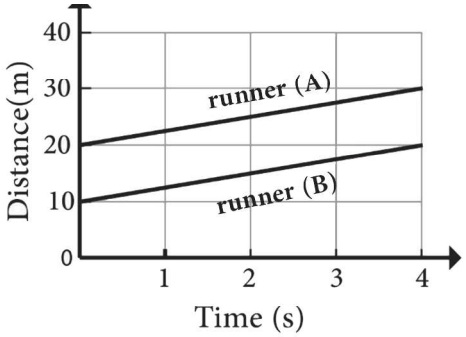
- ☐ 8
- ☐ 18
- ☐ 16
- ☐ 32

7) Which of the following graphs below represent two runners (A and B) moving with the same velocity?

- ☐ 

- ☐ 

- ☐ 

- ☐ 

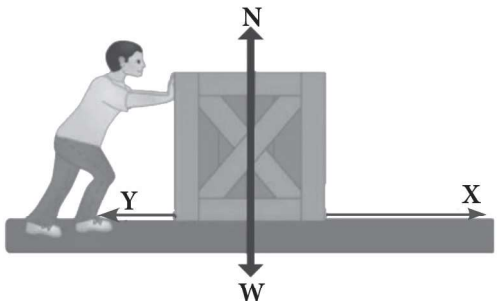
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Question 1 continued

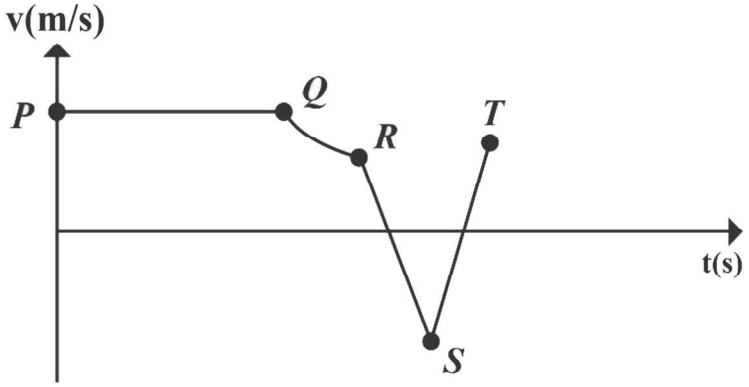
8) A boy is pushing a box with a constant force as shown in the figure below.



Which letter represents the friction force?

- ☐ N.
- ☐ X.
- ☐ Y.
- ☐ W.

9) The velocity-time graph below shows the motion of a body.



Which of the following periods is the acceleration of the body (0 m/s^2)?

- ☐ PQ.
- ☐ QR.
- ☐ RS.
- ☐ ST.

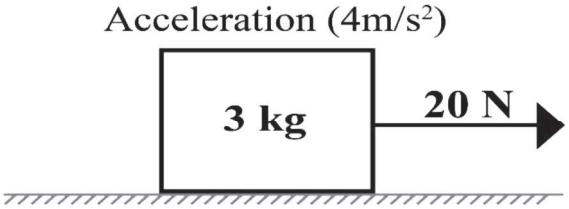
10) The tendency of an object to remain at rest or remain in motion is called:

- ☐ Mass.
- ☐ Inertia.
- ☐ Newton's first Law.
- ☐ Momentum.

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Question 1 continued

11) The figure below shows a block pulled by a horizontal force.



What is the friction force between the block and the surface?

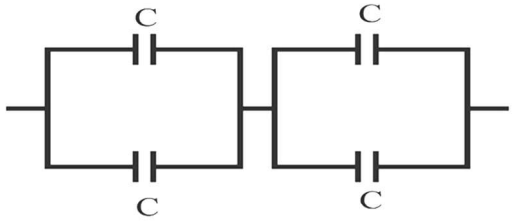
- ☐ 8 N.
- ☐ 12 N.
- ☐ 20 N.
- ☐ 32 N.

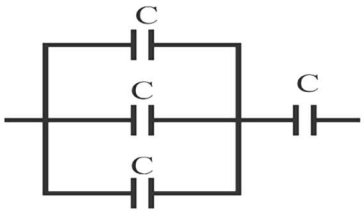
12) A machine gun is supported by (200 N) that keeps it steady. What is the maximum number of bullets that can be fired per minute if it fires a bullet of (0.05 Kg) with a speed of (1000 m/s)?

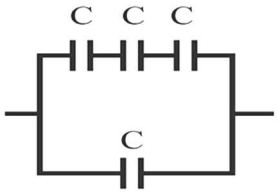
- ☐ 1000
- ☐ 240
- ☐ 200
- ☐ 4

13) Which of the following combinations has the largest total capacitance?

- ☐ 

- ☐ 

- ☐ 

- ☐ 

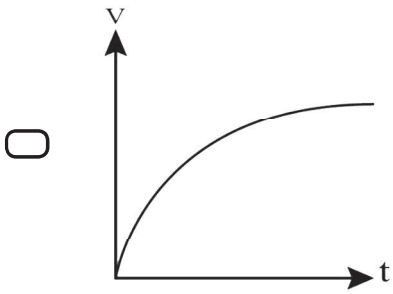
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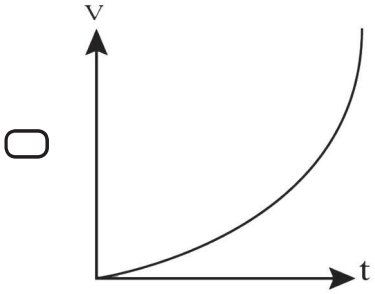
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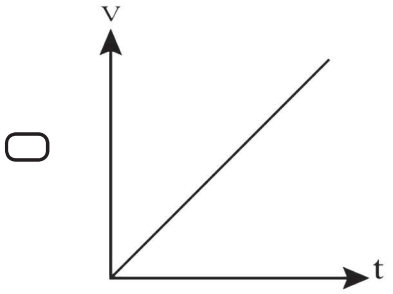
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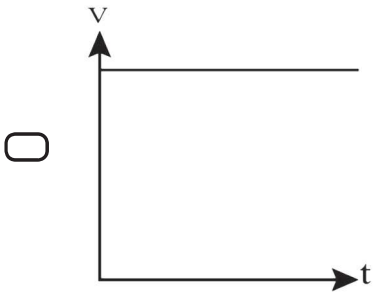
Question 1 continued

14) Which of the following graphs best represents the potential difference across a capacitor during the charging process?









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Question 2: Extended Questions (56 marks)

Write your answer for each of the following questions in the space provided.

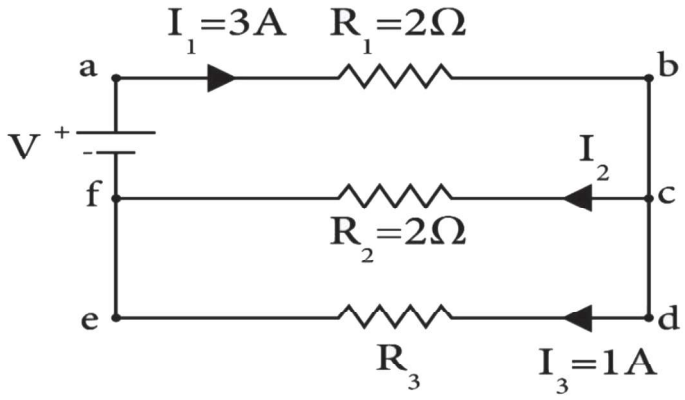
Be sure to show all your work, including the correct units where applicable.

15) a. Complete the table below: (4 marks)

Circuits Type	Voltage (common OR divides)	Current (common OR divides)
Parallel		
Series		

b. State Kirchhoff's current law. (1 mark)

c. The figure below shows an electric circuit.



(i) Calculate the value of (V). (4 marks)

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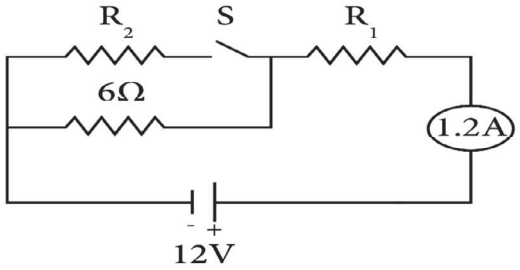
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Question 2 continued

(ii) Find the value of (R_3). (2 marks)

16) a. State Ohm's law. (1 mark)

b. The figure below shows an electric circuit.



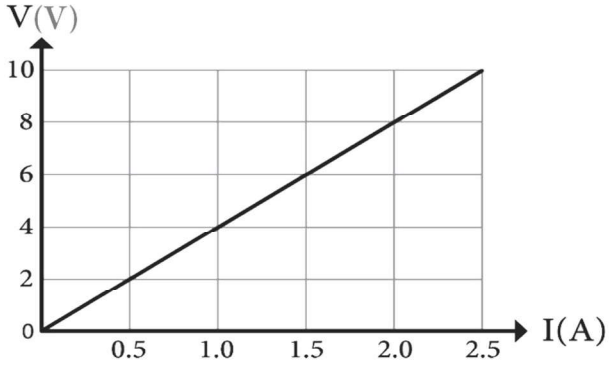
The ammeter reading is (1.2 A) when the switch (S) is opened, and when the switch (S) is closed the ammeter reading (2 A). Find the values of (R_1) and (R_2). (5 marks)

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Question 2 continued

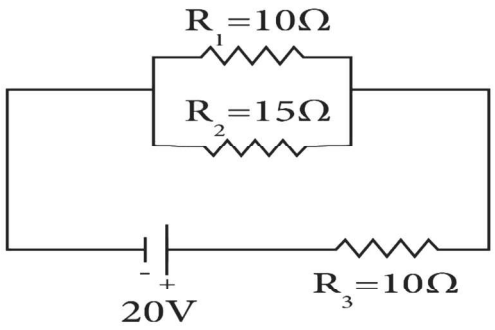
17) a. State Kirchhoff's voltage law. (1 mark)

b. The graph below shows the variation of voltage and current passing through the resistor (R).



Calculate the resistance of (R). (2 marks)

18) The figure below shows an electric circuit.



a. Calculate the total resistance of the circuit. (2 marks)

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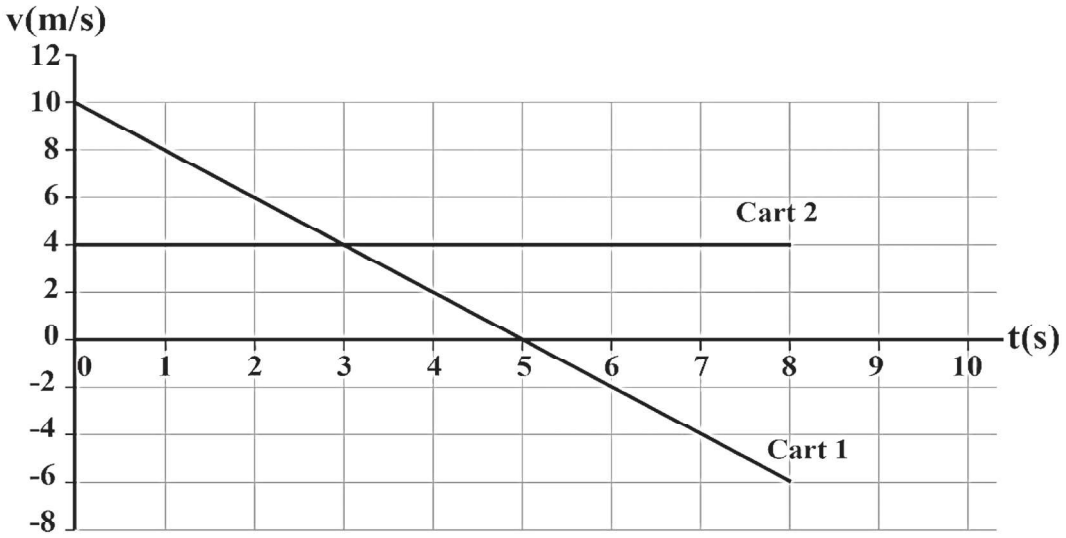
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Question 2 continued

b. What is the voltage across (R_3)? (2 marks)

19) The velocity – time graph below shows the motion of two carts.



a. What is the total displacement travelled by **cart 1** from (t = 0s) to (t = 3s)? (3 marks)

b. Calculate the acceleration of **cart 1**. (2 marks)

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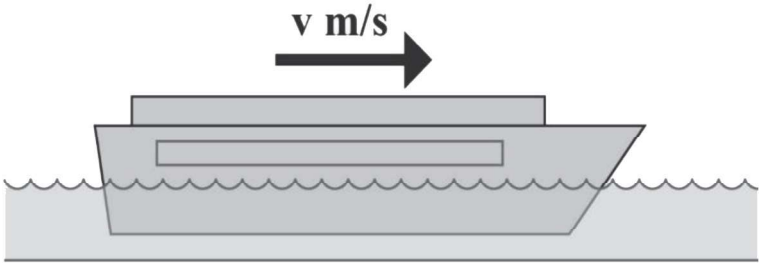
Question 2 continued

c. Calculate the time taken for the two carts to cover same displacement.

(Show all calculation) (3 marks)

20) A supertanker of mass (5×10^8 kg) starts sailing from rest. It takes (600 s) to reach its full speed of (10 m/s).

a. Draw arrows on the figure below that indicate the propulsive force and the resistance force of the water. (2 marks)



b. Find the propulsive force produced by the engines if the resistance force is (2780000 N). (3 marks)

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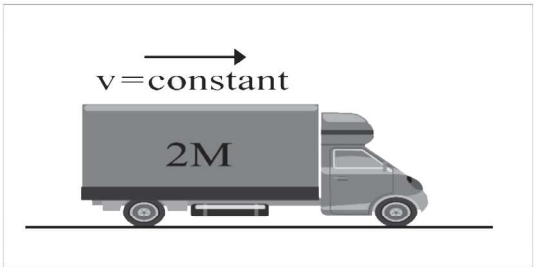
Question 2 continued

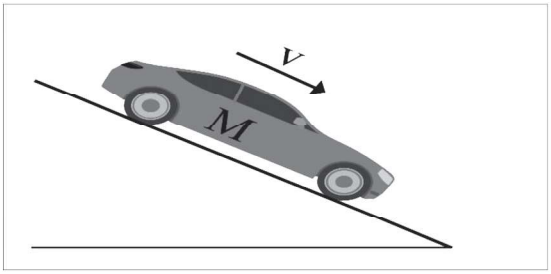
21) a. State the following:

(i) Newton's first law of motion. (1 mark)

(ii) Newton's third law of motion. (1 mark)

b. A car and truck are moving as shown in the figures below.





Is it possible for the two vehicles to have the same momentum? (2 marks)

☐ Possible. ☐ Not Possible.

(Choose the correct answer)

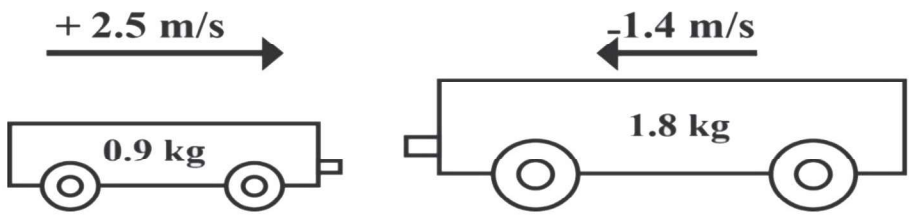
Explain your answer.

c. What is the average force required to stop a ball of mass (2 kg) moving with (6 m/s) in (2 s) time? (2 marks)

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Question 2 continued

22) The figure below shows two carts that about to collide with each other. The carts stick are joined together after the collision.



a. Which type of collision is the above? (2 marks)

☐ Elastic. ☐ Inelastic.

(Choose the correct answer)

Explain your answer.

_____

_____

b. Calculate the velocity after the collision. (2 marks)

_____

_____

_____

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c. Determine in which direction the cart of mass (1.8 kg) will move after the collision. (1 mark)

☐ To the right. ☐ To the left.

(Choose the correct answer)

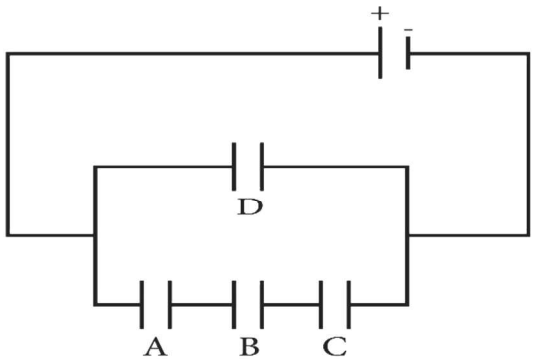
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Question 2 continued

23) The figure below shows a combination of capacitors (A, B, C, and D).



a. What capacitors have the same charge? (3 marks)

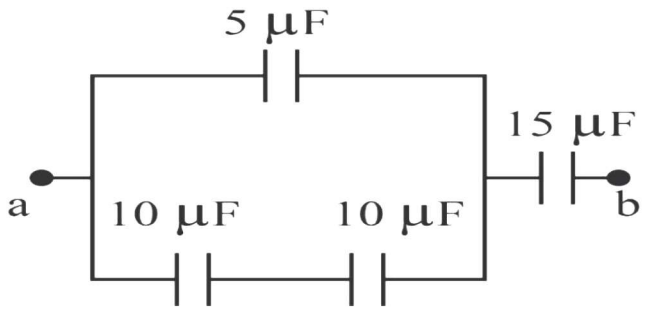
_____

b. If the capacitor (C) is removed, what will happen to the voltage across capacitor (B)? (1 mark)

☐ Increase ☐ Decrease ☐ Remain the same

(Choose the correct answer)

24) The figure below shows the combination of four capacitors.



Calculate the total capacitance between points (a) and (b). (4 marks)

_____

_____

_____

_____

_____

[End of Examination]

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Formulas and constants

D.C. Circuit Theory

$$V = IR$$

$$P = VI$$

$$P = I^2R$$

$$P = \frac{V^2}{R}$$

$$R = R_1 + R_2$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\sum \boldsymbol{I_{in}} = \sum \boldsymbol{I_{out}}$$

$$\sum \Delta \boldsymbol{V_{closed\ loop}} = \mathbf{0}$$

Newton's Laws of Motion

$$F = ma$$

$$momentum = mv$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$s = \left(\frac{u+v}{2}\right)t$$

$$v = u + at$$

$$a = \frac{(v-u)}{t}$$

$$v = \frac{\Delta s}{\Delta t}$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)\,v$$

$$F = \frac{m(v-u)}{\Delta t}$$

Capacitance and Capacitors

$$C = C_1 + C_2$$

$$C_t = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}}$$

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$C = \frac{Q}{V}$$

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سلطنة عمان
وزارة التربية والتعليم

مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م - الدور الأول - الفصل الدراسي الأول

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١٦) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

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- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Questions (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (⬭) next to the **correct** answer for each item.

1) Which of the following units is used to measure electric charge?

⬭ Ampere. ⬭ Coulomb.

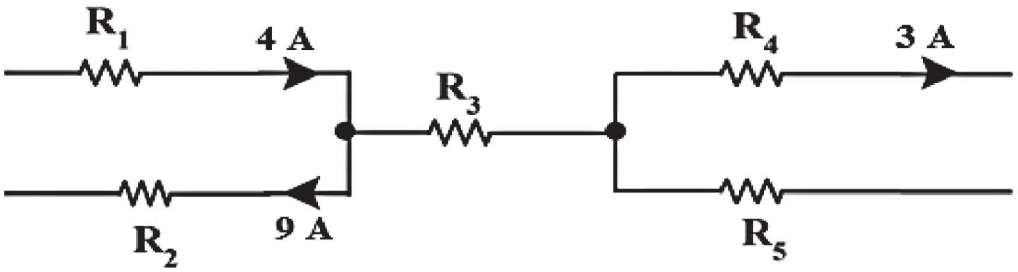
⬭ Joule. ⬭ Volt.

2) The amount of work in joules required to move a certain amount of charge from one place to another" is defined as:

⬭ Current. ⬭ Force.

⬭ Voltage. ⬭ Resistance.

3) What is the value and direction of the electric current passing through R_5 in the electric circuit shown below?



	Value of the current (A).	Direction of the current.
⬭	5	To the left.
⬭	5	To the right.
⬭	8	To the left.
⬭	8	To the right.

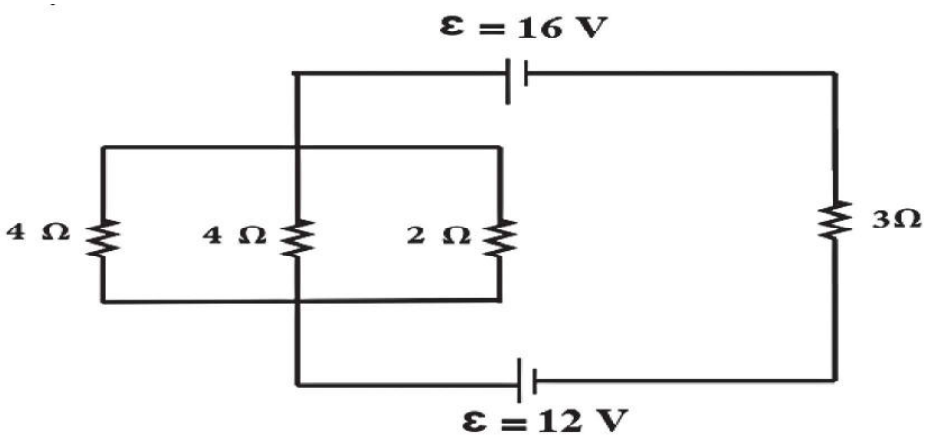
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Question 1 continued

4) A headlight of (40 W) is connected with a battery of potential deference (12 V). What is the value of the resistance of the headlight?

- ☐ 0.3 Ω
- ☐ 3.3 Ω
- ☐ 3.6 Ω
- ☐ 52 Ω

5) The diagram below shows an electric circuit.



What is the value and direction of the total electric current passing through the circuit?

	Value of the total current (A)	Direction of the current.
☐	1	Counter clockwise.
☐	1	Clockwise.
☐	7	Counter clockwise.
☐	7	Clockwise.

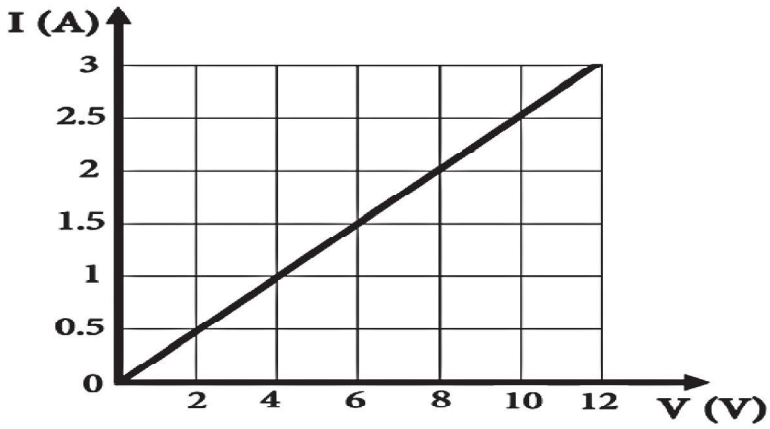
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Question 1 continued

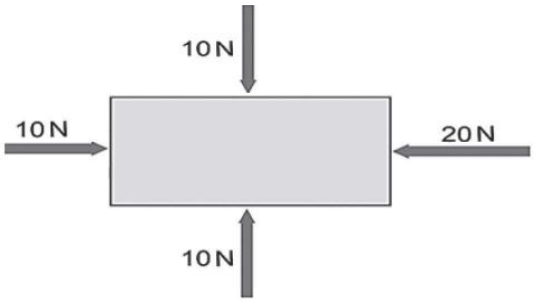
6) The figure below shows (I-V) graph.



What is the value of the resistance?

- ☐ 0.25 Ω
- ☐ 0.5 Ω
- ☐ 2 Ω
- ☐ 4 Ω

7) The figure below shows four horizontal forces acting on an object placed on a frictionless surface.



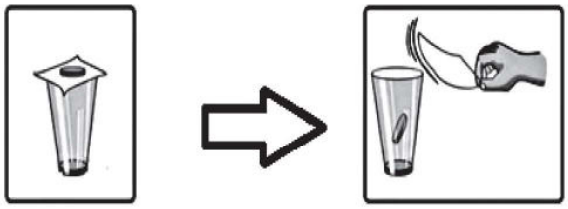
What is the magnitude and direction of the net force acting on the object?

	Force magnitude in (N)	Direction of the net force
☐	10	To the left.
☐	20	To the left.
☐	20	To the down.
☐	10	To the up.

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Question 1 continued

8) When a card placed on a glass cup is flicked with the finger, the coin placed over it falls in the cup as shown in the figure below.



Which law explains this observation?

- ☐ Newton's first law.
- ☐ Newton's second law.
- ☐ Newton's third law.
- ☐ Law of conservation of momentum.

9) What does the area under a velocity-time graph represent?

- ☐ Force.
- ☐ Work.
- ☐ Distance.
- ☐ Acceleration.

10) If the distance between the sun and the earth is (1.5×10^{11} m), what is the time taken by the light to travel from the sun to the earth?

- ☐ 3 minutes.
- ☐ 8 minutes.
- ☐ 10 minutes.
- ☐ 15 minutes.

11) What is the change of distance per unit time called?

- ☐ Acceleration.
- ☐ Velocity.
- ☐ Momentum.
- ☐ Speed.

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Question 1 continued

12) A car starts at rest and reaches a speed of (20 m/s) in (4 s).

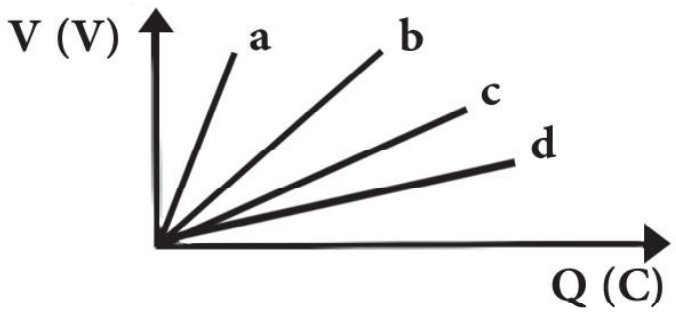
What is the car's acceleration?

- ☐ 0.25 m/s^2
- ☐ 5 m/s^2
- ☐ 24 m/s^2
- ☐ 80 m/s^2

13) Each plate of a capacitor stores a charge of magnitude (1 mC) when a (100 V) potential difference is applied. What is the capacitance of this capacitor?

- ☐ 5 μF
- ☐ 10 μF
- ☐ 50 μF
- ☐ 100 μF

14) The graph below shows the potential difference versus the charge for four capacitors.



Which capacitor has the largest capacitance?

- ☐ a.
- ☐ b.
- ☐ c.
- ☐ d.

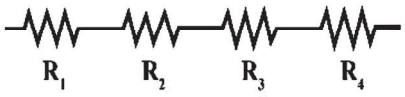
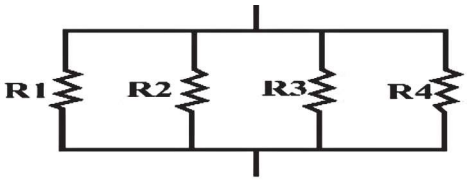
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Question 2: Extended Questions (56 marks)

Write your answer for each of the following questions in the space provided.

Be sure to show all your work, including the correct units where applicable.

15) In the table below, compare the two types of electric circuit. (6 marks)

		
Connection type	_____	_____
Current (Same / Different)	_____	_____
Total resistance (Increased /Decreased)	_____	_____

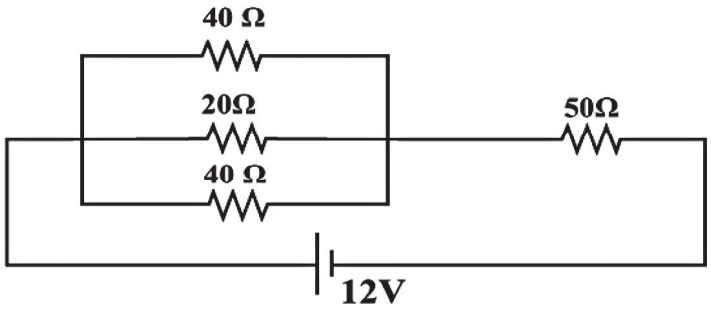
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Question 2 continued

16) The figure below shows an electric circuit.



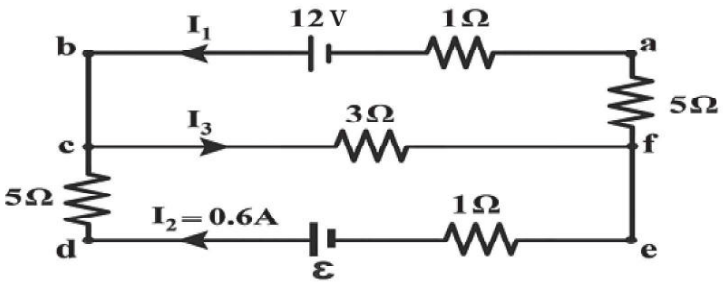
a. Calculate the total resistance of the circuit. (4 marks)

b. Calculate the current passing through the (50 Ω) resistor. (2 marks)

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Question 2 continued

17) The figure below shows an electric circuit.



a. Calculate the currents ($\mathbf{I_1}$) and ($\mathbf{I_3}$). (4 marks)

b. Calculate the value of ($\mathcal{E}$). (2 marks)

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Question 2 continued

18) a. State Kirchhoff's voltage law: (1 mark)

_____

_____

b. Four identical resistors are connected in series with a battery that dissipates (25W). If the same resistors are connected in parallel across the same power supply, what will be the power dissipated?

(Show all your calculations to support your answer.) (5 marks)

_____

_____

_____

_____

_____

_____

_____

19) a. Complete the following table which shows the different applications of Newton's laws of motion in daily life. (3 marks)

The application	Newton's law's (First , second , or third)
A horse is pulling a cart with increasing speed.	_____
You push on the wall and the wall pushes you back.	_____
You move back when the bus starts to move.	_____

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Question 2 continued

b. Figure (1) shows a force (F) applied on an object of a mass (0.2 kg) which is placed on a horizontal (A-C) plane.

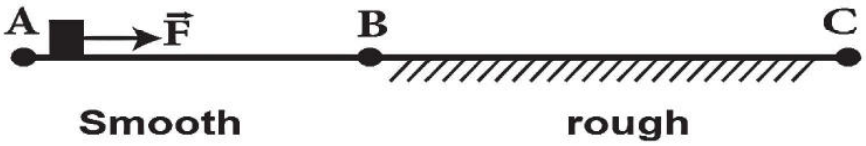


Figure (1)

Figure (2) represents a velocity-time graph for the same object while moving from point **A** to point **C**.

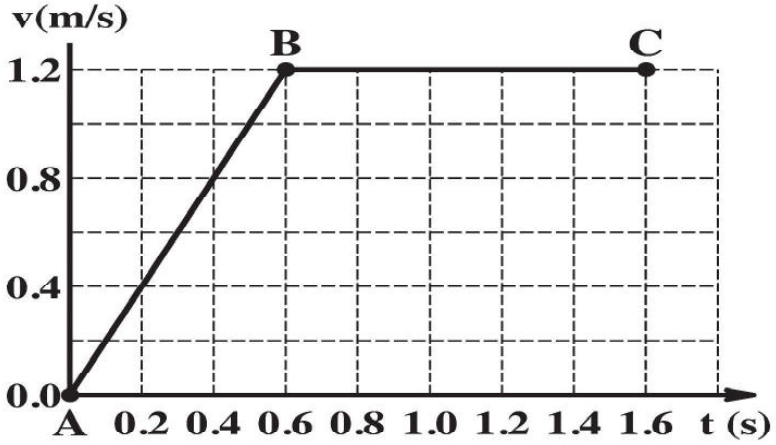


Figure (2)

(i) In which time interval is the acceleration of the object equal to (0 m/s^2)?

(1 mark)

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Question 2 continued

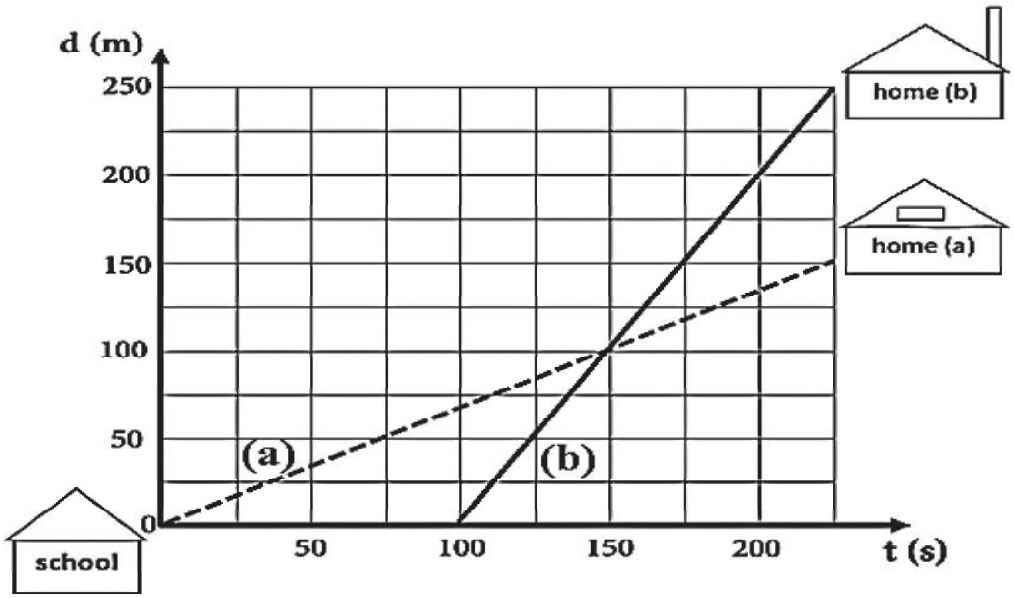
(ii) Calculate the magnitude of the applied force (F) on the object. (4 marks)

(iii) Calculate the distance traveled by the object along the path (A - B). (2 marks)

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Question 2 continued

20) The graph below represents distance versus time for two students, (a) and (b) when they were returning from school to their homes.



a. How many seconds later did student (b) leave school after student (a)? (1 mark)

b. Calculate the speed of student (b). (2 marks)

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Question 2 continued

c. Which student is faster? (2 marks)

☐ Student (a). ☐ Student (b).

(Choose the correct answer)

Explain your answer.

_____

_____

_____

21) Complete the following table which compares elastic and inelastic collisions.

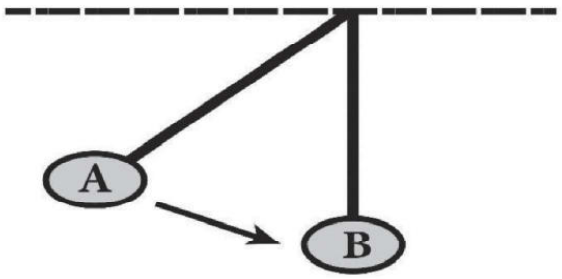
(4 marks)

	Elastic collision. (Conserved/Not conserved).	**Inelastic collision. (Conserved/Not conserved).**
Momentum.	_____	_____
Kinetic energy.	_____	_____

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Question 2 continued

22) The figure below shows a ball (A) with a speed of (6 m/s) and a mass of (0.4 kg) collides with a ball (B) of same mass.



a. Calculate the speed of the two balls after the collision if they moved as one body. (3 marks)

b. If the mass of the ball (A) will increase five times greater than before. What will happen to the momentum of the ball (A)? (2 mark)

☐ Increases. ☐ Decreases. ☐ Stays the same.

(Choose the correct answer)

Explain your answer.

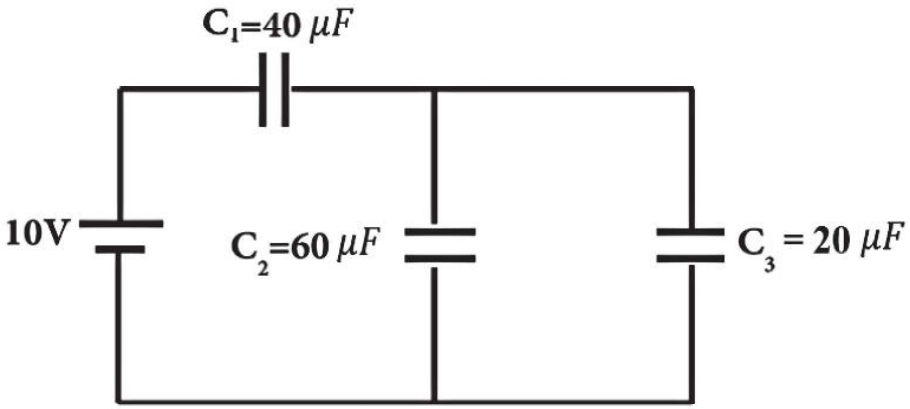
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Question 2 continued

23) The figure below shows an electric circuit.



a. Calculate the total capacitance of the combination of the capacitors. (2 marks)

b. Find the total charge that is stored in the combination of the capacitors. (2 marks)

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Question 2 continued

c. What will happen to the amount of charge in the capacitor if : (2 marks)

(i) The large plates are used:

_____

(ii) The plates are brought close together to each other:

_____

24) a. Define capacitance: (1 mark)

_____

_____

_____

b. If the potential difference across a capacitor is doubled, what will happen to the capacitance? (1 mark)

☐ Double. ☐ Halve. ☐ Remain the same.

(Choose the correct answer)

Explain your answer.

_____

_____

[End of Examination]

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Formulas and constants

D.C. Circuit Theory

$$V = IR$$

$$P = VI$$

$$P = I^2R$$

$$P = \frac{V^2}{R}$$

$$R_T = R_1 + R_2 + R_3 + R_4$$

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4}$$

$$\sum I_{in} = \sum I_{out}$$

$$I_T = I_1 + I_2 + I_3$$

$$\sum \Delta V_{closed\ loop} = 0$$

Newton's Laws of Motion

$$F = ma$$

$$P = mv$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$s = \left(\frac{u+v}{2}\right)t$$

$$v = u + at$$

$$a = \frac{(v-u)}{t}$$

$$v = \frac{\Delta s}{\Delta t}$$

$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$$

$$m_1u_1 + m_2u_2 = (m_1 + m_2)\,v$$

Capacitance and Capacitors

$$C_{total} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}}$$

$$C = C_1 + C_2$$

$$C = \frac{Q}{V}$$

Constants

$$g = 10\ m/s^2$$

Speed of light= $3 \times 10^8\ m/s$

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امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م - الدور الثاني - الفصل الدراسي الأول

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١٤) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓





امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م - الدور الأول

تنبيه:
- المادة: الفيزياء.
- الأسئلة في (١١) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
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- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

▬ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (▬) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ▬ **غير صحيح** ▭ ◉ ◔ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Questions (14 marks)

There are 14 multiple-choice items worth one mark each.
Shade in the bubble (⬭) next to the **best** answer for each item.

1) Which is the correct unit for electrical power?

⬭ Joule ⬭ Watt

⬭ Ampere ⬭ Ohm

2) Which of the following quantities are conserved in Kirchhoff's laws?

	Kirchhoff's first law	Kirchhoff's second law
⬭	Charge	Momentum
⬭	Charge	Energy
⬭	Momentum	Charge
⬭	Energy	Charge

3) Three resistors of (50 Ω), (50 Ω) and (100 Ω) are connected in parallel. What is the value of the resistance that should be connected in series with the combination to give a total resistance of (50 Ω)?

⬭ 30 Ω ⬭ 45 Ω

⬭ 70 Ω ⬭ 150 Ω

4) A headlight of (30 W) is connected with a battery of potential difference (6 V).

What is the value of the resistance of the headlight?

⬭ 0.2 Ω ⬭ 0.8 Ω

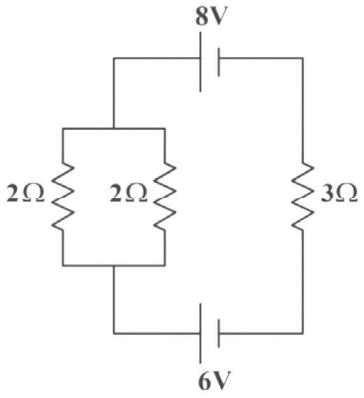
⬭ 1.2 Ω ⬭ 5.0 Ω

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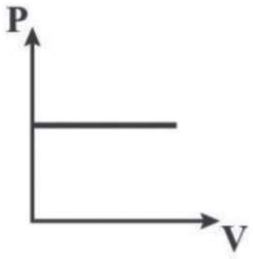
Question 1 continued

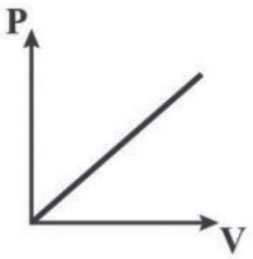
5) What is the value of the total current and its direction passing through the below circuit?

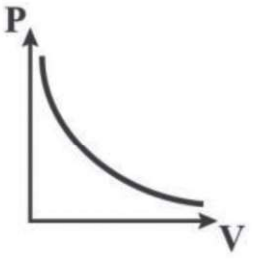
	Value of the total current (A)	Direction of the total current
☐	0.25	Counter Clockwise
☐	0.5	Counter Clockwise
☐	0.25	Clockwise
☐	0.5	Clockwise

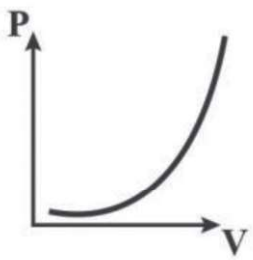


6) Which graph best represents the relationship between the power expended by a resistor that obeys Ohm's law and the potential difference applied to the resistor?

☐ 

☐ 

☐ 

☐ 

7) A moving body is described to be in equilibrium when:

- ☐ The net force acting on it is equal to zero.
- ☐ The net force acting on it is more than zero.
- ☐ The body is moving with a decreasing velocity.
- ☐ The body is moving with an increasing velocity.

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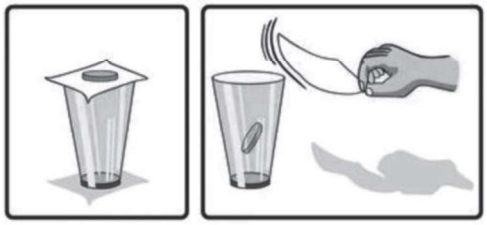
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Question 1 continued

8) When the cardboard is pulled suddenly to one side, the coin resists the change and falls into the glass as shown in the figure below. Which law explains this observation?

- ☐ Newton's first law.
- ☐ Newton's second law.
- ☐ Newton's third law.
- ☐ Law of momentum.



9) Earth exerts a gravitational force (F_E) on the moon as shown in the figure below.



Which raw describes correctly the magnitude and the direction of the force exerted by the moon (F_M) on earth?

	The magnitude (F_M)	The Direction
☐	F_E	Towards the moon
☐	F_E	Towards the earth
☐	Less than F_E	Towards the moon
☐	Less than F_E	Towards the earth

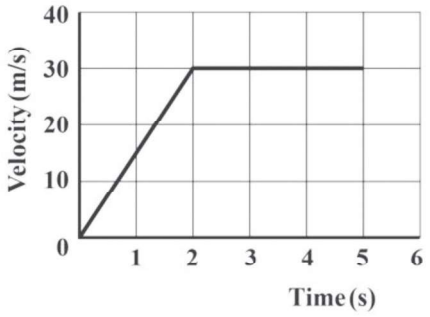
10) A car with a of mass of (800 kg) moving with a velocity of (10 m/s) collides with a stationary car with a mass of (600 kg) and they move as one body in the same direction. What is the momentum after the collision?

- ☐ 6000 N.s
- ☐ 8000 N.s
- ☐ 14000 N.s
- ☐ 2000 N.s

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Question 1 continued

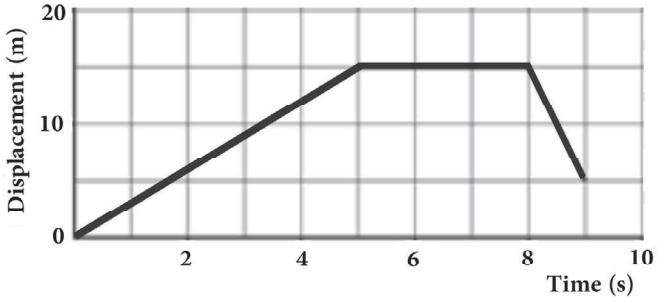
11) The velocity-time graph below shows the motion of a body. What is total distance travelled?



- ☐ 30 m
- ☐ 90 m
- ☐ 120 m
- ☐ 150 m

12) The displacement-time graph for an object moving in a straight line is shown below. What is the speed and velocity of the object in (9 s)?

	Speed (m/s)	Velocity (m/s)
☐	0.56	2.78
☐	2.78	0.56
☐	0.56	0.56
☐	2.78	2.78



13) Which of the following is equivalent to the Farad?

- ☐ C/V
- ☐ V/C
- ☐ $C^2.V$
- ☐ $C.V^2$

14) If the charge of a parallel-plate capacitor of capacitance (C) is doubled, what will be the new value of its capacitance?

- ☐ C/4
- ☐ C/2
- ☐ C
- ☐ 2C

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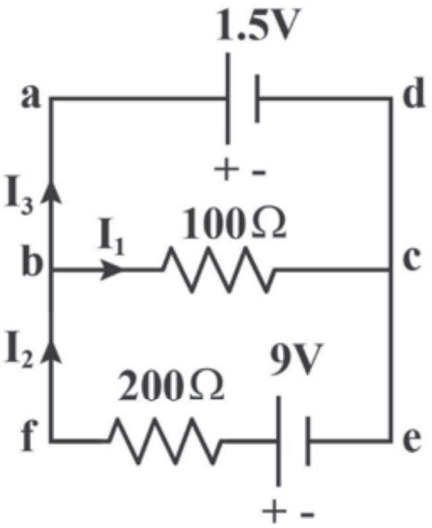
Question 2: Extended Questions (56 marks)

15) State:

a. **(i)** Kirchhoff's voltage law. (1 mark)

(ii) Kirchhoff's current law. (1 mark)

b. The figure below shows an electric circuit.



Find the values of the currents (I_1), (I_2) and (I_3)? (4 marks)

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Question 2 continued

16) Complete the table below: (4 marks)

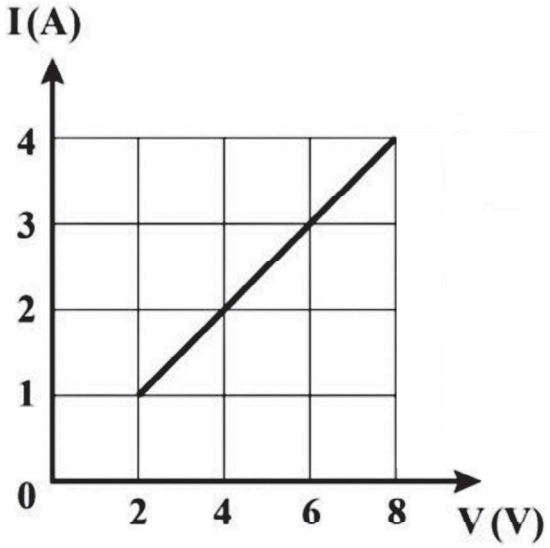
Quantity	Definition	SI unit
_____	Charge passing a point in a circuit in one second.	_____
Voltage (V)	_____	_____

17) **a.** State Ohm's law. (1 mark)

_____

_____

b. The graph below shows the variation of an electric current (I) passing through a resistor versus the voltage (V) across it. Find the resistance (R) of the resistor. (2 marks)



_____

_____

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Question 2 continued

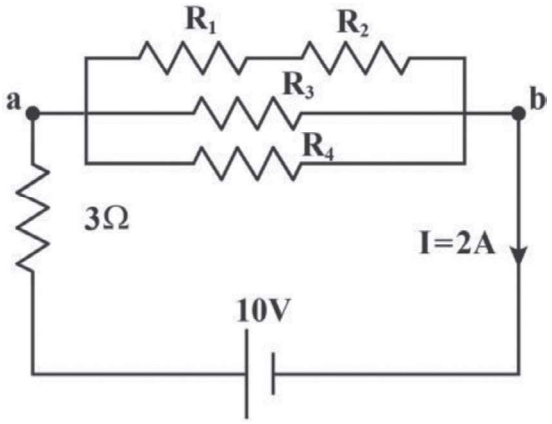
c. If the voltage is doubled what will happen to the following: (2 marks)

(i) The current.

(ii) The resistance.

18) a. Three identical resistors are first connected in parallel and then in series. What is the ratio of the resultant resistance of the first combination to the second (Rp/Rs)? (3 marks)

b. The figure below shows an electric circuit.



(i) Find out the total resistance (R_T) of the circuit. (2 marks)

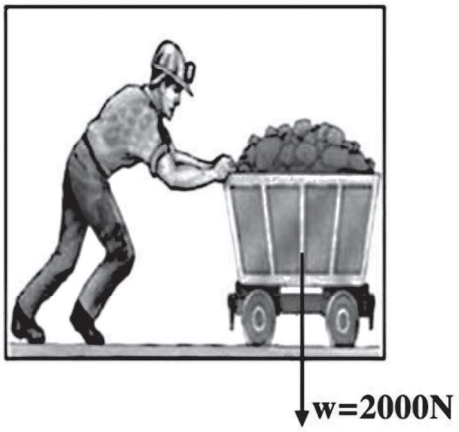
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Question 2 continued

(ii) What is the total resistance between points (a) and (b)? (2 marks)

(iii) Find the potential difference between points (a) and (b). (2 marks)

19) The figure below shows a builder pushing a cargo cart by a horizontal force of (50 N) with a constant velocity of (2 m/s).



a. On the figure above, draw all the forces acting on the cargo cart. **(show the directions and the magnitudes)**. (3 marks)

b. When the builder stopped pushing the cargo, its velocity decreased until it stopped. Name the force that caused the cargo to stop. (1 mark)

c. If the cargo stopped in (4 s), calculate:

(i) The acceleration of the cargo. (2 marks)

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Question 2 continued

(ii) The distance travelled by the cargo. (2 marks)

20) **a.** Define:

(i) Momentum. (1 mark)

(ii) Acceleration. (1 mark)

b. Complete the table below. (4 marks)

Quantity	Type of quantity (scalar or vector)	Definition
_____	_____	Distance per unit time
Velocity	_____	_____

21) A truck of mass (2000 kg) is moving with a velocity of (25 m/s).

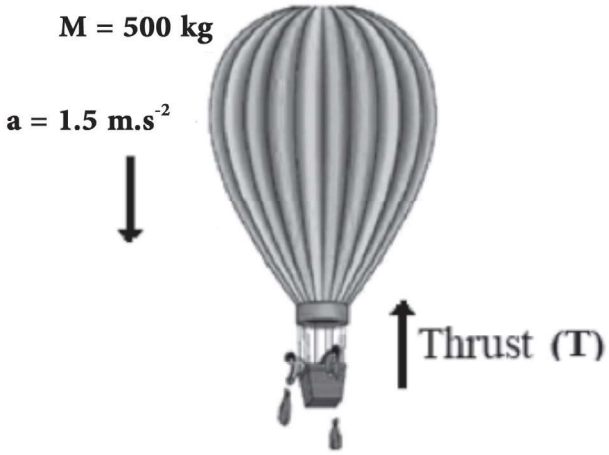
a. Calculate the momentum of the truck. (2 marks)

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Question 2 continued

b. An external force (F) is applied to the truck and it stopped in (10 s). Calculate the magnitude of the force. (3 marks)

22) The figure below shows a balloon descending downwards. How much mass (m) should be removed from it so that it moves downwards with an acceleration equals zero? (5 marks)



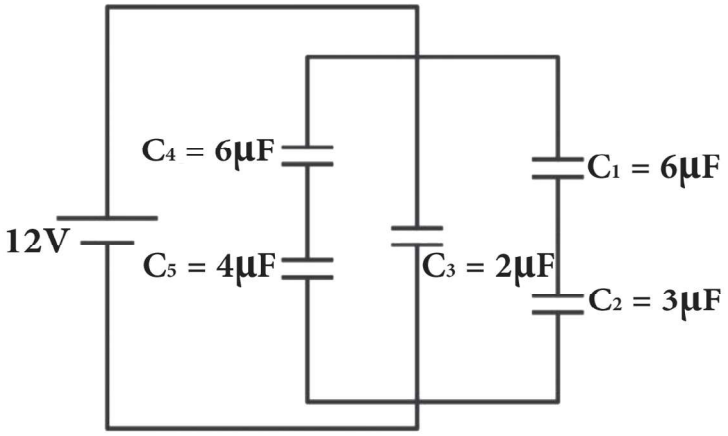
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Question 2 continued

23) The figure below shows five capacitors connected in an electric circuit.



a. Write three factors affecting the capacitance of a parallel plate capacitor. (3 marks)

b. Find the total capacitance of the combination of the capacitors. (4 marks)

c. If C_3 is removed from the combination, what will happen to the total capacitance of the capacitors? (1 mark)

☐ Increases ☐ Decreases ☐ Stays the same

(Choose the correct answer)

Explain your answer.

[End of Examination]

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Formulas and constants

D.C. Circuit Theory

$$V = IR$$

$$P = VI$$

$$P = I^2R$$

$$P = \frac{V^2}{R}$$

$$R = R_1 + R_2$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

Newton's Laws of Motion

$$F = ma$$

$$momentum = mv$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

$$s = \left(\frac{u+v}{2}\right)t$$

$$v = u + at$$

$$a = \frac{(v-u)}{t}$$

Capacitance and Capacitors

$$C = C_1 + C_2$$

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$$

$$V = \frac{Q}{C}$$

Constants

$$g = 10\ m.s^{-2}$$

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