3.4 Working Scientifically: 1-hour Pack

ISEB Common Entrance 13+ Science · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Five measurements of the height of a plant were: 24 cm, 26 cm, 23 cm, 27 cm, 25 cm. Calculate the range.

(1)

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2 Which instrument would you use to measure temperature?

- ☐ A) ruler
- ☐ B) voltmeter
- ☐ C) ammeter
- ☐ D) stopwatch
- ☐ E) thermometer

---

3 A student measures the diameter of a ball bearing five times: 12.1 mm, 12.4 mm, 12.2 mm, 12.3 mm, 12.0 mm. Calculate the mean diameter.

(1)

---

4 State the correct unit for recording the volume of gas collected in a gas syringe.

(1)

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5 Which instrument would you use to measure current?

- ☐ A) stopwatch
- ☐ B) ammeter
- ☐ C) newtonmeter
- ☐ D) balance
- ☐ E) voltmeter

---

6 A thermometer is read at the level of the meniscus. The reading lines up exactly halfway between 28°C and 32°C. State the temperature.

(1)

---

7 A student investigating enzyme activity took three readings at t = 20 s: 31 cm^3, 32 cm^3 and 45 cm^3. Calculate the mean using only the two consistent readings.

(1)

---

8 What does an ammeter measure?

- ☐ A) force
- ☐ B) temperature
- ☐ C) the volume of a liquid
- ☐ D) current
- ☐ E) time

---

9 A pencil was measured five times: 19.1 cm, 19.5 cm, 19.0 cm, 19.6 cm, 19.2 cm. Calculate the range of the results.

(1)

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10 Calculate the range of the block masses: 165 g, 166 g, 164 g, 165 g, 166 g.

(1)

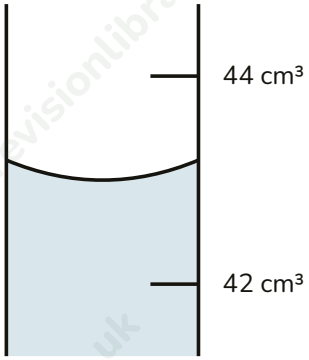
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11 Which instrument would you use to measure mass?

- ☐ A) voltmeter
- ☐ B) balance
- ☐ C) thermometer
- ☐ D) stopwatch
- ☐ E) ruler

---

12 A student reads the volume in a measuring cylinder where the meniscus is at the midpoint between 42 cm^3 and 44 cm^3. State the reading.



(1)

---

13 Which apparatus collects and measures the volume of oxygen released during photosynthesis? The gas must be collected directly, without using water displacement.

- ☐ A) Top-pan balance
- ☐ B) Measuring cylinder
- ☐ C) Gas syringe
- ☐ D) Pipette

---

14 Which instrument would you use to measure time?

- ☐ A) stopwatch
- ☐ B) thermometer
- ☐ C) voltmeter
- ☐ D) ammeter
- ☐ E) balance

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15 A student records the thickness of five metal sheets: 2.5 cm, 2.6 cm, 2.4 cm, 2.7 cm, 2.3 cm. Calculate the mean thickness.

(1)

---

16 A spring was stretched and measured five times: 11.2 cm, 11.6 cm, 11.1 cm, 11.7 cm, 11.3 cm. Calculate the range.

(1)

---

17 What does a voltmeter measure?

- ☐ A) length
- ☐ B) current
- ☐ C) time
- ☐ D) temperature
- ☐ E) potential difference

---

18 Give the correct unit for measuring the temperature of a heated solution in an experiment.

(1)

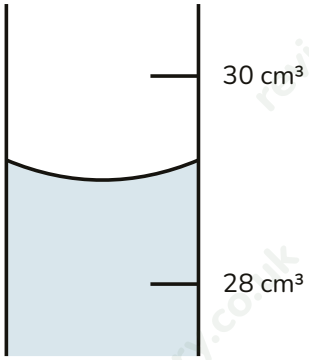
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19 Calculate the mean length of five copper wires: 35.2 cm, 35.5 cm, 35.1 cm, 35.6 cm, 35.3 cm.

(1)

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20 The meniscus of a liquid in a measuring cylinder lines up exactly halfway between the 28 cm^3 and 30 cm^3 marks. State the volume.



(1)

---

21 Temperature readings at 30 s were: 42°C, 43°C and 56°C. Calculate the mean using only the two consistent readings.

(1)

---

22 A bottle of sulfuric acid is labelled with a diamond-shaped symbol showing liquid from test tubes corroding a hand and a metal surface, in black on a white background with a red border. What hazard does this show?

- [ ] A) Irritant
- [ ] B) Toxic
- [ ] C) Flammable
- [ ] D) Corrosive

---

23 A bottle of sulfuric acid displays a diamond-shaped symbol showing droplets burning on skin and metal. What hazard is shown?

- [ ] A) Toxic
- [ ] B) Corrosive
- [ ] C) Flammable
- [ ] D) Oxidising

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24 A student measured the volume of liquid five times: 38 cm^3, 40 cm^3, 36 cm^3, 41 cm^3, 39 cm^3. Calculate the range.

(1)

---

25 Which unit should be used to record the volume of vinegar used in an experiment?

(1)

---

26 The volume of juice poured from a jug into a measuring container should be recorded in which unit?

(1)

---

27 Three repeat volume readings were taken: 45 cm^3, 46 cm^3 and 58 cm^3. Using only the two consistent readings, calculate the mean.

(1)

---

28 Both the number of electric cars sold in the UK and the average house prices in London have increased over the past decade. State the type of relationship between these variables.

(1)

---

29 Gas collected at t = 15 s was 20 cm^3 and at t = 45 s was 60 cm^3. Calculate the percentage increase over this time.

(1)

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30 As exercise frequency increases, resting heart rate decreases. State the type of correlation.

(1)

---

31 Match each term to its correct definition.
Terms: 1. Reliability 2. Sensitivity
Definitions:
A. The ability of an apparatus to measure small changes in a quantity.
B. The consistency of an experiment when repeated.

(1)

---

32 Gas volume at t = 0 s was 5 cm^3 and at t = 60 s was 25 cm^3. Calculate the percentage increase.

(1)

---

33 A cylinder of chlorine gas bears a diamond-shaped hazard symbol showing a black skull and crossbones. What hazard does this symbol represent?

- ☐ A) Toxic
- ☐ B) Oxidising
- ☐ C) Flammable
- ☐ D) Corrosive

---

34 The volume of gas at t = 10 s was 15 cm^3 and at t = 30 s was 45 cm^3. Calculate the percentage increase.

(1)

---

35 Calculate the range of wire thicknesses: 2.1 mm, 2.2 mm, 2.0 mm, 2.2 mm, 2.1 mm.

(1)

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36 Five temperature readings were: 18°C, 21°C, 17°C, 22°C, 19°C. Calculate the range.

(1)

---

37 Over a decade, both mobile phone ownership and online shopping have increased. State the type of relationship between these variables.

(1)

---

38 State the correct unit for recording the temperature of an ice bath.

(1)

---

39 A rod's length was recorded five times: 42.3 cm, 42.6 cm, 42.4 cm, 42.7 cm, 42.5 cm. Calculate the mean length.

(1)

---

40 Match each term to its definition.
Terms: 1. Resolution 2. Validity
Definitions:
A. The smallest change that an apparatus can detect.
B. Whether the investigation actually tests what it claims to test.

(1)

---

41 As temperature increases, the rate of enzyme activity increases (up to a point). What type of correlation is this?

(1)

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42 Which piece of apparatus is most suitable for measuring the volume of oxygen released during photosynthesis? The gas must be collected directly, without using water displacement.

- ☐ A) Measuring cylinder
- ☐ B) Pipette
- ☐ C) Burette
- ☐ D) Gas syringe

---

43 Which piece of apparatus should be used to collect and measure the carbon dioxide released by respiring seeds?

- ☐ A) Top-pan balance
- ☐ B) Measuring cylinder
- ☐ C) Gas syringe
- ☐ D) Pipette

---

44 A student took three repeat volume readings: 56 cm^3, 58 cm^3 and 71 cm^3. Calculate the mean of the two consistent readings.

(1)

---

45 Match each term to its definition.
Terms: 1. Reproducibility 2. Accuracy
Definitions:
A. How close measurements are to the true value.
B. How well results agree when different people use different equipment.

(1)

---

46 Three readings taken at 25 s were: 18 cm^3, 19 cm^3 and 32 cm^3. Calculate the mean using only the two consistent (non-anomalous) readings.

(1)

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47 A container of cleaning powder has a symbol showing a skull and crossbones. What hazard does this represent?

- ☐ A) Irritant
- ☐ B) Toxic
- ☐ C) Flammable
- ☐ D) Corrosive

---

48 Give one reason why you should read a measuring cylinder at eye level.

.....

(1)

---

49 Calculate the percentage increase in temperature from 25°C to 50°C during an experiment.

(1)

---

50 A piece of string was measured five times: 32.2 cm, 32.6 cm, 32.1 cm, 32.7 cm, 32.3 cm. Calculate the range.

(1)

---

51 Why must you read a gas syringe at the same height as the scale marking?

(1)

---

52 At t = 15 s, three repeat readings were: 12 cm^3, 13 cm^3 and 28 cm^3. Calculate the mean excluding the anomalous result.

(1)

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53 A metal rod was measured five times: 45.3 cm, 45.7 cm, 45.2 cm, 45.8 cm, 45.4 cm. Calculate the range.

(1)

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54 A student measures the mass of a metal block five times and obtains: 165 g, 166 g, 164 g, 165 g, 166 g. Calculate the mean mass.

(1)

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Mark scheme · 3.4 Working Scientifically: 1-hour Pack

Question 1

4 cm (oe) **B1**

Answer: 4 cm

Question 2

E (thermometer) **B1**

Answer: E) thermometer

Question 3

12.2 mm (oe) **B1**

Answer: 12.2 mm

Question 4

cm^3 (oe) **B1**

Answer: cm^3

Question 5

B (ammeter) **B1**

Answer: B) ammeter

Question 6

30°C (oe) **B1**

Answer: 30°C

Question 7

31.5 cm^3 (oe) **B1**

Answer: 31.5 cm^3

Question 8

D (current) **B1**

Answer: D) current

Question 9

0.6 cm (oe) **B1**

Answer: 0.6 cm

Question 10

2 g (oe) **B1**

Answer: 2 g

Question 11

B (balance) **B1**

Answer: B) balance

Question 12

43 cm^3 (oe) **B1**

Answer: 43 cm^3

Question 13

C (Gas syringe) cao **B1**

Answer: C) Gas syringe

Question 14

A (stopwatch) **B1**

Answer: A) stopwatch

Question 15

2.5 cm (oe) **B1**

Answer: 2.5 cm

Question 16

0.6 cm (oe) **B1**

Answer: 0.6 cm

Question 17

E (potential difference) **B1**

Answer: E) potential difference

Question 18

°C (degrees Celsius) (oe) **B1**

Answer: °C (degrees Celsius)

Question 19

35.34 cm (oe) **B1**

Answer: 35.34 cm

Question 20

29 cm^3 (oe) **B1**

Answer: 29 cm^3

Question 21

42.5°C (oe) **B1**

Answer: 42.5°C

Question 22

D (Corrosive) cao **B1**

Answer: D) Corrosive

Question 23

B (Corrosive) cao **B1**

Answer: B) Corrosive

Question 24

5 cm^3 (oe) **B1**

Answer: 5 cm^3

Question 25

cm^3 (oe) **B1**

Answer: cm^3

Question 26

cm^3 (oe) **B1**

Answer: cm^3

Question 27

45.5 cm^3 (oe) **B1**

Answer: 45.5 cm^3

Question 28

A (positive) correlation (oe) **B1**

Answer: A (positive) correlation

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Question 29

200% (oe) **B1**

Answer: 200%

Question 30

A negative correlation (oe) **B1**

Answer: A negative correlation

Question 31

1-B, 2-A (oe) **B1**

Answer: 1-B, 2-A

Question 32

400% (oe) **B1**

Answer: 400%

Question 33

A (Toxic) cao **B1**

Answer: A) Toxic

Question 34

200% (oe) **B1**

Answer: 200%

Question 35

0.2 mm (oe) **B1**

Answer: 0.2 mm

Question 36

5°C (oe) **B1**

Answer: 5°C

Question 37

A (positive) correlation (oe) **B1**

Answer: A (positive) correlation

Question 38

°C (degrees Celsius) (oe) **B1**

Answer: °C (degrees Celsius)

Question 39

42.5 cm (oe) **B1**

Answer: 42.5 cm

Question 40

1-A, 2-B (oe) **B1**

Answer: 1-A, 2-B

Question 41

A positive correlation (oe) **B1**

Answer: A positive correlation

Question 42

D (Gas syringe) cao **B1**

Answer: D) Gas syringe

Question 43

C (Gas syringe) cao **B1**

Answer: C) Gas syringe

Question 44

57 cm^3 (oe) **B1**

Answer: 57 cm^3

Question 45

1-B, 2-A (oe) **B1**

Answer: 1-B, 2-A

Question 46

18.5 cm^3 (oe) **B1**

Answer: 18.5 cm^3

Question 47

B (Toxic) cao **B1**

Answer: B) Toxic

Question 48

To avoid parallax error (oe) **B1**

Answer: To avoid parallax error

Question 49

100% (oe) **B1**

Answer: 100%

Question 50

0.6 cm (oe) **B1**

Answer: 0.6 cm

Question 51

To avoid parallax error (oe) **B1**

Answer: To avoid parallax error

Question 52

12.5 cm^3 (oe) **B1**

Answer: 12.5 cm^3

Question 53

0.6 cm (oe) **B1**

Answer: 0.6 cm

Question 54

165.2 g (oe) **B1**

Answer: 165.2 g

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