3.2 Chemistry: Materials: 2-hour Pack

ISEB CE 13+ Science (Chemistry) · Calculator allowed · about 120 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Which of these is an element?

- [ ] A) carbon dioxide
- [ ] B) ink
- [ ] C) brass
- [ ] D) sulfur
- [ ] E) magnesium oxide

---

2 Which of these elements is NOT a metal?

- [ ] A) zinc
- [ ] B) carbon
- [ ] C) iron
- [ ] D) calcium
- [ ] E) tin

---

3 Which statement is NOT true of a liquid?

- [ ] A) it can be poured and has a fixed volume
- [ ] B) it takes the shape of its container but keeps a fixed volume
- [ ] C) its particles are close together but can slide past one another
- [ ] D) its particles are packed in a regular pattern
- [ ] E) its particles are close together but arranged randomly

---

4 Which of these substances is a solid at room temperature?

- [ ] A) oxygen
- [ ] B) ethanol
- [ ] C) iron
- [ ] D) chlorine
- [ ] E) methane

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5 A stone has a mass of 87.5 g and a density of 2.5 g/cm3. Calculate its volume in cm3.

- ☐ A) 35 cm^3
- ☐ B) 350 cm^3
- ☐ C) 3.5 cm^3
- ☐ D) 218.75 cm^3
- ☐ E) 85 cm^3

---

6 Which of these is NOT an element?

- ☐ A) sulfur
- ☐ B) iron
- ☐ C) nitrogen
- ☐ D) helium
- ☐ E) water

---

7 Which of these elements is a non-metal?

- ☐ A) iron
- ☐ B) lead
- ☐ C) zinc
- ☐ D) iodine
- ☐ E) copper

---

8 Which statement is NOT true of a gas?

- ☐ A) it fills any container completely
- ☐ B) its particles are far apart and move quickly in all directions
- ☐ C) it has neither a fixed shape nor a fixed volume
- ☐ D) it can be compressed easily
- ☐ E) it can be poured and has a fixed volume

---

9 Which of these substances is a solid at room temperature?

- ☐ A) nitrogen
- ☐ B) iodine
- ☐ C) bromine
- ☐ D) neon
- ☐ E) hydrogen

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10 A technician tests four metal rods to measure the resistance in each circuit using identical voltmeters and ammeters. State the piece of equipment used to measure the current flowing through each rod.

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11 A stone has a mass of 75 g and a density of 3 g/cm3. Calculate its volume in cm3.

- ☐ A) 25 cm^3
- ☐ B) 225 cm^3
- ☐ C) 72 cm^3
- ☐ D) 0.04 cm^3
- ☐ E) 250 cm^3

---

12 An engineer is choosing a material to build the main support beams of a footbridge over a river. She is considering three materials: mild steel, reinforced concrete and carbon-fibre composite. Discuss which material would be the most suitable, using ideas about the properties of materials (such as strength, stiffness, density, cost and resistance to corrosion) to support your answer.

(6)

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13 Which of these elements is a metal?

- ☐ A) sulfur
- ☐ B) aluminium
- ☐ C) carbon
- ☐ D) phosphorus
- ☐ E) helium

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14 Which statement is NOT true of a liquid?

- [ ] A) its particles are held in fixed positions and can only vibrate
- [ ] B) its particles are close together but can slide past one another
- [ ] C) its particles are close together but arranged randomly
- [ ] D) it can be poured and has a fixed volume
- [ ] E) it takes the shape of its container but keeps a fixed volume

---

15 A solid block has a mass of 3200 kg and a volume of 4 m^3. Calculate its density in kg/m3.

- [ ] A) 3196 kg/m3
- [ ] B) 12800 kg/m3
- [ ] C) 8000 kg/m3
- [ ] D) 3204 kg/m3
- [ ] E) 800 kg/m3

---

16 Which of these is NOT a mixture?

- [ ] A) air
- [ ] B) crude oil
- [ ] C) ink
- [ ] D) calcium carbonate
- [ ] E) sea water

---

17 Which of these elements is a metal?

- [ ] A) phosphorus
- [ ] B) argon
- [ ] C) lead
- [ ] D) hydrogen
- [ ] E) oxygen

---

18 Which of these substances is NOT a liquid at room temperature?

- [ ] A) ethanol
- [ ] B) water
- [ ] C) bromine
- [ ] D) mercury
- [ ] E) sodium

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19 A metal object has a mass of 82.5 g and a density of 1.5 g/cm3. Calculate its volume in cm3.

- ☐ A) 81 cm^3
- ☐ B) 123.75 cm^3
- ☐ C) 55 cm^3
- ☐ D) 550 cm^3
- ☐ E) 5.5 cm^3

---

20 Which of these is NOT a compound?

- ☐ A) iron oxide
- ☐ B) carbon dioxide
- ☐ C) ammonia
- ☐ D) brass
- ☐ E) methane

---

21 Which of these elements is a non-metal?

- ☐ A) oxygen
- ☐ B) sodium
- ☐ C) magnesium
- ☐ D) gold
- ☐ E) lead

---

22 Which of these substances is NOT a liquid at room temperature?

- ☐ A) mercury
- ☐ B) iron
- ☐ C) water
- ☐ D) ethanol
- ☐ E) bromine

---

23 A group of pupils collect a water sample from a river estuary. The water contains mud and dissolved minerals. Name the technique the pupils should use to remove the mud from the mineral water.

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(1)

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24 Which of these substances is a solid at room temperature?

- [ ] A) nitrogen
- [ ] B) hydrogen
- [ ] C) mercury
- [ ] D) carbon
- [ ] E) carbon dioxide

---

25 Which of these is a mixture?

- [ ] A) oxygen
- [ ] B) sulfur
- [ ] C) sea water
- [ ] D) sodium chloride
- [ ] E) carbon

---

26 Which of these elements is a metal?

- [ ] A) hydrogen
- [ ] B) copper
- [ ] C) oxygen
- [ ] D) iodine
- [ ] E) helium

---

27 Which of these substances is NOT a liquid at room temperature?

- [ ] A) ethanol
- [ ] B) mercury
- [ ] C) bromine
- [ ] D) water
- [ ] E) calcium

---

28 A metal object has a mass of 1200 kg and a volume of 2 m^3. Calculate its density in kg/m3.

- [ ] A) 6000 kg/m3
- [ ] B) 1202 kg/m3
- [ ] C) 1198 kg/m3
- [ ] D) 600 kg/m3
- [ ] E) 2400 kg/m3

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29 Which of these is NOT an element?

- [ ] A) copper
- [ ] B) ammonia
- [ ] C) helium
- [ ] D) nitrogen
- [ ] E) iron

---

30 Which of these elements is a non-metal?

- [ ] A) argon
- [ ] B) aluminium
- [ ] C) iron
- [ ] D) magnesium
- [ ] E) gold

---

31 Which of these substances is NOT a solid at room temperature?

- [ ] A) gold
- [ ] B) carbon
- [ ] C) sulfur
- [ ] D) silver
- [ ] E) helium

---

32 A solid block has a density of 0.5 g/cm3 and a volume of 80 cm^3. Calculate its mass in g.

- [ ] A) 80.5 g
- [ ] B) 400 g
- [ ] C) 40 g
- [ ] D) 4 g
- [ ] E) 160 g

---

33 Which of these is a compound?

- [ ] A) carbon
- [ ] B) sea water
- [ ] C) sulfur
- [ ] D) water
- [ ] E) hydrogen

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34 Which of these elements is a non-metal?

- [ ] A) silver
- [ ] B) zinc
- [ ] C) helium
- [ ] D) iron
- [ ] E) calcium

---

35 Which of these substances is NOT a solid at room temperature?

- [ ] A) zinc
- [ ] B) silver
- [ ] C) lead
- [ ] D) gold
- [ ] E) methane

---

36 A sample of material has a density of 2 g/cm3 and a volume of 10 cm^3. Calculate its mass in g.

- [ ] A) 200 g
- [ ] B) 20 g
- [ ] C) 5 g
- [ ] D) 12 g
- [ ] E) 0.2 g

---

37 Which of these is a compound?

- [ ] A) methane
- [ ] B) helium
- [ ] C) air
- [ ] D) crude oil
- [ ] E) sulfur

---

38 Which of these elements is a metal?

- [ ] A) bromine
- [ ] B) iodine
- [ ] C) phosphorus
- [ ] D) sulfur
- [ ] E) iron

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39 Which of these substances is NOT a gas at room temperature?

- ☐ A) oxygen
- ☐ B) hydrogen
- ☐ C) mercury
- ☐ D) neon
- ☐ E) chlorine

---

40 A solid block has a mass of 70 g and a density of 2 g/cm3. Calculate its volume in cm3.

- ☐ A) 68 cm^3
- ☐ B) 35 cm^3
- ☐ C) 350 cm^3
- ☐ D) 3.5 cm^3
- ☐ E) 140 cm^3

---

41 A technician measures how temperature changes when four metal rods are heated in an experiment. State the piece of equipment used to measure the temperature of each rod.

(1)

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42 Which of these is NOT a mixture?

- ☐ A) methane
- ☐ B) air
- ☐ C) soil
- ☐ D) ink
- ☐ E) brass

---

43 Which of these elements is a non-metal?

- ☐ A) lead
- ☐ B) magnesium
- ☐ C) sodium
- ☐ D) nitrogen
- ☐ E) iron

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44 Which of these substances is a solid at room temperature?

- [ ] A) silver
- [ ] B) carbon dioxide
- [ ] C) hydrogen
- [ ] D) oxygen
- [ ] E) chlorine

---

45 A stone has a mass of 24 g and a density of 0.8 g/cm3. It is lowered into a measuring cylinder holding 40 cm^3 of water. Calculate the new water level in cm3.

- [ ] A) 59.2 cm^3
- [ ] B) 70 cm^3
- [ ] C) 30 cm^3
- [ ] D) 10 cm^3
- [ ] E) 64 cm^3

---

46 Which of these elements is a metal?

- [ ] A) hydrogen
- [ ] B) iodine
- [ ] C) zinc
- [ ] D) bromine
- [ ] E) phosphorus

---

47 Which of these substances is NOT a gas at room temperature?

- [ ] A) nitrogen
- [ ] B) methane
- [ ] C) hydrogen
- [ ] D) magnesium
- [ ] E) chlorine

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48 A metal object has a mass of 4000 kg and a density of 1000 kg/m3. Calculate its volume in m3.

- [ ] A) 3000 m^3
- [ ] B) 0.25 m^3
- [ ] C) 40 m^3
- [ ] D) 4000000 m^3
- [ ] E) 4 m^3

---

49 Which of these is NOT a mixture?

- [ ] A) iron oxide
- [ ] B) muddy water
- [ ] C) soil
- [ ] D) air
- [ ] E) sea water

---

50 Which of these elements is a non-metal?

- [ ] A) copper
- [ ] B) magnesium
- [ ] C) neon
- [ ] D) potassium
- [ ] E) tin

---

51 A solid block has a density of 0.5 g/cm3 and a volume of 5 cm^3. Calculate its mass in g.

- [ ] A) 2.5 g
- [ ] B) 25 g
- [ ] C) 5.5 g
- [ ] D) 10 g
- [ ] E) 0.1 g

---

52 Which of these substances is NOT a liquid at room temperature?

- [ ] A) ethanol
- [ ] B) carbon dioxide
- [ ] C) mercury
- [ ] D) water
- [ ] E) bromine

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53 Which of these is a compound?

- [ ] A) helium
- [ ] B) air
- [ ] C) ink
- [ ] D) carbon dioxide
- [ ] E) muddy water

---

54 Which of these elements is a non-metal?

- [ ] A) tin
- [ ] B) sodium
- [ ] C) lead
- [ ] D) silver
- [ ] E) sulfur

---

55 Which of these substances is NOT a liquid at room temperature?

- [ ] A) aluminium
- [ ] B) bromine
- [ ] C) water
- [ ] D) mercury
- [ ] E) ethanol

---

56 A sample of material of mass 240 g is lowered into a measuring cylinder. The water level rises from 40 cm^3 to 70 cm^3. Calculate the density of the sample of material in g/cm3.

- [ ] A) 80 g/cm3
- [ ] B) 8 g/cm3
- [ ] C) 6 g/cm3
- [ ] D) 0.125 g/cm3
- [ ] E) 7200 g/cm3

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57 Which gas makes up about 0.04% of dry air?

- [ ] A) oxygen
- [ ] B) carbon dioxide
- [ ] C) argon
- [ ] D) helium
- [ ] E) nitrogen

---

58 Which of these is a compound?

- [ ] A) carbon
- [ ] B) soil
- [ ] C) copper
- [ ] D) iron oxide
- [ ] E) gold

---

59 Which of these elements is NOT a non-metal?

- [ ] A) helium
- [ ] B) iodine
- [ ] C) oxygen
- [ ] D) carbon
- [ ] E) magnesium

---

60 Which of these substances is a liquid at room temperature?

- [ ] A) helium
- [ ] B) copper
- [ ] C) potassium
- [ ] D) carbon dioxide
- [ ] E) mercury

---

61 What is the change of state from liquid to solid called?

- [ ] A) evaporation
- [ ] B) freezing
- [ ] C) melting
- [ ] D) sublimation
- [ ] E) condensation

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62 An alloy of iron and nickel contains these metals in the ratio 3:2 by mass. If 250 g of alloy is made, calculate the mass of nickel.

(1)

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63 A stone has a density of 2.5 g/cm3 and a volume of 10 cm^3. Calculate its mass in g.

- ☐ A) 25 g
- ☐ B) 4 g
- ☐ C) 250 g
- ☐ D) 0.25 g
- ☐ E) 12.5 g

---

64 Which gas makes up about 78% of dry air?

- ☐ A) methane
- ☐ B) helium
- ☐ C) argon
- ☐ D) nitrogen
- ☐ E) hydrogen

---

65 Which of these is an element?

- ☐ A) muddy water
- ☐ B) granite
- ☐ C) copper
- ☐ D) calcium carbonate
- ☐ E) sodium chloride

---

66 Which statement is true of a liquid?

- ☐ A) it has a fixed shape
- ☐ B) it keeps its shape without a container
- ☐ C) it fills any container completely
- ☐ D) it takes the shape of its container but keeps a fixed volume
- ☐ E) its particles are packed in a regular pattern

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67 Which of these substances is NOT a gas at room temperature?

- ☐ A) sulfur
- ☐ B) hydrogen
- ☐ C) argon
- ☐ D) oxygen
- ☐ E) chlorine

---

68 What is the change of state from gas to liquid called?

- ☐ A) evaporation
- ☐ B) condensation
- ☐ C) freezing
- ☐ D) melting
- ☐ E) sublimation

---

69 Bronze is an alloy made of copper and tin. A craftsperson makes 400 g of bronze using copper and tin in the ratio 9:1 by mass. Calculate the mass of copper in the alloy.

(1)

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70 A metal object has a mass of 300 g and a density of 4 g/cm3. Calculate its volume in cm3.

- ☐ A) 296 cm^3
- ☐ B) 1200 cm^3
- ☐ C) 750 cm^3
- ☐ D) 7.5 cm^3
- ☐ E) 75 cm^3

---

71 Roughly what percentage of dry air is carbon dioxide?

- ☐ A) about 10%
- ☐ B) about 50%
- ☐ C) about 0.04%
- ☐ D) about 5%
- ☐ E) about 78%

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72 Which of these elements is a metal?

- ☐ A) neon
- ☐ B) chlorine
- ☐ C) oxygen
- ☐ D) potassium
- ☐ E) helium

---

73 Which statement is true of a gas?

- ☐ A) it can be compressed easily
- ☐ B) its particles are packed in a regular pattern
- ☐ C) it can be poured and has a fixed volume
- ☐ D) it keeps its shape without a container
- ☐ E) its particles are close together but can slide past one another

---

74 Which of these substances is NOT a gas at room temperature?

- ☐ A) oxygen
- ☐ B) zinc
- ☐ C) helium
- ☐ D) neon
- ☐ E) nitrogen

---

75 What is the change of state from solid to liquid called?

- ☐ A) condensation
- ☐ B) sublimation
- ☐ C) evaporation
- ☐ D) melting
- ☐ E) freezing

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76 A sample of plant pigments needs to be separated into its different colours. Name the technique used.

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77 A sample of material has a mass of 429 g and a density of 7.8 g/cm3. Calculate its volume in cm3.

- A) 550 cm^3
- B) 55 cm^3
- C) 5.5 cm^3
- D) 3346.2 cm^3
- E) 421.2 cm^3

---

78 Roughly what percentage of dry air is oxygen?

- A) about 10%
- B) about 1%
- C) about 21%
- D) about 5%
- E) about 90%

---

79 Which of these elements is a non-metal?

- A) aluminium
- B) zinc
- C) calcium
- D) gold
- E) hydrogen

---

80 Which statement is NOT true of a solid?

- A) it keeps its shape without a container
- B) it has a fixed shape
- C) its particles are packed in a regular pattern
- D) its particles are held in fixed positions and can only vibrate
- E) it takes the shape of its container but keeps a fixed volume

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81 Which of these substances is a liquid at room temperature?

- ☐ A) oxygen
- ☐ B) water
- ☐ C) copper
- ☐ D) potassium
- ☐ E) magnesium

---

82 What is the change of state from solid to gas called?

- ☐ A) evaporation
- ☐ B) melting
- ☐ C) sublimation
- ☐ D) condensation
- ☐ E) freezing

---

83 Steel is an alloy made by mixing iron and carbon. A factory produces 400 g of steel using iron and carbon in the ratio 99:1 by mass. Calculate the mass of iron used.

(1)

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84 A sample of material has a mass of 90 g and a density of 2 g/cm3. Calculate its volume in cm3.

- ☐ A) 88 cm^3
- ☐ B) 450 cm^3
- ☐ C) 180 cm^3
- ☐ D) 45 cm^3
- ☐ E) 4.5 cm^3

---

85 Which of these is an element?

- ☐ A) sodium chloride
- ☐ B) muddy water
- ☐ C) air
- ☐ D) helium
- ☐ E) brass

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86 Which of these elements is a non-metal?

- ☐ A) tin
- ☐ B) bromine
- ☐ C) sodium
- ☐ D) magnesium
- ☐ E) calcium

---

87 Which statement is NOT true of a gas?

- ☐ A) it can be compressed easily
- ☐ B) it fills any container completely
- ☐ C) it has a fixed shape
- ☐ D) it has neither a fixed shape nor a fixed volume
- ☐ E) its particles are far apart and move quickly in all directions

---

88 Which of these substances is a solid at room temperature?

- ☐ A) oxygen
- ☐ B) ethanol
- ☐ C) water
- ☐ D) helium
- ☐ E) magnesium

---

89 An alloy is made from nickel and copper in the ratio 1:4 by mass. If 50 g of nickel is used, calculate the total mass of the alloy.

(1)

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90 A stone has a mass of 202.5 g and a density of 2.7 g/cm3. Calculate its volume in cm3.

- ☐ A) 750 cm^3
- ☐ B) 546.75 cm^3
- ☐ C) 75 cm^3
- ☐ D) 7.5 cm^3
- ☐ E) 199.8 cm^3

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91 Which gas makes up about 21% of dry air?

- [ ] A) carbon dioxide
- [ ] B) hydrogen
- [ ] C) helium
- [ ] D) methane
- [ ] E) oxygen

---

92 Which of these is a compound?

- [ ] A) sulfur
- [ ] B) gold
- [ ] C) granite
- [ ] D) magnesium oxide
- [ ] E) helium

---

93 Which of these elements is NOT a non-metal?

- [ ] A) aluminium
- [ ] B) carbon
- [ ] C) phosphorus
- [ ] D) helium
- [ ] E) chlorine

---

94 Which statement is true of a gas?

- [ ] A) it has a fixed shape
- [ ] B) it fills any container completely
- [ ] C) its particles are close together but arranged randomly
- [ ] D) its particles are held in fixed positions and can only vibrate
- [ ] E) its particles are close together but can slide past one another

---

95 Which of these substances is a gas at room temperature?

- [ ] A) sodium
- [ ] B) magnesium
- [ ] C) carbon
- [ ] D) nitrogen
- [ ] E) gold

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96 Evaporation is the change of state from which of these?

- [ ] A) liquid to solid
- [ ] B) liquid to gas
- [ ] C) solid to liquid
- [ ] D) solid to gas
- [ ] E) gas to liquid

---

97 A technician compares how well four metal rods conduct electricity. She uses a voltmeter and battery to test each rod in an identical circuit. State the piece of equipment used to measure the voltage across each rod.

(1)

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98 A solid block has a mass of 90 g and a volume of 30 cm^3. Calculate its density in g/cm3.

- [ ] A) 2700 g/cm3
- [ ] B) 30 g/cm3
- [ ] C) 3 g/cm3
- [ ] D) 60 g/cm3
- [ ] E) 120 g/cm3

---

99 Roughly what percentage of dry air is argon?

- [ ] A) about 1%
- [ ] B) about 90%
- [ ] C) about 50%
- [ ] D) about 10%
- [ ] E) about 5%

---

100 Which of these is NOT a compound?

- [ ] A) calcium carbonate
- [ ] B) carbon dioxide
- [ ] C) methane
- [ ] D) iron oxide
- [ ] E) ink

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101 Which of these elements is NOT a non-metal?

- ☐ A) copper
- ☐ B) chlorine
- ☐ C) neon
- ☐ D) oxygen
- ☐ E) bromine

---

102 Which statement is NOT true of a liquid?

- ☐ A) its particles are close together but arranged randomly
- ☐ B) its particles are close together but can slide past one another
- ☐ C) it takes the shape of its container but keeps a fixed volume
- ☐ D) it fills any container completely
- ☐ E) it can be poured and has a fixed volume

---

103 Which of these substances is a gas at room temperature?

- ☐ A) potassium
- ☐ B) chlorine
- ☐ C) iron
- ☐ D) calcium
- ☐ E) magnesium

---

104 Condensation is the change of state from which of these?

- ☐ A) solid to gas
- ☐ B) solid to liquid
- ☐ C) gas to liquid
- ☐ D) liquid to solid
- ☐ E) liquid to gas

---

105 A solid block has a mass of 200 g and a density of 2.5 g/cm3. Calculate its volume in cm3.

- ☐ A) 197.5 cm^3
- ☐ B) 8 cm^3
- ☐ C) 800 cm^3
- ☐ D) 500 cm^3
- ☐ E) 80 cm^3

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106 Roughly what percentage of dry air is nitrogen?

- [ ] A) about 50%
- [ ] B) about 21%
- [ ] C) about 78%
- [ ] D) about 1%
- [ ] E) about 90%

---

107 Which of these elements is NOT a non-metal?

- [ ] A) tin
- [ ] B) carbon
- [ ] C) phosphorus
- [ ] D) hydrogen
- [ ] E) bromine

---

108 Which statement is NOT true of a gas?

- [ ] A) it has neither a fixed shape nor a fixed volume
- [ ] B) it keeps its shape without a container
- [ ] C) it can be compressed easily
- [ ] D) it fills any container completely
- [ ] E) its particles are far apart and move quickly in all directions

---

109 Which of these substances is a solid at room temperature?

- [ ] A) nitrogen
- [ ] B) neon
- [ ] C) methane
- [ ] D) helium
- [ ] E) zinc

---

110 Sublimation is the change of state from which of these?

- [ ] A) gas to liquid
- [ ] B) solid to liquid
- [ ] C) liquid to solid
- [ ] D) solid to gas
- [ ] E) liquid to gas

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111 A sample of material has a density of 0.8 g/cm3 and a volume of 55 cm^3. Calculate its mass in g.

- [ ] A) 68.75 g
- [ ] B) 4.4 g
- [ ] C) 44 g
- [ ] D) 55.8 g
- [ ] E) 440 g

---

112 Which of these is NOT a mixture?

- [ ] A) air
- [ ] B) crude oil
- [ ] C) soil
- [ ] D) helium
- [ ] E) sea water

---

113 Which of these elements is NOT a metal?

- [ ] A) magnesium
- [ ] B) chlorine
- [ ] C) iron
- [ ] D) silver
- [ ] E) zinc

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114 Which statement is true of a solid?

- ☐ A) it fills any container completely
- ☐ B) it can be compressed easily
- ☐ C) its particles are far apart and move quickly in all directions
- ☐ D) it can be poured and has a fixed volume
- ☐ E) it keeps its shape without a container

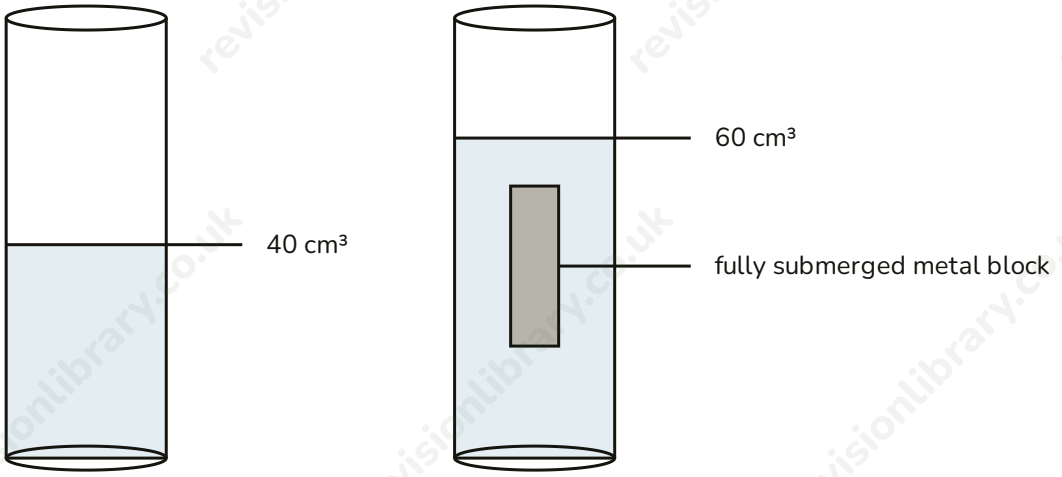
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115 Which of these substances is NOT a liquid at room temperature?

- ☐ A) zinc
- ☐ B) ethanol
- ☐ C) water
- ☐ D) mercury
- ☐ E) bromine

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116 A pupil wants to find the density of a small, irregularly shaped metal block. She uses a measuring cylinder containing 40 cm³ of water. When the metal block is lowered into the cylinder, the water level rises to 60 cm³. The mass of the block is 158 g.



(a) Calculate the volume of the metal block. **(2)**

.....

(b) Calculate the density of the metal block. Give your answer to 2 significant figures. **(2)**

.....

(c) The table shows the densities of four metals: aluminium 2.7 g/cm^3, iron 7.9 g/cm^3, copper 8.9 g/cm^3, lead 11.3 g/cm^3. Use your answer to (b) to identify the metal in the block. **(1)**

Metal	Density (g/cm³)
Aluminium	2.7
Iron	7.9
Copper	8.9
Lead	11.3

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117 Freezing is the change of state from which of these?

- [ ] A) gas to liquid
- [ ] B) liquid to solid
- [ ] C) solid to gas
- [ ] D) liquid to gas
- [ ] E) solid to liquid

---

118 A solid block has a mass of 350 g and a density of 5 g/cm3. Calculate its volume in cm3.

- [ ] A) 1750 cm^3
- [ ] B) 345 cm^3
- [ ] C) 7 cm^3
- [ ] D) 70 cm^3
- [ ] E) 700 cm^3

---

119 Which of these is NOT a compound?

- [ ] A) sodium chloride
- [ ] B) carbon dioxide
- [ ] C) nitrogen
- [ ] D) iron oxide
- [ ] E) methane

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Mark scheme · 3.2 Chemistry: Materials: 2-hour Pack

Question 1

D (sulfur) **B1**

Answer: D) sulfur

Question 2

B (carbon) **B1**

Answer: B) carbon

Question 3

D (its particles are packed in a regular pattern) **B1**

Answer: D) its particles are packed in a regular pattern

Question 4

C (iron) **B1**

Answer: C) iron

Question 5

A (35 cm^3) **B1**

Answer: A) 35 cm^3

Question 6

E (water) **B1**

Answer: E) water

Question 7

D (iodine) **B1**

Answer: D) iodine

Question 8

E (it can be poured and has a fixed volume) **B1**

Answer: E) it can be poured and has a fixed volume

Question 9

B (iodine) **B1**

Answer: B) iodine

Question 10

Ammeter (oe) **B1**

Answer: Ammeter

Question 11

A (25 cm^3) **B1**

Answer: A) 25 cm^3

Question 12

Level 1 Basic, isolated statements about one material or one property, with little or no comparison between materials. Limited use of scientific vocabulary. **1-2**

Level 2 Some relevant properties of at least two materials are described and linked to the choice of material, with a basic comparison and a conclusion, though the reasoning may be incomplete or not fully justified. **3-4**

Level 3 A clear, well-reasoned discussion comparing the properties (e.g. strength, stiffness, density, cost, corrosion resistance) of at least two, ideally all three, materials, leading to a justified conclusion about the most suitable material for the footbridge, using accurate scientific vocabulary throughout. **5-6**

Indicative content:

- Mild steel: very strong in tension and compression, and stiff, but is dense (heavy) and can corrode (rust) if not protected/painted regularly, which adds to maintenance cost.
- Reinforced concrete: strong in compression and, with steel reinforcement, reasonably strong in tension too; it is cheap and durable, but very dense (heavy), and beams may need to be bulky.
- Carbon-fibre composite: very strong and stiff for its low weight (low density), and does not corrode, giving low maintenance, but it is much more expensive to produce than steel or concrete.
- A balanced conclusion might recommend steel or reinforced concrete for a low-cost, standard footbridge, or carbon-fibre composite where light weight and low maintenance are prioritised and cost is less important.
- Credit any other relevant, correctly explained property (e.g. ease of shaping, sustainability/recyclability, expected lifespan) used to support a justified conclusion.

Question 13

B (aluminium) **B1**

Answer: B) aluminium

Question 14

A (its particles are held in fixed positions and can only vibrate) **B1**

Answer: A) its particles are held in fixed positions and can only vibrate

Question 15

E (800 kg/m3) **B1**

Answer: E) 800 kg/m3

Question 16

D (calcium carbonate) **B1**

Answer: D) calcium carbonate

Question 17

C (lead) **B1**

Answer: C) lead

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Question 18

E (sodium) **B1**

Answer: E) sodium

Question 19

C (55 cm^3) **B1**

Answer: C) 55 cm^3

Question 20

D (brass) **B1**

Answer: D) brass

Question 21

A (oxygen) **B1**

Answer: A) oxygen

Question 22

B (iron) **B1**

Answer: B) iron

Question 23

Filtration (oe) **B1**

Answer: Filtration

Question 24

D (carbon) **B1**

Answer: D) carbon

Question 25

C (sea water) **B1**

Answer: C) sea water

Question 26

B (copper) **B1**

Answer: B) copper

Question 27

E (calcium) **B1**

Answer: E) calcium

Question 28

D (600 kg/m3) **B1**

Answer: D) 600 kg/m3

Question 29

B (ammonia) **B1**

Answer: B) ammonia

Question 30

A (argon) **B1**

Answer: A) argon

Question 31

E (helium) **B1**

Answer: E) helium

Question 32

C (40 g) **B1**

Answer: C) 40 g

Question 33

D (water) **B1**

Answer: D) water

Question 34

C (helium) **B1**

Answer: C) helium

Question 35

E (methane) **B1**

Answer: E) methane

Question 36

B (20 g) **B1**

Answer: B) 20 g

Question 37

A (methane) **B1**

Answer: A) methane

Question 38

E (iron) **B1**

Answer: E) iron

Question 39

C (mercury) **B1**

Answer: C) mercury

Question 40

B (35 cm^3) **B1**

Answer: B) 35 cm^3

Question 41

Thermometer (oe) **B1**

Answer: Thermometer

Question 42

A (methane) **B1**

Answer: A) methane

Question 43

D (nitrogen) **B1**

Answer: D) nitrogen

Question 44

A (silver) **B1**

Answer: A) silver

Question 45

B (70 cm^3) **B1**

Answer: B) 70 cm^3

Question 46

C (zinc) **B1**

Answer: C) zinc

Question 47

D (magnesium) **B1**

Answer: D) magnesium

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Question 48

E ($4\ m^3$) **B1**

Answer: E) $4\ m^3$

Question 49

A (iron oxide) **B1**

Answer: A) iron oxide

Question 50

C (neon) **B1**

Answer: C) neon

Question 51

A (2.5 g) **B1**

Answer: A) 2.5 g

Question 52

B (carbon dioxide) **B1**

Answer: B) carbon dioxide

Question 53

D (carbon dioxide) **B1**

Answer: D) carbon dioxide

Question 54

E (sulfur) **B1**

Answer: E) sulfur

Question 55

A (aluminium) **B1**

Answer: A) aluminium

Question 56

B (8 g/cm3) **B1**

Answer: B) 8 g/cm3

Question 57

B (carbon dioxide) **B1**

Answer: B) carbon dioxide

Question 58

D (iron oxide) **B1**

Answer: D) iron oxide

Question 59

E (magnesium) **B1**

Answer: E) magnesium

Question 60

E (mercury) **B1**

Answer: E) mercury

Question 61

B (freezing) **B1**

Answer: B) freezing

Question 62

100 g (oe) **B1**

Answer: 100 g

Question 63

A (25 g) **B1**

Answer: A) 25 g

Question 64

D (nitrogen) **B1**

Answer: D) nitrogen

Question 65

C (copper) **B1**

Answer: C) copper

Question 66

D (it takes the shape of its container but keeps a fixed volume) **B1**

Answer: D) it takes the shape of its container but keeps a fixed volume

Question 67

A (sulfur) **B1**

Answer: A) sulfur

Question 68

B (condensation) **B1**

Answer: B) condensation

Question 69

360 g (oe) **B1**

Answer: 360 g

Question 70

E ($75\ cm^3$) **B1**

Answer: E) $75\ cm^3$

Question 71

C (about 0.04%) **B1**

Answer: C) about 0.04%

Question 72

D (potassium) **B1**

Answer: D) potassium

Question 73

A (it can be compressed easily) **B1**

Answer: A) it can be compressed easily

Question 74

B (zinc) **B1**

Answer: B) zinc

Question 75

D (melting) **B1**

Answer: D) melting

Question 76

Chromatography (oe) **B1**

Answer: Chromatography

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Question 77

B ($55\ cm^3$) **B1**

Answer: B) $55\ cm^3$

Question 78

C (about 21%) **B1**

Answer: C) about 21%

Question 79

E (hydrogen) **B1**

Answer: E) hydrogen

Question 80

E (it takes the shape of its container but keeps a fixed volume) **B1**

Answer: E) it takes the shape of its container but keeps a fixed volume

Question 81

B (water) **B1**

Answer: B) water

Question 82

C (sublimation) **B1**

Answer: C) sublimation

Question 83

396 g (oe) **B1**

Answer: 396 g

Question 84

D ($45\ cm^3$) **B1**

Answer: D) $45\ cm^3$

Question 85

D (helium) **B1**

Answer: D) helium

Question 86

B (bromine) **B1**

Answer: B) bromine

Question 87

C (it has a fixed shape) **B1**

Answer: C) it has a fixed shape

Question 88

E (magnesium) **B1**

Answer: E) magnesium

Question 89

250 g (oe) **B1**

Answer: 250 g

Question 90

C ($75\ cm^3$) **B1**

Answer: C) $75\ cm^3$

Question 91

E (oxygen) **B1**

Answer: E) oxygen

Question 92

D (magnesium oxide) **B1**

Answer: D) magnesium oxide

Question 93

A (aluminium) **B1**

Answer: A) aluminium

Question 94

B (it fills any container completely) **B1**

Answer: B) it fills any container completely

Question 95

D (nitrogen) **B1**

Answer: D) nitrogen

Question 96

B (liquid to gas) **B1**

Answer: B) liquid to gas

Question 97

Voltmeter (oe) **B1**

Answer: Voltmeter

Question 98

C (3 g/cm3) **B1**

Answer: C) 3 g/cm3

Question 99

A (about 1%) **B1**

Answer: A) about 1%

Question 100

E (ink) **B1**

Answer: E) ink

Question 101

A (copper) **B1**

Answer: A) copper

Question 102

D (it fills any container completely) **B1**

Answer: D) it fills any container completely

Question 103

B (chlorine) **B1**

Answer: B) chlorine

Question 104

C (gas to liquid) **B1**

Answer: C) gas to liquid

Question 105

E ($80\ cm^3$) **B1**

Answer: E) $80\ cm^3$

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Question 106

C (about 78%) **B1**

Answer: C) about 78%

Question 107

A (tin) **B1**

Answer: A) tin

Question 108

B (it keeps its shape without a container) **B1**

Answer: B) it keeps its shape without a container

Question 109

E (zinc) **B1**

Answer: E) zinc

Question 110

D (solid to gas) **B1**

Answer: D) solid to gas

Question 111

C (44 g) **B1**

Answer: C) 44 g

Question 112

D (helium) **B1**

Answer: D) helium

Question 113

B (chlorine) **B1**

Answer: B) chlorine

Question 114

E (it keeps its shape without a container) **B1**

Answer: E) it keeps its shape without a container

Question 115

A (zinc) **B1**

Answer: A) zinc

Question 116

(a) 60 - 40 **M1**

(a) 20 cm^3, cao **A1**

(a) Answer: 20 cm^3

(b) 158 / their (a) **M1**

(b) 7.9 g/cm^3, ft from (a) **A1**

(b) Answer: 7.9 g/cm^3

(c) iron, ft from (b) **B1**

(c) Answer: Iron

Question 117

B (liquid to solid) **B1**

Answer: B) liquid to solid

Question 118

D (70 cm^3) **B1**

Answer: D) 70 cm^3

Question 119

C (nitrogen) **B1**

Answer: C) nitrogen

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