3.7 Physics: Electricity, Magnetism and Waves: 1-hour Pack

Total Marks

ISEB CE 13+ Science (Physics) · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A ray of light strikes a plane mirror.

(a) State the law of reflection. **(1)**

(b) The mirror is then rotated through 10 degrees while the incident ray stays in the same position. Calculate the angle through which the reflected ray turns. **(2)**

.....

2 A water wave travels at 1.5 m/s and has a frequency of 3 Hz. Calculate its wavelength in m.

- ☐ A) 0.5 m
- ☐ B) 4.5 m
- ☐ C) 2 m
- ☐ D) 0.05 m
- ☐ E) 5 m

3 Which statement describes a variable resistor in a circuit?

- ☐ A) measures the current in a circuit
- ☐ B) measures the potential difference across a component
- ☐ C) provides the potential difference to push charge round
- ☐ D) opens and closes a circuit
- ☐ E) changes the current by changing the resistance

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4 Which of these materials is a good electrical conductor?

- ☐ A) dry wood
- ☐ B) glass
- ☐ C) steel
- ☐ D) ceramic
- ☐ E) rubber

---

5 In a household ring main, several wall sockets are each connected directly across the mains power supply. Identify whether these sockets are arranged in series or in parallel.

(1)

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6 Ammeter A1 reads 0.3 A in a series circuit containing 3 lamps. What does a second ammeter, placed after the last lamp, read?

- ☐ A) 3 A
- ☐ B) 0.9 A
- ☐ C) 0.3 A
- ☐ D) 0.1 A
- ☐ E) 0.15 A

---

7 A current of 1 A flows through a wire of resistance 10 ohm. Calculate the potential difference across it in V.

- ☐ A) 100 V
- ☐ B) 11 V
- ☐ C) 9 V
- ☐ D) 10 V
- ☐ E) 0.1 V

---

8 A sound wave travels at 340 m/s and has a wavelength of 0.4 m. Calculate its frequency in Hz.

- ☐ A) 850 Hz
- ☐ B) 136 Hz
- ☐ C) 8500 Hz
- ☐ D) 85 Hz
- ☐ E) 339.6 Hz

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9 Which circuit component provides the potential difference to push charge round?

- [ ] A) transformer
- [ ] B) ammeter
- [ ] C) variable resistor
- [ ] D) switch
- [ ] E) cell

---

10 Which of these materials is an electrical insulator?

- [ ] A) aluminium
- [ ] B) graphite
- [ ] C) ceramic
- [ ] D) copper
- [ ] E) silver

---

11 A mirror is rotated through 15 degrees while an incident light ray stays in the same position. Through how many degrees does the reflected ray turn?

(1)

---

12 Three lamps are connected in series to a 12 V supply. The potential difference across the first lamp is 2 V and across the second is 1 V. What is the potential difference across the third lamp?

- [ ] A) 3 V
- [ ] B) 9 V
- [ ] C) 4 V
- [ ] D) 12 V
- [ ] E) 10 V

---

13 A current of 0.5 A flows through a heater element of resistance 5 ohm. Calculate the potential difference across it in V.

- [ ] A) 2.5 V
- [ ] B) 0.1 V
- [ ] C) 4.5 V
- [ ] D) 10 V
- [ ] E) 5.5 V

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14 A wave on a rope travels at 6 m/s and has a wavelength of 3 m. Calculate its frequency in Hz.

- ☐ A) 20 Hz
- ☐ B) 0.5 Hz
- ☐ C) 3 Hz
- ☐ D) 2 Hz
- ☐ E) 18 Hz

---

15 Which statement describes a cell in a circuit?

- ☐ A) opens and closes a circuit
- ☐ B) changes the current by changing the resistance
- ☐ C) melts and breaks the circuit if the current is too high
- ☐ D) measures the potential difference across a component
- ☐ E) provides the potential difference to push charge round

---

16 Which of these materials is an electrical insulator?

- ☐ A) graphite
- ☐ B) glass
- ☐ C) aluminium
- ☐ D) iron
- ☐ E) copper

---

17 A student tests how the number of cells in a circuit affects the total voltage. Identify the dependent variable.

(1)

---

18 A cell supplies 1.9 A to two lamps in parallel. The current through the first lamp is 1 A. What is the current through the second lamp?

- ☐ A) 0.9 A
- ☐ B) 1 A
- ☐ C) 2.9 A
- ☐ D) 1.9 A
- ☐ E) 0.95 A

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19 A kettle rated at 100 W is used for 4 hours. Calculate the energy transferred in kWh.

- ☐ A) 0.1 kWh
- ☐ B) 24 kWh
- ☐ C) 0.4 kWh
- ☐ D) 400 kWh
- ☐ E) 0.025 kWh

---

20 A current of 2 A flows through a wire of resistance 12 ohm. Calculate the potential difference across it in V.

- ☐ A) 14 V
- ☐ B) 240 V
- ☐ C) 6 V
- ☐ D) 24 V
- ☐ E) 10 V

---

21 A wave on a spring has a frequency of 5 Hz and a wavelength of 1.2 m. Calculate its speed in m/s.

- ☐ A) 6 m/s
- ☐ B) 0.6 m/s
- ☐ C) 6.2 m/s
- ☐ D) 0.24 m/s
- ☐ E) 60 m/s

---

22 Which statement describes a voltmeter in a circuit?

- ☐ A) measures the current in a circuit
- ☐ B) measures the potential difference across a component
- ☐ C) allows current to flow in one direction only
- ☐ D) provides the potential difference to push charge round
- ☐ E) has a resistance that falls as the temperature rises

---

23 Two resistors, 9 ohm and 18 ohm, are connected in parallel across a 24 V supply. Calculate the total current supplied by the battery.

(1)

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24 A cell supplies 1.45 A to two lamps in parallel. The current through the first lamp is 1.2 A. What is the current through the second lamp?

- [ ] A) 1.74 A
- [ ] B) 1.2 A
- [ ] C) 2.65 A
- [ ] D) 0.725 A
- [ ] E) 0.25 A

---

25 An electric shower rated at 2500 W is used for 1 hour. Calculate the energy transferred in kWh.

- [ ] A) 25 kWh
- [ ] B) 2500 kWh
- [ ] C) 150 kWh
- [ ] D) 0.25 kWh
- [ ] E) 2.5 kWh

---

26 A current of 2 A flows through a wire of resistance 8 ohm. Calculate the potential difference across it in V.

- [ ] A) 4 V
- [ ] B) 6 V
- [ ] C) 10 V
- [ ] D) 16 V
- [ ] E) 0.25 V

---

27 Which of these materials is a good electrical conductor?

- [ ] A) rubber
- [ ] B) cotton cloth
- [ ] C) graphite
- [ ] D) dry wood
- [ ] E) plastic

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28 A current of 20 mA flows through a lamp of resistance 200 ohm. Calculate the potential difference across it in V.

- ☐ A) 4 V
- ☐ B) 0.4 V
- ☐ C) 4000 V
- ☐ D) 40 V
- ☐ E) 10 V

---

29 A circuit consists of a 4 ohm resistor connected in series with a parallel combination of a 6 ohm resistor and a 12 ohm resistor. The circuit is connected to a 24 V supply.

(a) Calculate the combined resistance of the parallel section. **(2)**

.....

(b) Calculate the total resistance of the circuit. **(1)**

.....

(c) Calculate the current supplied by the battery, and hence the voltage across the parallel section. **(3)**

.....

---

30 A wave on a spring has a frequency of 6 Hz and a wavelength of 0.5 m. Calculate its speed in m/s.

- ☐ A) 30 m/s
- ☐ B) 3 m/s
- ☐ C) 12 m/s
- ☐ D) 6.5 m/s
- ☐ E) 0.3 m/s

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31 A fan heater is rated at 2.3 kW and connected to a 230 V supply. Calculate the current drawn using current = power / voltage.

(1)

---

32 Three lamps are connected in series to a 15 V supply. The potential difference across the first lamp is 3 V and across the second is 2.5 V. What is the potential difference across the third lamp?

- ☐ A) 15 V
- ☐ B) 5.5 V
- ☐ C) 12 V
- ☐ D) 5 V
- ☐ E) 9.5 V

---

33 A washing machine rated at 2000 W is used for 5 hours. Calculate the energy transferred in kWh.

- ☐ A) 2 kWh
- ☐ B) 0.4 kWh
- ☐ C) 10 kWh
- ☐ D) 600 kWh
- ☐ E) 10000 kWh

---

34 A sound wave has a frequency of 850 Hz and a wavelength of 0.4 m. Calculate its speed in m/s.

- ☐ A) 850.4 m/s
- ☐ B) 3400 m/s
- ☐ C) 34 m/s
- ☐ D) 340 m/s
- ☐ E) 2125 m/s

---

35 A lamp has a resistance of 240 ohm and a current of 0.1 A passes through it. Calculate the voltage across the lamp.

(1)

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36 2 identical lamps are connected in parallel across a 6 V battery. What is the potential difference across one lamp?

- [ ] A) 3 V
- [ ] B) 6 V
- [ ] C) 12 V
- [ ] D) 2 V
- [ ] E) 4 V

---

37 A washing machine rated at 2500 W is used for 2 hours. Electricity costs 12 p per kWh. Calculate the cost in pence.

- [ ] A) 5 p
- [ ] B) 60000 p
- [ ] C) 17 p
- [ ] D) 600 p
- [ ] E) 60 p

---

38 A current of 2 A flows through a heater element of resistance 5 ohm. Calculate the potential difference across it in V.

- [ ] A) 7 V
- [ ] B) 2.5 V
- [ ] C) 3 V
- [ ] D) 0.4 V
- [ ] E) 10 V

---

39 A sound wave travels at 340 m/s and has a wavelength of 3.4 m. Calculate its frequency in Hz.

- [ ] A) 336.6 Hz
- [ ] B) 100 Hz
- [ ] C) 1156 Hz
- [ ] D) 1000 Hz
- [ ] E) 0.01 Hz

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40 In a circuit, each of two bells is independently connected across a single cell, with no shared component path. Is this series or parallel?

(1)

---

41 A heater rated at 1500 W is used for 8 hours. Calculate the energy transferred in kWh.

- ☐ A) 120 kWh
- ☐ B) 720 kWh
- ☐ C) 12000 kWh
- ☐ D) 12 kWh
- ☐ E) 1.5 kWh

---

42 A lamp has a potential difference of 3 V across it when a current of 10 mA flows. Calculate its resistance in ohm.

- ☐ A) 0.3 ohm
- ☐ B) 300 ohm
- ☐ C) 3000 ohm
- ☐ D) 30 ohm
- ☐ E) 0.03 ohm

---

43 A water wave travels at 2 m/s and has a frequency of 1 Hz. Calculate its wavelength in m.

- ☐ A) 0.5 m
- ☐ B) 20 m
- ☐ C) 2 m
- ☐ D) 0.2 m
- ☐ E) 1 m

---

44 A transformer receives 500 J of primary energy and outputs 475 J in the secondary coil. Calculate the efficiency.

(1)

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45 Ammeter A1 reads 0.2 A in a series circuit containing 3 lamps. What does a second ammeter, placed after the last lamp, read?

- [ ] A) 0.1 A
- [ ] B) 2 A
- [ ] C) 0.02 A
- [ ] D) 0.2 A
- [ ] E) 0.6 A

---

46 A washing machine rated at 100 W is used for 2 hours. Calculate the energy transferred in kWh.

- [ ] A) 0.2 kWh
- [ ] B) 200 kWh
- [ ] C) 0.05 kWh
- [ ] D) 12 kWh
- [ ] E) 0.1 kWh

---

47 A current of 1 A flows through a resistor of resistance 15 ohm. Calculate the potential difference across it in V.

- [ ] A) 16 V
- [ ] B) 150 V
- [ ] C) 15 V
- [ ] D) 1.5 V
- [ ] E) 14 V

---

48 A wave on a spring travels at 6 m/s and has a wavelength of 1.2 m. Calculate its frequency in Hz.

- [ ] A) 7.2 Hz
- [ ] B) 4.8 Hz
- [ ] C) 50 Hz
- [ ] D) 5 Hz
- [ ] E) 0.2 Hz

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49 A heating element has a resistance of 50 ohm with a current of 2 A. Find the voltage applied across it.

(1)

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50 4 identical lamps are connected in parallel across a 12 V battery. What is the potential difference across one lamp?

- [ ] A) 8 V
- [ ] B) 12 V
- [ ] C) 3 V
- [ ] D) 48 V
- [ ] E) 2.4 V

---

51 An electric shower rated at 3000 W is used for 1 hour. Calculate the energy transferred in kWh.

- [ ] A) 3 kWh
- [ ] B) 180 kWh
- [ ] C) 3000 kWh
- [ ] D) 30 kWh
- [ ] E) 0.3 kWh

---

52 A current of 3 A flows through a lamp of resistance 30 ohm. Calculate the potential difference across it in V.

- [ ] A) 10 V
- [ ] B) 27 V
- [ ] C) 0.1 V
- [ ] D) 33 V
- [ ] E) 90 V

---

53 A water wave has a frequency of 5 Hz and a wavelength of 1 m. Calculate its speed in m/s.

- [ ] A) 6 m/s
- [ ] B) 0.5 m/s
- [ ] C) 5 m/s
- [ ] D) 50 m/s
- [ ] E) 0.2 m/s

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54 Which of the following is a unit of electric charge?

- [ ] A) Coulomb
- [ ] B) Joule
- [ ] C) Volt
- [ ] D) Hertz

---

55 A washing machine rated at 2500 W is used for 8 hours. Electricity costs 35 p per kWh. Calculate the cost in pence.

- [ ] A) 55 p
- [ ] B) 20 p
- [ ] C) 7000 p
- [ ] D) 700 p
- [ ] E) 700000 p

---

56 A current of 3 A flows through a wire of resistance 25 ohm. Calculate the potential difference across it in V.

- [ ] A) 750 V
- [ ] B) 28 V
- [ ] C) 0.12 V
- [ ] D) 22 V
- [ ] E) 75 V

---

57 A wave on a rope travels at 8 m/s and has a frequency of 4 Hz. Calculate its wavelength in m.

- [ ] A) 20 m
- [ ] B) 2 m
- [ ] C) 32 m
- [ ] D) 4 m
- [ ] E) 0.5 m

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Mark scheme · 3.7 Physics: Electricity, Magnetism and Waves: 1-hour Pack

Question 1

(a) the angle of incidence equals the angle of reflection, oe **B1**

(a) Answer: The angle of incidence equals the angle of reflection.

(b) recognises the reflected ray turns through twice the angle the mirror is rotated **M1**

(b) 20 degrees (2 x 10), cao **A1**

(b) Answer: 20 degrees

Question 2

A (0.5 m) **B1**

Answer: A) 0.5 m

Question 3

E (changes the current by changing the resistance) **B1**

Answer: E) changes the current by changing the resistance

Question 4

C (steel) **B1**

Answer: C) steel

Question 5

Parallel (oe) **B1**

Answer: Parallel

Question 6

C (0.3 A) **B1**

Answer: C) 0.3 A

Question 7

D (10 V) **B1**

Answer: D) 10 V

Question 8

A (850 Hz) **B1**

Answer: A) 850 Hz

Question 9

E (cell) **B1**

Answer: E) cell

Question 10

C (ceramic) **B1**

Answer: C) ceramic

Question 11

30 degrees (oe) **B1**

Answer: 30 degrees

Question 12

B (9 V) **B1**

Answer: B) 9 V

Question 13

A (2.5 V) **B1**

Answer: A) 2.5 V

Question 14

D (2 Hz) **B1**

Answer: D) 2 Hz

Question 15

E (provides the potential difference to push charge round) **B1**

Answer: E) provides the potential difference to push charge round

Question 16

B (glass) **B1**

Answer: B) glass

Question 17

Total voltage of the circuit (oe) **B1**

Answer: Total voltage of the circuit

Question 18

A (0.9 A) **B1**

Answer: A) 0.9 A

Question 19

C (0.4 kWh) **B1**

Answer: C) 0.4 kWh

Question 20

D (24 V) **B1**

Answer: D) 24 V

Question 21

A (6 m/s) **B1**

Answer: A) 6 m/s

Question 22

B (measures the potential difference across a component) **B1**

Answer: B) measures the potential difference across a component

Question 23

4 A (oe) **B1**

Answer: 4 A

Question 24

E (0.25 A) **B1**

Answer: E) 0.25 A

Question 25

E (2.5 kWh) **B1**

Answer: E) 2.5 kWh

Question 26

D (16 V) **B1**

Answer: D) 16 V

Question 27

C (graphite) **B1**

Answer: C) graphite

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Question 28

A (4 V) **B1**

Answer: A) 4 V

Question 29

(a) 1/R = 1/6 + 1/12 **M1**

(a) R = 4 ohm, cao **A1**

(a) Answer: 4 ohm

(b) R(total) = 4 (series) + 4 (parallel, ft from (a)) = 8 ohm **B1**

(b) Answer: 8 ohm

(c) I = V / R(total) = 24 / 8, ft from (b) **M1**

(c) I = 3 A **A1**

(c) V(parallel) = I x R(parallel) = 3 x 4 = 12 V, ft from (a) **A1**

(c) Answer: I = 3 A, voltage across the parallel section = 12 V

Question 30

B (3 m/s) **B1**

Answer: B) 3 m/s

Question 31

10 A (oe) **B1**

Answer: 10 A

Question 32

E (9.5 V) **B1**

Answer: E) 9.5 V

Question 33

C (10 kWh) **B1**

Answer: C) 10 kWh

Question 34

D (340 m/s) **B1**

Answer: D) 340 m/s

Question 35

24 V (oe) **B1**

Answer: 24 V

Question 36

B (6 V) **B1**

Answer: B) 6 V

Question 37

E (60 p) **B1**

Answer: E) 60 p

Question 38

E (10 V) **B1**

Answer: E) 10 V

Question 39

B (100 Hz) **B1**

Answer: B) 100 Hz

Question 40

Parallel (oe) **B1**

Answer: Parallel

Question 41

D (12 kWh) **B1**

Answer: D) 12 kWh

Question 42

B (300 ohm) **B1**

Answer: B) 300 ohm

Question 43

C (2 m) **B1**

Answer: C) 2 m

Question 44

95% (oe) **B1**

Answer: 95%

Question 45

D (0.2 A) **B1**

Answer: D) 0.2 A

Question 46

A (0.2 kWh) **B1**

Answer: A) 0.2 kWh

Question 47

C (15 V) **B1**

Answer: C) 15 V

Question 48

D (5 Hz) **B1**

Answer: D) 5 Hz

Question 49

100 V (oe) **B1**

Answer: 100 V

Question 50

B (12 V) **B1**

Answer: B) 12 V

Question 51

A (3 kWh) **B1**

Answer: A) 3 kWh

Question 52

E (90 V) **B1**

Answer: E) 90 V

Question 53

C (5 m/s) **B1**

Answer: C) 5 m/s

Question 54

A (Coulomb) cao **B1**

Answer: A) Coulomb

Question 55

D (700 p) **B1**

Answer: D) 700 p

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Question 56

E (75 V) **B1**

Answer: E) 75 V

Question 57

B (2 m) **B1**

Answer: B) 2 m

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