Work Done

Questions:

Total mark – 26

1.

A scientist uses different drivers to test the stopping distances of the same car.

Look at the results.

Driver	Speed (m/s)	Thinking distance (m)	Braking distance (m)
A	8	6	6
B	16	13	24
C	32	24	96
D	16	12	22
E	8	5	6
F	32	30	120

Driver **C** travels at 32 m/s on the road and then stops. The car has a mass of 1200 kg.

i. Show that the **kinetic energy** stored by the car at 32 m/s is 614 000 J.

[3]

ii. Describe what happens to the kinetic energy of the car as it brakes and stops.

---

[2]

iii. The braking distance of the car is 96 m.

Calculate the **braking force** on the car.

Give your answer to **4** significant figures.

Answer = _____ N **[3]**

2.

A car on a roller coaster is stationary at the top of a slope.

It has a weight of 6 500 N and a potential energy of 217 000 J.

Calculate how high above the ground it is.

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answer: ..... m

[2]

3.

A pump lifts 500 kg of water to a water tank at the top of a building.

The water gains 240 000 J of gravitational potential energy.

The gravitational field strength is 10 N/kg.

Use the equation: Potential energy = Mass × Height × Gravitational field strength

Calculate the height of the water tank.

A 4.8 m
B 48 m
C 240 m
D 480 m

Your answer ☐

[1]

4.

This question is about an electric kettle.

i. An electric kettle is filled with water, connected to the mains and switched on. The electricity for the kettle is generated in a coal-fired power station. Describe the energy transfer that occurs when the kettle is switched on. Include ideas about energy stores in your answer.

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[2]

ii. The mains supply has a potential difference of 230 V.

The kettle has a current of 5.0 A. The kettle is switched on for 2.0 minutes.

Calculate the total energy transferred to the kettle in 2.0 minutes.

Total energy transferred = ... J **[4]**

5.

In the brakes of a car there are brake pads and a brake disc, as shown in **Fig. 21.2**.

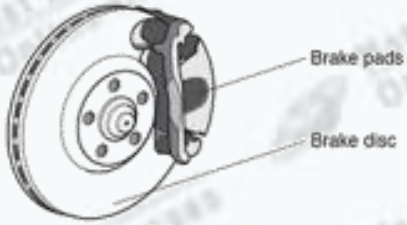

Fig. 21.2

When a car stops, energy transfers between stores.

The brake pads squeeze the brake disc and cause a friction force.

i. Explain how braking stops the car.

Include ideas about **energy stores** in your answer.

---**[2]**

ii. High speed cars have ventilated brakes with air holes in the disc, as shown in **Fig. 21.3.**

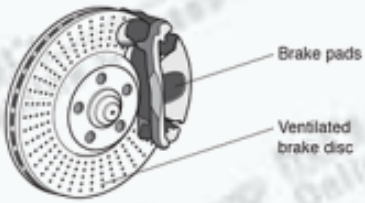

Fig. 21.3

The air holes allow more air to circulate around the disc.

Suggest how these brakes can reduce braking distances.

---**[1]**

6.

(a). A student wants to investigate how a ball bounces.

He drops the ball from different heights and measures the bounce height each time.

He calculates the ratio bounce height / drop height.

The table shows his results.

Drop height (cm)	Bounce height (cm)	Bounce height / drop height
100	70	0.70
80	64	0.80
60	54	0.90
40	40	1.00
20		

The student predicts the ratio bounce height / drop height to be 1:1 when the drop height is 20 cm.

i. Suggest why he has made this prediction.

---[1]

ii. Use ideas about energy to explain why this prediction cannot be correct.

---[1]

(b). Suggest **two** improvements to his experiment.

(c). The mass of the ball is 60 grams.

i. Calculate the mass of the ball in kg.

Mass = ... kg **[1]**

ii. Calculate the potential energy of the ball when it is 0.80 m above the ground.

Use your answer to **(i)** and the equation:

potential energy = mass × height × gravitational field strength

Gravitational field strength = 10 N / kg

Potential energy = ... J **[2]**